**ANALYSIS FILES/STEPS:**

1. Data cleaning code (data-cleaning-code)
   1. PACKAGES:
      1. Tidyverse for ggplot, magriterr, etc
      2. Readxl for reading in data
      3. Writexl for write\_xlxs function
   2. Loaded individual datasets from each coder (measurement data only)
   3. Deleted one scan that was coded by two coders (Jared and Kayna, kept Kayna’s)
   4. Added “coder” column with name of each coder to each individual dataset
   5. Compiled all individual datasets into one dataset
   6. Renamed columns with abbreviations of measurements (Appendix A? of dissertation)
   7. Imported demographic dataset
   8. Recoded race/ethnicity with abbreviations in Table 3.3? of dissertation
   9. Added age group column
   10. Set and double checked variable classifications (numeric vs char vs factor)
   11. ***Created headscan\_full excel***
       1. ***All participants, all measurement values***
       2. ***Includes visual and statistic outliers, and NA values***
       3. ***All demographic categories are retained***
2. Demographic data exploration (demographic-data-exploration)
   1. PACKAGES:
      1. Tidyverse for ggplot, magriterr, etc
      2. Readxl for reading in data
      3. Extrafont to make plots in times new roman
      4. Flextable for flextable() with custom function (allows times new roman)
   2. Loaded headscan\_full
   3. Numeric age info:
      1. Table of sumstats
      2. Histogram of age frequency
   4. Race/ethnicity (all categories retained) info:
      1. Table of sumstats
      2. Boxplot of age by race/eth category
      3. Histogram of race/eth category frequencies
   5. Gender (all categories retained) info:
      1. Table of sumstats
      2. Boxplot of age by gender category
      3. Histogram of race/eth category frequencies
   6. Age group info:
      1. Table of sumstats
      2. Boxplot of age (num) by age group
      3. Histogram of age group frequencies
   7. Headscan sample demographics plot of age, sorted by race/eth, color by gender
   8. Couple of other plots (not that great)
3. Summary stats SA1 (summary-stats-SA1)
   1. PACKAGES:
      1. Tidyverse for ggplot, magriterr, etc
      2. Readxl for reading in data
      3. Extrafont to make plots in times new roman
      4. Flextable for flextable() with custom function (allows times new roman)
      5. Writexl for write\_xlxs function
      6. Forcats for fct\_reorder
   2. Loaded headscan\_full
   3. Transformed all measurement data from centimeters to millimeters
   4. ***Created measureNAs excel***
      1. ***Sum of NA values per measurement***
      2. ***Proportion of NA values per measurement***
   5. Measurement NA info:
      1. Table of proportion and sum of na values per each measurement location
      2. (CREATE NEW TABLE IN ORDER OF NA)
