

# analysis\_chunks

2025-11-18

## R Markdown

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When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.

```
library(plyr)
```

```
## Warning: package 'plyr' was built under R version 4.3.3
```

```
library(rstatix)
```

```
##  
## Attaching package: 'rstatix'
```

```
## The following objects are masked from 'package:plyr':  
##  
##     desc, mutate
```

```
## The following object is masked from 'package:stats':  
##  
##     filter
```

```
library(effectsize)
```

```
##  
## Attaching package: 'effectsize'
```

```
## The following objects are masked from 'package:rstatix':  
##  
##     cohens_d, eta_squared
```

```
library(ggpubr)
```

```
## Loading required package: ggplot2
```

```
##  
## Attaching package: 'ggpubr'
```

```
## The following object is masked from 'package:plyr':  
##  
##     mutate
```

```
library(tidyverse)
```

```
## Warning: package 'stringr' was built under R version 4.3.3
```

```
## — Attaching core tidyverse packages ————— tidyverse 2.0.0 —  
## ✓ dplyr    1.1.4    ✓ readr    2.1.5  
## ✓forcats   1.0.0    ✓ stringr  1.5.1  
## ✓ lubridate 1.9.3    ✓ tibble   3.2.1  
## ✓ purrr    1.0.2    ✓ tidyrr   1.3.1
```

```
## — Conflicts ————— tidyverse_conflicts() —  
## ✘ dplyr::arrange() masks plyr::arrange()  
## ✘ purrr::compact() masks plyr::compact()  
## ✘ dplyr::count() masks plyr::count()  
## ✘ dplyr::desc() masks rstatix::desc(), plyr::desc()  
## ✘ dplyr::failwith() masks plyr::failwith()  
## ✘ dplyr::filter() masks rstatix::filter(), stats::filter()  
## ✘ dplyr::id() masks plyr::id()  
## ✘ dplyr::lag() masks stats::lag()  
## ✘ dplyr::mutate() masks ggpubr::mutate(), rstatix::mutate(), plyr::mutate()  
## ✘ dplyr::rename() masks plyr::rename()  
## ✘ dplyr::summarise() masks plyr::summarise()  
## ✘ dplyr::summarize() masks plyr::summarize()  
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
library(ez)
```

```
## Warning: package 'ez' was built under R version 4.3.3
```

```
## Warning in check_dep_version(): ABI version mismatch:  
## lme4 was built with Matrix ABI version 1  
## Current Matrix ABI version is 0  
## Please re-install lme4 from source or restore original 'Matrix' package
```

```
library(reshape2)
```

```
## Warning: package 'reshape2' was built under R version 4.3.3
```

```
##  
## Attaching package: 'reshape2'  
##  
## The following object is masked from 'package:tidyr':  
##  
##     smiths
```

```
library(ggplot2)
```

```
##### Data Preparation #####
userPerformanceData <- read.csv("UserPerformance.csv", header=TRUE, sep = ",")  
summary(userPerformanceData)
```

```
##      PID      CoachingStyle      Viewpoint       Pose  
## Min.   : 1.0  Length:432      Length:432      Min.   :1.0  
## 1st Qu.: 5.0  Class :character Class :character  1st Qu.:2.0  
## Median : 9.5  Mode  :character Mode  :character  Median :3.5  
## Mean   : 9.5                           Mean   :3.5  
## 3rd Qu.:14.0                           3rd Qu.:5.0  
## Max.   :18.0                           Max.   :6.0  
##      FootHeight      Foot      LeftHandY      Right.Hand.Y  
## Min.   :0.0000  Length:432      Min.   :-0.74378  Min.   :-0.69790  
## 1st Qu.:0.2227  Class :character 1st Qu.:-0.34396  1st Qu.:-0.35246  
## Median :0.3086  Mode  :character Median :-0.07250  Median :-0.06817  
## Mean   :0.3132                           Mean   :-0.01946  Mean   : 0.01172  
## 3rd Qu.:0.3930                           3rd Qu.: 0.32282  3rd Qu.: 0.39355  
## Max.   :0.8889                           Max.   : 0.69700  Max.   : 0.84767  
##      Steadiness      Mistake  
## Min.   :0.00000  Min.   :0.0000  
## 1st Qu.:0.03886  1st Qu.:0.0000  
## Median :0.08577  Median :1.0000  
## Mean   :0.11251  Mean   :0.8449  
## 3rd Qu.:0.15573  3rd Qu.:1.0000  
## Max.   :0.52124  Max.   :5.0000
```

```
##### Remove P2 and P12
userPerformanceData <- userPerformanceData[userPerformanceData$PID!=2,]
userPerformanceData <- userPerformanceData[userPerformanceData$PID!=12,]
```

```
### SUS
SUS_Data <- read.csv("SUS.csv", header=TRUE, sep = ",")  
##### Remove P2 and P12
SUS_Data <- SUS_Data[SUS_Data$UserId!=2,]
SUS_Data <- SUS_Data[SUS_Data$UserId!=12,]
summary(SUS_Data)
```

```
##      UserId          SUS
## Min.   : 1.000   Min.   : 57.50
## 1st Qu.: 5.750   1st Qu.: 69.38
## Median : 9.500   Median : 82.50
## Mean   : 9.812   Mean   : 80.00
## 3rd Qu.:14.250   3rd Qu.: 92.50
## Max.   :18.000   Max.   :100.00
```

```
### TLX
TLX_Data <- read.csv("TLX.csv", header=TRUE, sep = ",")
##### Remove P2 and P12
TLX_Data <- TLX_Data[TLX_Data$UserId!=2,]
TLX_Data <- TLX_Data[TLX_Data$UserId!=12,]
summary(TLX_Data)
```

	User Id	Type	Score
##	Min. : 1.000	Length:96	Min. : 3.00
##	1st Qu.: 5.750	Class :character	1st Qu.: 23.50
##	Median : 9.500	Mode :character	Median : 50.00
##	Mean   : 9.812		Mean   : 49.66
##	3rd Qu.:14.250		3rd Qu.: 70.75
##	Max.   :18.000		Max.   :100.00

```
### TLX
MidQuestion_Data <- read.csv("Mid_Questionnaire.csv", header=TRUE, sep = ",")
##### Remove P2 and P12
MidQuestion_Data <- MidQuestion_Data[MidQuestion_Data$PID!="Me336",] #P2
MidQuestion_Data <- MidQuestion_Data[MidQuestion_Data$PID!="Ka513",] #12
summary(MidQuestion_Data)
```

```

##      PID          Viewpoint        Coaching.Style       Embodiment
## Length:64      Length:64      Length:64      Min.    :1.350
## Class :character Class :character Class :character 1st Qu.:3.470
## Mode  :character Mode  :character Mode  :character Median   :4.090
##                                         Mean     :4.203
##                                         3rd Qu.:4.790
##                                         Max.    :6.910
## Social_Presence Social_Presence_Scale3 Enjoyment       Difficulty
## Min.   :2.200   Min.   :-1.8000      Min.   :1.000   Min.   :1.000
## 1st Qu.:4.000   1st Qu.: 0.0000      1st Qu.:4.000   1st Qu.:1.000
## Median  :4.300   Median  : 0.3000      Median  :4.000   Median  :2.000
## Mean    :4.286   Mean    : 0.2859      Mean    :4.219   Mean    :1.781
## 3rd Qu.:4.900   3rd Qu.: 0.9000      3rd Qu.:5.000   3rd Qu.:2.000
## Max.    :6.400   Max.    : 2.4000      Max.    :5.000   Max.    :5.000
## PerceptionCoach Recommendation
## Min.   :1.00   Min.   : 4.000
## 1st Qu.:2.00   1st Qu.: 8.000
## Median  :3.00   Median  :10.000
## Mean    :3.18   Mean    : 9.375
## 3rd Qu.:4.00   3rd Qu.:11.000
## Max.    :5.00   Max.    :11.000

```

#### ##### Descriptive analysis

```

## Get summary stats
userPerformance_Descriptive <- userPerformanceData %>%
  group_by(CoachingStyle) %>%
  get_summary_stats(FootHeight, Steadiness, Mistake, type = "common")

userPerformance_Descriptive

```

```

## # A tibble: 6 × 11
##   CoachingStyle variable     n   min   max median   iqr   mean    sd    se    ci
##   <chr>         <fct>   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 Autonomous St... FootHei...  192 0     0.795  0.306  0.178  0.307  0.144  0.01  0.021
## 2 Autonomous St... Steadin...  192 0     0.521  0.104  0.142  0.13   0.107  0.008  0.015
## 3 Autonomous St... Mistake   192 0     5     1     1     0.88   1.07   0.077  0.152
## 4 Controlling S... FootHei...  192 0.007 0.889  0.299  0.173  0.308  0.135  0.01   0.019
## 5 Controlling S... Steadin...  192 0.003 0.445  0.077  0.103  0.099  0.09   0.007  0.013
## 6 Controlling S... Mistake   192 0     5     0.5   1     0.833  1.04   0.075  0.149

```

```

userPerformance_Descriptive <- userPerformanceData %>%
  group_by(CoachingStyle, Viewpoint) %>%
  get_summary_stats(FootHeight, Steadiness, Mistake, type = "common")

userPerformance_Descriptive

