Feedback MTurk Study

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Introduction

Load Data

```
# ?register_google
# register_google(key = "AIzaSyCTk2a5vIEqcvgz9KmQmItoNF7J8_hiMMk")
#
# #uses Google API to obtain location data based on longitude and latitude....dont use unless necessary
# d_respondents_only[ , c("housenumber", "street", "city", "county", "state", "zip", "country") := revg
# #
# head(d_respondents_only)
# #
# #
# fwrite(d_respondents_only, file='datatable_clean_survey_responses_v2.dta')

d_respondents <- fread('datatable_clean_survey_responses_v2.dta')

setnames(d_respondents,
         old = c('Duration (in seconds)'),
         new = c('Survey_Duration'))
kable(t(head(d_respondents[, names(d_respondents)[!names(d_respondents) %in% c(
    "Q70_First Click","Q70_Last Click","Q70_Page Submit","Q70_Click Count",
    "Q90_First Click","Q90_Last Click","Q90_Page Submit","Q90_Click Count",
    "Q61_First Click","Q61_Last Click","Q61_Page Submit","Q61_Click Count",
    "Q62_First Click","Q62_Last Click","Q62_Page Submit","Q62_Click Count",
    "Q63_First Click","Q63_Last Click","Q63_Page Submit","Q63_Click Count",
    "Q64_First Click","Q64_Last Click","Q64_Page Submit","Q64_Click Count",
    "Q65_First Click","Q65_Last Click","Q65_Page Submit","Q65_Click Count",
    "Q66_First Click","Q66_Last Click","Q66_Page Submit","Q66_Click Count",
    "Q67_First Click","Q67_Last Click","Q67_Page Submit","Q67_Click Count",
    "Q68_First Click","Q68_Last Click","Q68_Page Submit","Q68_Click Count",
    "housenumber","street","zip")],with=FALSE],3)))
```

StartDate	2020-11-09 20:46:55	2020-11-09 20:47:33	2020-11-09 20:47:23
EndDate	2020-11-09 20:50:39	2020-11-09 20:51:24	2020-11-09 20:51:35
Status	IP Address	IP Address	IP Address
IPAddress	174.88.123.135	172.93.166.91	68.36.215.223
Progress	100	100	100
Survey_Duration	223	231	251
Finished	TRUE	TRUE	TRUE
RecordedDate	2020-11-09 20:50:39	2020-11-09 20:51:25	2020-11-09 20:51:35

ResponseId	R_VLuUQ4C82PP9HEd	R_29cCZD1XK1dpmdY	R_3lVN8EncJofnqnV
RecipientLastName	NA	NA	NA
RecipientFirstName	NA	NA	NA
RecipientEmail	NA	NA	NA
ExternalReference	NA	NA	NA
LocationLatitude	43.68	33.75	42.66
LocationLongitude	-79.29	-84.39	-83.12
DistributionChannel	anonymous	anonymous	anonymous
UserLanguage	EN	EN	EN
Amazon_Turk_ID	A4D99Y82KOLC8	A1AC47WJLNW4G7	A77K8W55MJEKX
Gender	Male	Male	Female
Q82_3_TEXT	NA	NA	NA
Age_Range	35-44	25-34	45-54
Education_Level	Trade school	Master's degree and above	Bachelor's degree
Q1	Pneumonia	Pneumonia	Pneumonia
Q2	Normal	Normal	Pneumonia
Q3	Normal	Normal	Pneumonia
Q4	Pneumonia	Pneumonia	Pneumonia
Q5	Normal	Normal	Pneumonia
Q6	Pneumonia	Normal	Pneumonia
Q7	Pneumonia	Normal	Normal
Q8	Normal	Normal	Normal
Q9	Pneumonia	Normal	Pneumonia
Q10	Pneumonia	Pneumonia	Pneumonia
Control_Q1			
Q11	Normal	Normal	Pneumonia
Q12	Normal	Normal	Normal
Q13	Pnuemonia	Pnuemonia	Pnuemonia
Q14	Pneumonia	Normal	Pneumonia
Q15	Pneumonia	Normal	Pneumonia
Q16	Normal	Pneumonia	Pneumonia
Q17	Normal	Normal	Pneumonia
Q18	Pneumonia	Pneumonia	Pneumonia
Q19	Pneumonia	Normal	Pneumonia
Q20	Normal	Pneumonia	Pneumonia
Control_Q2			
Q21	Pneumonia	Normal	Pneumonia
Q22	Pneumonia	Pneumonia	Pneumonia
Q23	Normal	Pneumonia	Normal
Q24	Pneumonia	Normal	Pneumonia
Q25	Normal	Normal	Pneumonia
Q26	Pneumonia	Normal	Pneumonia
Q27	Pneumonia	Pneumonia	Pneumonia
Q28	Normal	Normal	Pneumonia
Q29	Normal	Pneumonia	Pneumonia
Q30	Pneumonia	Normal	Pneumonia
Q36			
Self_Reflect_Q1			
Q41			
Self_Reflect_Q2			
Q38			
Q43			
Q45	NA	NA	NA

Q47	NA	NA	NA
Q46	NA	NA	NA
Q48	NA	NA	NA
Total_Score	16	12	15
Random ID	14409	58508	96075
Assignment	FL_41	FL_16	FL_41
Q1_Score	0	0	0
Q2_Score	1	1	0
Q3_Score	0	0	1
Q4_Score	1	1	1
Q5_Score	1	1	0
Q6_Score	1	0	1
Q7_Score	1	0	0
Q8_Score	1	1	1
Q9_Score	1	0	1
Q10_Score	0	0	0
Q11_Score	0	0	1
Q12_Score	1	1	1
Q13_Score	0	0	0
Q14_Score	1	0	1
Q15_Score	0	1	0
Q16_Score	1	0	0
Q17_Score	0	0	1
Q18_Score	0	0	0
Q19_Score	1	0	1
Q20_Score	1	0	0
Q21_Score	0	1	0
Q22_Score	0	0	0
Q23_Score	0	1	0
Q24_Score	0	1	0
Q25_Score	0	0	1
Q26_Score	1	0	1
Q27_Score	1	1	1
Q28_Score	0	0	1
Q29_Score	1	0	0
Q30_Score	0	1	0
Assignment_Group	Negative Images	Positive Images	Negative Images
TaskPhase1_Score	0.7	0.4	0.5
TaskPhase2_Score	0.5	0.2	0.5
TaskPhase3_Score	0.3	0.5	0.4
city	Toronto	Atlanta	Rochester Hills
county	Canada	United States	United States
state	Ontario	Georgia	Michigan
country	Canada	United States	United States

```
nrow(d_respondents)
```

```
## [1] 350
```

```
#remove duplicate Amazon Turk IDs
nrow(d_respondents)  #350 rows
```

```
## [1] 350
```

```
d_respondents <- d_respondents[ !duplicated(d_respondents$Amazon_Turk_ID) , ]  #350 rows
```

EDA

Helper Functions

```
create_heatmap <- function(var1, var2) {
  ### Create a heatmap for a table of frequencies between two variables ###
  df <- data.frame(table(var1,var2))

  ggplot(df,aes(x=var1,y=var2)) +
    geom_tile(aes(fill=Freq,color=Freq),show.legend=FALSE,alpha=.8) +
    geom_text(aes(label=Freq)) +
    scale_fill_continuous(high = "darkslategray4", low = "powderblue")
}

g_legend<-function(a.gplot){
  #extract legend from a ggplot object
  #https://stackoverflow.com/questions/13649473/add-a-common-legend-for-combined-ggplots
  #https://github.com/hadley/ggplot2/wiki/Share-a-legend-between-two-ggplot2-graphs
  tmp <- ggplot_gtable(ggplot_build(a.gplot))
  leg <- which(sapply(tmp$grobs, function(x) x$name) == "guide-box")
  legend <- tmp$grobs[[leg]]
  return(legend)}
```

```
#some EDA

#d_respondents[ , table(state, country)]


table(d_respondents$state, d_respondents$country) %>%
        as.data.frame() %>%
        arrange(desc(Freq)) %>%
        filter(Freq>0)
```

```
##                        Var1           Var2 Freq
## 1                Tamil Nadu          India  107
## 2                California  United States   72
## 3                  New York  United States   22
## 4                    Kansas  United States   21
## 5                     Texas  United States   15
## 6                   Florida  United States    9
## 7             Massachusetts  United States    7
## 8                  Missouri  United States    6
## 9                Connecticut  United States    5
## 10                   Georgia  United States    5
## 11                   Indiana  United States    5
## 12                  Michigan  United States    5
## 13                New Jersey  United States    5
## 14                  Illinois  United States    4
## 15                  Virginia  United States    4
## 16                    Kerala          India    3
## 17               Maharashtra          India    3
```

```
## 18                   Colorado  United States    3
## 19                   Kentucky  United States    3
## 20                   Maryland  United States    3
## 21             North Carolina  United States    3
## 22                     Oregon  United States    3
## 23                    Ontario         Canada    2
## 24                    Alabama  United States    2
## 25                      Idaho  United States    2
## 26                  Minnesota  United States    2
## 27                Mississippi  United States    2
## 28                     Nevada  United States    2
## 29                       Ohio  United States    2
## 30               Pennsylvania  United States    2
## 31                 Washington  United States    2
## 32            Qarku i Tiranës        Albania    1
## 33            Khulna Division     Bangladesh    1
## 34                     Bahia         Brazil    1
## 35                   Atacama          Chile    1
## 36 Provence-Alpes-Côte d'Azur         France    1
## 37    Departamento de Olancho       Honduras    1
## 38             Andhra Pradesh          India    1
## 39                  Karnataka          India    1
## 40                   Sardegna          Italy    1
## 41                    England United Kingdom    1
## 42                    Arizona  United States    1
## 43                       Iowa  United States    1
## 44                  Louisiana  United States    1
## 45                      Maine  United States    1
## 46                   Nebraska  United States    1
## 47                   Oklahoma  United States    1
## 48             South Carolina  United States    1
## 49               South Dakota  United States    1
## 50                  Tennessee  United States    1
```

```
table(d_respondents$country) %>%
        as.data.frame() %>%
        arrange(desc(Freq))
```

```
##              Var1 Freq
## 1   United States  225
## 2           India  115
## 3          Canada    2
## 4         Albania    1
## 5      Bangladesh    1
## 6          Brazil    1
## 7           Chile    1
## 8          France    1
## 9        Honduras    1
## 10          Italy    1
## 11 United Kingdom    1
```

```
table(d_respondents$Total_Score) %>%
  as.data.frame() %>%
  arrange(desc(Var1))
```

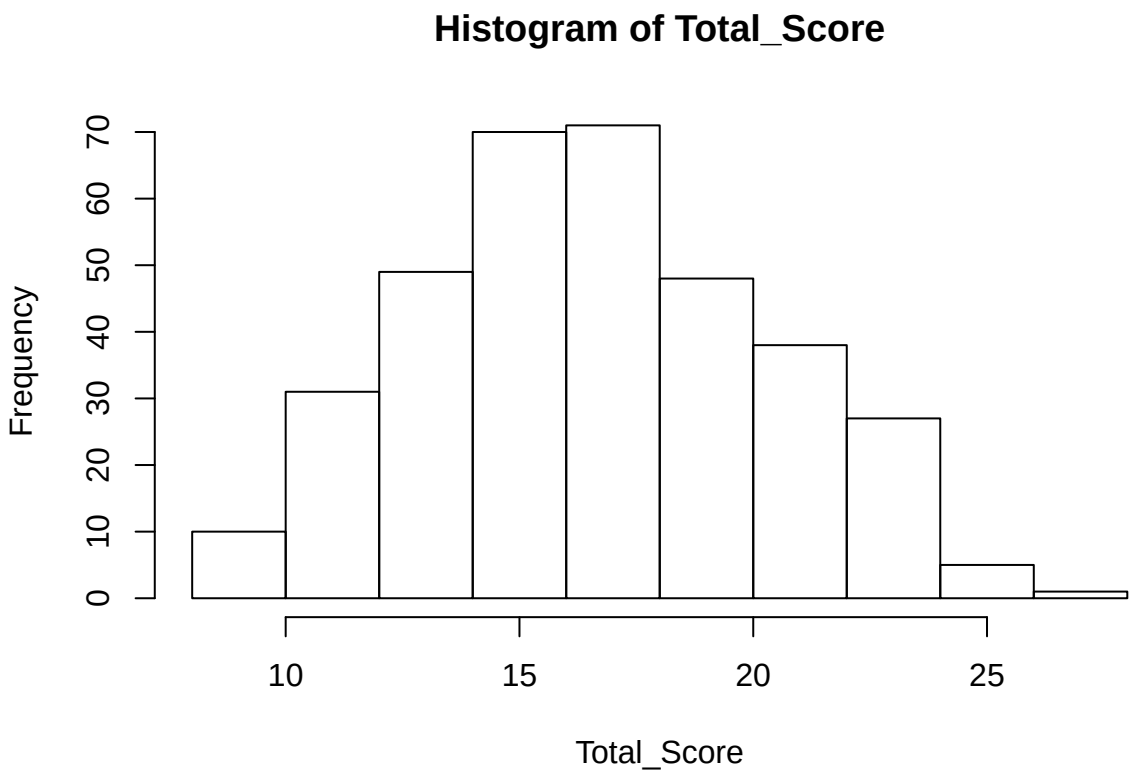
```
##    Var1 Freq
## 1    27    1
## 2    26    1
## 3    25    4
## 4    24   12
## 5    23   15
## 6    22   16
## 7    21   22
## 8    20   27
## 9    19   21
## 10   18   31
## 11   17   40
## 12   16   40
## 13   15   30
## 14   14   30
## 15   13   19
## 16   12   18
## 17   11   13
## 18   10    6
## 19    9    3
## 20    8    1
```

```
d_respondents %>%
  group_by(Assignment_Group) %>%
  summarise(mean = mean(Total_Score),
            count = n(),
            time_duration = mean(Survey_Duration))
```

```
## `summarise()` ungrouping output (override with `.groups` argument)
```

```
## # A tibble: 5 x 4
##   Assignment_Group  mean count time_duration
##   <chr>            <dbl> <int>         <dbl>
## 1 Control           16.7    69          638.
## 2 Medical Feedback  17.8    70          656.
## 3 Negative Images   16.5    72          783
## 4 Positive Images   17.3    70          505.
## 5 Self-Reflect      17.2    69          612.
```

```
#d_respondents[ , .(count = .N, avg = mean(Total_Score)), by=Assignment_Group] #same thing

d_respondents[ , hist(Total_Score)]
```




```
## $breaks
##  [1]  8 10 12 14 16 18 20 22 24 26 28
##
## $counts
##  [1] 10 31 49 70 71 48 38 27  5  1
##
## $density
##  [1] 0.014286 0.044286 0.070000 0.100000 0.101429 0.068571 0.054286 0.038571
##  [9] 0.007143 0.001429
##
## $mids
##  [1]  9 11 13 15 17 19 21 23 25 27
##
## $xname
## [1] "Total_Score"
##
## $equidist
## [1] TRUE
##
## attr(,"class")
## [1] "histogram"
```

```
tapply(d_respondents$Total_Score, d_respondents$Assignment_Group, summary)
```

```
## $Control
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     8.0    14.0    16.0    16.7    19.0    24.0
##
## $`Medical Feedback`
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
```

```
##    10.0    16.0    17.5    17.8    20.0    24.0
##
## $`Negative Images`
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     9.0    13.0    16.0    16.5    19.2    25.0
##
## $`Positive Images`
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     9.0    15.0    17.0    17.3    20.0    27.0
##
## $`Self-Reflect`
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     9.0    14.0    17.0    17.2    20.0    25.0
```

```
tapply(d_respondents$Total_Score, d_respondents$Assignment_Group, sd)
```

```
##          Control Medical Feedback  Negative Images  Positive Images
##            3.659            3.279            3.996            3.817
##     Self-Reflect
##            3.882
```

```
d_respondents[ , sd(Total_Score)]
```

```
## [1] 3.743
```

