

XuChris_ZhangMengru_Assignment3

Chris Xu, Mengru Zhang

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# Setting the working directory
# Commented out because we each have different working directories
# setwd("~/Personal/Brown/BHDS2010/Assignment 3/Assignment3")

# Import libraries used in this analysis
library(tidyverse) # To use ggplot, filter, mutate, etc. tidyverse functions

# Read in the data from the csv
text_msg <- read.csv("TextMessages.csv")

# Visually examine the structure of the data
head(text_msg)

##   Group Baseline Six_months Participant
## 1     1       52        32          1
## 2     1       68        48          2
## 3     1       85        62          3
## 4     1       47        16          4
## 5     1       73        63          5
## 6     1       57        53          6

# The Group column shows the two groups of participants. The Baseline and Six_months
# columns contain the number of text messages measured at two separate time points.
# Lastly, the participant column contains the subject number.

# For visualization, we will create a long version of the text_msg dataset,
text_msg_long <- text_msg %>%
  pivot_longer(
    cols = c("Baseline", "Six_months"),
    names_to = "Timepoint",
    values_to = "n_Msg"
  )

# Print out the fist few rows of text_msg_long to verify the pivot is correctly processed
head(text_msg_long)

## # A tibble: 6 x 4
##   Group Participant Timepoint n_Msg
##   <int>      <int> <chr>     <int>
## 1     1         1 Baseline     52
## 2     1         1 Six_months   32
## 3     1         2 Baseline     68
## 4     1         2 Six_months   48
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## 5      1      3 Baseline      85
## 6      1      3 Six_months   62

# Summary statistics: We compute the summary statistics of the data, including mean,
# median, count, standard deviation, standard error, minimum, and maximum.
summary_stats <- text_msg_long %>%
  group_by(Group, Timepoint) %>%
  summarise(
    n = n(),
    mean = mean(n_Msg, na.rm = TRUE),
    median = median(n_Msg, na.rm = TRUE),
    sd = sd(n_Msg, na.rm = TRUE),
    se = sd / sqrt(n),
    min = min(n_Msg, na.rm = TRUE),
    max = max(n_Msg, na.rm = TRUE)
  )

# Next we print out the results
print(summary_stats)

## # A tibble: 4 x 9
## # Groups:   Group [2]
##   Group Timepoint     n   mean median    sd    se   min   max
##   <int> <chr>     <int> <dbl> <dbl> <dbl> <dbl> <int> <int>
## 1     1 Baseline     25  64.8    64 10.7  2.14    47    85
## 2     1 Six_months   25  53.0    58 16.3  3.27     9    78
## 3     2 Baseline     25  65.6    65 10.8  2.17    46    89
## 4     2 Six_months   25  61.8    62  9.41  1.88    46    79

# There are 25 data points in each group at each timepoint.
# Group 1 and Group 2 showed similar means and medians around 65, with standard deviation
# of 10.7-10.8. The minimum values of both groups are 46-47, and maximum are 85 and 89,
# respectively. Overall, the two groups display similar summary statistics at the
# Baseline timepoint. At the Six Months timepoint, the statistics are quite different.
# Group 1 has a mean of 53 and median of 58, while Group 2 has a mean of 61.8 and
# median of 62.
# For Group 1, the standard deviation increased to 16.3, while for Group 2, the standard
# deviation slightly decreased to 9.41. Group 1 sees more extreme values on the
# downside, with a minimum of 9 text messages. Both groups saw maximum number of text
# messages near 80.

