# EDA

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If replicating analysis: Download and save in the your local dir: FACES_fns.R

### Formatting data

Skip down to the next section if you don't need to look at the formating.

```
faces <- read_csv('FACES_data_Spring_2019_AllData.csv')
```

```
## Parsed with column specification:
## cols(
##   .default = col_double(),
##   Time = col_character(),
##   Group = col_character()
## )
```

```
## See spec(...) for full column specifications.
```

```
long_face <- faces %>%
  pivot_longer(`FACES 1`:SEAS10, names_to = 'Survey', values_to = 'Response') %>%
  mutate(Survey = str_replace(Survey,'[:digit:]', '') %>%
                  str_replace('[:digit:]', '')  %>%
                  str_trim(side = 'both')) %>%
  group_by(`Participant #`, Time, Group, Survey) %>%
  mutate(Question = row_number())
```

### FACES Scale

Motivating thought: FACES is essentially a program that combines several aspects that contribute to the positive outcome of a child with ASD. Therefore, the response from the FACES survey response are a combination of the other surveys.

| FACES | Other Survey |
|---|---|
| Fostering | NA |
| Advocacy | Special Education Advisory Scale (SEAS) & Autism Knowledge Scale (AKS) |
| Communication | School Communication Scale (SCS) |
| Empowerment | Family Empowerment Scale (FES) |
| Support | Family Professional Partnership Scale (FPPS) |

A short description of each survey is at the bottom of this PDF.

I don't know how we should weigh each survey, but maybe that should be considered. For now... just the mean value of each survey.

```
sum_face <- long_face %>%
  filter(!is.na(Response)) %>% # some participants did not answer all the surveys/questions
  mutate(FACES = ifelse(Survey == 'FACES', T, F)) %>%
  group_by(`Participant #`, FACES, Time, Group) %>%
  summarise(Mean = mean(Response),
            Sample = n(),
            stdev = sd(Response))

write_csv(long_face, path = paste0(getwd(), '/long_data.csv'))
```

How many distinct different combinations of Group, Time, and FACES/non-FACES surveys are there?

```
(poss_groupings <- sum_face %>%
  ungroup() %>%
  select(-`Participant #`) %>%
  distinct(FACES, Group, Time))
```

```
## # A tibble: 8 x 3
##   FACES Group        Time
##   <lgl> <chr>        <chr>
## 1 FALSE Experimental Post
## 2 FALSE Experimental Pre
## 3 TRUE  Experimental Post
## 4 TRUE  Experimental Pre
## 5 FALSE Control      Post
## 6 FALSE Control      Pre
## 7 TRUE  Control      Post
## 8 TRUE  Control      Pre
```

```
# write_csv(poss_groupings, path = paste0(getwd(), '/groupings.csv'))
```

### Running ttest

Goal: to compare different groups of mean responses. I showed each code chunk for the sake of clarity... but I'm not changing much between them.

In this chunk, I'm comparing Experimental and Control groups. The `nosey` function is in the `'FACES_fns.R'` file which can be downloaded from the google drive folder.

```
test <- character() # Where i'll save tests
pval <- numeric() # p-values will be saved here

# For iterations
x <- unique(sum_face$FACES)
y <- unique(sum_face$Time)
z <- unique(sum_face$Group)

for (i in x) { # iterating through FACES (TRUE if it is a FACES survey, FALSE if it isn't.)
```

```
  for (j in y) { # iterating through Pre and Post intervention
    tt <- t.test( # testing Experimental vs control group mean scores
      nosey(sum_face, faces  = i, time  = j, group  = z[1],  Metric = 'Mean'),
      nosey(sum_face, faces  = i, time  = j, group  = z[2],  Metric = 'Mean')
      )

    pval <- append(pval, tt$p.value)
    test <- append(test, paste0(ifelse(i, 'FACES', 'non-FACES'), ' - ', j, ': Expr vs Control'))
  }
}

# Saving result to a dataframe
tt.df1 <- data.frame('Test' = test,
                     'P-Value' = pval)
```

