

ANOVA Table

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Load Libraries

```
library(tidyverse)
```

Demographics Data Frame

Characteristic	Placebo_Group	Lavage_Group	Debridement_Group
Age (yr)	52.0	51.2	53.6
Male sex (%)	93.3	88.5	96.6
Race: White (%)	60.0	59.0	61.0
Race: Black (%)	31.7	31.2	22.0
Race: Other (%)	8.3	9.9	17.0
Severity: Mild (%)	28.3	27.9	30.5
Severity: Moderate (%)	46.7	45.9	45.8
Severity: Severe (%)	25.0	26.2	23.7
Analgesic use: Nonprescription (%)	70.0	67.2	64.4
Analgesic use: Prescription (%)	21.7	21.3	15.3
Mean score: Knee symptoms	49.4	50.2	51.4
Mean score: Function	62.2	62.4	57.6
Anxiety	27.0	30.2	28.4
Depression	20.0	28.1	22.0
Expectations for benefit	3.5	3.5	3.6
Optimism	72.6	74.5	73.7
Satisfaction with general health	39.3	43.7	46.5
Social functioning	65.5	60.3	67.6
Somatization	11.3	9.6	10.0
Stress	28.4	26.1	27.9
Vitality	54.8	52.7	57.7

Data From Graphs

Table 2

Table 3

Simulate Data

```
##      before 2 weeks 6 weeks 3 months 6 months    1 year 18 months    2 years
## 1 56.96494 47.71385 38.89746 19.37406 77.57323 115.69844 66.65130 24.2835003
## 2 48.72933 74.46247 37.18595 60.13723 75.58387 30.07753 60.10865 -0.8963438
## 3 34.11324 61.26135 42.28131 19.62006 38.07152 60.33042 52.46808 74.8339260
## 4 45.07690 32.22290 58.46931 26.82283 43.07723 13.22748 45.89489 61.2310840
## 5 60.07532 77.28434 67.35135 92.27875 18.34659 58.37443 73.39304 68.2418392
## 6 30.14179 35.79299 69.46131 64.27313 57.20966 46.98025 49.35637 80.5185234
##      Group
## 1 Lavage
## 2 Lavage
## 3 Lavage
## 4 Lavage
## 5 Lavage
## 6 Lavage

##      before 2 weeks 6 weeks 3 months 6 months    1 year 18 months    2 years
## 1 58.98109 50.33921 28.39576 40.31109 41.83336 29.85904 60.26407 42.53262
## 2 39.93463 29.05159 51.28446 26.30026 63.40225 44.46072 60.86655 40.34373
## 3 44.02165 64.67490 52.71707 16.38917 30.47592 62.74622 45.62040 44.33922
## 4 46.00619 50.76593 61.22684 35.30420 62.79746 41.06869 54.32676 44.82421
## 5 23.07301 24.75240 69.23138 47.23728 46.80990 50.58003 45.22031 39.26350
## 6 49.43758 55.58854 45.36365 43.22556 35.19765 40.59050 43.52266 39.94339
##      Group
## 1 Placebo
## 2 Placebo
## 3 Placebo
## 4 Placebo
## 5 Placebo
## 6 Placebo
```

Kaytie: Anova table

Data of Score on the Physical functioning

```
str(AIMS2_df)
attach(AIMS2_df)
# recreate a data frame with Response, time, and groups as the columns
Response <- c(AIMS2_df[1:180,1], AIMS2_df[1:180,2], AIMS2_df[1:180,3],
              AIMS2_df[1:180,4], AIMS2_df[1:180,5], AIMS2_df[1:180,6],
              AIMS2_df[1:180,7], AIMS2_df[1:180,8])
time <- rep(Time, each = 180)
```

```

# create factors
ftime <- as.factor(time)
fgroups <- as.factor(Group)

# create the data frame
AIMS <- data.frame(Response, time, ftime, Group, fgroups)

# level of the factors
levels(fgroups)
levels(ftime)

# show the table
AIMS

# fit into a model
model <- lm(Response ~ fgroups * ftime, AIMS)
anova(model)
# Both factor of groups and time are significant.
# The interaction effect is significant with $\alpha$ = 0.1

```

Data of Score on Pain Subscale of the Arthritis Impact Measurement

```

# recreate a data frame with response, time, and groups as the columns
response <- c(pain_df[1:180,1], pain_df[1:180,2], pain_df[1:180,3],
               pain_df[1:180,4], pain_df[1:180,5], pain_df[1:180,6],
               pain_df[1:180,7], pain_df[1:180,8])
Pain <- data.frame(response, time, ftime, Group, fgroups)

# show the table
Pain

# fit into a model
model1 <- lm(response ~ fgroups * ftime, Pain)
anova(model1)
# The factor groups is not significant.
# But the interaction effect is significant with $\alpha$ = 0.1