```

```
## # A tibble: 12 × 12
##   CoachingStyle Viewpoint variable     n    min    max median   iqr   mean    sd
##   <chr>        <chr>      <fct>     <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 Autonomous Sty... First Pe... FootHei...    96  0.025  0.795  0.299  0.158  0.298  0.134
## 2 Autonomous Sty... First Pe... Steadin...    96  0.001  0.307  0.062  0.09   0.081  0.07 
## 3 Autonomous Sty... First Pe... Mistake    96  0       5     1     1     0.938  1.10 
## 4 Autonomous Sty... Third Pe... FootHei...    96  0       0.726  0.318  0.187  0.317  0.154
## 5 Autonomous Sty... Third Pe... Steadin...    96  0       0.521  0.166  0.156  0.178  0.117
## 6 Autonomous Sty... Third Pe... Mistake    96  0       4     0.5   1     0.823  1.04 
## 7 Controlling St... First Pe... FootHei...    96  0.007  0.889  0.294  0.155  0.296  0.141
## 8 Controlling St... First Pe... Steadin...    96  0.003  0.445  0.059  0.09   0.094  0.093
## 9 Controlling St... First Pe... Mistake    96  0       4     1     1     0.823  0.973
## 10 Controlling St... Third Pe... FootHei...   96  0.021  0.656  0.321  0.179  0.32   0.129
## 11 Controlling St... Third Pe... Steadin...   96  0.004  0.434  0.086  0.103  0.104  0.088
## 12 Controlling St... Third Pe... Mistake    96  0       5     0     1     0.844  1.12 

## # i 2 more variables: se <dbl>, ci <dbl>
```

```
### SUS
SUS_Descriptive <- SUS_Data %>%
  get_summary_stats(SUS, type = "common")

SUS_Descriptive
```

```
## # A tibble: 1 × 10
##   variable     n    min    max median   iqr   mean    sd    se    ci
##   <fct>     <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 SUS        16  57.5  100   82.5  23.1   80  14.3  3.56  7.60
```

```
### TLX
TLX_Descriptive <- TLX_Data %>%
  group_by(Type) %>%
  get_summary_stats(Score, type = "common")

TLX_Descriptive
```

```
## # A tibble: 6 × 11
##   Type      variable     n    min    max median   iqr   mean    sd    se    ci
##   <chr>    <fct>     <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 Effort    Score      16    20    100   60    26.5  60.2  23.3  5.83  12.4
## 2 Frustration Score    16    5     70    39    36.8  34.9  21.2  5.29  11.3
## 3 Mental Demand Score    16    5     96    36.5  48.2  40.3  30.9  7.72  16.5
## 4 Performance Score    16   22    100   70    29.8  65.6  22.5  5.63  12.0
## 5 Physical Dema... Score    16   14    100   61    42.8  61.6  31.0  7.76  16.5
## 6 Temporal Dema... Score    16    3    100   29.5  39    35.2  30.4  7.61  16.2
```

```
### MidQuestion_Data
MidQuestion_Descriptive <- MidQuestion_Data %>%
  group_by(Coaching.Style, Viewpoint) %>%
  get_summary_stats(Embodiment, Social_Presence, Enjoyment, Difficulty, PerceptionCoach, Recommendation, type = "common")
```

```
MidQuestion_Descriptive
```

```
## # A tibble: 24 × 12
##   Viewpoint Coaching.Style variable     n    min    max median    iqr   mean    sd
##   <chr>      <chr>           <fct>     <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 First Per... Autonomous-SS. Embodim...     16  2.06  6.56  3.82 1.03  4.05 1.23
## 2 First Per... Autonomous-SS. Social_...     16  2.8   6.4   4   0.45  4.21 0.874
## 3 First Per... Autonomous-SS. Enjoyme...     16  1     5     4   1.25  3.94 1.29
## 4 First Per... Autonomous-SS. Difficu...     16  1     5     2   1.25  2.06 1.29
## 5 First Per... Autonomous-SS. Percept...     16  1     5     2   1.62  2.44 1.18
## 6 First Per... Autonomous-SS. Recomme...     16  6     11    10  3.25  9.25 1.73
## 7 Third Per... Autonomous-SS. Embodim...     16  2.85  6.47  4.30 0.99  4.35 0.898
## 8 Third Per... Autonomous-SS. Social_...     16  3.1   5.8   4   0.975 4.24 0.753
## 9 Third Per... Autonomous-SS. Enjoyme...     16  2     5     4   1   4.12 0.806
## 10 Third Per... Autonomous-SS. Difficu...    16  1     4     2   1   1.88 0.806
## # i 14 more rows
## # i 2 more variables: se <dbl>, ci <dbl>
```

```
#####
##### Statistical analysis
```

```
### ANOVA
##### Assign User ID as a factor for analysis
userPerformanceData$PID <- as.factor(userPerformanceData$PID)
userPerformanceData$CoachingStyle <- as.factor(userPerformanceData$CoachingStyle)
userPerformanceData$Viewpoint <- as.factor(userPerformanceData$Viewpoint)

#Foot Height
analysisData_Foot.aov <- ezANOVA(data = userPerformanceData, dv= FootHeight, wid = PID, within = .(Viewpoint, CoachingStyle), detailed = TRUE) #between = Foot, #Pose
```

```
## Warning: Collapsing data to cell means. *IF* the requested effects are a subset
## of the full design, you must use the "within_full" argument, else results may
## be inaccurate.
```

```
analysisData_Foot.aov
```

```
## $ANOVA
##          Effect DFn DFd      SSn      SSd        F
## 1      (Intercept)  1  15 6.054114e+00 0.506732923 179.21020576
## 2      Viewpoint    1  15 7.060254e-03 0.031372013   3.37574181
## 3      CoachingStyle 1  15 1.376684e-05 0.006882933   0.03000212
## 4 Viewpoint:CoachingStyle 1  15 6.793097e-05 0.019150306   0.05320879
##          p p<.05      ges
## 1 9.564110e-10      * 9.147602e-01
## 2 8.605396e-02      1.236042e-02
## 3 8.648011e-01      2.440272e-05
## 4 8.206875e-01      1.204010e-04
```

## #Steadiness

```
analysisData_Steadiness.aov <- ezANOVA(data = userPerformanceData, dv= Steadiness, wid = PID, within = CoachingStyle * Viewpoint, detailed = TRUE)
```

## Warning: Collapsing data to cell means. \*IF\* the requested effects are a subset  
 ## of the full design, you must use the "within\_full" argument, else results may  
 ## be inaccurate.

```
analysisData_Steadiness.aov
```

```
## $ANOVA
##          Effect DFn DFd      SSn      SSd        F        p
## 1      (Intercept)  1  15 0.83259194 0.06434981 194.077942 5.485866e-10
## 2      CoachingStyle 1  15 0.01534485 0.02410878   9.547259 7.470289e-03
## 3      Viewpoint    1  15 0.04589008 0.04144832  16.607459 9.950213e-04
## 4 CoachingStyle:Viewpoint  1  15 0.03042098 0.01700706  26.830899 1.119899e-04
##          p<.05      ges
## 1      * 0.85001217
## 2      * 0.09457021
## 3      * 0.23801409
## 4      * 0.17154533
```

## #Mistake

```
analysisData_Mistake.aov <- ezANOVA(data = userPerformanceData, dv= Mistake, wid = PID, within = CoachingStyle * Viewpoint, detailed = TRUE)
```