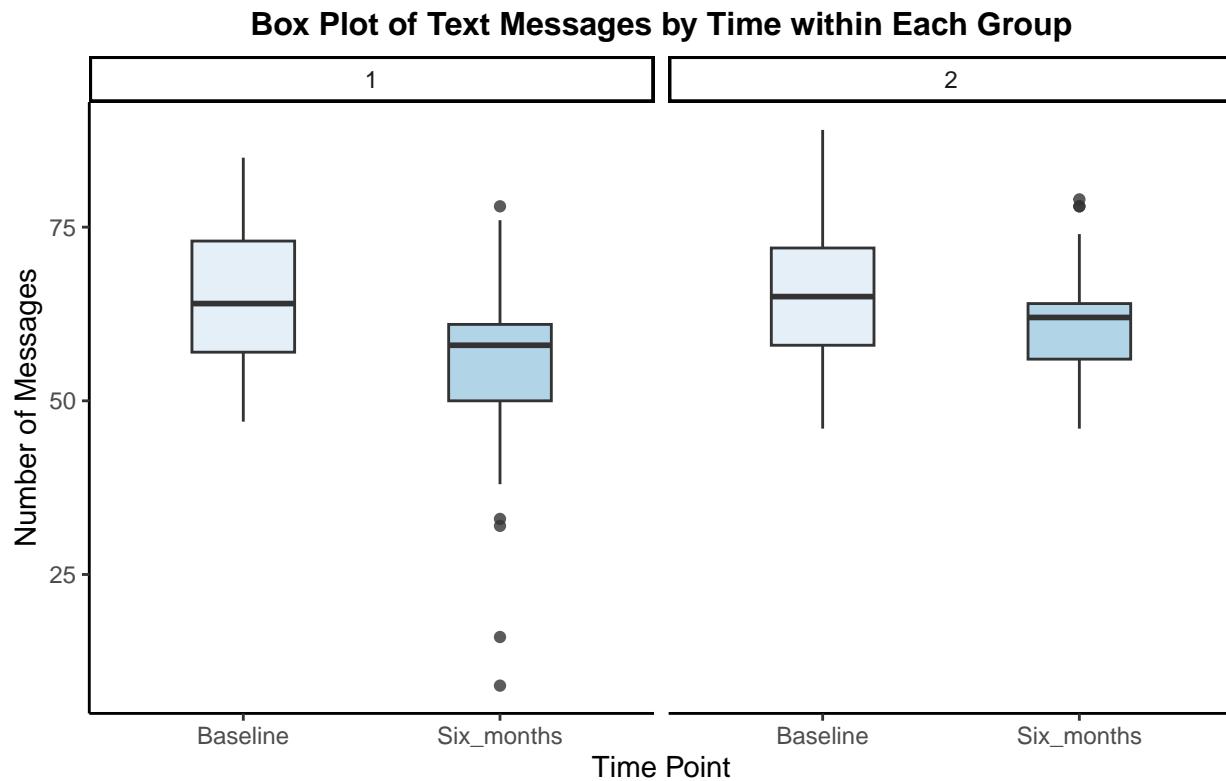
# Visualization 1: We first create box plots of text messages stratified by Group and
# Time
# Caption for chart to explain the data
vis_1_caption = "n = 25 for each group. The number of text messages a person typed were
# captured at two time points: baseline, and six months."
# Start a blank canvas, clarify the data on two axes
# Box plot, set width and color opacity
# Define faceted chart
# Choose color palette
# Add axis labels, title, and caption
# Choose theme
# Set title and caption location
text_msg_long %>% ggplot (aes(x = Timepoint, y = n_Msg, fill = Timepoint)) +
  geom_boxplot(width = 0.4, alpha = 0.8) +