```

Anova tables

```

# compare mean scores on physical functioning between groups
library(emmeans)
lsmAIMS <- lsmeans(model, ~ fgroups)
Tukey_Method <- summary(contrast(lsmAIMS, method = "pairwise",
                                    adjust = "tukey"),
                           infer = c(T,F), level = 0.99, side = "two-sided")
Tukey_Method

```

compare groups

```

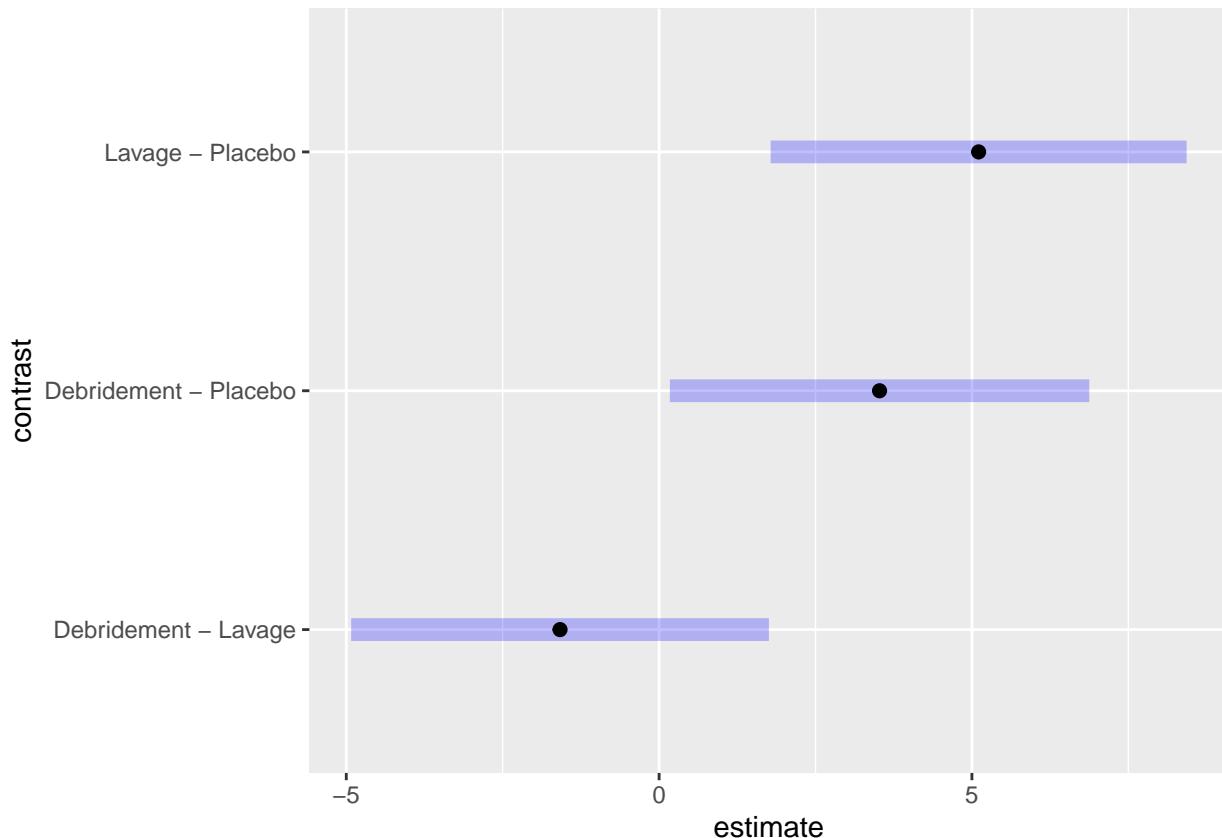
## contrast estimate SE df lower.CL upper.CL
## Debridement - Lavage -1.58 1.14 1416 -4.922 1.75
## Debridement - Placebo 3.52 1.15 1416 0.172 6.88
## Lavage - Placebo 5.11 1.14 1416 1.783 8.43
##
## Results are averaged over the levels of: ftime
## Confidence level used: 0.99
## Conf-level adjustment: tukey method for comparing a family of 3 estimates

# compare mean scores on physical functioning
# between treatment groups and control groups
Dunnet_Method <- summary(contrast(lsmAIMS, method = "trt.vs.ctrl",
                                    adjust = "mut", ref = 3),
                           infer = c(T,F), level = 0.99, side = ">")
Dunnet_Method

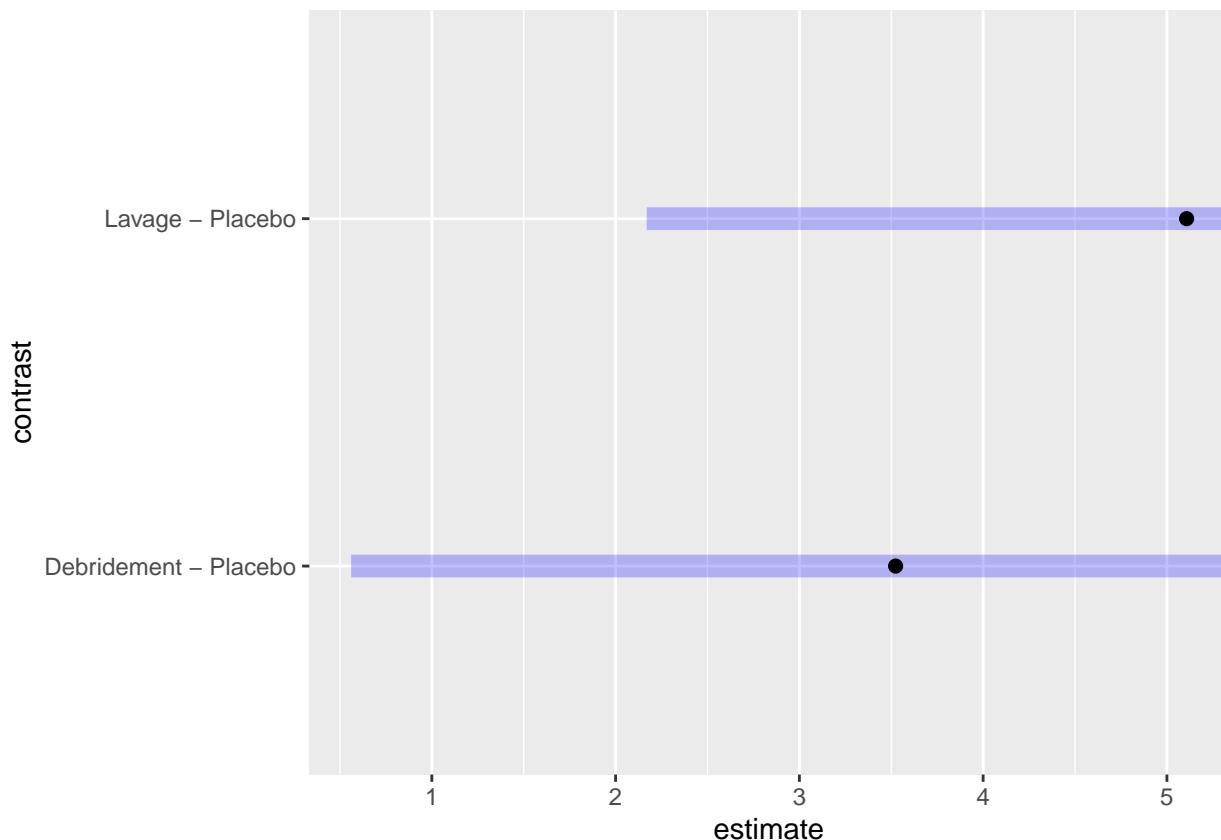
## contrast estimate SE df lower.CL upper.CL
## Debridement - Placebo 3.52 1.15 1416 0.561 Inf
## Lavage - Placebo 5.11 1.14 1416 2.169 Inf
##
## Results are averaged over the levels of: ftime
## Confidence level used: 0.99
## Conf-level adjustment: bonferroni method for 2 estimates

# graph
plot(Tukey_Method)