## Warning: Collapsing data to cell means. \*IF\* the requested effects are a subset  
 ## of the full design, you must use the "within\_full" argument, else results may  
 ## be inaccurate.

```
analysisData_Mistake.aov
```

```
## $ANOVA
##          Effect DFn DFd      SSn      SSD       F
## 1 (Intercept)   1  15 46.97960069 28.6523438 24.5946376
## 2 CoachingStyle  1  15  0.03515625  0.4301215  1.2260343
## 3 Viewpoint     1  15  0.03515625  2.8745660  0.1834516
## 4 CoachingStyle:Viewpoint  1  15  0.07335069  2.7252604  0.4037267
##          p p<.05    ges
## 1 0.0001713826 * 0.575294049
## 2 0.2856204677 0.001012639
## 3 0.6745101952 0.001012639
## 4 0.5347447384 0.002110469
```

```
##### Interpret effectsize
interpret_cohens_d(0.0166139261, rules = "cohen1988")
```

```
## [1] "very small"
## (Rules: cohen1988)
```

```
##### Pairwise t tests
```

```
#Steadiness
userPerformanceData %>%
  pairwise_t_test(Steadiness ~ Viewpoint, paired = TRUE, p.adjust.method = "bonf")
```

```
## # A tibble: 1 × 10
##   .y.    group1 group2   n1   n2 statistic    df      p  p.adj p.adj.signif
## * <chr>  <chr>  <chr> <int> <int>     <dbl> <dbl>  <dbl> <dbl> <chr>
## 1 Steadi... First... Third...   192   192     -6.41   191 1.13e-9 1.13e-9 ****
```

```
userPerformanceData %>%
  pairwise_t_test(Steadiness ~ CoachingStyle, paired = TRUE, p.adjust.method = "bonf")
```

```
## # A tibble: 1 × 10
##   .y.    group1 group2   n1   n2 statistic    df      p  p.adj p.adj.signif
## * <chr>  <chr>  <chr> <int> <int>     <dbl> <dbl>  <dbl> <dbl> <chr>
## 1 Steadi... Auton... Contr...   192   192      3.91   191 1.26e-4 1.26e-4 ***
```

```
userPerformanceData %>%
  group_by(Viewpoint) %>%
  pairwise_t_test(Steadiness ~ CoachingStyle, paired = TRUE, p.adjust.method = "bonf")
```

```
## # A tibble: 2 × 11
##   Viewpoint   .y.    group1 group2   n1   n2 statistic    df      p  p.adj
## * <fct>     <chr>  <chr>  <chr> <int> <int>     <dbl> <dbl>  <dbl> <dbl>
## 1 First Person Steadi... Auton... Contr...   96   96     -1.59    95 1.16e-1 1.16e-1
## 2 Third Person Steadi... Auton... Contr...   96   96      6.12    95 2.06e-8 2.06e-8
## # i 1 more variable: p.adj.signif <chr>
```

```
userPerformanceData %>%
  group_by(CoachingStyle) %>%
  pairwise_t_test(Steadiness ~ Viewpoint, paired = TRUE, p.adjust.method = "bonf")
```

```
## # A tibble: 2 × 11
##   CoachingStyle .y.    group1 group2    n1    n2 statistic    df      p
## * <fct>        <chr>   <chr>  <chr> <int> <int>    <dbl> <dbl>     <dbl>
## 1 Autonomous Style Steadine.. First... Third...    96    96    -8.24    95 9.5 e-13
## 2 Controlling Style Steadine.. First... Third...    96    96   -0.965    95 3.37e- 1
## # i 2 more variables: p.adj <dbl>, p.adj.signif <chr>
```

```
userPerformanceData %>%
  group_by(Pose, Viewpoint) %>%
  pairwise_t_test(Steadiness ~ CoachingStyle, paired = TRUE, p.adjust.method = "bonf")
```

```
## # A tibble: 12 × 12
##   Viewpoint   Pose .y.    group1 group2    n1    n2 statistic    df      p
## * <fct>       <int> <chr>   <chr>  <chr> <int> <int>    <dbl> <dbl>     <dbl>
## 1 First Person 1 Steadine.. Auton... Contr...    16    16   -1.49    15 1.57e-1
## 2 Third Person  1 Steadine.. Auton... Contr...    16    16   0.964    15 3.5 e-1
## 3 First Person  2 Steadine.. Auton... Contr...    16    16  -0.0828    15 9.35e-1
## 4 Third Person  2 Steadine.. Auton... Contr...    16    16   5.31     15 8.81e-5
## 5 First Person  3 Steadine.. Auton... Contr...    16    16   -1.43    15 1.72e-1
## 6 Third Person  3 Steadine.. Auton... Contr...    16    16   0.905    15 3.8 e-1
## 7 First Person  4 Steadine.. Auton... Contr...    16    16   0.528    15 6.05e-1
## 8 Third Person  4 Steadine.. Auton... Contr...    16    16   6.04     15 2.27e-5
## 9 First Person  5 Steadine.. Auton... Contr...    16    16  -0.803    15 4.35e-1
## 10 Third Person 5 Steadine.. Auton... Contr...    16    16   0.449    15 6.6 e-1
## 11 First Person 6 Steadine.. Auton... Contr...    16    16 -0.000566    15 1 e+0
## 12 Third Person 6 Steadine.. Auton... Contr...    16    16   4.88     15 2 e-4
## # i 2 more variables: p.adj <dbl>, p.adj.signif <chr>
```

```
userPerformanceData %>%
  group_by(Pose, CoachingStyle) %>%
  pairwise_t_test(Steadiness ~ Viewpoint, paired = TRUE, p.adjust.method = "bonf")
```

```
## # A tibble: 12 × 12
##   CoachingStyle Pose .y. group1 group2   n1   n2 statistic    df     p
## * <fct>          <int> <chr> <chr> <int> <int>    <dbl> <dbl>    <dbl>
## 1 Autonomous Sty... 1 Stea... First... Third... 16   16   -3.43    15 4 e-3
## 2 Controlling St... 1 Stea... First... Third... 16   16   -1.40    15 1.81e-1
## 3 Autonomous Sty... 2 Stea... First... Third... 16   16   -7.58    15 1.68e-6
## 4 Controlling St... 2 Stea... First... Third... 16   16   -1.63    15 1.24e-1
## 5 Autonomous Sty... 3 Stea... First... Third... 16   16   -1.83    15 8.8 e-2
## 6 Controlling St... 3 Stea... First... Third... 16   16   0.603    15 5.56e-1
## 7 Autonomous Sty... 4 Stea... First... Third... 16   16   -4.84    15 2.17e-4
## 8 Controlling St... 4 Stea... First... Third... 16   16   -0.613    15 5.49e-1
## 9 Autonomous Sty... 5 Stea... First... Third... 16   16   -0.917    15 3.74e-1
## 10 Controlling St... 5 Stea... First... Third... 16   16   0.105    15 9.18e-1
## 11 Autonomous Sty... 6 Stea... First... Third... 16   16   -4.86    15 2.07e-4
## 12 Controlling St... 6 Stea... First... Third... 16   16   -0.630    15 5.38e-1
## # i 2 more variables: p.adj <dbl>, p.adj.signif <chr>
```

## #Foot Height

```
userPerformanceData %>%
  group_by(CoachingStyle) %>%
  pairwise_t_test(FootHeight ~ Viewpoint, paired = TRUE, p.adjust.method = "bonf")
```

```
## # A tibble: 2 × 11
##   CoachingStyle .y. group1 group2   n1   n2 statistic    df     p p.adj
## * <fct>          <chr> <chr> <chr> <int> <int>    <dbl> <dbl> <dbl> <dbl>
## 1 Autonomous Style FootH... First... Third... 96   96   -1.41    95 0.16 0.16
## 2 Controlling Style FootH... First... Third... 96   96   -2.17    95 0.032 0.032
## # i 1 more variable: p.adj.signif <chr>
```

```
userPerformanceData %>%
  group_by(CoachingStyle, Pose) %>%
  pairwise_t_test(FootHeight ~ Viewpoint, paired = TRUE, p.adjust.method = "bonf")
```

```
## # A tibble: 12 × 12
##   CoachingStyle Pose .y. group1 group2   n1   n2 statistic    df     p
## * <fct>          <int> <chr> <chr> <chr> <int> <int>    <dbl> <dbl>    <dbl>
## 1 Autonomous Style 1 Foot... First... Third... 16   16   -2.96    15 0.01
## 2 Autonomous Style 2 Foot... First... Third... 16   16   -1.68    15 0.113
## 3 Autonomous Style 3 Foot... First... Third... 16   16   0.548    15 0.592
## 4 Autonomous Style 4 Foot... First... Third... 16   16   1.30     15 0.212
## 5 Autonomous Style 5 Foot... First... Third... 16   16   -1.19    15 0.254
## 6 Autonomous Style 6 Foot... First... Third... 16   16   0.434    15 0.671
## 7 Controlling Style 1 Foot... First... Third... 16   16   -2.69    15 0.017
## 8 Controlling Style 2 Foot... First... Third... 16   16   -0.751   15 0.464
## 9 Controlling Style 3 Foot... First... Third... 16   16   -1.07    15 0.302
## 10 Controlling Style 4 Foot... First... Third... 16   16   -1.69    15 0.113
## 11 Controlling Style 5 Foot... First... Third... 16   16   -0.705   15 0.492
## 12 Controlling Style 6 Foot... First... Third... 16   16   0.361    15 0.723
## # i 2 more variables: p.adj <dbl>, p.adj.signif <chr>
```

```
userPerformanceData %>%
  group_by(Viewpoint, Pose) %>%
  pairwise_t_test(FootHeight ~ CoachingStyle, paired = TRUE, p.adjust.method = "bonf")
```

```
## # A tibble: 12 × 12
##   Viewpoint   Pose .y. group1 group2   n1   n2 statistic    df     p p.adj
##   * <fct>      <int> <chr> <chr> <chr> <int> <dbl> <dbl> <dbl> <dbl>
## 1 First Pers...     1 Foot... Auton... Contr...    16    16    0.709    15 0.489 0.489
## 2 First Pers...     2 Foot... Auton... Contr...    16    16   -0.752    15 0.464 0.464
## 3 First Pers...     3 Foot... Auton... Contr...    16    16    0.0684   15 0.946 0.946
## 4 First Pers...     4 Foot... Auton... Contr...    16    16    2.69     15 0.017 0.017
## 5 First Pers...     5 Foot... Auton... Contr...    16    16   -0.983    15 0.341 0.341
## 6 First Pers...     6 Foot... Auton... Contr...    16    16   -0.336    15 0.741 0.741
## 7 Third Pers...     1 Foot... Auton... Contr...    16    16    0.735    15 0.474 0.474
## 8 Third Pers...     2 Foot... Auton... Contr...    16    16    1.10     15 0.289 0.289
## 9 Third Pers...     3 Foot... Auton... Contr...    16    16   -1.52     15 0.15   0.15
## 10 Third Pers...    4 Foot... Auton... Contr...    16    16   -0.678    15 0.508 0.508
## 11 Third Pers...    5 Foot... Auton... Contr...    16    16    0.216    15 0.832 0.832
## 12 Third Pers...    6 Foot... Auton... Contr...    16    16   -0.261    15 0.798 0.798
## # i 1 more variable: p.adj.signif <chr>
```