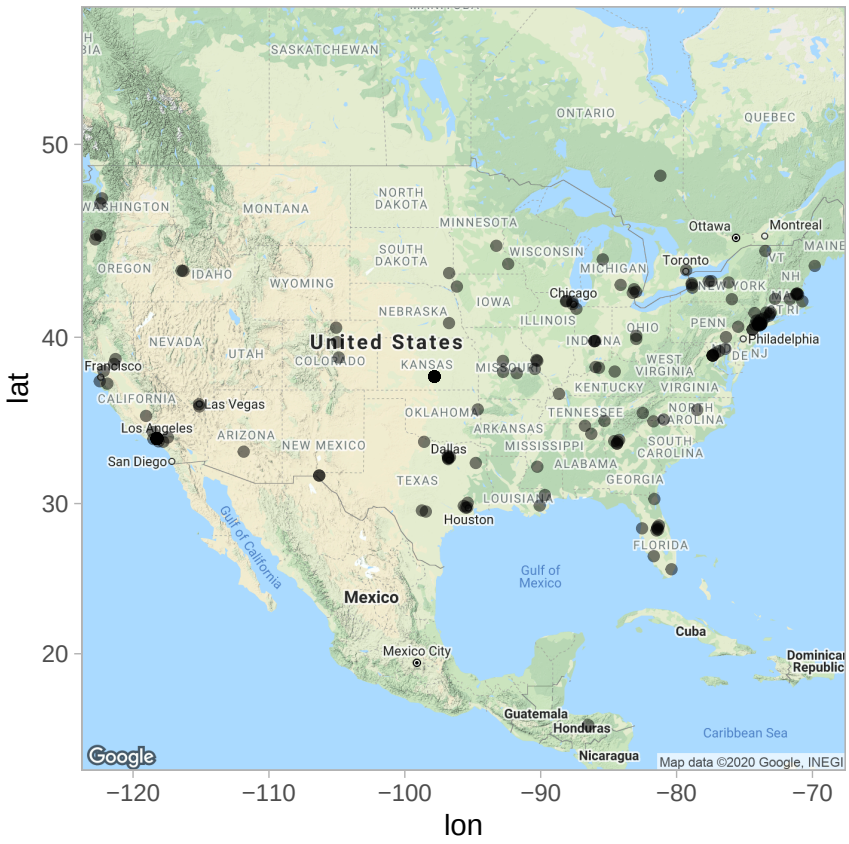
```
library(ggmap)
?register_google
register_google(key = "AIzaSyCTk2a5vIEqcvgz9KmQmItoNF7J8_hiMMk")
# ggmap_show_api_key()

us_map<-get_map(location='united states', zoom=4, maptype = "terrain",
             source='google',color='color')
```

```
## Source : https://maps.googleapis.com/maps/api/staticmap?center=united%20states&zoom=4&size=640x640&s
```

```
## Source : https://maps.googleapis.com/maps/api/geocode/json?address=united+states&key=xxx
```

```
ggmap(us_map) + geom_point(x=d_respondents$LocationLongitude, y = d_respondents$LocationLatitude, show_
```

```
## Warning: `show_guide` has been deprecated. Please use `show.legend` instead.
```



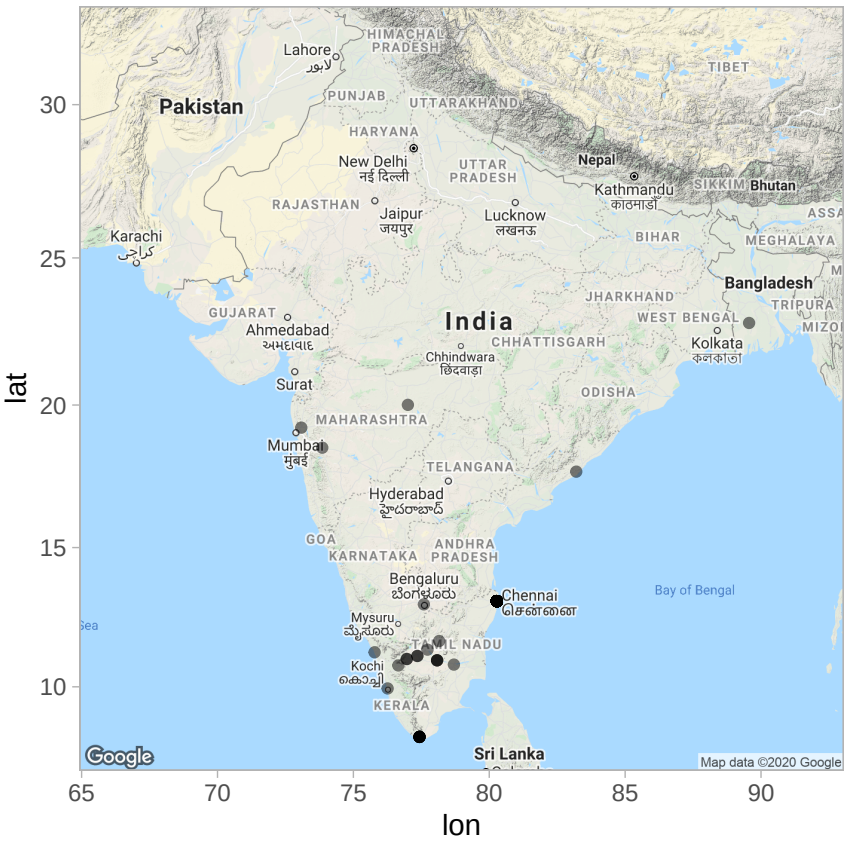

```
india_map<-get_map(location='india', zoom=5, maptype = "terrain",
             source='google',color='color')
```

```
## Source : https://maps.googleapis.com/maps/api/staticmap?center=india&zoom=5&size=640x640&scale=2&map
```

```
## Source : https://maps.googleapis.com/maps/api/geocode/json?address=india&key=xxx
```

```
ggmap(india_map) + geom_point(x=d_respondents$LocationLongitude, y = d_respondents$LocationLatitude, sh
```

```
## Warning: `show_guide` has been deprecated. Please use `show.legend` instead.
```



Randomization Check

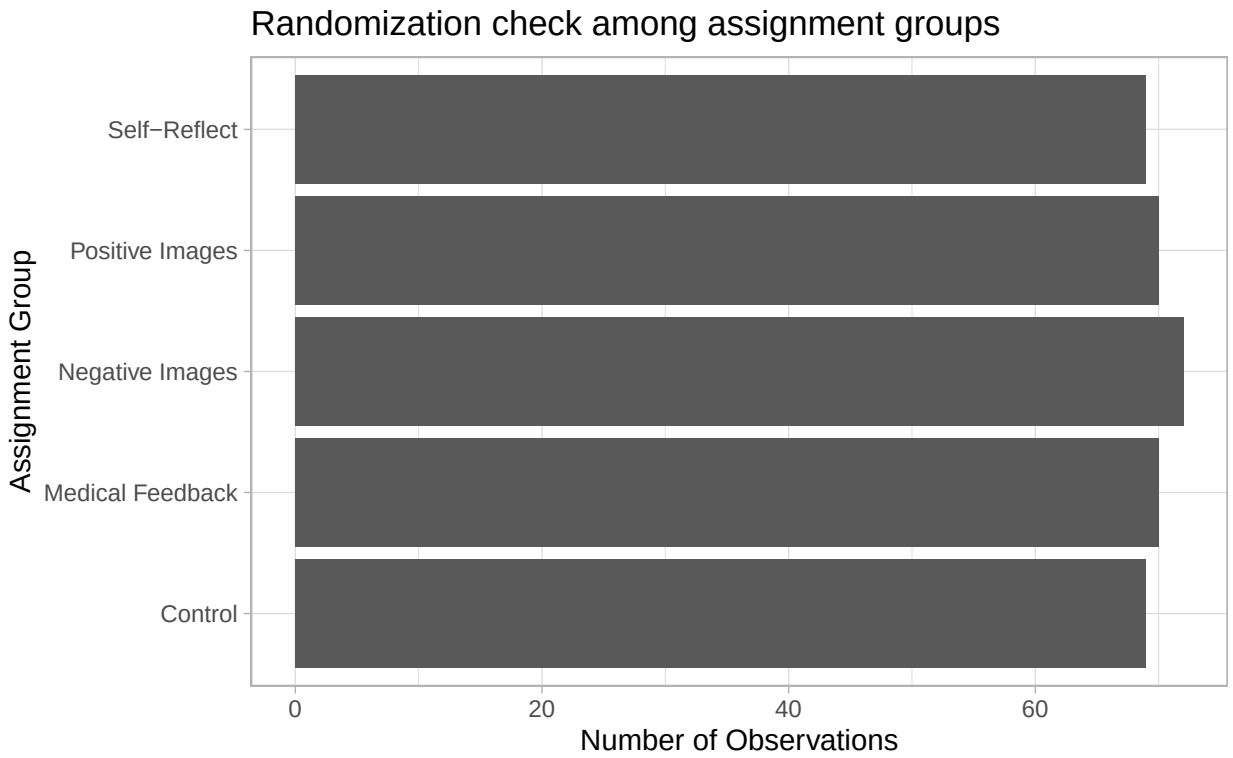
```
#http://www.sthda.com/english/wiki/chi-square-goodness-of-fit-test-in-r

respondent_counts <- d_respondents[ , .(.N), keyby=Assignment_Group]

respondent_counts_chisq_test <- chisq.test(respondent_counts[,2], p=c(1/5, 1/5, 1/5, 1/5, 1/5))
pander(respondent_counts_chisq_test,style ='rmarkdown')
```

Table 2: Chi-squared test for given probabilities: `respondent_counts[, 2]`

Test statistic	df	P value
0.08571	4	0.9991

```
respondent_counts %>%
  ggplot(aes(x = Assignment_Group,y=N)) +
  geom_bar(stat = 'identity') +
  coord_flip() +
  xlab('Assignment Group') +
  ylab('Number of Observations') +
  labs(title='Randomization check among assignment groups',
       caption = paste0('Assuming equal distribution among assignment groups, a chi-squared goodness of
                        round(respondent_counts_chisq_test$parameter,4),' degrees of \nfreedom ', 'yiel
                        round(respondent_counts_chisq_test$p.value,4),
```

```
                        ', suggesting that the observed proportions are not significantly different fro
  theme(plot.caption = element_text(hjust = 0))
```



Assuming equal distribution among assignment groups, a chi−squared goodness of fit test wit
freedom yields p=0.9991, suggesting that the observed proportions are not significantly differe
expected proportions at a significance level of 0.05.

```
#p-value = 0.9991, which is greater than significance level of 0.05.
#We can conclude that the observed proportions are not significantly different from the expected propor
```

