

## Assignment 3

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```
# First, we will want to install the appropriate packages "tidyverse" and "ggplot2"
# and then utilize the library() function to load in the packages and their
# dependencies. We also will name an object "text" and read the .csv file
# TextMessages unto it, upon which we will generate our visual summaries
# and run the relevant descriptive statistics.
```

```
text <- read.csv("TextMessages.csv")
#install.packages("ggplot2")
library(ggplot2)
#install.packages("tidyverse")
library(tidyverse)
library(dplyr)

##
## Attaching package: 'dplyr'
## The following objects are masked from 'package:stats':
##      filter, lag
## The following objects are masked from 'package:base':
##      intersect, setdiff, setequal, union
```

## Visualization 1

```
# To get a quick understanding of the exact names of the variables involved,  
# we can simply run the names() function, followed by the glimpse() command, to  
# ensure that the data are in order and accurately reflect the csv file.  
names(text)
```

```

# visualizations. We then need to reshape the dataset from wide format to
# long format, using the pivot_longer() command. In the original wide structure,
# each participant featured separate columns for the number of text messages
# sent at Baseline and at Six months. After reshaping, these two columns are
# combined into a single variable called TextMessages, with a corresponding
# Time variable, which indicates whether each observation came from the
# Baseline or Six-month time point. This transformation will serve to make
# the data tidy, which is ideal for plotting/faceting and conducting
# group/time comparisons within ggplot2.

text_long <- text %>% mutate(Baseline = as.numeric(Baseline),
  Six_months = as.numeric(Six_months)) %>% pivot_longer(
  cols = c(Baseline, Six_months),
  names_to = "Time",
  values_to = "TextMessages")

# We want to refine the structure by explicitly converting key variables into
# factors with defined levels. The Time variable (split between indication of
# Baseline or Six months) will be converted into a factor and ordered, so that
# Baseline appears first, ensuring consistency in the plots. The Group variable
# will also be converted into a factor, so that it represents categorical data
# rather than numeric values. In defining these variables as factors, we
# ensure that ggplot2 treats them as categorical axes rather than continuous
# scales.

text_long <- text_long %>% mutate(Time = factor(Time,
  levels = c("Baseline", "Six_months")),
  Group = as.factor(Group))

# VISUALIZATION 1:

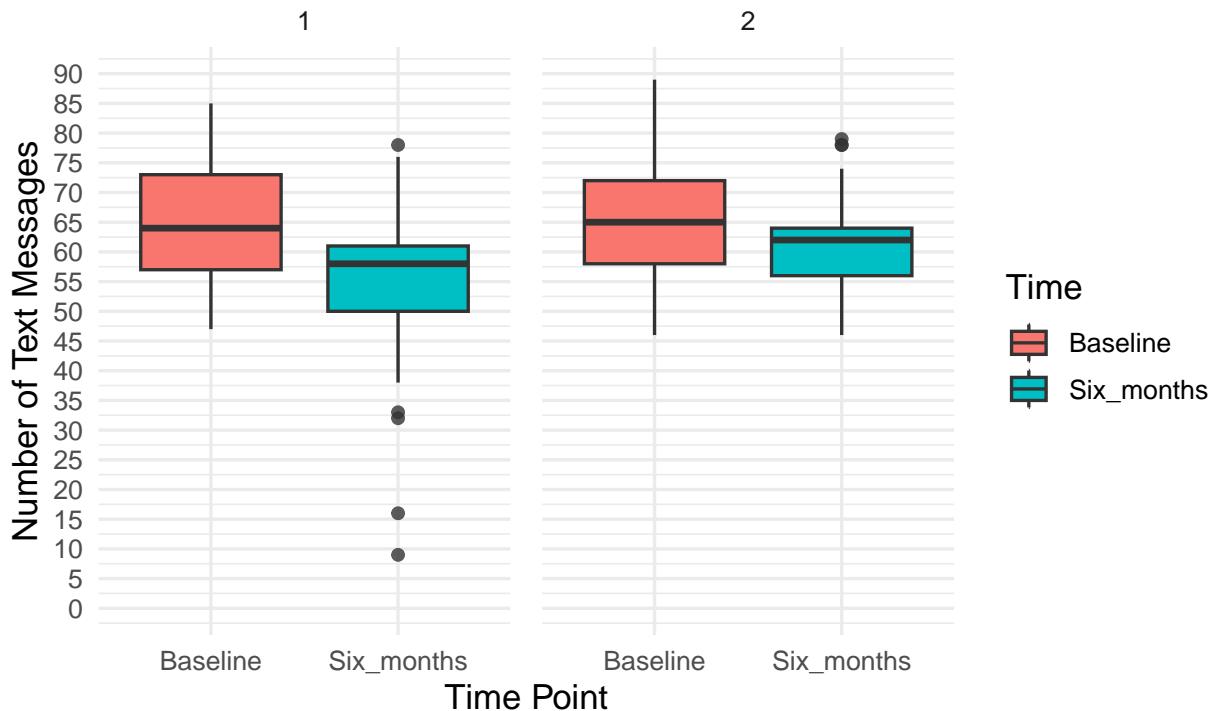
# We want to generate a set of faceted boxplots that display the distribution
# of texts across the two time points for each participant group. The function
# ggplot() will map Time to the x-axis, TextMessages to the y-axis, and Time
# to the fill color, to create distinction between the periods. We will then
# utilize the geom_boxplot() layer to create boxplots that show the central
# tendency, variability, and potential outliers. The facet_wrap(~ Group)
# function produces separate panels for each group, allowing for side-by-side
# comparisons for texting behaviors.