### #Number of Mistakes

```
userPerformanceData %>%
  group_by(CoachingStyle, Pose) %>%
  pairwise_t_test(Mistake ~ Viewpoint, paired = TRUE, p.adjust.method = "bonf")
```

```
## # A tibble: 12 × 12
##   CoachingStyle   Pose .y. group1 group2   n1   n2 statistic    df     p
##   * <fct>          <int> <chr> <chr> <chr> <int> <dbl> <dbl> <dbl>
## 1 Autonomous Style     1 Mist... First... Third...    16    16    0.939    15 0.362
## 2 Autonomous Style     2 Mist... First... Third...    16    16    1.70     15 0.11
## 3 Autonomous Style     3 Mist... First... Third...    16    16   -0.126    15 0.901
## 4 Autonomous Style     4 Mist... First... Third...    16    16   -1.32     15 0.206
## 5 Autonomous Style     5 Mist... First... Third...    16    16    0.460    15 0.652
## 6 Autonomous Style     6 Mist... First... Third...    16    16    0.808    15 0.432
## 7 Controlling Style    1 Mist... First... Third...    16    16    2.24     15 0.041
## 8 Controlling Style    2 Mist... First... Third...    16    16   -3.16     15 0.006
## 9 Controlling Style    3 Mist... First... Third...    16    16   -0.355    15 0.728
## 10 Controlling Style   4 Mist... First... Third...    16    16   -1.26     15 0.228
## 11 Controlling Style   5 Mist... First... Third...    16    16    0.899    15 0.383
## 12 Controlling Style   6 Mist... First... Third...    16    16    1.10     15 0.289
## # i 2 more variables: p.adj <dbl>, p.adj.signif <chr>
```

### userPerformanceData %>%

```
group_by(Viewpoint, Pose) %>%
  pairwise_t_test(Mistake ~ CoachingStyle, paired = TRUE, p.adjust.method = "bonf")
```

```
## # A tibble: 12 × 12
##   Viewpoint Pose .y. group1 group2   n1   n2 statistic    df     p p.adj
## * <fct>      <int> <chr> <chr> <int> <int>     <dbl> <dbl> <dbl> <dbl>
## 1 First Pers... 1 Mist... Auton... Contr... 16   16   -0.187  15 0.855 0.855
## 2 First Pers... 2 Mist... Auton... Contr... 16   16    1.38  15 0.188 0.188
## 3 First Pers... 3 Mist... Auton... Contr... 16   16    1.07  15 0.3   0.3
## 4 First Pers... 4 Mist... Auton... Contr... 16   16    0.764 15 0.456 0.456
## 5 First Pers... 5 Mist... Auton... Contr... 16   16    0.324 15 0.751 0.751
## 6 First Pers... 6 Mist... Auton... Contr... 16   16   -0.522 15 0.609 0.609
## 7 Third Pers... 1 Mist... Auton... Contr... 16   16    1.14  15 0.27  0.27
## 8 Third Pers... 2 Mist... Auton... Contr... 16   16   -3.58  15 0.003 0.003
## 9 Third Pers... 3 Mist... Auton... Contr... 16   16    0.545 15 0.594 0.594
## 10 Third Pers... 4 Mist... Auton... Contr... 16   16    0     15 1     1
## 11 Third Pers... 5 Mist... Auton... Contr... 16   16    0.565 15 0.58  0.58
## 12 Third Pers... 6 Mist... Auton... Contr... 16   16   -0.212 15 0.835 0.835
## # i 1 more variable: p.adj.signif <chr>
```

#### ##### Mid-Questionnaire Data

*#Enjoyment*

```
MidQuestion_Data %>%
  pairwise_t_test(Enjoyment ~ Coaching.Style, paired = TRUE, p.adjust.method = "bonf")
```

```
## # A tibble: 1 × 10
##   .y.      group1  group2   n1   n2 statistic    df     p p.adj p.adj.signif
## * <chr>    <chr> <chr> <int> <int>     <dbl> <dbl> <dbl> <dbl> <chr>
## 1 Enjoyment Autonom... Contr... 32   32   -2.17  31 0.037 0.037 *
```

*#Difficulty*

```
MidQuestion_Data %>%
  pairwise_t_test(Difficulty ~ Coaching.Style, paired = TRUE, p.adjust.method = "bonf")
```

```
## # A tibble: 1 × 10
##   .y.      group1  group2   n1   n2 statistic    df     p p.adj p.adj.signif
## * <chr>    <chr> <chr> <int> <int>     <dbl> <dbl> <dbl> <dbl> <chr>
## 1 Difficulty Autono... Contr... 32   32    2.17  31 0.037 0.037 *
```

*#Embodiment*

```
MidQuestion_Data %>%
  pairwise_t_test(Embodiment ~ Viewpoint, paired = TRUE, p.adjust.method = "bonf")
```

```
## # A tibble: 1 × 10
##   .y.      group1  group2   n1   n2 statistic    df     p p.adj p.adj.signif
## * <chr>    <chr> <chr> <int> <int>     <dbl> <dbl> <dbl> <dbl> <chr>
## 1 Embodiment First ... Third... 32   32   -2.78  31 0.009 0.009 **
```

```
#Social Presence
MidQuestion_Data %>%
  group_by(Viewpoint) %>%
  pairwise_t_test(Social_Presence ~ Coaching.Style, paired = TRUE, p.adjust.method = "bonf")
```

```
## # A tibble: 2 × 11
##   Viewpoint .y.     group1 group2    n1    n2 statistic    df      p p.adj
## * <chr>     <chr>   <chr>  <chr> <int> <int>     <dbl> <dbl> <dbl> <dbl>
## 1 First Person Social_Pre... Auton... Contr...    16    16    -0.190    15 0.852 0.852
## 2 Third Person Social_Pre... Auton... Contr...    16    16    -1.06     15 0.307 0.307
## # i 1 more variable: p.adj.signif <chr>
```

```
#Perception
MidQuestion_Data %>%
  pairwise_t_test(PerceptionCoach ~ Coaching.Style, paired = TRUE, p.adjust.method = "bonf")
```

```
## # A tibble: 1 × 10
##   .y.     group1 group2    n1    n2 statistic    df      p p.adj p.adj.signif
## * <chr>   <chr>  <chr> <int> <int>     <dbl> <dbl> <dbl> <dbl> <chr>
## 1 Percep... Auton... Contr...    32    32    -6.87    31 1.08e-7 1.08e-7 ****
```

```
MidQuestion_Data %>%
  group_by(Viewpoint) %>%
  pairwise_t_test(PerceptionCoach ~ Coaching.Style, paired = TRUE, p.adjust.method = "bonf")
```

```
## # A tibble: 2 × 11
##   Viewpoint .y.     group1 group2    n1    n2 statistic    df      p p.adj
## * <chr>     <chr>   <chr>  <chr> <int> <int>     <dbl> <dbl> <dbl> <dbl>
## 1 First Person Percep... Auton... Contr...    16    16    -4.42    15 4.99e-4 4.99e-4
## 2 Third Person Percep... Auton... Contr...    16    16    -5.19    15 1.1 e-4 1.1 e-4
## # i 1 more variable: p.adj.signif <chr>
```

```
#Recommendation
MidQuestion_Data %>%
  pairwise_t_test(Recommendation ~ Coaching.Style, paired = TRUE, p.adjust.method = "bonf")
```

```
## # A tibble: 1 × 10
##   .y.     group1 group2    n1    n2 statistic    df      p p.adj p.adj.signif
## * <chr>   <chr>  <chr> <int> <int>     <dbl> <dbl> <dbl> <dbl> <chr>
## 1 Recommenda... Auton... Contr...    32    32    -3.52    31 0.001 0.001 **
```

```
MidQuestion_Data %>%
  group_by(Viewpoint) %>%
  pairwise_t_test(Recommendation ~ Coaching.Style, paired = TRUE, p.adjust.method = "bonf")
```

```
## # A tibble: 2 × 11
##   Viewpoint .y.      group1 group2    n1    n2 statistic     df     p p.adj
## * <chr>     <chr>     <chr>  <chr> <int> <int>     <dbl> <dbl> <dbl> <dbl>
## 1 First Person Recommenda... Auton... Contr...    16    16     -3.16    15 0.006 0.006
## 2 Third Person Recommenda... Auton... Contr...    16    16     -2.07    15 0.056 0.056
## # i 1 more variable: p.adj.signif <chr>
```

```
#####
##### Visualization #####
#####

#####
```

```
### Rename columns
userPerformanceData$CoachingStyle <- mapvalues(userPerformanceData$CoachingStyle, from = c("Autonomous Style", "Controlling Style"), to = c("Autonomous-Supportive Style", "Controlled Style"))

### Rename
userPerformanceData$CoachingStyleName <- mapvalues(userPerformanceData$CoachingStyle, from = c("Autonomous-Supportive Style", "Controlled Style"), to = c("Autonomous-SS.", "Controlled S."))

stat_Score.test <- userPerformanceData %>%
  group_by(CoachingStyle) %>%
  pairwise_t_test(Steadiness ~ Viewpoint, paired = TRUE, p.adjust.method = "bonf")

stat_Score.test <- stat_Score.test %>%
  filter(p < 0.05) %>%
  arrange(desc(CoachingStyle)) %>%
  add_xy_position(x = "CoachingStyle")

stat_Score.test1 <- userPerformanceData %>%
  group_by(Viewpoint) %>%
  pairwise_t_test(Steadiness ~ CoachingStyle, paired = TRUE, p.adjust.method = "bonf")

stat_Score.test1 <- stat_Score.test1 %>%
  filter(p < 0.05) %>%
  add_xy_position(x = "CoachingStyle", group = "Viewpoint")

stat_Score.test2 <- userPerformanceData %>%
  pairwise_t_test(Steadiness ~ CoachingStyle, paired = TRUE, p.adjust.method = "bonf")

stat_Score.test2 <- stat_Score.test2 %>%
  filter(p < 0.05) %>%
  add_xy_position(x = "CoachingStyle")
```