Covariate Balance Check

```
#let's consider adding age bins and education bins

d_respondents[ Age_Range == "18-24", age_bin := 1]
d_respondents[ Age_Range == "25-34", age_bin := 2]
d_respondents[ Age_Range == "35-44", age_bin := 3]
d_respondents[ Age_Range == "45-54", age_bin := 4]
d_respondents[ Age_Range == "55-64", age_bin := 5]
d_respondents[ Age_Range == "Above 65", age_bin := 6]

d_respondents[ Education_Level == "Associate's degree", edu_bin := 1]
d_respondents[ Education_Level == "Bachelor's degree", edu_bin := 2]
d_respondents[ Education_Level == "High school", edu_bin := 3]
d_respondents[ Education_Level == "Master's degree and above", edu_bin := 4]
d_respondents[ Education_Level == "Some high school", edu_bin := 5]
d_respondents[ Education_Level == "Trade school", edu_bin := 6]

d_respondents[ Assignment_Group == "Control", assign_bin := 1]
d_respondents[ Assignment_Group == "Medical Feedback", assign_bin := 2]
```

```
d_respondents[ Assignment_Group == "Negative Images", assign_bin := 3]
d_respondents[ Assignment_Group == "Positive Images", assign_bin := 4]
d_respondents[ Assignment_Group == "Self-Reflect", assign_bin := 5]

d_respondents[ , US_Dummy := ifelse(country == "United States", 1, 0)]

d_respondents[ , Male_Dummy := ifelse(Gender == "Male", 1, 0)]

#add treatment dummy

d_respondents[ , Treatment_Dummy := ifelse(Assignment_Group != "Control", 1, 0)]

#head(d_respondents)
```

```
d_respondents %>%
  group_by(Assignment_Group) %>%
  summarise(num_respondents = n(),
            pre_treatment_avg = mean(TaskPhase1_Score),
            taskphase2_avg = mean(TaskPhase2_Score),
            taskphase3_avg = mean(TaskPhase3_Score))
```

```
## `summarise()` ungrouping output (override with `.groups` argument)
```

```
## # A tibble: 5 x 5
##   Assignment_Group num_respondents pre_treatment_a~ taskphase2_avg
##   <chr>                      <int>            <dbl>          <dbl>
## 1 Control                       69            0.607          0.461
## 2 Medical Feedback              70            0.634          0.523
## 3 Negative Images               72            0.578          0.494
## 4 Positive Images               70            0.614          0.514
## 5 Self-Reflect                  69            0.599          0.526
## # ... with 1 more variable: taskphase3_avg <dbl>
```

```
d_respondents %>%
  group_by(Assignment_Group) %>%
  summarise(num_respondents = n(),
            avg_age_bin = mean(age_bin),
            avg_edu_bin = mean(edu_bin),
            male = mean(Male_Dummy),
            US = mean(US_Dummy))
```

```
## `summarise()` ungrouping output (override with `.groups` argument)
```

```
## # A tibble: 5 x 6
##   Assignment_Group num_respondents avg_age_bin avg_edu_bin  male    US
##   <chr>                      <int>       <dbl>       <dbl> <dbl> <dbl>
## 1 Control                       69        2.68        2.61 0.609 0.652
## 2 Medical Feedback              70        2.63        2.47 0.586 0.529
## 3 Negative Images               72        2.62        2.58 0.583 0.625
## 4 Positive Images               70        2.86        2.6  0.586 0.714
## 5 Self-Reflect                  69        2.83        2.42 0.594 0.696
```

```
d_respondents %>%
  group_by(Assignment_Group) %>%
  summarise(num_respondents = n(),
            )
```

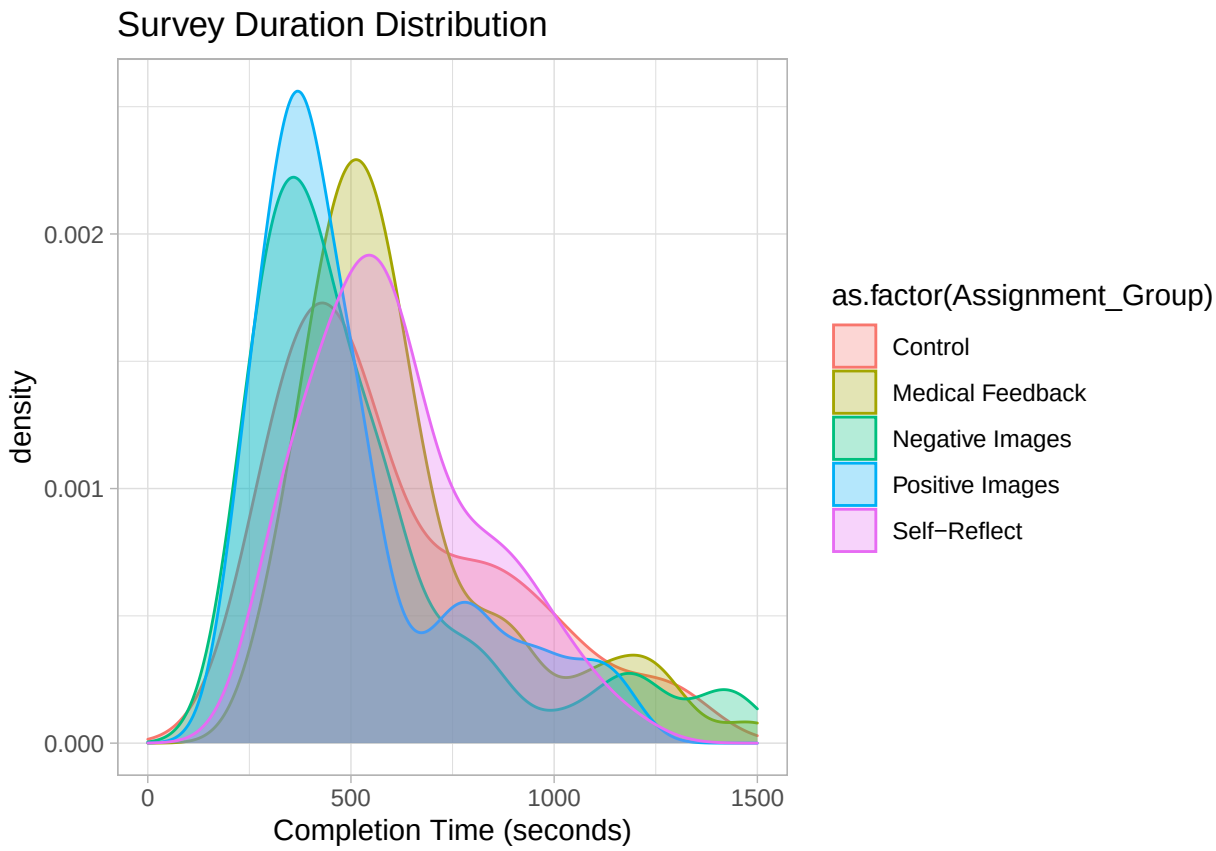
```
## `summarise()` ungrouping output (override with `.groups` argument)
```

```
## # A tibble: 5 x 2
##   Assignment_Group num_respondents
##   <chr>                      <int>
## 1 Control                       69
## 2 Medical Feedback              70
## 3 Negative Images               72
## 4 Positive Images               70
## 5 Self-Reflect                  69
```

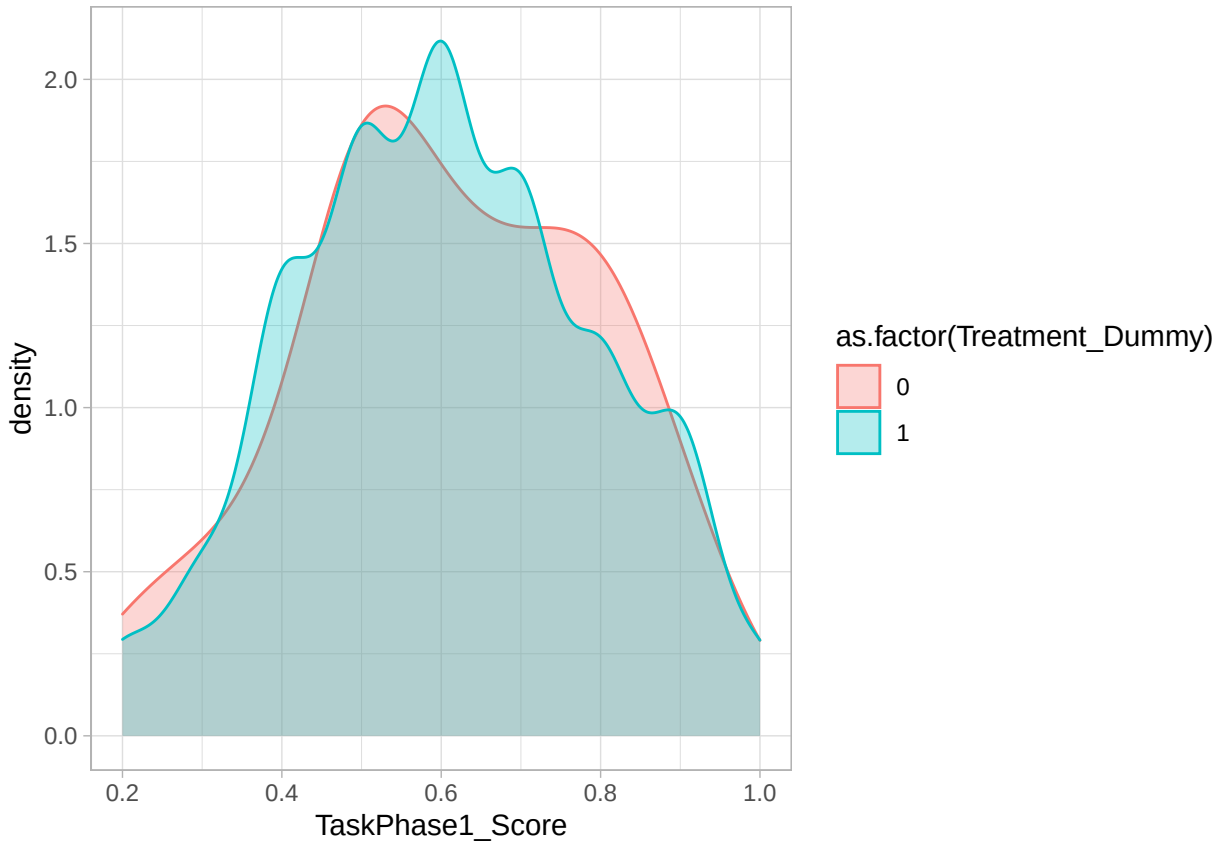
Visuals

```
#Density distribution of Survey Duration
ggplot(d_respondents, aes(x=Survey_Duration, colour=as.factor(Assignment_Group), fill = as.factor(Assig
  geom_density(alpha = 0.3) +
  xlim(0, 1500) +
  xlab("Completion Time (seconds)") +
  ggtitle("Survey Duration Distribution")
```

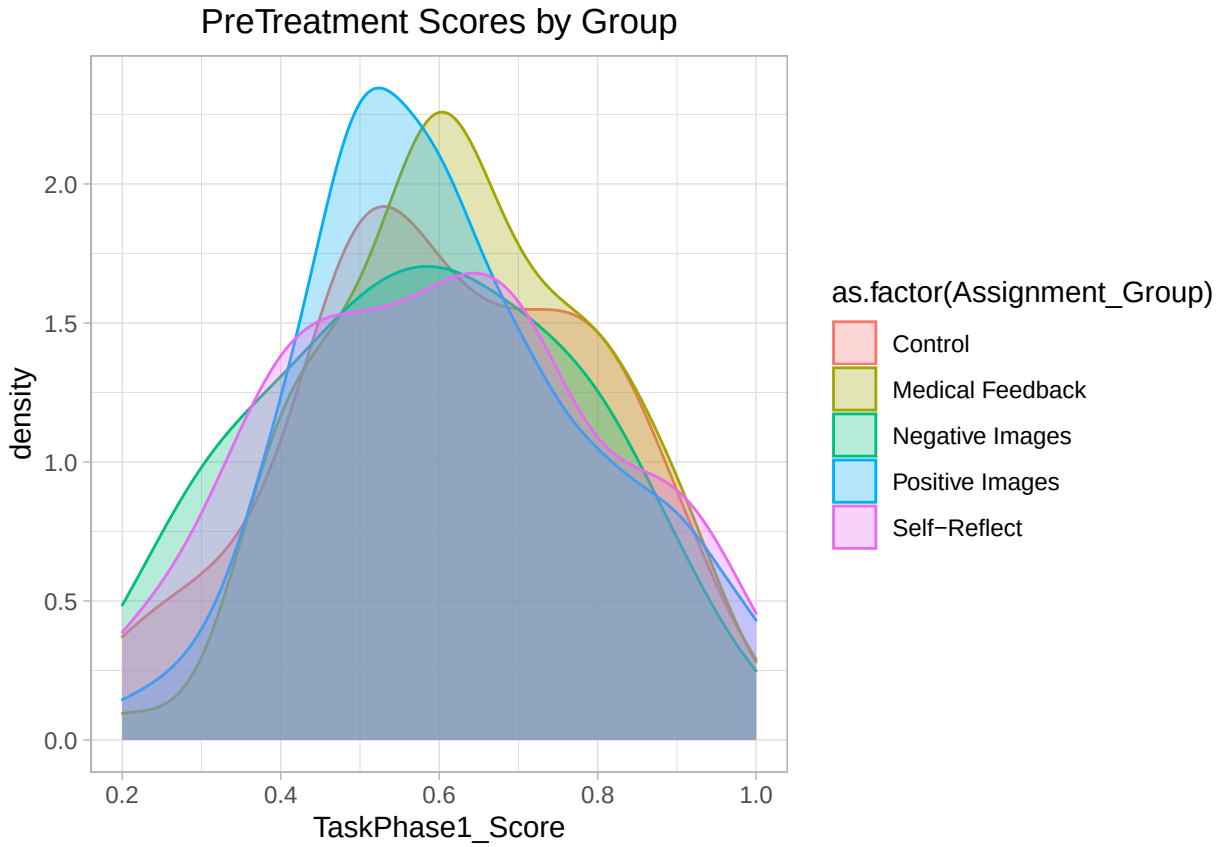
```
## Warning: Removed 6 rows containing non-finite values (stat_density).
```