boxplot1 <- ggplot(text_long, aes(x = Time, y = TextMessages, fill = Time)) +
  geom_boxplot(outlier.alpha = 0.8) + facet_wrap(~ Group) + labs(
  title = "Distribution of Text Messages by Time and Group",
  subtitle = "Faceted by Group; boxplots show spread at Baseline vs Six_months",
  x = "Time Point",
  y = "Number of Text Messages",
  fill = "Time") + scale_y_continuous(limits = c(0, 90),
  breaks = seq(0, 90, by = 5)) + theme_minimal(base_size = 13) + theme(
  plot.title = element_text(face = "bold"),
  panel.spacing = unit(12, "pt"))
print(boxplot1)

```

## Distribution of Text Messages by Time and Group

Faceted by Group; boxplots show spread at Baseline vs Six\_months



```
# The faceted boxplots illustrate the distribution of text counts, for each
# participant Group (1, 2) across two time points (Baseline, Six_months).
# In both groups, the median number of text messages is moderately high, with
# slightly greater variability at Baseline, as compared to Six months (indicated
# by the wider interquartile range and the presence of a few lower outliers).
# Across groups, the pattern suggests a small decline in text frequency over
# time, with the central tendencies remaining fairly consistent.
# The consistency of medians across groups and the overlapping interquartile
# ranges thus indicate that no dramatic behavioral shift occurred, with a rather
# gradual convergence toward more uniform texting patterns over time (as
# indicated by the compactness of the boxes at the Six_months mark). The
# whiskers demonstrate that most of the values fall within a similar overall
# range.
```

## Visualization 2

```
# create stratified bar charts of text messages Group and Time using our
# converted data file text_long from above. We want to generate a set of faceted
# bar charts that display the distribution of texts across the two time points
# for each participant group. Using the function ggplot to map the variable
# Time that we created to the x-axis and the variable TextMessages to the
# y-axis, we generate these bar charts. We also utilized Time to differentiate
# the fill color of each time period (Baseline and Six_months). geom_bar()
# creates bar charts where the height of the bar proportional to the number of
# cases in each group, showing us the average number of text messages sent by
# each group at each time period. Finally, using facet_wrap(~ Group) function
```

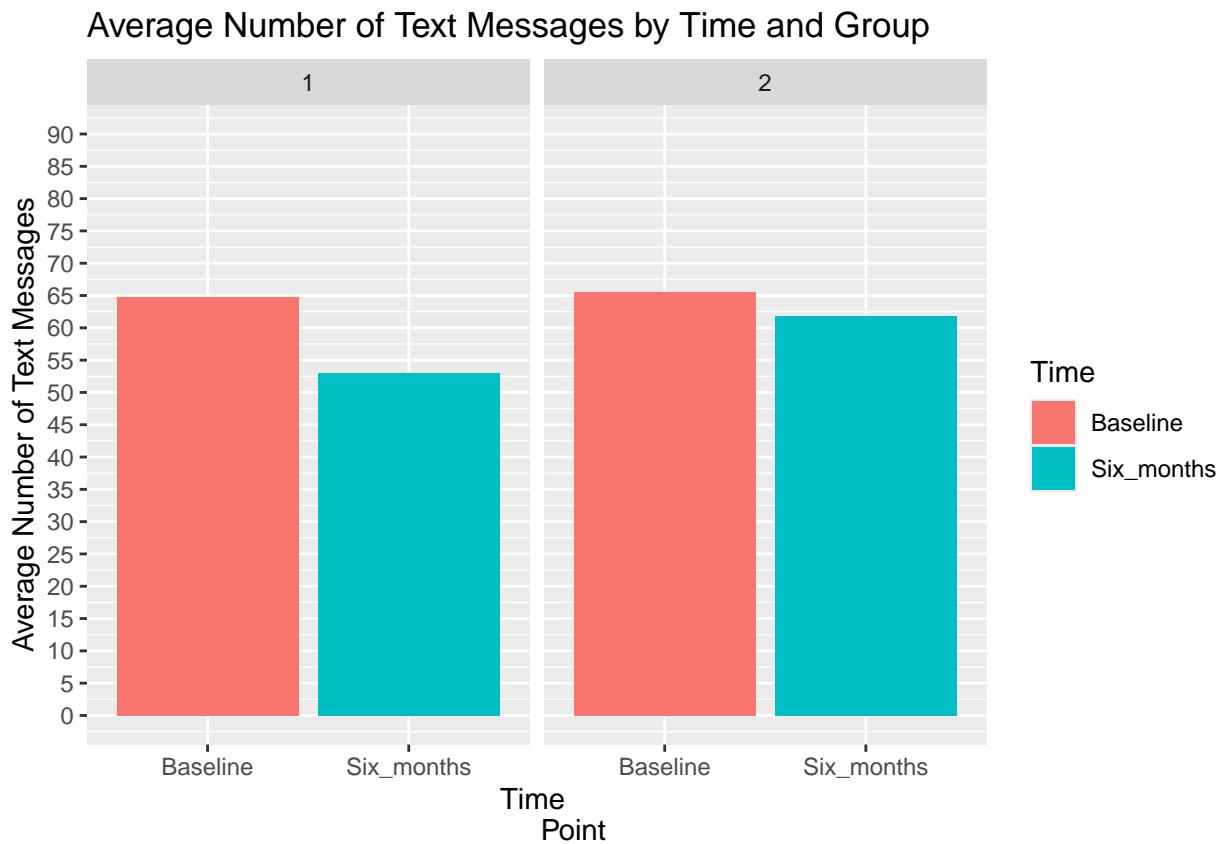
```