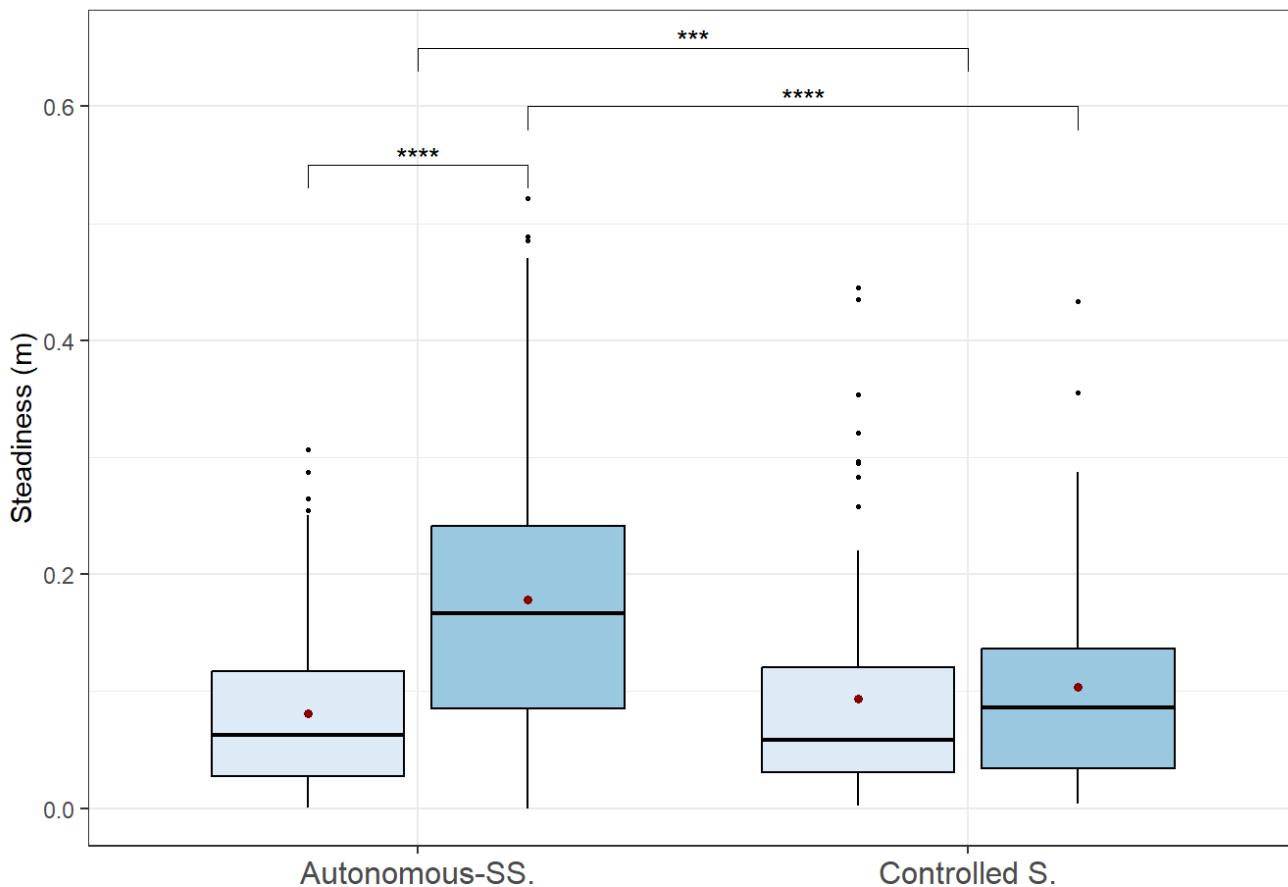
```
#####
# User Performance
# Steadiness
newplot1 <- ggboxplot(
  userPerformanceData, x = "CoachingStyleName", y = "Steadiness",
  fill = "Viewpoint", palette = "Blues", #order = c("Controlled Style", "Autonomous-Supportive Style"),
  ylim = c(1200, 1230),
  size = .4, bxp.errorbar.width = 0.1, outlier.size = 0.5,
) +
  labs(x="", y = "Steadiness (m)") +
  stat_summary(aes(fill= Viewpoint), position = position_dodge(width=.8), fun=mean, geom="point",
  shape=20, size=2, color="darkred") +
  theme_bw()+
  theme(axis.text.x = element_text(size = 12), legend.title = element_blank(), legend.position= "none")

newplot1 <- newplot1 + stat_pvalue_manual(stat_Score.test, label = "p.adj.signif", position = position_dodge(0.8), y.position = 0.55)

newplot1 <- newplot1 + stat_pvalue_manual(stat_Score.test1, label = "p.adj.signif", position = position_dodge(0.8), y.position = 0.60)

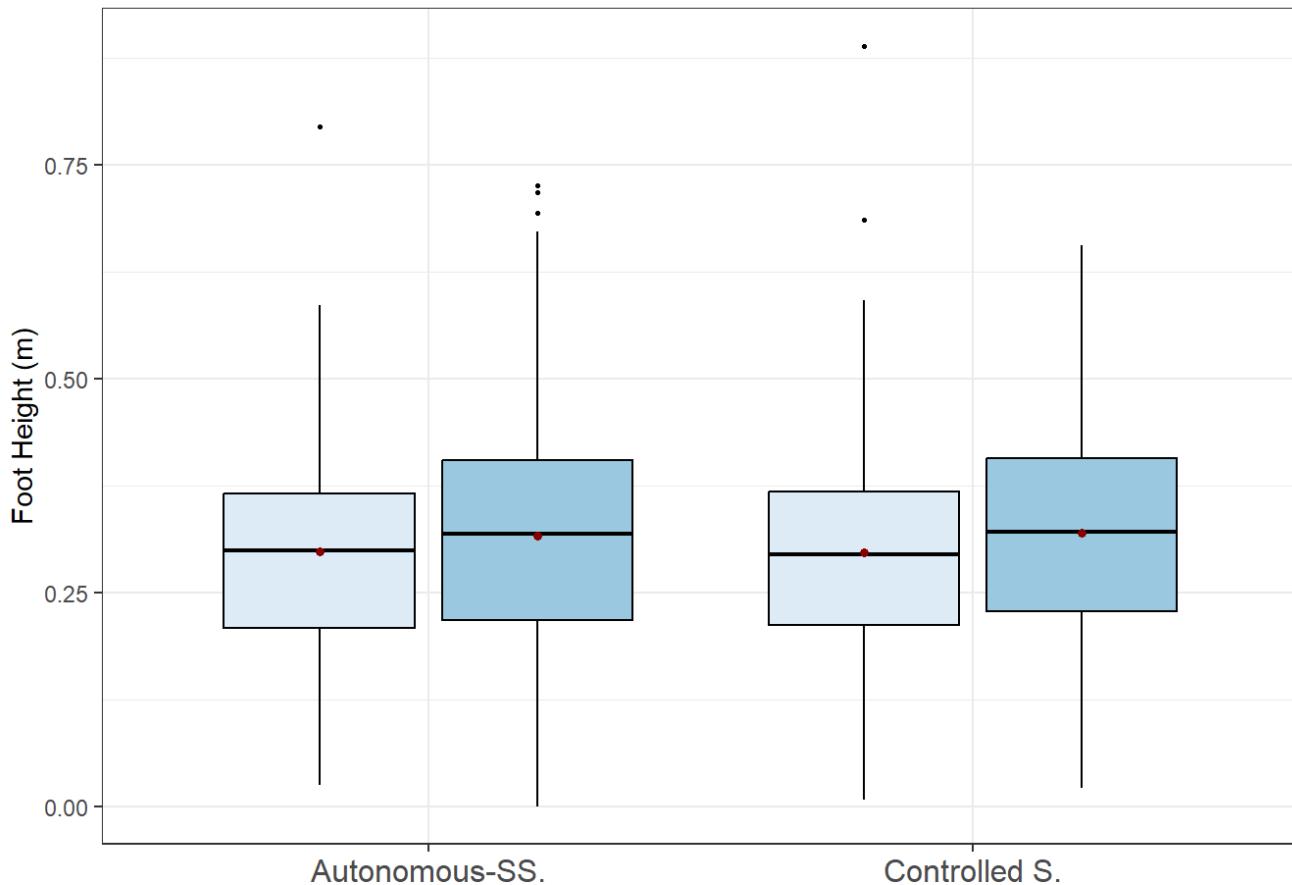
newplot1 <- newplot1 + stat_pvalue_manual(stat_Score.test2, label = "p.adj.signif", position = position_dodge(0.8), y.position = 0.65)

newplot1
```