Rinse and repeat for other variables. If you get it then feel free to skip to the results

```
test <- character()
pval <- numeric()
x <- unique(sum_face$FACES)
y <- unique(sum_face$Time)
z <- unique(sum_face$Group)

for (i in x) { # iterating through FACES
  for (j in z) { # iterating through Groups (Experimental vs control)
    tt <- t.test( # testing pre intervention mean scores against post intervention mean scores
      nosey(sum_face, faces  = i, time  = y[1], group  = j,  Metric = 'Mean'),
      nosey(sum_face, faces  = i, time  = y[2], group  = j,  Metric = 'Mean')
      )

    pval <- append(pval, tt$p.value)
    test <- append(test, paste0(ifelse(i, 'FACES', 'non-FACES'), ' - ', j, ': Post vs Pre'))
  }
}

tt.df2 <- data.frame('Test' = test,
                     'P-Value' = pval)
```

Final repeat, to test FACES (FACES survey responses vs other survey responses)

```
test <- character()
pval <- numeric()
x <- unique(sum_face$FACES)
y <- unique(sum_face$Time)
z <- unique(sum_face$Group)

for (i in y) {
  for (j in z) {
    tt <- t.test(
      nosey(sum_face, faces  = x[1], time  = i, group  = j,  Metric = 'Mean'),
      nosey(sum_face, faces  = x[2], time  = i, group  = j,  Metric = 'Mean')
      )
```

```
    pval <- append(pval, tt$p.value)
    test <- append(test, paste0(i, ' - ', j, ': Non-FACES vs FACES Survey'))
  }
}

tt.df3 <- data.frame('Test' = test,
                     'P-Value' = pval)
```

**Results**

| Test | P.Value |
|---|---|
| non-FACES - Post: Expr vs Control | 0.0634692 |
| non-FACES - Experimental: Post vs Pre | 0.0711151 |
| non-FACES - Pre: Expr vs Control | 0.0967523 |
| FACES - Experimental: Post vs Pre | 0.2888067 |
| FACES - Post: Expr vs Control | 0.4438538 |
| Pre - Control: Non-FACES vs FACES Survey | 0.4752328 |
| non-FACES - Control: Post vs Pre | 0.4908066 |
| Post - Control: Non-FACES vs FACES Survey | 0.6416418 |
| Post - Experimental: Non-FACES vs FACES Survey | 0.6500739 |
| Pre - Experimental: Non-FACES vs FACES Survey | 0.7805412 |
| FACES - Pre: Expr vs Control | 0.9091508 |
| FACES - Control: Post vs Pre | 0.9204947 |

**Final thoughts**

- The most different response come from the experiment vs control groups for post intervention and responses from the non-FACES surveys (or the established surveys). This makes sense to me because of the validation and fine tuning that has been doen for these surveys over their iterations. Also they had the largest sample size of response, since I pooled together all non-FACES survey responses.
- The 2nd most significant difference is the before and after intervention for the experimental groups and their non-FACES survey responses. Not surprising... and it is consistent with my first observation.
- The 3rd is experiment vs control groups for pre intervention and responses from non-FACES surveys. This is interesting because we want them to be as close as possible at the beginning of the intervention so that we can have a clean comparison. Food for thought here.
- The 4th and 5th responses is when we start seing differences in the survey response for post and pre intervention and experimental and control groups for the FACES survey responses.
- At this point you're probably confused about what we are comparing at each step... or at least I am. So I want to make a helpful visual... but for now you'll have to settle with this explaination. The cominbations are a result of a nested experimental design. Since we have 3 variables, each with 2 factor levels, then by fixing two factor levels you create 4 distinct groupings of the third variable. Do this for each variable and that is $4 \times 3$ or 12 t-tests.

**Survey Descriptions**

Back to the top

- Family Empowerment Scale (FES) {The E}
  - Measure empowerment in families with children who have emotional, behavioral, or mental disorders.

- School Communication Scale (SCS) {The C}
  - Assess a youth's ability to communicate by examining the frequency of use of the various skills that are needed to use effective communication practices.
- Family Professional Partnership Scale (FPPS) {The S}
  - Contains two subscales:
    1. Child-Focused Relationships
    2. Family-Focused Relationships
    * Designed as a research tool
      · Evaluation tool to measure satisfaction with programs
      · As an outcome measure to assess pre- and post- effects of training on the family-professional partnerships
      · As a measure of a variable (relationship satisfaction) that might affect other family outcomes, such as family quality of life, participation in education, etc.
  - Special Education Advisory Scale (SEAS) {The A}
    * Developed by Burke to asses the quality of advocacy services and processes. Autism Knowledge Scale (AKS) {The A}