```



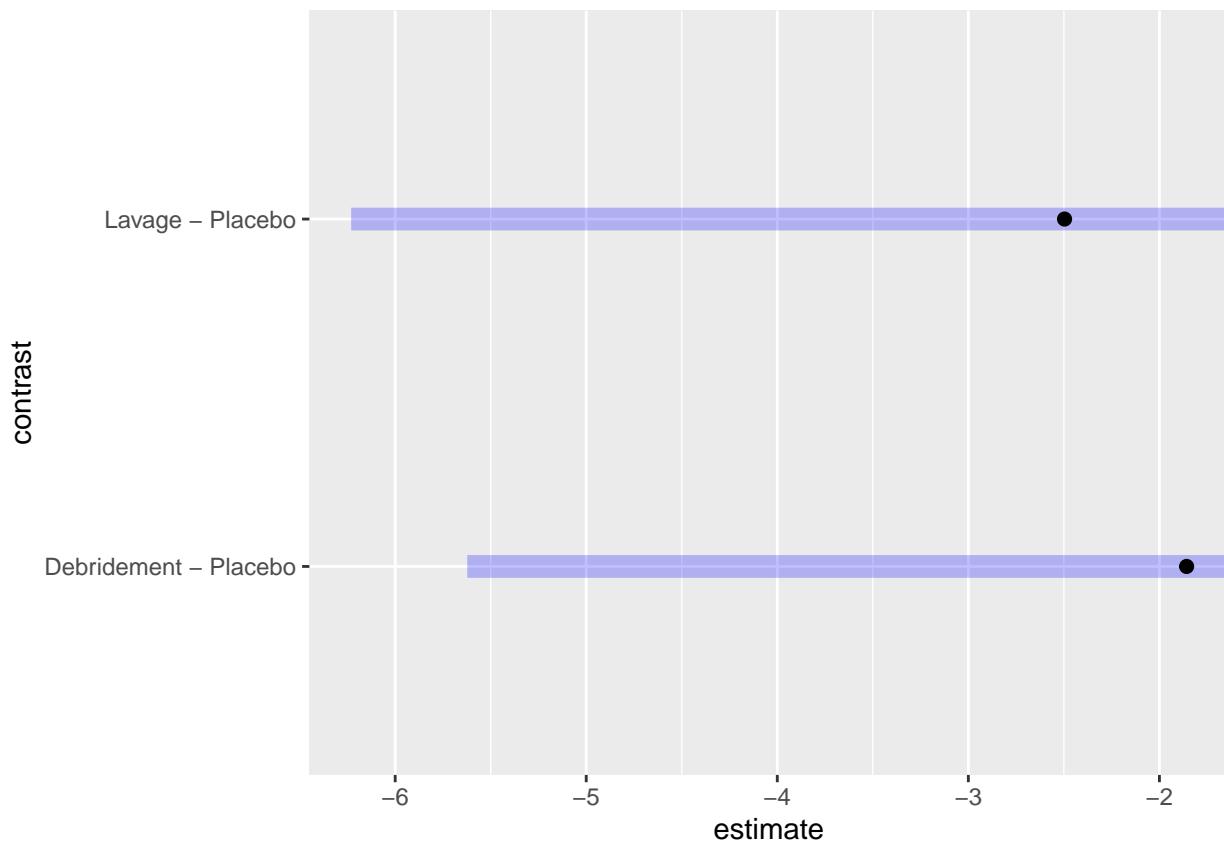
```
plot(Dunnet_Method)
```



```
lsmPain <- lsmeans(model1, ~ fgroups)
# compare mean scores on pain sub-scale of
# the Arthritis Impact Measurement between treatment groups and control groups
Dunnet_method <- summary(contrast(lsmPain, method = "trt.vs.ctrl",
                                    adjust = "mut", ref = 3),
                           infer = c(T,F), level = 0.99, side = ">")
Dunnet_method
```

```
##   contrast      estimate    SE   df lower.CL upper.CL
##   Debridement - Placebo    -1.86 1.46 1416    -5.62     Inf
##   Lavage - Placebo       -2.50 1.45 1416    -6.23     Inf
## 
## Results are averaged over the levels of: ftime
## Confidence level used: 0.99
## Conf-level adjustment: bonferroni method for 2 estimates
```

```
plot(Dunnet_method)
```



```

lsmAIMS1 <- lsmeans(model, ~ ftime)
# compare mean scores on physical functioning between different time
# after treatment and before
Dunnet_Method1 <- summary(contrast(lsmAIMS1, method = "trt.vs.ctrl",
                                      adjust = "mut", ref = 8),
                           infer = c(T,F), level = 0.99, side = ">")
Dunnet_Method1