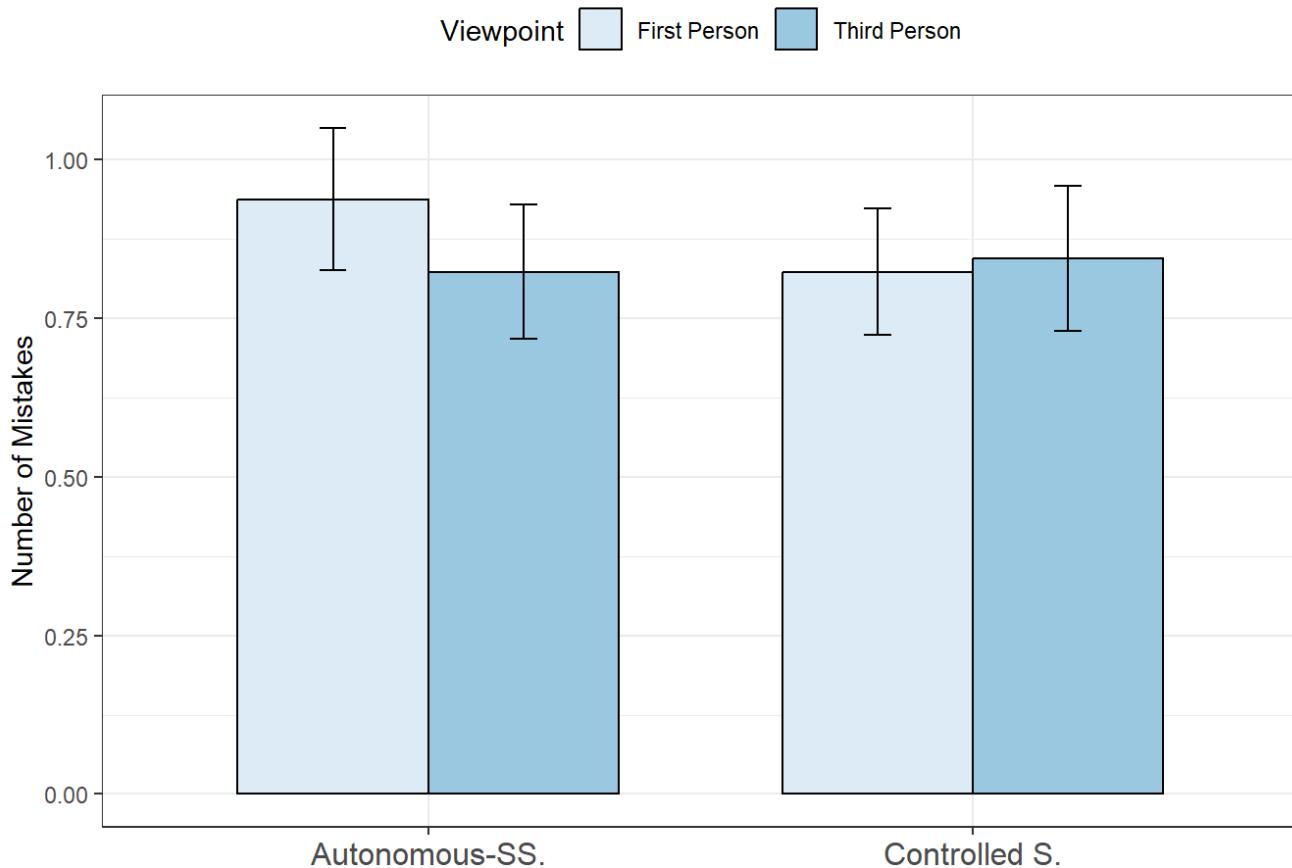


```
#Foot Height
newplot2 <- ggboxplot(
  userPerformanceData, x = "CoachingStyleName", y = "FootHeight",
  fill = "Viewpoint", palette = "Blues", #order = c("Controlled Style", "Autonomous-Supportive Style"),
  ylim = c(1200, 1230),
  size = .4, bxp.errorbar.width = 0.1, outlier.size = 0.5,
) +
  labs(x="", y = "Foot Height (m)") +
  stat_summary(aes(fill= Viewpoint), position = position_dodge(width=.8), fun=mean, geom="point",
shape=20, size=2, color="darkred",) +
  theme_bw()+
  theme(axis.text.x = element_text(size = 12), legend.title = element_blank(), legend.position= "none")

newplot2
```

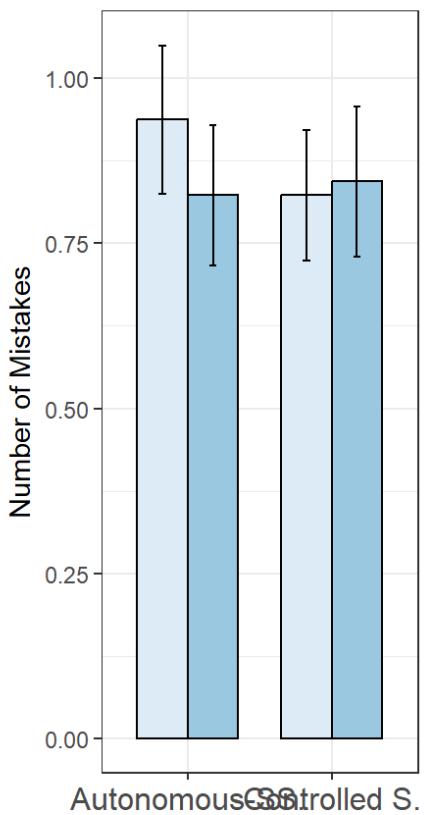
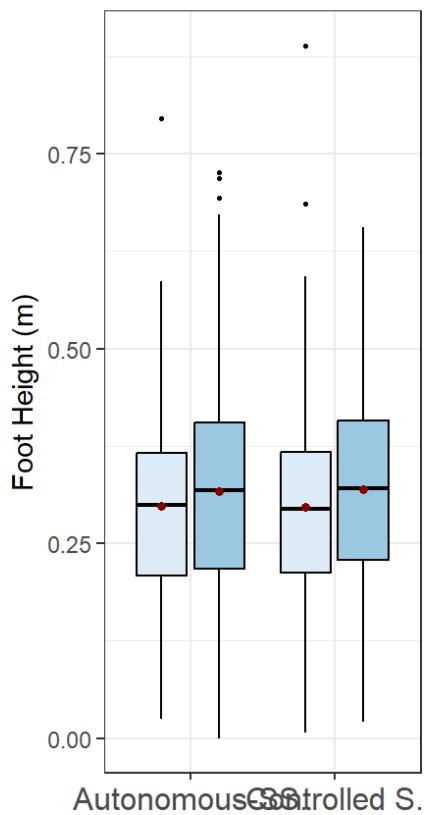
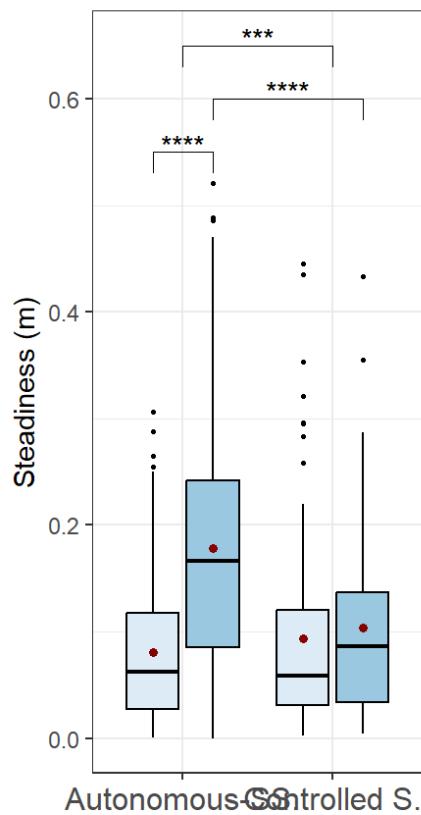


```
#Mistakes
newplot3 <- ggbarplot(
  userPerformanceData, x = "CoachingStyleName", y = "Mistake",
  fill = "Viewpoint", color = "black", palette = "Blues",
  position = position_dodge(0.7), #order = c("Controlled Style", "Autonomous-Supportive Style"),
  add = "mean_se", label = FALSE, lab.nb.digits = 2, lab.vjust = 4.2,
) +
  labs(x="", y = "Number of Mistakes") +
  theme_bw()+
  theme(axis.text.x = element_text(size = 12), legend.background = element_rect(fill = "transparent", color = NA), legend.position = "top") # c(.873, .88)) axis.text.x = element_text(size = 12),
newplot3
```



```
# Combine plots
ggarrange(newplot1, newplot2, newplot3, ncol=3, nrow = 1, common.legend = TRUE)
```