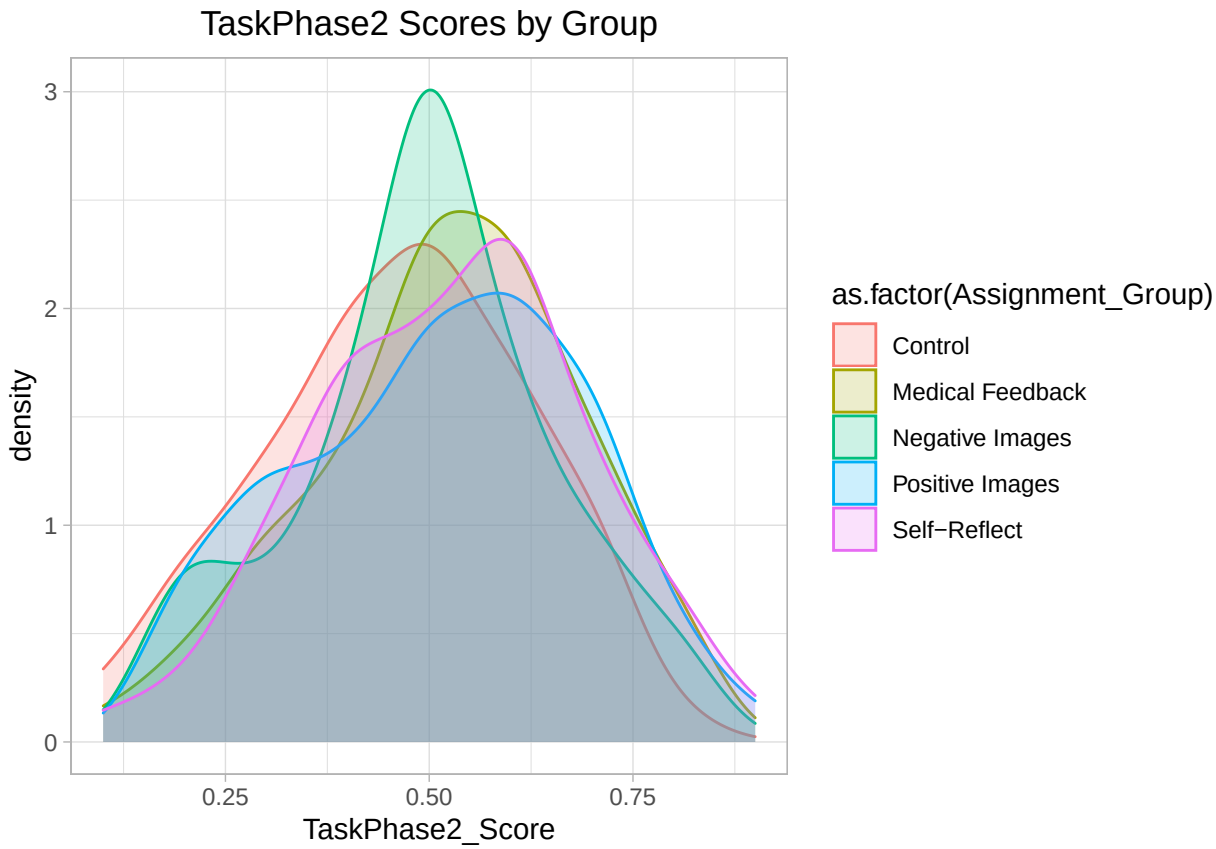

```
#Comparing pretreatment values
ggplot(d_respondents, aes(x=TaskPhase1_Score, fill = as.factor(Treatment_Dummy), colour=as.factor(Treatm
```



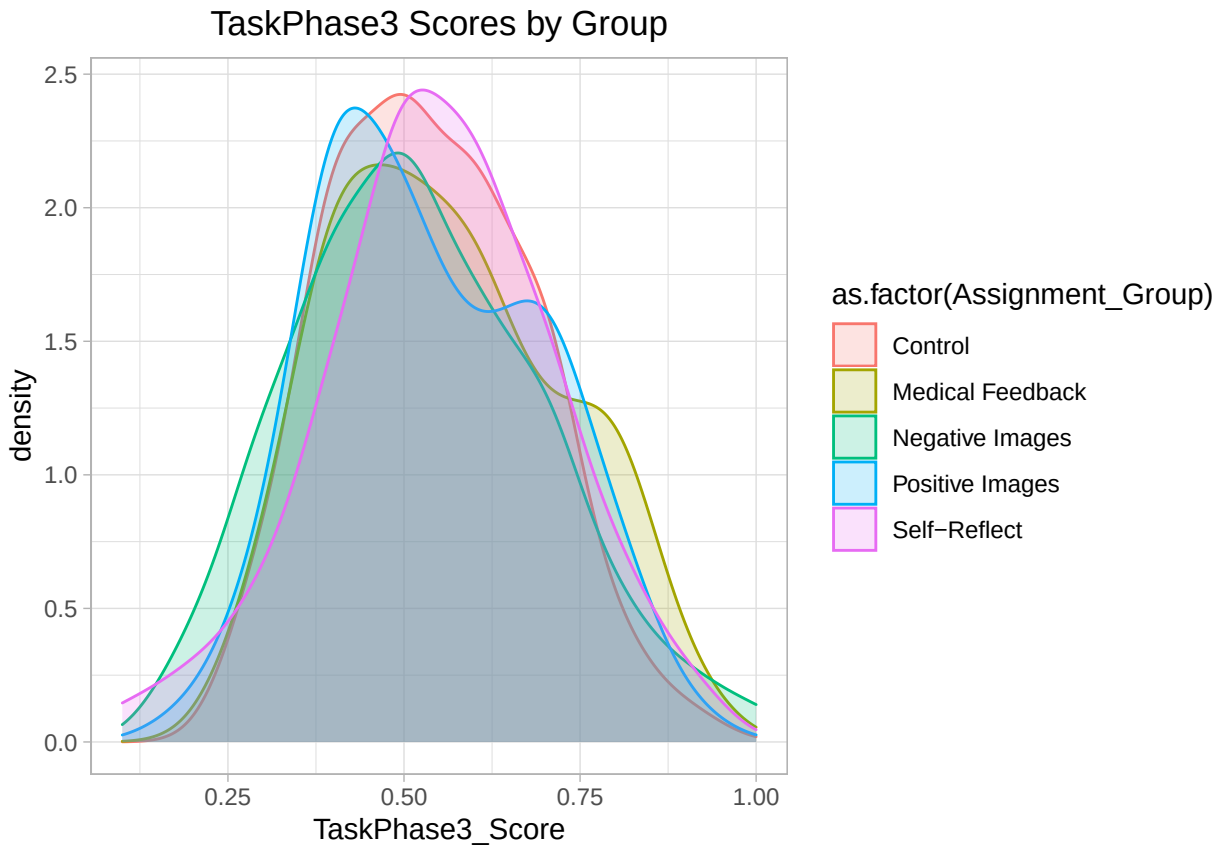

```
ggplot(d_respondents, aes(x=TaskPhase1_Score, fill = as.factor(Assignment_Group), colour=as.factor(Assi
```




```
#Comparing taskphase2 values
ggplot(d_respondents, aes(x=TaskPhase2_Score, fill = as.factor(Assignment_Group), colour=as.factor(Assi
```




```
#Comparing taskphase3 values
ggplot(d_respondents, aes(x=TaskPhase3_Score, fill = as.factor(Assignment_Group), colour=as.factor(Assi
```




```
task2a_bp <- ggplot(d_respondents, aes(x = Treatment_Dummy, y=TaskPhase1_Score, colour=as.factor(Treatme
  geom_boxplot() +
  stat_summary(fun.y = mean, geom = "errorbar", aes(ymax = ..y.., ymin = ..y..), width = .75, linetype =
  xlab('') +
  ylab('Task Score (%)') +
  ggtitle("Pre Treatment Scores") +
  scale_y_continuous(labels = scales::percent,limits = c(0,1)) +
  theme(axis.text.x = element_blank(),
        axis.ticks = element_blank(),
        plot.title = element_text(hjust = 0.5,size=10),
        legend.position = "bottom",
        legend.title = element_blank())
```

```
## Warning: `fun.y` is deprecated. Use `fun` instead.
```

```
task2b_bp <- ggplot(d_respondents, aes(x = Treatment_Dummy, y=TaskPhase2_Score, colour=as.factor(Treatme
  geom_boxplot() +
  stat_summary(fun.y = mean, geom = "errorbar", aes(ymax = ..y.., ymin = ..y..), width = .75, linetype =
  xlab('') +
  ylab('') +
  ggtitle("Task Phase 2 Scores") +
  scale_y_continuous(labels = scales::percent,limits = c(0,1)) +
  theme(axis.text.x = element_blank(),
        axis.ticks = element_blank(),
        plot.title = element_text(hjust = 0.5,size=10),
        legend.position = "none")
```

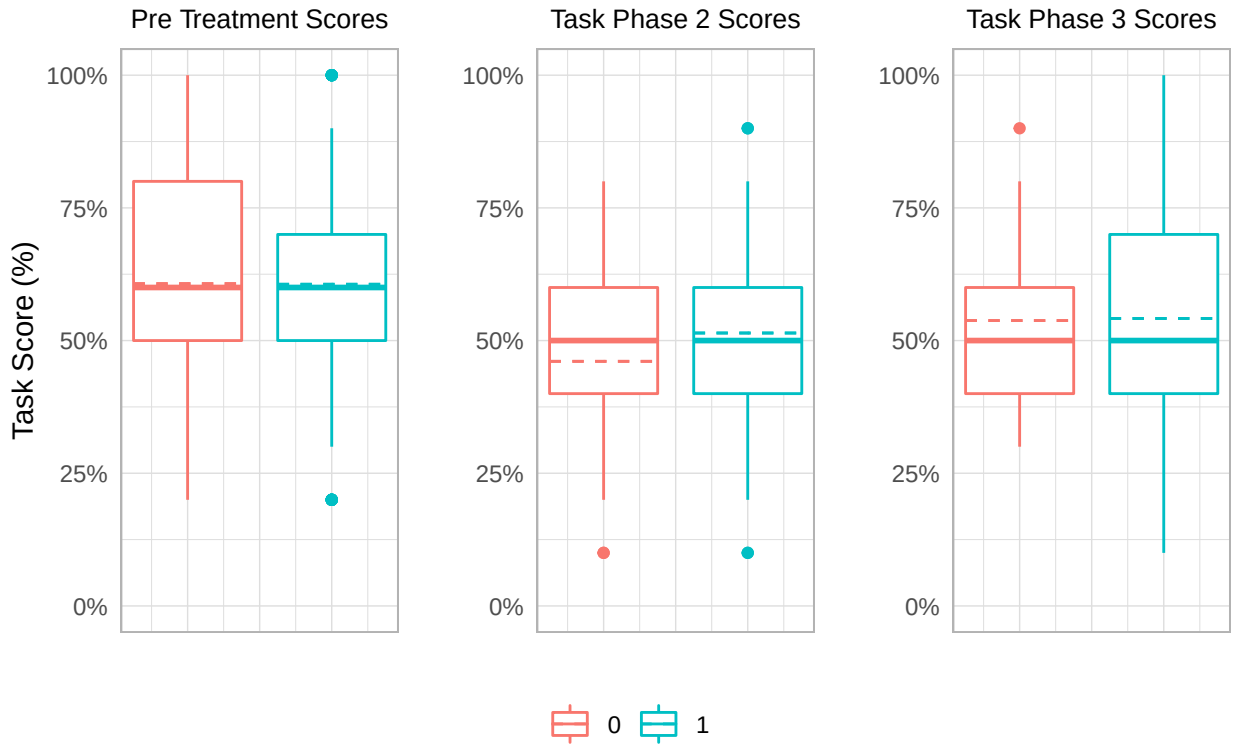
```
## Warning: `fun.y` is deprecated. Use `fun` instead.
```

```
task2c_bp <- ggplot(d_respondents, aes(x = Treatment_Dummy, y=TaskPhase3_Score, colour=as.factor(Treatm
  geom_boxplot() +
  stat_summary(fun.y = mean, geom = "errorbar", aes(ymax = ..y.., ymin = ..y..), width = .75, linetype =
  xlab('') +
  ylab('') +
  ggtitle("Task Phase 3 Scores") +
  scale_y_continuous(labels = scales::percent,limits = c(0,1)) +
  theme(axis.text.x = element_blank(),
        axis.ticks = element_blank(),
        plot.title = element_text(hjust = 0.5,size=10),
        legend.position = "none")
```

```
## Warning: `fun.y` is deprecated. Use `fun` instead.
```

```
mylegend_2<-g_legend(task2a_bp)

grid.arrange(arrangeGrob(task2a_bp + theme(legend.position="none"),task2b_bp,task2c_bp,ncol=3),
             mylegend_2,
             nrow=2,
             heights=c(10,1),
             top = textGrob("Compare task scores in different phases\n",just='right',gp=gpar(fontsize=14
```

ompare task scores in different phases




```
pander(t.test(d_respondents[Treatment_Dummy == 0, TaskPhase1_Score],
       d_respondents[Treatment_Dummy == 1, TaskPhase1_Score]))
```

Table 3: Welch Two Sample t-test: d_respondents[Treatment_Dummy == 0, TaskPhase1_Score] and d_respondents[Treatment_Dummy == 1, TaskPhase1_Score]

Test statistic	df	P value	Alternative hypothesis	mean of x	mean of y
0.04674	102.6	0.9628	two.sided	0.6072	0.606

```
# boxplots for multiple treatment groups
task1a_bp <- ggplot(d_respondents, aes(x = Assignment_Group, y=TaskPhase1_Score, colour=as.factor(Assig
  geom_boxplot() +
  stat_summary(fun.y = mean, geom = "errorbar", aes(ymax = ..y.., ymin = ..y..), width = .75, linetype =
  xlab('') +
  ylab('Task Score (%)') +
  ggtitle("Pre Treatment Scores") +
  scale_y_continuous(labels = scales::percent,limits = c(0,1)) +
  theme(axis.text.x = element_blank(),
        axis.ticks = element_blank(),
        plot.title = element_text(hjust = 0.5,size=10),
        legend.position = "bottom",
        legend.title = element_blank())
```

```
## Warning: `fun.y` is deprecated. Use `fun` instead.
```

```
task1b_bp <- ggplot(d_respondents, aes(x = Assignment_Group, y=TaskPhase2_Score, colour=as.factor(Assig
  geom_boxplot() +
  stat_summary(fun.y = mean, geom = "errorbar", aes(ymax = ..y.., ymin = ..y..), width = .75, linetype =
  xlab('') +
  ylab('') +
  ggtitle("Task Phase 2 Scores") +
  scale_y_continuous(labels = scales::percent,limits = c(0,1)) +
  theme(axis.text.x = element_blank(),
        axis.ticks = element_blank(),
        plot.title = element_text(hjust = 0.5,size=10),
        legend.position = "none")
```

```
## Warning: `fun.y` is deprecated. Use `fun` instead.
```