```

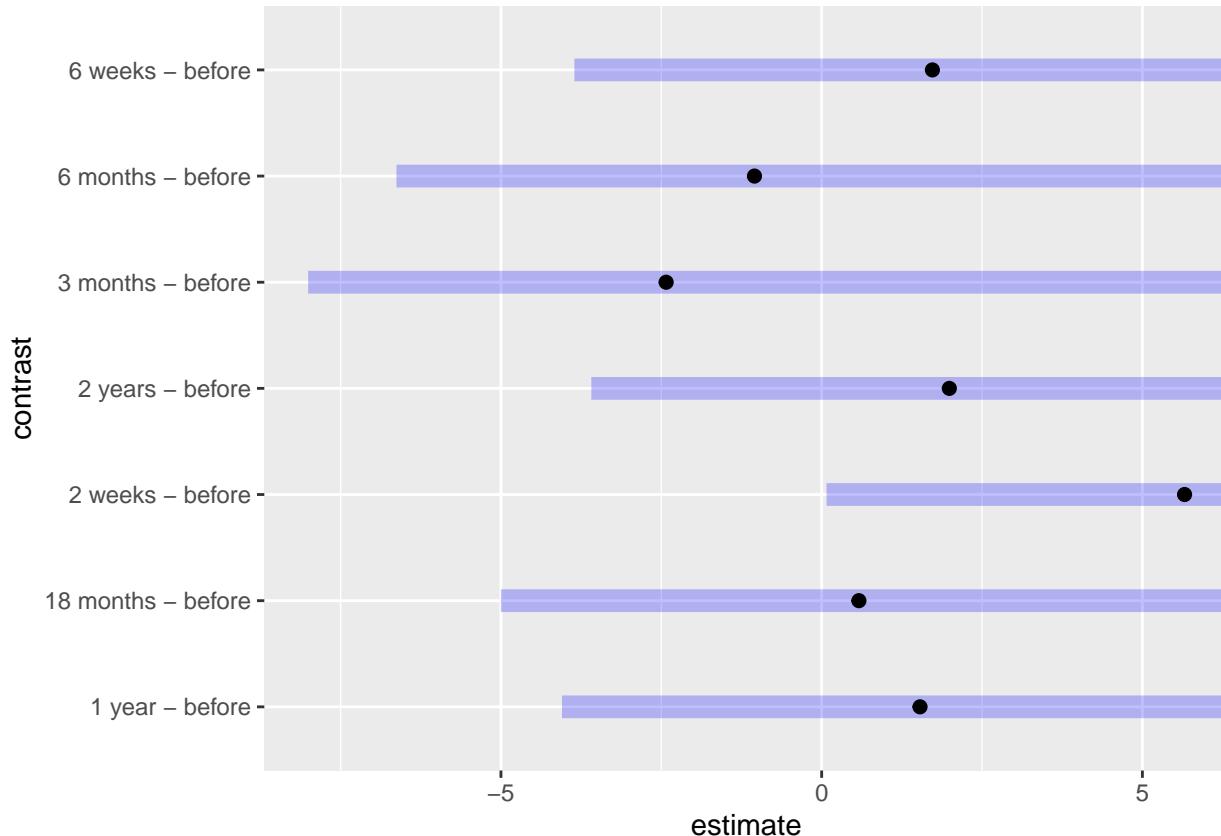
compare times

```

##   contrast      estimate    SE    df lower.CL upper.CL
##   1 year - before     1.53 1.87 1416   -4.0483     Inf
##   18 months - before   0.58 1.87 1416   -5.0011     Inf
##   2 weeks - before     5.66 1.87 1416    0.0761     Inf
##   2 years - before     1.99 1.87 1416   -3.5912     Inf
##   3 months - before    -2.42 1.87 1416   -8.0060     Inf
##   6 months - before    -1.05 1.87 1416   -6.6291     Inf
##   6 weeks - before     1.73 1.87 1416   -3.8552     Inf
##
## Results are averaged over the levels of: fgroups
## Confidence level used: 0.99
## Conf-level adjustment: bonferroni method for 7 estimates

```

```
plot(Dunnet_Method1)
```



```
# compare mean scores on pain sub-scale of
# the Arthritis Impact Measurement between different time
# after treatment and before
lsmPain1 <- lsmeans(model1, ~ ftime)
Dunnet_method1 <- summary(contrast(lsmPain1, method = "trt.vs.ctrl",
                                     adjust = "mut", ref = 8),
                           infer = c(T,F), level = 0.99, side = ">")
Dunnet_method1
```

```
##   contrast      estimate    SE   df lower.CL upper.CL
## 1 year - before     -0.787 2.37 1416    -7.88      Inf
## 18 months - before    -3.455 2.37 1416   -10.55      Inf
## 2 weeks - before     -8.444 2.37 1416   -15.54      Inf
## 2 years - before     -1.119 2.37 1416    -8.21      Inf
## 3 months - before    -7.926 2.37 1416   -15.02      Inf
## 6 months - before     -7.202 2.37 1416   -14.30      Inf
## 6 weeks - before     -8.867 2.37 1416   -15.96      Inf
##
## Results are averaged over the levels of: fgroups
## Confidence level used: 0.99
## Conf-level adjustment: bonferroni method for 7 estimates
```

```
plot(Dunnet_method1)
```