First Person      Third Person



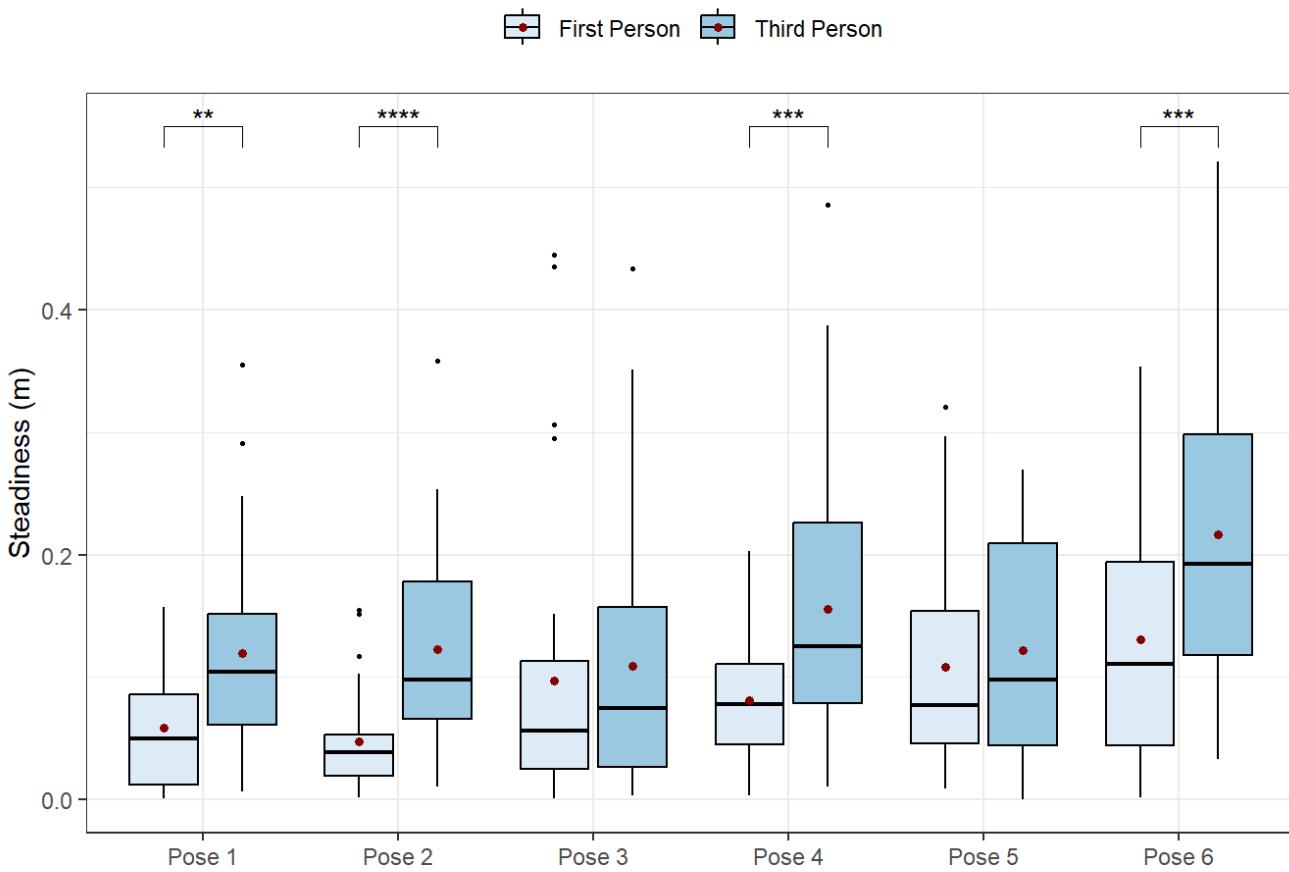
```
##### Pose Visualization -- Steadiness #####
### Rename columns
userPerformanceData$PoseName <- mapvalues(userPerformanceData$Pose, from = c("1", "2", "3", "4", "5", "6"), to = c("Pose 1", "Pose 2", "Pose 3", "Pose 4", "Pose 5", "Pose 6"))

##### Viewpoint
stat_viewpoint.test <- userPerformanceData %>%
  group_by(Pose) %>%
  pairwise_t_test(Steadiness ~ Viewpoint, paired = TRUE, p.adjust.method = "bonf")

stat_viewpoint.test <- stat_viewpoint.test %>%
  filter(p < 0.05) %>%
  add_xy_position(x = "Pose")

poseViewpointPlot <- ggboxplot(
  userPerformanceData, x = "PoseName", y = "Steadiness",
  fill = "Viewpoint", palette = "Blues", #order = c("Controlled Style", "Autonomous-Supportive Style"),
  ylim = c(1200, 1230),
  size = .4, bxp.errorbar.width = 0.1, outlier.size = 0.5,
) +
  labs(x="", y = "Steadiness (m)") +
  stat_summary(aes(fill= Viewpoint), position = position_dodge(width=.8), fun=mean, geom="point",
shape=20, size=2, color="darkred",) +
  theme_bw()+
  theme(legend.title = element_blank(), legend.position= "top")

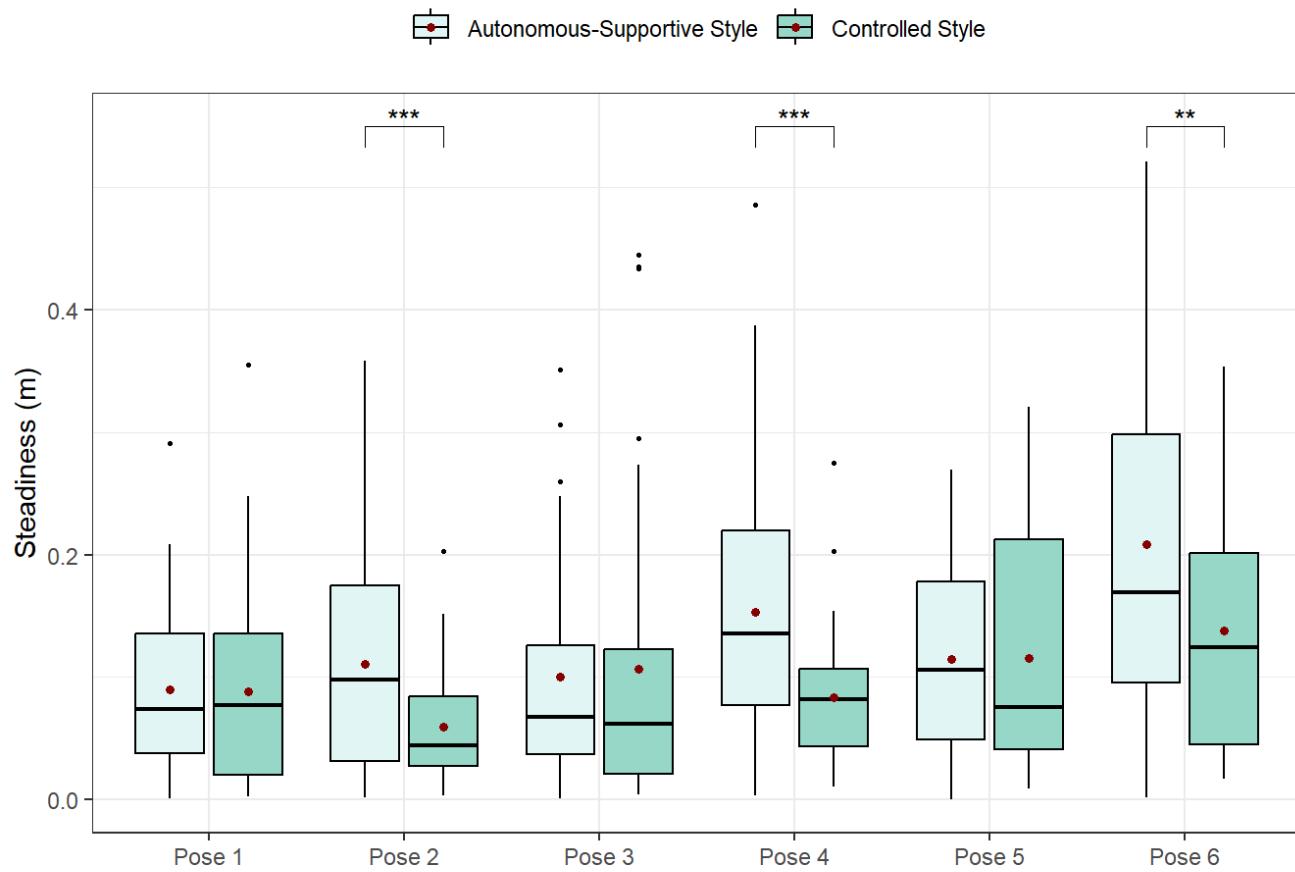
poseViewpointPlot + stat_pvalue_manual(stat_viewpoint.test, label = "p.adj.signif", position = position_dodge(0.8), y.position = 0.55)
```



```
##### Coaching Style
stat_style.test <- userPerformanceData %>%
  group_by(Pose) %>%
  pairwise_t_test(Steadiness ~ CoachingStyle, paired = TRUE, p.adjust.method = "bonf")

stat_style.test <- stat_style.test %>%
  filter(p < 0.05) %>%
  add_xy_position(x = "Pose")

poseStylePlot <- ggboxplot(
  userPerformanceData, x = "PoseName", y = "Steadiness",
  fill = "CoachingStyle", palette = "BuGn", #order = c("Controlled Style", "Autonomous-Supportive Style"),
  #ylim = c(1200, 1230),
  size = .4, bxp.errorbar.width = 0.1, outlier.size = 0.5,
) +
  labs(x="", y = "Steadiness (m)") +
  stat_summary(aes(fill= CoachingStyle), position = position_dodge(width=.8), fun=mean, geom="point",
  shape=20, size=2, color="darkred",) +
  theme_bw()+
  theme(legend.title = element_blank(), legend.position= "top")
poseStylePlot + stat_pvalue_manual(stat_style.test, label = "p.adj.signif", position = position_dodge(0.8), y.position = 0.55)
```



```
##### Combine

stat_combine.test <- userPerformanceData %>%
  group_by(CoachingStyleName, PoseName) %>%
  pairwise_t_test(Steadiness ~ Viewpoint, paired = TRUE, p.adjust.method = "bonf")

stat_combine.test <- stat_combine.test %>%
  filter(p < 0.05) %>%
  add_xy_position(x = "CoachingStyleName")