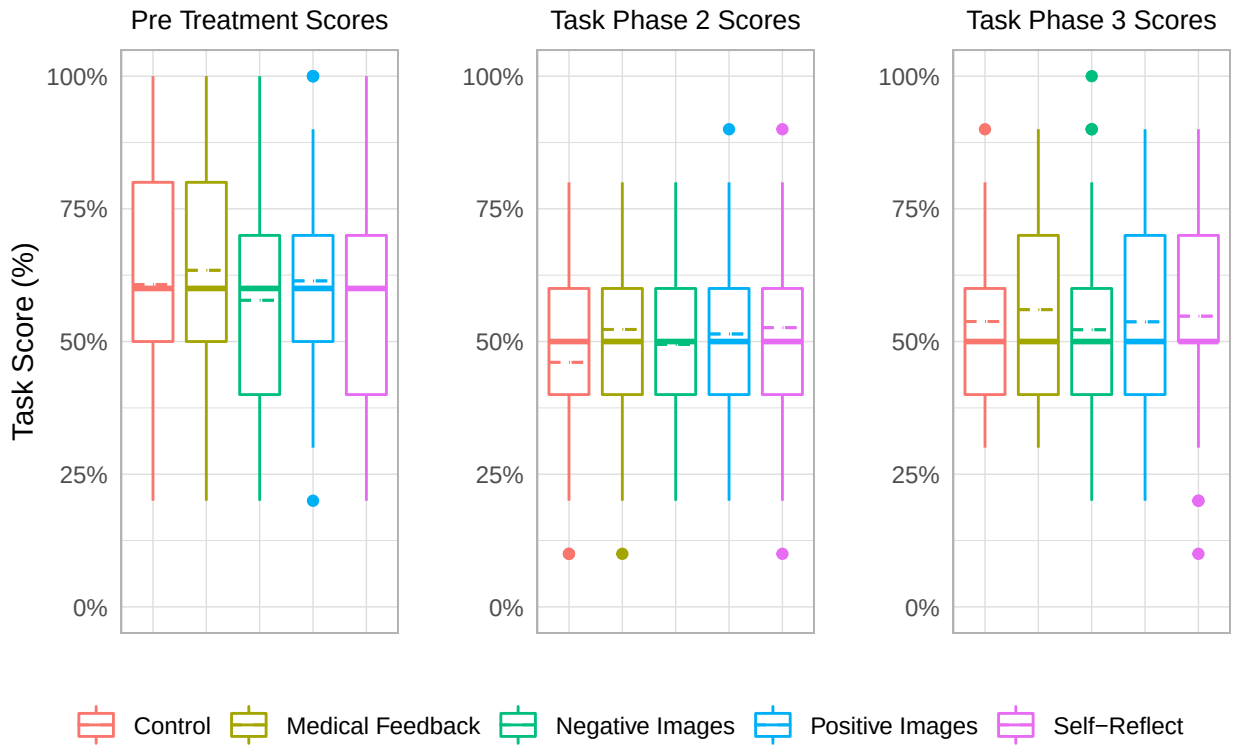
```
task1c_bp <- ggplot(d_respondents, aes(x = Assignment_Group, y=TaskPhase3_Score, colour=as.factor(Assig
  geom_boxplot() +
  stat_summary(fun.y = mean, geom = "errorbar", aes(ymax = ..y.., ymin = ..y..), width = .75, linetype =
  xlab('') +
  ylab('') +
  ggtitle("Task Phase 3 Scores") +
  scale_y_continuous(labels = scales::percent,limits = c(0,1)) +
  theme(axis.text.x = element_blank(),
        axis.ticks = element_blank(),
        plot.title = element_text(hjust = 0.5,size=10),
        legend.position = "none")
```

```
## Warning: `fun.y` is deprecated. Use `fun` instead.
```

```
mylegend_1<-g_legend(task1a_bp)

grid.arrange(arrangeGrob(task1a_bp + theme(legend.position="none"),task1b_bp,task1c_bp,ncol=3),
```

```
            mylegend_1,
            nrow=2,
            heights=c(10,1),
            top = textGrob("Compare task scores in different phases\n",just='right',gp=gpar(fontsize=14
```

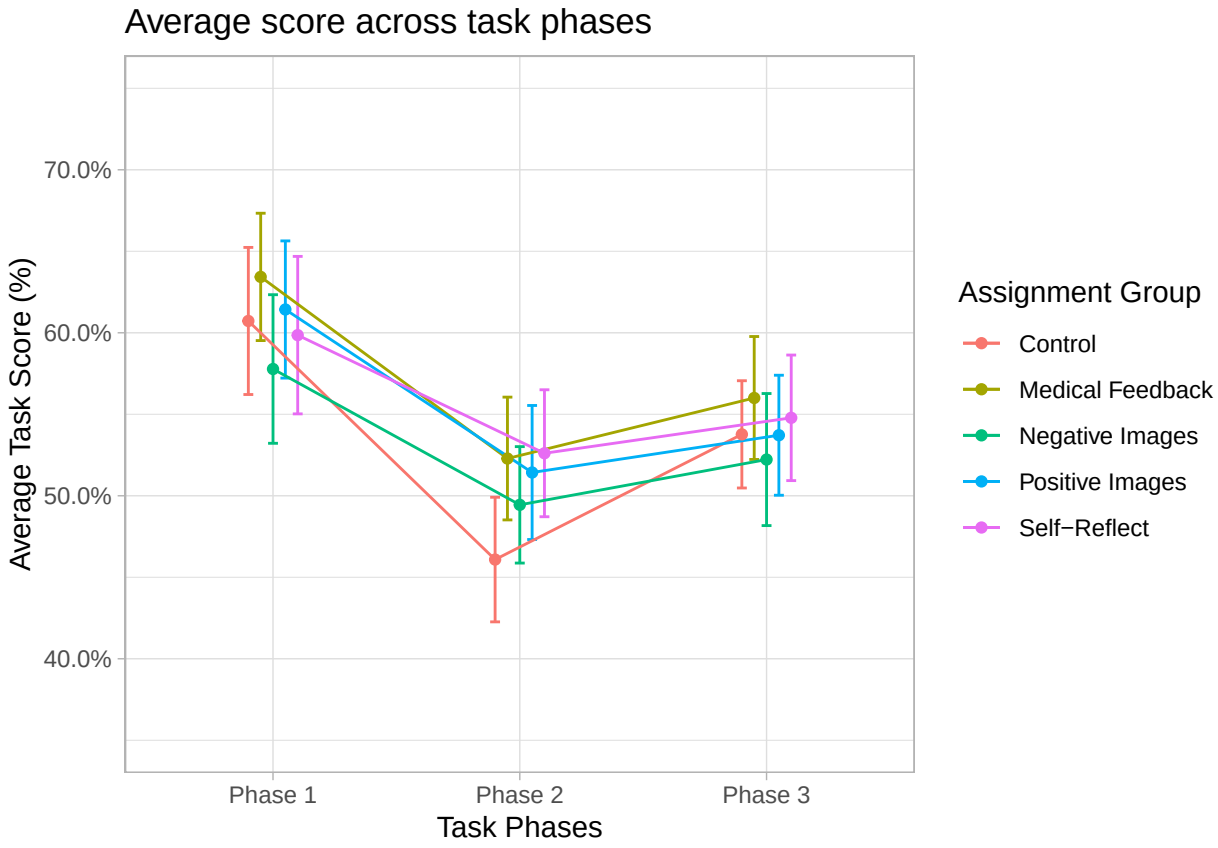
mpare task scores in different phases




```
# pander(t.test(d_respondents[Treatment_Dummy == 0, TaskPhase1_Score],
#        d_respondents[Treatment_Dummy == 1, TaskPhase1_Score]))
```

```
# Compare score across time for all groups
# https://sphweb.bumc.bu.edu/otlt/MPH-Modules/BS/BS704_Confidence_Intervals/BS704_Confidence_Intervals_
# TODO finish formatting
# TODO duplicate for treatment dummy as well
summary_task_score <- (melt(d_respondents,id.vars=c('Assignment_Group'),
                            measure.vars = c('TaskPhase1_Score','TaskPhase2_Score','TaskPhase3_Score'))
  ,.('avg_score'=mean(value),'sd_score'=sd(value),'obs'=.N),keyby=.(Assignment_Group,variable)])[
    ,se:=1.96*sd_score/sqrt(obs)]

summary_task_score %>%
  ggplot( aes(x=variable, y=avg_score, group=Assignment_Group, color=Assignment_Group)) +
  geom_errorbar(aes(ymin=avg_score-1.96*sd_score/sqrt(obs), ymax=avg_score+1.96*sd_score/sqrt(obs)),
                width=.2,
                position=position_dodge(0.25)) +
  geom_line(position=position_dodge(0.25)) +
  geom_point(position=position_dodge(0.25)) +
  scale_y_continuous(labels = scales::percent,limits = c(.35,.75)) +
  scale_x_discrete(breaks=c("TaskPhase1_Score", "TaskPhase2_Score","TaskPhase3_Score"),
                   labels=c("Phase 1", "Phase 2", "Phase 3")) +
```

```
  xlab('Task Phases') +
  ylab('Average Task Score (%)') +
  labs(title='Average score across task phases', color = "Assignment Group")
```




```
# TODO add this to the appendix
kable(summary_task_score)
```

Assignment_Group	variable	avg_score	sd_score	obs	se
Control	TaskPhase1_Score	0.6072	0.1912	69	0.0451
Control	TaskPhase2_Score	0.4609	0.1620	69	0.0382
Control	TaskPhase3_Score	0.5377	0.1394	69	0.0329
Medical Feedback	TaskPhase1_Score	0.6343	0.1667	70	0.0391
Medical Feedback	TaskPhase2_Score	0.5229	0.1608	70	0.0377
Medical Feedback	TaskPhase3_Score	0.5600	0.1610	70	0.0377
Negative Images	TaskPhase1_Score	0.5778	0.1973	72	0.0456
Negative Images	TaskPhase2_Score	0.4944	0.1546	72	0.0357
Negative Images	TaskPhase3_Score	0.5222	0.1754	72	0.0405
Positive Images	TaskPhase1_Score	0.6143	0.1796	70	0.0421
Positive Images	TaskPhase2_Score	0.5143	0.1755	70	0.0411
Positive Images	TaskPhase3_Score	0.5371	0.1571	70	0.0368
Self-Reflect	TaskPhase1_Score	0.5986	0.2047	69	0.0483
Self-Reflect	TaskPhase2_Score	0.5261	0.1651	69	0.0390
Self-Reflect	TaskPhase3_Score	0.5478	0.1632	69	0.0385

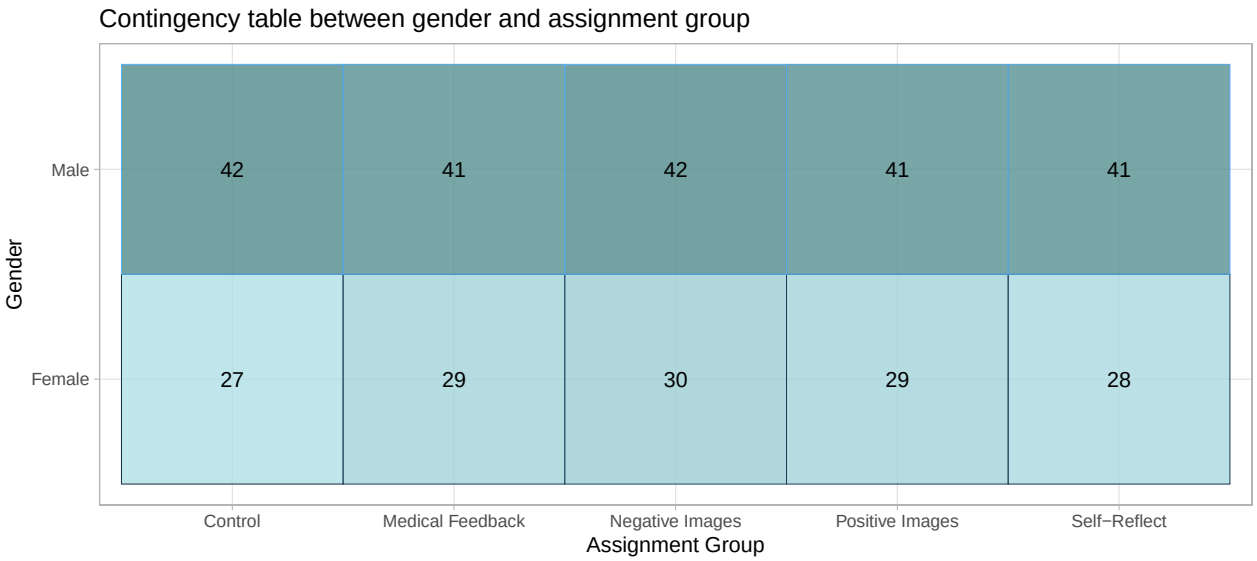
Gender

```r
# TODO format figures and captions
#check balance between gender

gender_chiqq <- chisq.test(d_respondents[ , table(Assignment_Group, Gender)])
pander(gender_chiqq,style='rmarkdown')
```

Table 5: Pearson's Chi-squared test: `d_respondents[, table(Assignment_Group, Gender)]`

Test statistic	df	P value
0.1258	4	0.9981

```r
create_heatmap(var1 = d_respondents$Assignment_Group,var2 = d_respondents$Gender) +
  xlab('Assignment Group') +
  ylab('Gender') +
  labs(title = 'Contingency table between gender and assignment group',
       caption = paste0('Assuming gender distributions are the same among assignment groups, a chi-squa
                        round(gender_chiqq$parameter,4),' \ndegrees of freedom ', 'yields p=',
                        round(gender_chiqq$p.value,4),
                        ', suggesting that there is no relationship between gender and assignment group
  theme(plot.caption = element_text(hjust = 0))
```



Assuming gender distributions are the same among assignment groups, a chi−squared test for independence with 4 degrees of freedom yields p=0.9981, suggesting that there is no relationship between gender and assignment groups at a significance level of 0.05.