      3. Histogram of missing value ordered by measurement location (one for count, one for prop)
   6. Overall, race/eth, gender, age sumstats for all measurements!
      1. Histogram of measurement frequency
      2. Table of overall measurement sumstats
      3. Table of all race/eth categories sumstats
      4. Boxplots (ordered and not) of measurement by all race/eth categories
      5. Table of all gender categories sumstats
      6. Boxplots (ordered and not) of measurement by all gender categories
      7. Table of all age group categories sumstats
      8. Boxplots (ordered and not) of measurement by age group categories
   7. Removed visual outliers and redeveloped all of above for following measurements:
      1. GoSub\_C
      2. NRB\_L
      3. SelDH\_C
      4. SnasM\_C
      5. TrGo\_C
      6. TrSman\_C
      7. TrSnas\_C
4. Removing visual outliers (removing-visual-outliers)
   1. Loaded headscan\_full
   2. Changed measurement data in cm to mm
   3. For all 7 above measures:
      1. Looking at histogram with all data
      2. Checking max value
      3. Change values close to max (visual outliers) to NA
      4. Checking how many values were filtered out
      5. Histogram of filtered data
   4. ***Created headscan\_full1 excel***
      1. ***26 individual measurement values changed to NA based on visual outlier status***
      2. ***Numeric measurement data changed from cm to mm***
   5. ***Created all\_vis\_out1 excel***
      1. ***2 columns:***
         1. ***ID: id number***
         2. ***Vis\_out: what was the measurement that was changed to NA in headscan\_full1 dataset***
5. Bivariate panel
   1. PACKAGES:
      1. Tidyverse for ggplot, magriterr, etc
      2. Readxl for reading in data
      3. Extrafont to make plots in times new roman
      4. rstatix for identify\_outliers
   2. Loaded headscan\_full1
   3. Made panel numbers dataframe to be able to use geom\_text inside geom\_rect(angle)
      1. From Zhuang 2007 article
   4. Generated bivariate panel with face width (Sellion menton length) and face width (bizygomatic length)
      1. Original zhaung 2007 panel overlaid
   5. Investigated and changed one outlier for face length to NA (using rstatix identify\_outliers)
   6. Generated same bivariate plot as above (d)
   7. Generated bivariate plot colored by gender
   8. Generated bivariate plot colored by age group
   9. Generated bivariate plot colored by race/eth
6. Exploring measurement variables
   1. PACKAGES:
      1. Tidyverse for ggplot, magriterr, etc
      2. Readxl for reading in data
      3. Extrafont to make plots in times new roman
      4. Flextable for flextable() with custom function (allows times new roman)
      5. Writexl for write\_xlxs function
      6. Corrr for correlate() function
      7. Ggcorrplot for correlation plot in times new roman
      8. Ggrepel for geom\_text\_repel
   2. Loaded headscan\_full1
   3. Created headscan\_num with only measurement variables (did not save excel)
   4. ***Used correlate from corrr package to create correlation\_data\_full dataset***
      1. ***Top and bottom correlation spreadsheet (duplicates)***
   5. ***Created correlation\_data and deleted code! Because it was edited in excel***
      1. ***Bottom only correlation spreadsheet (no duplicates)***
   6. Generated correlation plot using ggcorrplot (after some dataframe manipulation to wide dataframe)
   7. Loaded correlation\_data
   8. Pivoted longer and added column that lists “first & second” measure
   9. Removed missing values (same measure correlation)
   10. Generated table that lists first&second and correlation rounded to 4 digits
   11. Generated table as above sorted high to low correlation NEED TO DO
   12. Created high\_cor dataframe with only correlation values over 0.7
       1. Considered highly correlated for this research
   13. Generated table of highly correlated measures
   14. Plot of correlations over 0.7
   15. From headscan\_full1 dataset, created dataset called coders (not to excel)
   16. Generated plot of how many participants each data collector digitized
   17. ***Loaded intraRR dataset (created in excel from Isabel thesis)***
   18. Generated plot of intraRR values wrapped by coder
   19. ***Created 4 excel spreadsheets for intraRR:***
       1. ***Kayna\_intra, Isabel\_intra, chandler\_intra, jared\_intra***
       2. ***Same as intraRR dataset but separated by coder***
   20. Generated plot of intraRR icc values ordered from low to high for all coders
   21. Created low\_intraRR dataframe by filtering to only icc values lower than 0.9
       1. Added column ‘percent coded’ indicating how much each data collector did
   22. Generated plot of low icc values wrapped by coder