# produces separate panels for each group, allowing us to generate side-by-side
# comparisons.

barchart <- ggplot(text_long, aes(x = Time, y = TextMessages, fill = Time)) +
  geom_bar(stat = "summary", fun = "mean", position = "dodge") +
  facet_wrap(~ Group) +
  labs(title = "Average Number of Text Messages by Time and Group", x = "Time
Point", y = "Average Number of Text Messages", fill = "Time") +
  scale_y_continuous(limits = c(0,90), breaks = seq(from = 0, to = 90, by =
5))

# view bar chart
barchart

```



```

# This plot shows the average number of text messages sent in each group, at
# both the baseline and six month mark of the observational period. On the left
# side, we see Group 1, who sent an approximate average of 65 texts at the
# beginning of the observational period and an approximate average of 53 text
# messages sent at the six month mark. On the right side, we see Group 2, who
# also sent an approximate average of 65 text messages at the beginning of the
# observational period, and an approximate average of 62 text messages at the
# six month mark. From this plot, it seems that both groups had a decline in
# the amount of texting they did, with Group 1 having a steeper decline between
# the beginning of the observational period and the six month mark.

```

## Summary Statistics

```
# compute summary statistics by Group and Time to examine the number of text
# messages sent by participants in each group at baseline and at six months.
summary_stats <- text_long %>%
  group_by(Group, Time) %>%
  summarise(
    n = n(),
    mean = mean(TextMessages),
    sd = sd(TextMessages),
    min = min(TextMessages),
    max = max(TextMessages))

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

# view results
print(summary_stats)

## # A tibble: 4 x 7
## # Groups:   Group [2]
##   Group Time       n   mean     sd   min   max
##   <fct> <fct> <int> <dbl> <dbl> <dbl> <dbl>
## 1 1     Baseline    25  64.8  10.7    47    85
## 2 1     Six_months  25  53.0  16.3     9    78
## 3 2     Baseline    25  65.6  10.8    46    89
## 4 2     Six_months  25  61.8  9.41    46    79

# For Group 1, the mean number of text messages decreased from 64.84
# ( $SD = 10.68$ ) at baseline to 52.96 ( $SD = 16.33$ ) at six months, suggesting a
# reduction in texting activity over time. Message counts ranged from 47 to 85
# at baseline and from 9 to 78 at six months, the largest range in our data. For
# Group 2, the mean number of text messages showed a smaller decline, from 65.60
# ( $SD = 10.84$ ) at baseline to 61.84 ( $SD = 9.41$ ) at six months. Message counts
# ranged from 46 to 89 at baseline and from 46 to 79 at six months. Overall,
# both groups exhibited a decrease in texting activity over the six-month
# period, with Group 1 seeming to show a larger reduction on average than Group
# 2. This could be a point of further analysis.
```