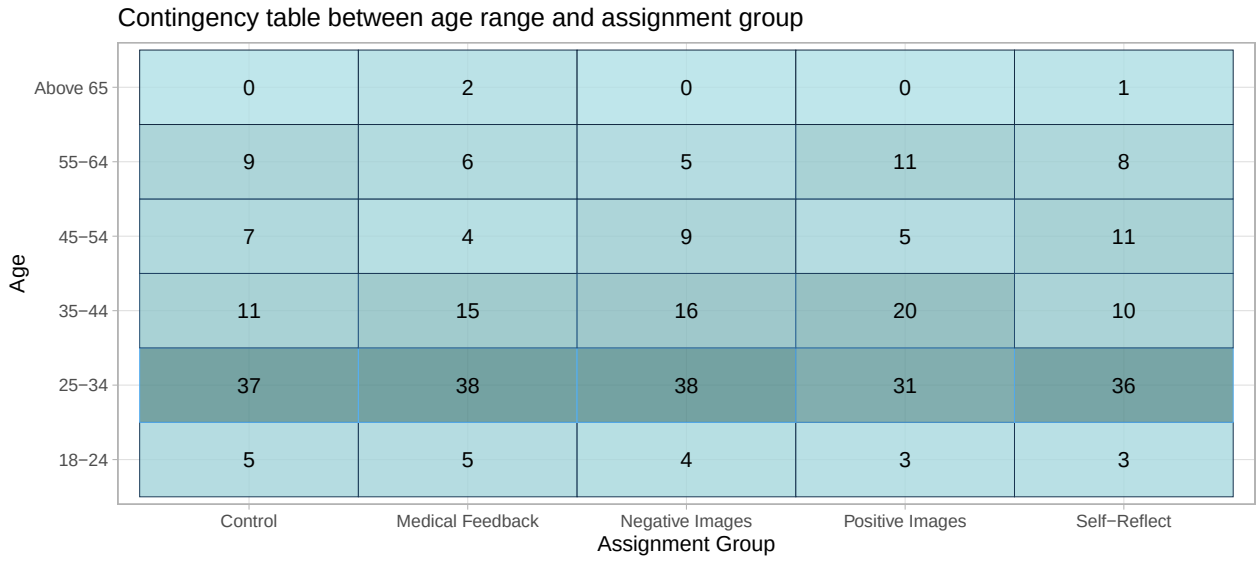
Age Range

```r
# TODO format figures and captions
#check balance between age-range

# expected frequency count for each cell of the contingency table should be at least 5. Since this is n
# https://stats.stackexchange.com/questions/81483/warning-in-r-chi-squared-approximation-may-be-incorre
age_chisq <- chisq.test(d_respondents[ , table(Assignment_Group, Age_Range)],simulate.p.value = TRUE)
pander(age_chisq,style='rmarkdown')
```

Table 6: Pearson's Chi-squared test with simulated p-value (based on 2000 replicates): `d_respondents[, table(Assignment_Group, Age_Range)]`

Test statistic	df	P value
19.22	NA	0.5092

```
create_heatmap(var1 = d_respondents$Assignment_Group,var2 = d_respondents$Age_Range) +
  xlab('Assignment Group') +
  ylab('Age') +
  labs(title = 'Contingency table between age range and assignment group',
       caption = paste0('Assuming age distributions are the same among assignment groups, a chi-squared
                        round(age_chisq$p.value,4),
                        ', suggesting that there is no relationship between age and assignment groups a
  theme(plot.caption = element_text(hjust = 0))
```



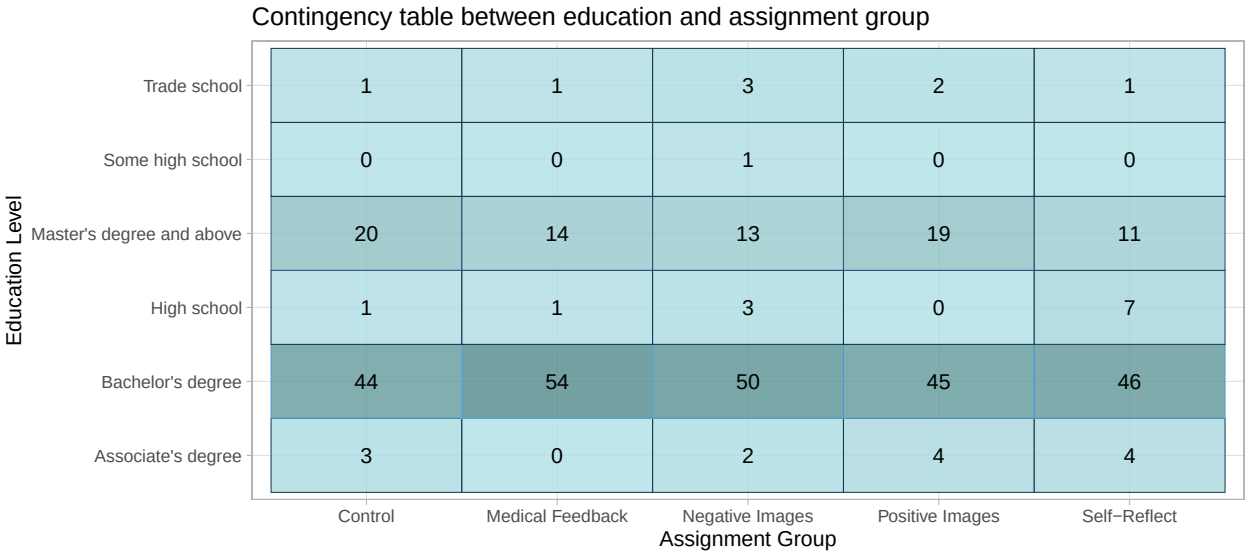
Education Level

```
# TODO format figures and captions
#check balance between education levels
edu_chisq <- chisq.test(d_respondents[ , table(Assignment_Group, Education_Level)],simulate.p.value = T
pander(edu_chisq,style='rmarkdown')
```

Table 7: Pearson's Chi-squared test with simulated p-value (based on 2000 replicates): `d_respondents[, table(Assignment_Group, Education_Level)]`

Test statistic	df	P value
28.7	NA	0.06947

```
create_heatmap(var1 = d_respondents$Assignment_Group,var2 = d_respondents$Education_Level) +
  xlab('Assignment Group') +
  ylab('Education Level') +
  labs(title = 'Contingency table between education and assignment group',
       caption = paste0('Assuming education distributions are the same among assignment groups, a chi-s
                        round(edu_chisq$p.value,4),
                        ', suggesting that there is no relationship \nbetween education and assignment
  theme(plot.caption = element_text(hjust = 0))
```



Country: US, non-US

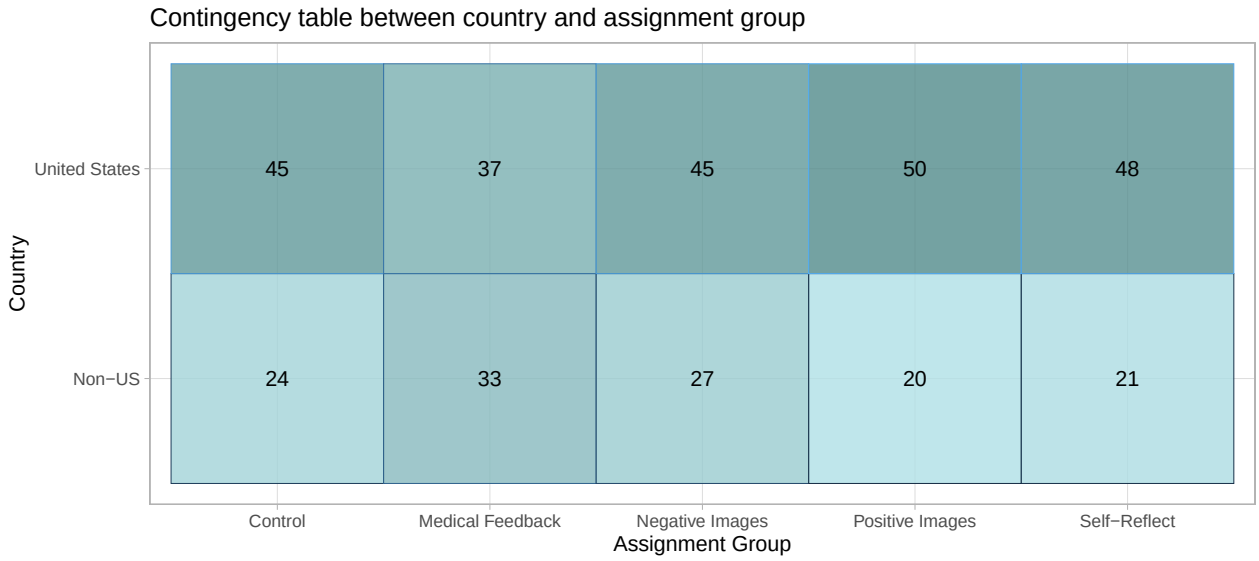
```
# TODO format figures and captions
# out.width = "80%"
# check balance between US and non-US respondents

us_chisq <- chisq.test(d_respondents[ , table(Assignment_Group, US_Dummy)])
pander(us_chisq,style='rmarkdown')
```

Table 8: Pearson's Chi-squared test: `d_respondents[, table(Assignment_Group, US_Dummy)]`

Test statistic	df	P value
6.502	4	0.1647

```
create_heatmap(var1 = d_respondents$Assignment_Group,var2 = d_respondents$US_Dummy) +
  xlab('Assignment Group') +
  ylab('Country') +
  scale_y_discrete(breaks=c("0", "1"),
                   labels=c("Non-US", "United States")) +
  labs(title = 'Contingency table between country and assignment group',
       caption = paste0('Assuming country distributions are the same among assignment groups, a chi-squa
                        round(us_chisq$parameter,4),' degrees of freedom ', 'yields p=',
```

```
                        round(us_chisq$p.value,4),
                        ', suggesting that there is no relationship between country and assignment \ngr
  theme(plot.caption = element_text(hjust = 0))
```




```
# ATE of treatment on Total Score

d_respondents[ Treatment_Dummy == 1, mean(Total_Score)] - d_respondents[ Treatment_Dummy == 0, mean(Tota
```

```
## [1] 0.5143
```

```
sd(d_respondents$Total_Score)
```

```
## [1] 3.743
```

```
# ATE of treatment on TaskPhase2 Score

d_respondents[ Treatment_Dummy == 1, mean(TaskPhase2_Score)] - d_respondents[ Treatment_Dummy == 0, mean
```

```
## [1] 0.05337
```

```
sd(d_respondents$TaskPhase2_Score)
```

```
## [1] 0.1645
```

```
#trying 2SLS...but dont think it applies here

# d_respondents[ , lm(Total_Score ~ Education_Level)]
# d_respondents[ , ivreg(Total_Score ~ Education_Level | Assignment_Group)]
```

```
power.t.test( delta = .05, sd=.16, sig.level = 0.05, power=0.8)
```

```
##
##      Two-sample t test power calculation
##
##               n = 161.7
##           delta = 0.05
##              sd = 0.16
```

```
##       sig.level = 0.05
##           power = 0.8
##     alternative = two.sided
##
## NOTE: n is number in *each* group
```

Analysis

Helper Functions

```
get_robust_se <- function(model){
  # Get robust SE for use in stargazer
  vcov <- vcovHC(model,type = "HC1")
  return(sqrt(diag(vcov)))
}
```

Task Phase 2 Analysis

```
# does any treatment have an effect on task phase 2 score?
mod_task2_a <- d_respondents[, lm(TaskPhase2_Score ~ Treatment_Dummy)]

mod_task2_b <- d_respondents[, lm(TaskPhase2_Score ~ Treatment_Dummy +
                                                     TaskPhase1_Score +
                                                     as.factor(Gender) +
                                                     as.factor(Education_Level) +
                                                     as.factor(Age_Range))]


stargazer(mod_task2_a,
          mod_task2_b,
          se = list(get_robust_se(mod_task2_a),get_robust_se(mod_task2_b)),
          omit = c("Education_Level","Age_Range"),
          add.lines = list(c('Education Fixed Effects', 'No','Yes'),
                           c('Age Fixed Effects','No','Yes')),
          header=FALSE,
          type='latex')
```

```
#add an F test to compare
pander(anova(mod_task2_a, mod_task2_b, test='F'),stle='rmarkdown')
```

Table 10: Analysis of Variance Table

Res.Df	RSS	Df	Sum of Sq	F	Pr(>F)
348	9.287	NA	NA	NA	NA
336	8.338	12	0.9498	3.19	0.0002426

```
#does the specific treatment group have an effect on task phase 2 score?
mod_task2_c <- d_respondents[, lm(TaskPhase2_Score ~ as.factor(Assignment_Group))]

mod_task2_d <- d_respondents[, lm(TaskPhase2_Score ~ as.factor(Assignment_Group) +
                                                     TaskPhase1_Score +
                                                     as.factor(Gender) +
                                                     as.factor(Education_Level) +
```

Table 9:

	Dependent variable:	
	TaskPhase2_Score	
	(1)	(2)
Treatment_Dummy	0.053**	0.051**
	(0.022)	(0.022)
TaskPhase1_Score		0.240***
		(0.047)
as.factor(Gender)Male		−0.010
		(0.017)
Constant	0.461***	0.281***
	(0.019)	(0.072)
Education Fixed Effects	No	Yes
Age Fixed Effects	No	Yes
Observations	350	350
R^2	0.017	0.117
Adjusted R^2	0.014	0.083
Residual Std. Error	0.163 (df = 348)	0.158 (df = 336)
F Statistic	5.911** (df = 1; 348)	3.433*** (df = 13; 336)
Note:		*p<0.1; **p<0.05; ***p<0.01

```
                                                    as.factor(Age_Range))]

# Do you think that there are features of the data that might systematically predict that people will r
# TODO update this heterogeneity issue. I'm not quite sure this applies because they're both considered
# mod5 <- d_respondents[, lm(TaskPhase2_Score ~ Treatment_Dummy + as.factor(assign_bin) +
#                                 Treatment_Dummy * as.factor(assign_bin))]
stargazer(mod_task2_c,
          mod_task2_d,
          se = list(get_robust_se(mod_task2_c),get_robust_se(mod_task2_d)),
          omit = c("Education_Level","Age_Range"),
          add.lines = list(c('Education Fixed Effects', 'No','Yes'),
                           c('Age Fixed Effects','No','Yes')),
          header=FALSE,
          type='latex')
```