   23. Generated dodge histogram of low icc values for all coders (color by coder)
   24. Created high\_cor\_full for values with high correlation
   25. Full joined low\_intraRR and high\_cor\_full by (first) measure
       1. Shows measurements of ‘concern’ or questionable measures
   26. Generated plot of correlation by intraRR icc values
   27. Generated plot of correlation by intraRR icc values wrapped by coder
   28. Generated plot of InterRR values ordered low to high icc
   29. Generated plot of just low interRR (after filtering to new dataframe)
   30. Generated plot of correlation by interRR icc values
   31. Generated plot of intraRR by interRR icc values wrapped by coder
   32. Generated plot of questionable stats by per measure (number)
   33. ***Created questionable measures excel, measures in this include:***
       1. ***All interRR iccs below 0.9***
       2. ***All intraRR iccs below 0.9***
       3. ***All correlation values 0.7***
       4. ***Indication for what measurements are involved***
7. Cors-interintra-nas
   1. PACKAGES:
      1. Tidyverse for ggplot, magriterr, etc
      2. Readxl for reading in data
      3. Extrafont to make plots in times new roman
      4. Flextable for flextable() with custom function (allows times new roman)
      5. Writexl for write\_xlxs function
   2. Loaded several datasets
   3. Generated table of all correlations, na proportion, all coder intraRR, interRR
      1. This was used by me to develop choosing-measurement-vars doc
   4. Generated tables for highly correlated variables, including all of above info
      1. AA\_C, ProA\_L, ProA\_C
      2. BiW\_C and BiW\_L
      3. SnasM\_L, SnasM\_C, SelM\_L
      4. TrSel\_C, TrSnas\_C, TrTr\_C, TrTr\_L (twice, oops)
      5. SelP\_L and SelP\_C
      6. ProS\_C and ProS\_L
      7. SmanM\_C and SmanM\_L
   5. All of this info was used in choosing measurement variables
8. PCA1
   1. PACKAGES:
      1. Tidyverse for ggplot, magriterr, etc
      2. Readxl for reading in data
      3. Extrafont to make plots in times new roman
      4. Flextable for flextable() with custom function (allows times new roman)
      5. Writexl for write\_xlxs function
      6. GGfortify for autoplot function
      7. Scales for percent function
   2. Loaded headscan\_full1 with visual outliers as NA values
   3. Created PCAdata\_num with only chosen numeric variables
      1. Chosen from choosing measure vars docx
   4. Created PCAdata\_full will all variables
      1. Chosen from choosing measure vars docx
   5. Loaded measureNAs dataset
   6. Generated table of NA values in chosen vars
   7. NEED ordered table of NA values
   8. NEED plot of NA values
   9. IF DOING MULTIVARIATE IMPUTATION, DO IT HERE
   10. Dropped NA values from measurement vars, added demographic variables back in
       1. PCAdata\_full dataframe
   11. Removed ID column from PCAdata\_num and PCAdata\_full
   12. Following link in R code, ran PCA:
       1. PCA data was scaled using prcomp(data, scale=TRUE)
       2. PCA data were rotated by -1
       3. Variance explained was gathered using equation:
          1. SD^2/sum(SD^2)
   13. Scree plot generated using qplot
   14. Variance explained manipulated into dataframe
   15. Scree plot generated using ggplot
   16. Manipulated x variable of PCA output to match PCA2.Rmd
       1. Plots were same, but mirrored and rotated
       2. Went with PCA2 as better due to
          1. more prevalence of that process online
          2. the ability to use that process with ggplot (and make ellipses)
   17. Used autoplot to generate plots of pc1 and pc2
       1. No color coding
       2. Race/eth
       3. Race/eth Loadings displayed
       4. Gender
       5. Gender loadings displayed
       6. Age group
       7. Age group loadings displayed
   18. ***Created PCAdata\_full excel***
       1. ***12 chosen measurement variables in mm***
       2. ***Gender, race\_eth, age all categories and NA values retained***
       3. ***NA values dropped (entire row)***
       4. ***1707 rows (used for plots above)***
9. PCA demographics
   1. Do the same exploration but with new dataset IF NOT IMPUTING
10. PCA2
    1. Run with the 12 finalized measurements
11. Removing statistical outliers
12. compare these outliers and visual outliers (NEW FILE NEEDED)
    1. make table comparing IDs and measurements
    2. Note that statistical outliers is only testing 12 selected measures. Filter out any other measures from all\_vis\_out1 before using here.
    3. Make table and see how to make ID with multiple outliers into one line? Or, create new column that indicates if an ID has more than one outlier measurement
13. MANOVA demographics
    1. Do the same exploration but with new dataset IF NOT IMPUTING
14. MANOVA assumptions
15. MANOVA equalcovars