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facet_grid(. ~ Group, switch = "y") +
scale_fill_brewer("Paired") +
labs(x = "Time Point", y = "Number of Messages",
title = "Box Plot of Text Messages by Time within Each Group",
caption = str_wrap(vis_1_caption, width = 100)) +
theme_classic() +
theme(legend.position = "none",
plot.title = element_text(face = "bold", size = 12, hjust = 0.5),
plot.caption.position = "plot",
plot.caption = element_text(hjust = 0))

```



$n = 25$ for each group. The number of text messages a person typed were captured at two time points: baseline, and six months.

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# The box plot shows that the number of text messages sent decreased from the Baseline
# observation to that six months later. The decrease appears more significant in Group
# 1 than Group 2, which we will show later in the summary statistics section.
# The number of text messages six months later for Group 1 contains a fair amount of
# outliers on the downside, with the minimum being 9 messages.

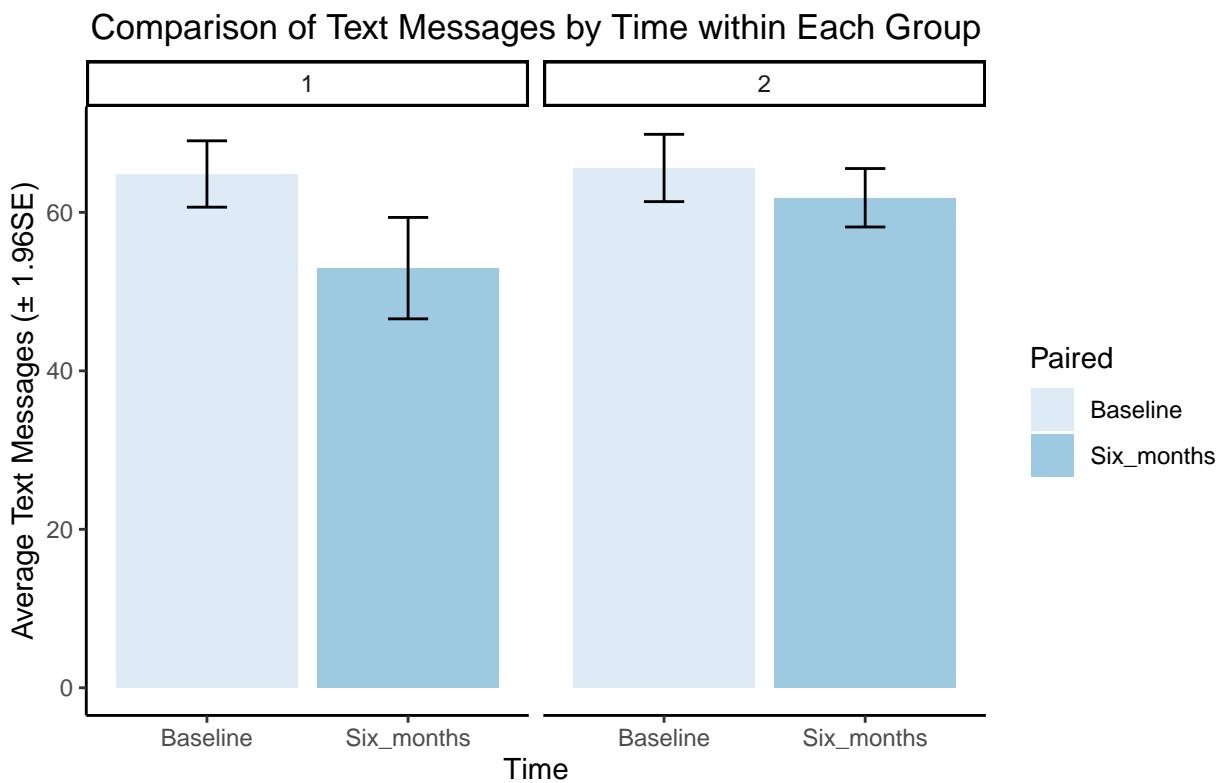
# Visualization 2: We then create bar charts of text messages stratified by Group and
# Time
# Caption for chart to explain the data
vis_2_caption = "n = 25 for each group. The number of text messages a person typed were
# captured at two time points: baseline, and six months. Error bars indicating 95%
# confidence interval."
# Start a blank canvas, clarify the data on two axes
# Define a bar chart, where the height of the bars represents the means
# Define error bars to be  $\pm 1.96$  standard error, i.e. 95% CI

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# Define faceted chart
# Add axis labels, title, and caption
# Set title and caption location
ggplot(summary_stats, aes(x = Timepoint, y = mean, fill = Timepoint)) +
  geom_bar(stat = "identity", position = "dodge") +
  geom_errorbar(aes(ymin = mean - 1.96*se,
                     ymax = mean + 1.96*se),
                width = 0.2, position = position_dodge(width = 0.9)) +
  facet_wrap(~ Group) +
  scale_fill_brewer("Paired") +
  labs(
    title = "Comparison of Text Messages by Time within Each Group",
    x = "Time",
    y = "Average Text Messages ( $\pm$  1.96SE)",
    fill = "Time Period",
    caption = str_wrap(vis_2_caption, width = 100)
  ) +
  theme_classic() +
  theme(
    plot.title = element_text(hjust = 0.5),
    legend.position = "right",
    plot.caption.position = "plot",
    plot.caption = element_text(hjust = 0)
  )
)

```



$n = 25$ for each group. The number of text messages a person typed were captured at two time points: baseline, and six months. Error bars indicating 95% confidence interval.

Group 1 showed a significant decrease in the average number of text messages sent,
↪ dropping from approximately 65 at Baseline to about 53 at the six-month mark. The
↪ error bars (which represent 95% CI) do not overlap, suggesting this change is
↪ statistically significant.

Group 2 showed only a slight decrease in average text messages, from approximately 66
↪ at Baseline to 62 at six months. The error bars for these two time points overlap,
↪ suggesting this small drop is likely not statistically significant.

In summary, while both groups started with a similar average, Group 1 experienced a
↪ much larger and more statistically significant reduction in text messages after six
↪ months compared to Group 2.