Table 11:

	Dependent variable:	
	TaskPhase2_Score	
	(1)	(2)
as.factor(Assignment_Group)Medical Feedback	0.062**	0.055*
	(0.027)	(0.029)
as.factor(Assignment_Group)Negative Images	0.034	0.039
	(0.027)	(0.027)
as.factor(Assignment_Group)Positive Images	0.053*	0.050*
	(0.029)	(0.027)
as.factor(Assignment_Group)Self-Reflect	0.065**	0.058**
	(0.028)	(0.029)
TaskPhase1_Score		0.238***
		(0.048)
as.factor(Gender)Male		−0.010
		(0.017)
Constant	0.461***	0.282***
	(0.019)	(0.073)
Education Fixed Effects	No	Yes
Age Fixed Effects	No	Yes
Observations	350	350
R^2	0.021	0.119
Adjusted R^2	0.010	0.076
Residual Std. Error	0.164 (df = 345)	0.158 (df = 333)
F Statistic	1.874 (df = 4; 345)	2.805*** (df = 16; 333)
Note:		*p<0.1; **p<0.05; ***p<0.01

```
pander(anova(mod_task2_c, mod_task2_d, test='F'),style='rmarkdown')
```

Table 12: Analysis of Variance Table

Res.Df	RSS	Df	Sum of Sq	F	Pr(>F)
345	9.244	NA	NA	NA	NA
333	8.323	12	0.921	3.071	0.0003943

Task Phase 3 Analysis

```
# test final task and any treatment
mod_task3_a <- d_respondents[, lm(TaskPhase3_Score ~ Treatment_Dummy)]
mod_task3_b <- d_respondents[, lm(TaskPhase3_Score ~ Treatment_Dummy +
                                                     TaskPhase1_Score +
                                                     as.factor(Gender) +
                                                     as.factor(Education_Level) +
                                                     as.factor(Age_Range))]

stargazer(mod_task3_a,
          mod_task3_b,
          se = list(get_robust_se(mod_task3_a),get_robust_se(mod_task3_b)),
          omit = c("Education_Level","Age_Range"),
          add.lines = list(c('Education Fixed Effects', 'No','Yes'),
                           c('Age Fixed Effects','No','Yes')),
          header=FALSE,
          type='latex')
```

```
pander(anova(mod_task3_a, mod_task3_b, test='F'),style='rmarkdown')
```

Table 14: Analysis of Variance Table

Res.Df	RSS	Df	Sum of Sq	F	Pr(>F)
348	8.865	NA	NA	NA	NA
336	8.117	12	0.7479	2.58	0.002743

```
# test final task and specific treatment
mod_task3_c <- d_respondents[, lm(TaskPhase3_Score ~ as.factor(Assignment_Group))]
mod_task3_d <- d_respondents[, lm(TaskPhase3_Score ~ as.factor(Assignment_Group) +
                                                     TaskPhase1_Score +
                                                     as.factor(Gender) +
                                                     as.factor(Education_Level) +
                                                     as.factor(Age_Range))]

stargazer(mod_task3_c,
          mod_task3_d,
          se = list(get_robust_se(mod_task3_c),get_robust_se(mod_task3_d)),
          omit = c("Education_Level","Age_Range"),
          add.lines = list(c('Education Fixed Effects', 'No','Yes'),
                           c('Age Fixed Effects','No','Yes')),
          header=FALSE,
          type='latex')
```

Table 13:

	Dependent variable:	
	TaskPhase3_Score	
	(1)	(2)
Treatment_Dummy	0.004	0.002
	(0.019)	(0.019)
TaskPhase1_Score		0.161***
		(0.047)
as.factor(Gender)Male		−0.004
		(0.017)
Constant	0.538***	0.515***
	(0.017)	(0.064)
Education Fixed Effects	No	Yes
Age Fixed Effects	No	Yes
Observations	350	350
R^2	0.0001	0.084
Adjusted R^2	−0.003	0.049
Residual Std. Error	0.160 (df = 348)	0.155 (df = 336)
F Statistic	0.034 (df = 1; 348)	2.384*** (df = 13; 336)
Note:		*p<0.1; **p<0.05; ***p<0.01

Table 15:

	Dependent variable:	
	TaskPhase3_Score	
	(1)	(2)
as.factor(Assignment_Group)Medical Feedback	0.022	0.011
	(0.026)	(0.026)
as.factor(Assignment_Group)Negative Images	−0.015	−0.011
	(0.027)	(0.026)
as.factor(Assignment_Group)Positive Images	−0.001	0.004
	(0.025)	(0.025)
as.factor(Assignment_Group)Self-Reflect	0.010	0.005
	(0.026)	(0.026)
TaskPhase1_Score		0.157***
		(0.047)
as.factor(Gender)Male		−0.004
		(0.017)
Constant	0.538***	0.518***
	(0.017)	(0.064)
Education Fixed Effects	No	Yes
Age Fixed Effects	No	Yes
Observations	350	350
R^2	0.006	0.087
Adjusted R^2	−0.005	0.043
Residual Std. Error	0.160 (df = 345)	0.156 (df = 333)
F Statistic	0.545 (df = 4; 345)	1.971** (df = 16; 333)
Note:		*p<0.1; **p<0.05; ***p<0.01

```
pander(anova(mod_task3_c, mod_task3_d, test='F'),style='rmarkdown')
```

Table 16: Analysis of Variance Table

Res.Df	RSS	Df	Sum of Sq	F	Pr(>F)
345	8.81	NA	NA	NA	NA
333	8.099	12	0.7113	2.437	0.004751

Wearing Off Effects

```
# TODO add within subjects design
# TODO d_respondents[ , lm(mean(TaskPhase3_Score,TaskPhase2_Score) ~  Assignment_Group + TaskPhase1_Sco
# TODO d_respondents[ , lm(TaskPhaseB ~  Assignment_Group + TaskPhaseA + as.factor(AmazonTurk_ID))] whe
```

```
mod_task3_e <- d_respondents[ , lm(TaskPhase3_Score ~ TaskPhase2_Score)]
mod_task3_f <- d_respondents[ , lm(TaskPhase3_Score ~ TaskPhase2_Score + Treatment_Dummy)]
mod_task3_g <- d_respondents[ , lm(TaskPhase3_Score ~ TaskPhase2_Score + as.factor(Assignment_Group))]
mod_task3_h <- d_respondents[ , lm(TaskPhase3_Score ~ TaskPhase2_Score +
                                                      as.factor(Assignment_Group) +
                                                      as.factor(Gender) +
                                                      as.factor(Education_Level) +
                                                      as.factor(Age_Range))]

stargazer(mod_task3_e,
          mod_task3_f,
          mod_task3_g,
          mod_task3_h,
          se = list(get_robust_se(mod_task3_e),
                    get_robust_se(mod_task3_f),
                    get_robust_se(mod_task3_h)),
                    get_robust_se(mod_task3_g),
          omit = c("Education_Level","Age_Range"),
          add.lines = list(c('Education Fixed Effects', 'No','No','No','Yes'),
                           c('Age Fixed Effects','No','No','No','Yes')),
          covariate.labels = c("Task Phase 2 Score", "Any Treatment", "Medical Feedback",
                               "Negative Images", "Positive Images", "Self-reflection",'Male'),
          header=FALSE,
          type='latex')
```

```
pander(anova(mod_task3_e, mod_task3_f, test='F'),style='rmarkdown')
```

Table 19: Analysis of Variance Table

Res.Df	RSS	Df	Sum of Sq	F	Pr(>F)
348	8.326	NA	NA	NA	NA
347	8.322	1	0.004358	0.1817	0.6702

```
pander(anova(mod_task3_g, mod_task3_h, test='F'),style='rmarkdown')
```

Table 20: Analysis of Variance Table

Res.Df	RSS	Df	Sum of Sq	F	Pr(>F)
344	8.286	NA	NA	NA	NA
333	7.863	11	0.4227	1.627	0.08955

```
##
mod_task3_i <- d_respondents[ , lm(TaskPhase3_Score ~ TaskPhase1_Score + TaskPhase2_Score)]
mod_task3_j <- d_respondents[ , lm(TaskPhase3_Score ~ TaskPhase1_Score + TaskPhase2_Score + Treatment_Du
mod_task3_k <- d_respondents[ , lm(TaskPhase3_Score ~ TaskPhase1_Score + TaskPhase2_Score + as.factor(As
mod_task3_l <- d_respondents[, lm(TaskPhase3_Score ~ TaskPhase1_Score + TaskPhase2_Score +
                                                      as.factor(Assignment_Group) +
                                                      as.factor(Gender) +
                                                      as.factor(Education_Level) +
                                                      as.factor(Age_Range))]
```

Table 17:

	Dependent variable:			
	TaskPhase3_Score			
	(1)	(2)	(3)	(4)
Task Phase 2 Score	0.239***	0.242***	0.238***	0.241***
	(0.050)	(0.051)	(0.052)	(0.051)
Any Treatment		−0.009		
		(0.019)		
Medical Feedback			0.008	0.001
			(0.027)	(0.027)
Negative Images			−0.023	−0.023
			(0.026)	(0.026)
Positive Images			−0.013	−0.007
			(0.025)	(0.026)
Self-reflection			−0.005	−0.010
			(0.025)	(0.027)
Male				−0.003
				(0.017)
Constant	0.420***	0.426***	0.428***	0.520***
	(0.026)	(0.028)	(0.062)	(0.062)
Education Fixed Effects	No	No	No	Yes
Age Fixed Effects	No	No	No	Yes
Observations	350	350	350	350
R^2	0.061	0.061	0.065	0.113
Adjusted R^2	0.058	0.056	0.052	0.070
Residual Std. Error	0.155 (df = 348)	0.155 (df = 347)	0.155 (df = 344)	0.154 (df = 3
F Statistic	22.540*** (df = 1; 348)	11.330*** (df = 2; 347)	4.815*** (df = 5; 344)	2.654*** (df = 1
Note:				*p<0.1; **p<0.05; ***

Table 18:

Task Phase 2 Score	Any Treatment	Medical Feedback	Negative Images	Positive Images	Self-reflection
0.028	0.051	0.026	0.026	0.025	0.024

```
stargazer(mod_task3_i,
          mod_task3_j,
          mod_task3_k,
          mod_task3_l,
          se = list(get_robust_se(mod_task3_i),
                    get_robust_se(mod_task3_j),
                    get_robust_se(mod_task3_k),
                    get_robust_se(mod_task3_l)),
          header=FALSE,
          type='latex')
```

```
pander(anova(mod_task3_i, mod_task3_j, test = 'F'),style='rmarkdown')
```

Table 22: Analysis of Variance Table

Res.Df	RSS	Df	Sum of Sq	F	Pr(>F)
347	8.181	NA	NA	NA	NA
346	8.178	1	0.002531	0.1071	0.7437

```
pander(anova(mod_task3_k, mod_task3_l, test = 'F'),style='rmarkdown')
```

Table 23: Analysis of Variance Table

Res.Df	RSS	Df	Sum of Sq	F	Pr(>F)
343	8.151	NA	NA	NA	NA
332	7.739	11	0.4128	1.61	0.09435

```
# lm(TaskPhase3_Score ~ TaskPhase2_Score) vs lm(TaskPhase3_Score ~ TaskPhase1_Score + TaskPhase2_Score)
pander(anova(mod_task3_e, mod_task3_i, test = 'F'),style='rmarkdown')
```

Table 24: Analysis of Variance Table

Res.Df	RSS	Df	Sum of Sq	F	Pr(>F)
348	8.326	NA	NA	NA	NA
347	8.181	1	0.1455	6.172	0.01345

Playground

```
# compare self-reflect against medical feedback groups?
#make dummies
d_respondents[ , Self_Reflect_Dummy := ifelse(Assignment_Group == "Self-Reflect", 1, 0)]
d_respondents[ , Med_Feedback_Dummy := ifelse(Assignment_Group == "Medical Feedback", 1, 0)]

mod_test_dummies1 <- d_respondents[ , lm(TaskPhase2_Score ~ Treatment_Dummy + Self_Reflect_Dummy)]
mod_test_dummies2 <- d_respondents[ , lm(TaskPhase2_Score ~ Treatment_Dummy + Med_Feedback_Dummy)]

stargazer(mod_test_dummies1,
          mod_test_dummies2,
          se = list(get_robust_se(mod_test_dummies1),
```

Table 21:

	Dependent variable:		
	TaskPhase3_Score		
	(1)	(2)	(3)
TaskPhase1_Score	0.113**	0.113**	0.109*
	(0.046)	(0.046)	(0.046
TaskPhase2_Score	0.202***	0.204***	0.202**
	(0.053)	(0.054)	(0.053
Treatment_Dummy		−0.007	
		(0.019)	
as.factor(Assignment_Group)Medical Feedback			0.007
			(0.026
as.factor(Assignment_Group)Negative Images			−0.01
			(0.026
as.factor(Assignment_Group)Positive Images			−0.01
			(0.024
as.factor(Assignment_Group)Self-Reflect			−0.00
			(0.024
as.factor(Gender)Male			
as.factor(Education_Level)Bachelor's degree			
as.factor(Education_Level)High school			
as.factor(Education_Level)Master's degree and above			
as.factor(Education_Level)Some high school			
as.factor(Education_Level)Trade school			
as.factor(Age_Range)25-34			
as.factor(Age_Range)35-44			
as.factor(Age_Range)45-54			
as.factor(Age_Range)55-64			
as.factor(Age_Range)Above 65			

```
                  get_robust_se(mod_test_dummies2)),
          header=FALSE,
          type = 'latex')
```

```
##
## \begin{table}[!htbp] \centering
##   \caption{}
##   \label{}
## \begin{tabular}{@{\extracolsep{5pt}}lcc}
## \\[-1.8ex]\hline
## \hline \\[-1.8ex]
##  & \multicolumn{2}{c}{\textit{Dependent variable:}} \\
## \cline{2-3}
## \\[-1.8ex] & \multicolumn{2}{c}{TaskPhase2\_Score} \\
## \\[-1.8ex] & (1) & (2)\\
## \hline \\[-1.8ex]
##  Treatment\_Dummy & 0.050$^{**}$ & 0.051$^{**}$ \\
##   & (0.022) & (0.023) \\
##   & & \\
##  Self\_Reflect\_Dummy & 0.016 &  \\
##   & (0.023) &  \\
##   & & \\
##  Med\_Feedback\_Dummy &  & 0.011 \\
##   &  & (0.022) \\
##   & & \\
##  Constant & 0.461$^{***}$ & 0.461$^{***}$ \\
##   & (0.019) & (0.019) \\
##   & & \\
## \hline \\[-1.8ex]
## Observations & 350 & 350 \\
## R$^{2}$ & 0.018 & 0.017 \\
## Adjusted R$^{2}$ & 0.012 & 0.012 \\
## Residual Std. Error (df = 347) & 0.163 & 0.164 \\
## F Statistic (df = 2; 347) & 3.192$^{**}$ & 3.079$^{**}$ \\
## \hline
## \hline \\[-1.8ex]
## \textit{Note:}  & \multicolumn{2}{r}{$^{*}$p$<$0.1; $^{**}$p$<$0.05; $^{***}$p$<$0.01} \\
## \end{tabular}
## \end{table}
```

```
# compare positive images against negative images feedback groups?
#make dummies
d_respondents[ , Positive_Images_Dummy := ifelse(Assignment_Group == "Positive Images", 1, 0)]
d_respondents[ , Negative_Images_Dummy := ifelse(Assignment_Group == "Negative Images", 1, 0)]

mod_test_dummies3 <- d_respondents[ , lm(TaskPhase2_Score ~ Treatment_Dummy + Positive_Images_Dummy)]
mod_test_dummies4 <- d_respondents[ , lm(TaskPhase2_Score ~ Treatment_Dummy + Negative_Images_Dummy)]

stargazer(mod_test_dummies3,
          mod_test_dummies4,
          se = list(get_robust_se(mod_test_dummies3),
                    get_robust_se(mod_test_dummies4)),
          type = 'text')
```

```
##
## ============================================================
##                                   Dependent variable:
##                               ---------------------------
##                                     TaskPhase2_Score
##                                    (1)            (2)
## ------------------------------------------------------------
## Treatment_Dummy                   0.053**       0.060***
##                                   (0.022)        (0.023)
##
## Positive_Images_Dummy              0.0001
##                                   (0.024)
##
## Negative_Images_Dummy                            -0.027
##                                                  (0.022)
##
## Constant                          0.461***      0.461***
##                                   (0.019)        (0.019)
##
## ------------------------------------------------------------
## Observations                        350            350
## R2                                 0.017          0.021
## Adjusted R2                        0.011          0.015
## Residual Std. Error (df = 347)     0.164          0.163
## F Statistic (df = 2; 347)          2.947*        3.670**
## ============================================================
## Note:                           *p<0.1; **p<0.05; ***p<0.01
```

Playground 2

```
### linear model playground
d_test <- d_respondents[,c("Assignment_Group","TaskPhase1_Score","TaskPhase2_Score","TaskPhase3_Score",

#does treatment have an effect on total score?
mod_test1 <- d_test[ , lm(TaskPhase2_Score ~ TaskPhase1_Score + Treatment_Dummy)]


mod_test2 <- d_test[, lm(TaskPhase2_Score ~ TaskPhase1_Score + Treatment_Dummy + (TaskPhase1_Score * Tr

#does treatment and pretreatment score have an effect on total score?


###
# seems that if i ad in TaskPhase1 to the linear model, the RSEs disappear...
mod_test3 <- d_test[, lm(TaskPhase2_Score ~  Treatment_Dummy  +
                                  TaskPhase1_Score +
                                  as.factor(Education_Level) +
                                  as.factor(Gender) +
                                  as.factor(Age_Range)
                         )]

coeftest(mod_test3, vcov = vcovHC(mod_test3,"HC1"))
```

```
##
```

```
## t test of coefficients:
##
##                                                 Estimate Std. Error t value
## (Intercept)                                      0.28108    0.07213    3.90
## Treatment_Dummy                                  0.05071    0.02217    2.29
## TaskPhase1_Score                                 0.24027    0.04682    5.13
## as.factor(Education_Level)Bachelor's degree     -0.00683    0.04856   -0.14
## as.factor(Education_Level)High school            0.04068    0.05619    0.72
## as.factor(Education_Level)Master's degree and above -0.01698    0.05128   -0.33
## as.factor(Education_Level)Some high school      -0.12065    0.05108   -2.36
## as.factor(Education_Level)Trade school           0.02867    0.06926    0.41
## as.factor(Gender)Male                           -0.00995    0.01735   -0.57
## as.factor(Age_Range)25-34                        0.04469    0.03768    1.19
## as.factor(Age_Range)35-44                        0.04198    0.03952    1.06
## as.factor(Age_Range)45-54                        0.06975    0.04178    1.67
## as.factor(Age_Range)55-64                        0.08035    0.04252    1.89
## as.factor(Age_Range)Above 65                     0.12575    0.05172    2.43
##                                                 Pr(>|t|)
## (Intercept)                                      0.00012 ***
## Treatment_Dummy                                  0.02281 *
## TaskPhase1_Score                                 4.9e-07 ***
## as.factor(Education_Level)Bachelor's degree      0.88827
## as.factor(Education_Level)High school            0.46957
## as.factor(Education_Level)Master's degree and above  0.74080
## as.factor(Education_Level)Some high school       0.01874 *
## as.factor(Education_Level)Trade school           0.67922
## as.factor(Gender)Male                            0.56658
## as.factor(Age_Range)25-34                        0.23642
## as.factor(Age_Range)35-44                        0.28890
## as.factor(Age_Range)45-54                        0.09593 .
## as.factor(Age_Range)55-64                        0.05968 .
## as.factor(Age_Range)Above 65                     0.01556 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
summary(d_respondents$TaskPhase1_Score)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.200   0.500   0.600   0.606   0.700   1.000
```

```
stargazer(mod_test1,
          mod_test2,
          mod_test3,
          se = list(get_robust_se(mod_test1),get_robust_se(mod_test2), get_robust_se(mod_test3)),
          type='latex')
```

```
##
## % Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harva
## % Date and time: Sun, Dec 06, 2020 - 17:30:50
## \begin{table}[!htbp] \centering
##   \caption{}
##   \label{}
## \begin{tabular}{@{\extracolsep{5pt}}lccc}
## \\[-1.8ex]\hline
## \hline \\[-1.8ex]
```

```
##  & \multicolumn{3}{c}{\textit{Dependent variable:}} \\
## \cline{2-4}
## \\[-1.8ex] & \multicolumn{3}{c}{TaskPhase2\_Score} \\
## \\[-1.8ex] & (1) & (2) & (3)\\
## \hline \\[-1.8ex]
##  TaskPhase1\_Score & 0.249$^{***}$ & 0.153 & 0.240$^{***}$ \\
##   & (0.044) & (0.095) & (0.047) \\
##   & & & \\
##  as.factor(Education\_Level)Bachelor's degree &  &  & $-$0.007 \\
##   &  &  & (0.049) \\
##   & & & \\
##  as.factor(Education\_Level)High school &  &  & 0.041 \\
##   &  &  & (0.056) \\
##   & & & \\
##  as.factor(Education\_Level)Master's degree and above &  &  & $-$0.017 \\
##   &  &  & (0.051) \\
##   & & & \\
##  as.factor(Education\_Level)Some high school &  &  & $-$0.121$^{**}$ \\
##   &  &  & (0.051) \\
##   & & & \\
##  as.factor(Education\_Level)Trade school &  &  & 0.029 \\
##   &  &  & (0.069) \\
##   & & & \\
##  as.factor(Gender)Male &  &  & $-$0.010 \\
##   &  &  & (0.017) \\
##   & & & \\
##  as.factor(Age\_Range)25-34 &  &  & 0.045 \\
##   &  &  & (0.038) \\
##   & & & \\
##  as.factor(Age\_Range)35-44 &  &  & 0.042 \\
##   &  &  & (0.040) \\
##   & & & \\
##  as.factor(Age\_Range)45-54 &  &  & 0.070$^{*}$ \\
##   &  &  & (0.042) \\
##   & & & \\
##  as.factor(Age\_Range)55-64 &  &  & 0.080$^{*}$ \\
##   &  &  & (0.043) \\
##   & & & \\
##  as.factor(Age\_Range)Above 65 &  &  & 0.126$^{**}$ \\
##   &  &  & (0.052) \\
##   & & & \\
##  Treatment\_Dummy & 0.054$^{**}$ & $-$0.019 & 0.051$^{**}$ \\
##   & (0.021) & (0.065) & (0.022) \\
##   & & & \\
##  TaskPhase1\_Score:Treatment\_Dummy &  & 0.120 &  \\
##   &  & (0.107) &  \\
##   & & & \\
##  Constant & 0.310$^{***}$ & 0.368$^{***}$ & 0.281$^{***}$ \\
##   & (0.032) & (0.057) & (0.072) \\
##   & & & \\
## \hline \\[-1.8ex]
## Observations & 350 & 350 & 350 \\
## R$^{2}$ & 0.098 & 0.101 & 0.117 \\
## Adjusted R$^{2}$ & 0.092 & 0.093 & 0.083 \\
```

```
## Residual Std. Error & 0.157 (df = 347) & 0.157 (df = 346) & 0.158 (df = 336) \\
## F Statistic & 18.780$^{***}$ (df = 2; 347) & 12.920$^{***}$ (df = 3; 346) & 3.433$^{***}$ (df = 13; 3
## \hline
## \hline \\[-1.8ex]
## \textit{Note:}  & \multicolumn{3}{r}{$^{*}$p$<$0.1; $^{**}$p$<$0.05; $^{***}$p$<$0.01} \\
## \end{tabular}
## \end{table}
```

```
mod_test4 <- d_test[ , lm(TaskPhase3_Score ~ TaskPhase2_Score)]
coeftest(mod_test4)
```

```
##
## t test of coefficients:
##
##                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)        0.4205     0.0267   15.77   <2e-16 ***
## TaskPhase2_Score   0.2389     0.0503    4.75    3e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# use Robust SE
mod_test2 <- d_respondents[, lm(TaskPhase2_Score ~ Treatment_Dummy  + as.factor(Education_Level) + (Trea
mod_test2$vcovHC_ <- vcovHC(mod_test2)
coeftest(mod_test2, vcov = mod_test2$vcovHC_)
```

```
##
## t test of coefficients:
##
##                                                                 Estimate
## (Intercept)                                                      0.53333
## Treatment_Dummy                                                  0.00667
## as.factor(Education_Level)Bachelor's degree                     -0.07424
## as.factor(Education_Level)High school                           -0.03333
## as.factor(Education_Level)Master's degree and above             -0.07333
## as.factor(Education_Level)Some high school                      -0.14000
## as.factor(Education_Level)Trade school                          -0.23333
## Treatment_Dummy:as.factor(Education_Level)Bachelor's degree      0.04142
## Treatment_Dummy:as.factor(Education_Level)High school            0.07515
## Treatment_Dummy:as.factor(Education_Level)Master's degree and above  0.04386
## Treatment_Dummy:as.factor(Education_Level)Trade school           0.30762
##                                                                 Std. Error
## (Intercept)                                                             NA
## Treatment_Dummy                                                         NA
## as.factor(Education_Level)Bachelor's degree                             NA
## as.factor(Education_Level)High school                                   NA
## as.factor(Education_Level)Master's degree and above                     NA
## as.factor(Education_Level)Some high school                              NA
## as.factor(Education_Level)Trade school                                  NA
## Treatment_Dummy:as.factor(Education_Level)Bachelor's degree             NA
## Treatment_Dummy:as.factor(Education_Level)High school                   NA
## Treatment_Dummy:as.factor(Education_Level)Master's degree and above     NA
## Treatment_Dummy:as.factor(Education_Level)Trade school                  NA
##                                                                 t value
## (Intercept)                                                          NA
## Treatment_Dummy                                                      NA
## as.factor(Education_Level)Bachelor's degree                          NA
```

```
## as.factor(Education_Level)High school                                      NA
## as.factor(Education_Level)Master's degree and above                        NA
## as.factor(Education_Level)Some high school                                 NA
## as.factor(Education_Level)Trade school                                     NA
## Treatment_Dummy:as.factor(Education_Level)Bachelor's degree                NA
## Treatment_Dummy:as.factor(Education_Level)High school                      NA
## Treatment_Dummy:as.factor(Education_Level)Master's degree and above        NA
## Treatment_Dummy:as.factor(Education_Level)Trade school                     NA
##                                                                    Pr(>|t|)
## (Intercept)                                                              NA
## Treatment_Dummy                                                          NA
## as.factor(Education_Level)Bachelor's degree                              NA
## as.factor(Education_Level)High school                                    NA
## as.factor(Education_Level)Master's degree and above                      NA
## as.factor(Education_Level)Some high school                               NA
## as.factor(Education_Level)Trade school                                   NA
## Treatment_Dummy:as.factor(Education_Level)Bachelor's degree              NA
## Treatment_Dummy:as.factor(Education_Level)High school                    NA
## Treatment_Dummy:as.factor(Education_Level)Master's degree and above      NA
## Treatment_Dummy:as.factor(Education_Level)Trade school                   NA
```