stat_combine1.test <- userPerformanceData %>%
  group_by(Viewpoint, PoseName) %>%
  pairwise_t_test(Steadiness ~ CoachingStyleName, paired = TRUE, p.adjust.method = "bonf")

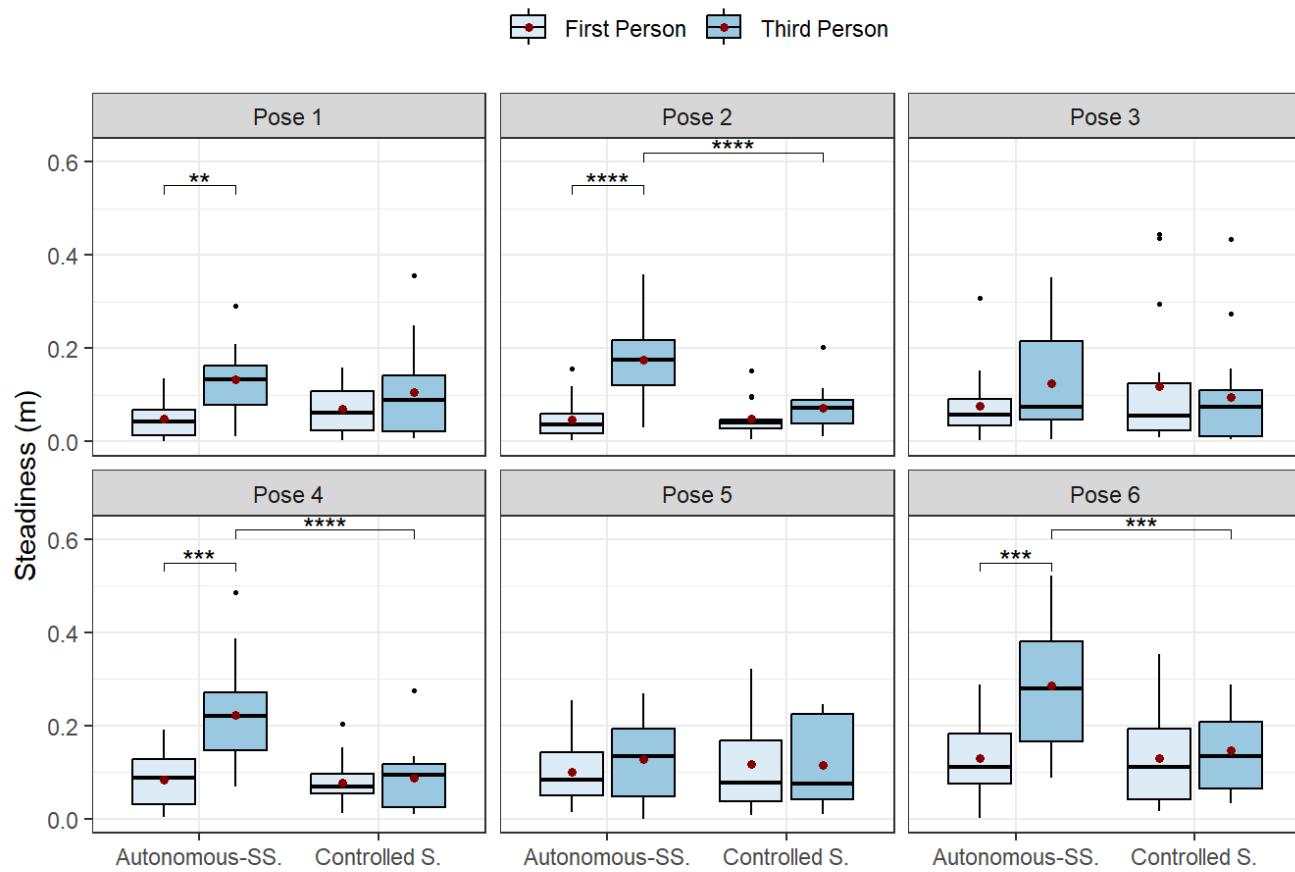
stat_combine1.test <- stat_combine1.test %>%
  filter(p < 0.05) %>%
  add_xy_position("CoachingStyleName", group = "Viewpoint")

poseCombinedPlot <- ggboxplot(
  userPerformanceData, x = "CoachingStyleName", y = "Steadiness", fill = "Viewpoint",
  facet.by = "PoseName", palette = "Blues", #order = c("Controlled Style", "Autonomous-Supportive
  Style"),
  #ylim = c(1200, 1230),
  size = .4, bxp.errorbar.width = 0.1, outlier.size = 0.5,
) +
  labs(x="", y = "Steadiness (m)") +
  stat_summary(aes(fill= Viewpoint), position = position_dodge(width=.8), fun=mean, geom="point",
  shape=20, size=2, color="darkred",) +
  theme_bw()+
  theme( legend.title = element_blank(), legend.position= "top") #axis.text.x = element_text(size
= 12),

poseCombinedPlot <- poseCombinedPlot + stat_pvalue_manual(stat_combine.test, label = "p.adj.signif",
f, y.position = 0.55)

poseSteadinessPlot <- poseCombinedPlot + stat_pvalue_manual(stat_combine1.test, label = "p.adj.sig
nif", y.position = 0.62)

poseSteadinessPlot
```



```
##### Pose Visualization -- Foot Height #####
stat_footpose.test <- userPerformanceData %>%
  group_by(CoachingStyleName, PoseName) %>%
  pairwise_t_test(FootHeight ~ Viewpoint, paired = TRUE, p.adjust.method = "bonf")

stat_footpose.test <- stat_footpose.test %>%
  filter(p < 0.05) %>%
  add_xy_position(x = "CoachingStyleName")

stat_footpose1.test <- userPerformanceData %>%
  group_by(Viewpoint, PoseName) %>%
  pairwise_t_test(FootHeight ~ CoachingStyleName, paired = TRUE, p.adjust.method = "bonf")

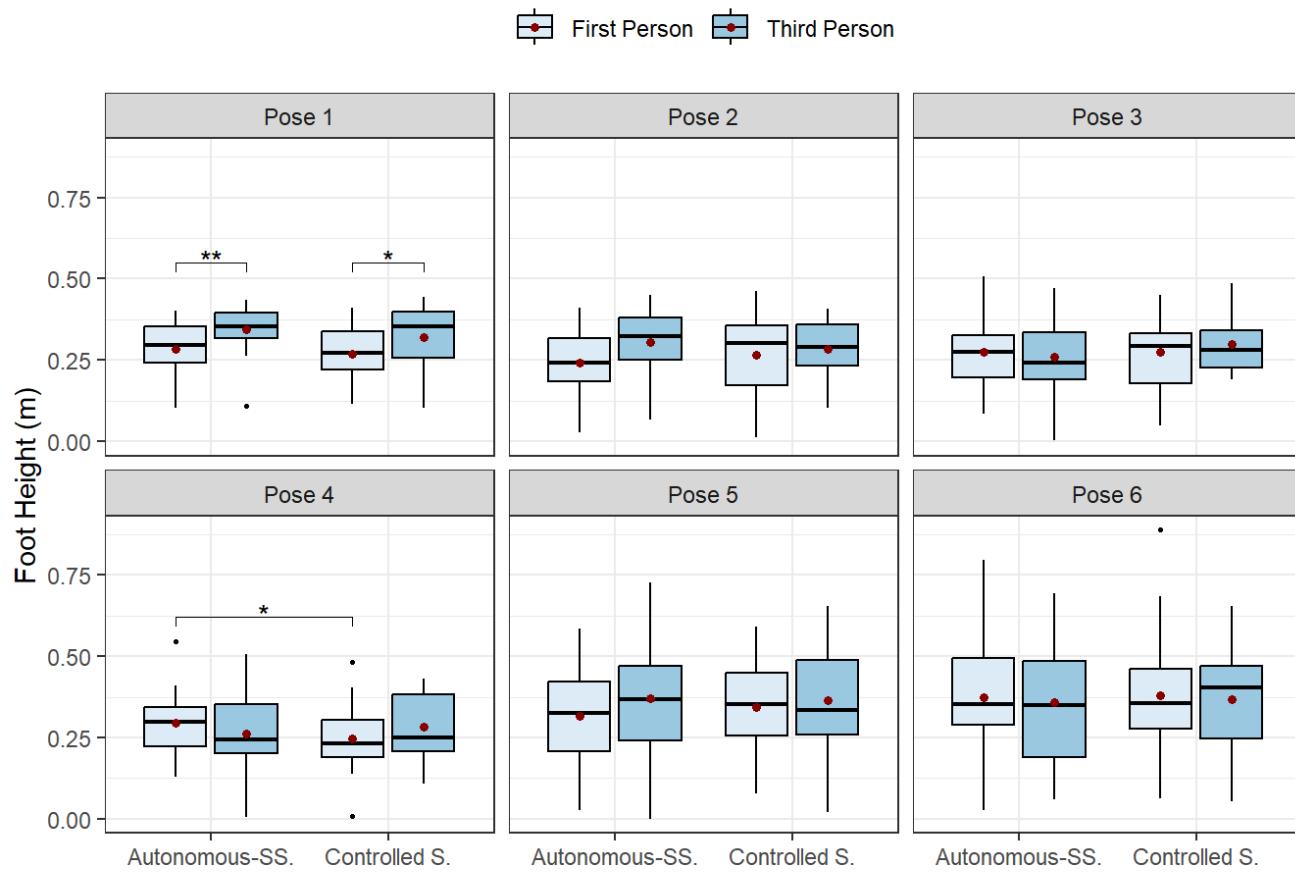
stat_footpose1.test <- stat_footpose1.test %>%
  filter(p < 0.05) %>%
  add_xy_position(x = "CoachingStyleName", group = "Viewpoint")

poseFootPlot <- ggboxplot(
  userPerformanceData, x = "CoachingStyleName", y = "FootHeight", fill = "Viewpoint",
  facet.by = "PoseName",
  palette = "Blues", #order = c("Controlled Style", "Autonomous-Supportive Style"),
  #ylim = c(1200, 1230),
  size = .4, bxp.errorbar.width = 0.1, outlier.size = 0.5,
) +
  labs(x="", y = "Foot Height (m)") +
  stat_summary(aes(fill= Viewpoint), position = position_dodge(width=.8), fun=mean, geom="point",
  shape=20, size=2, color="darkred",) +
  theme_bw()+
  theme( legend.title = element_blank(), legend.position= "top") #axis.text.x = element_text(size = 12),

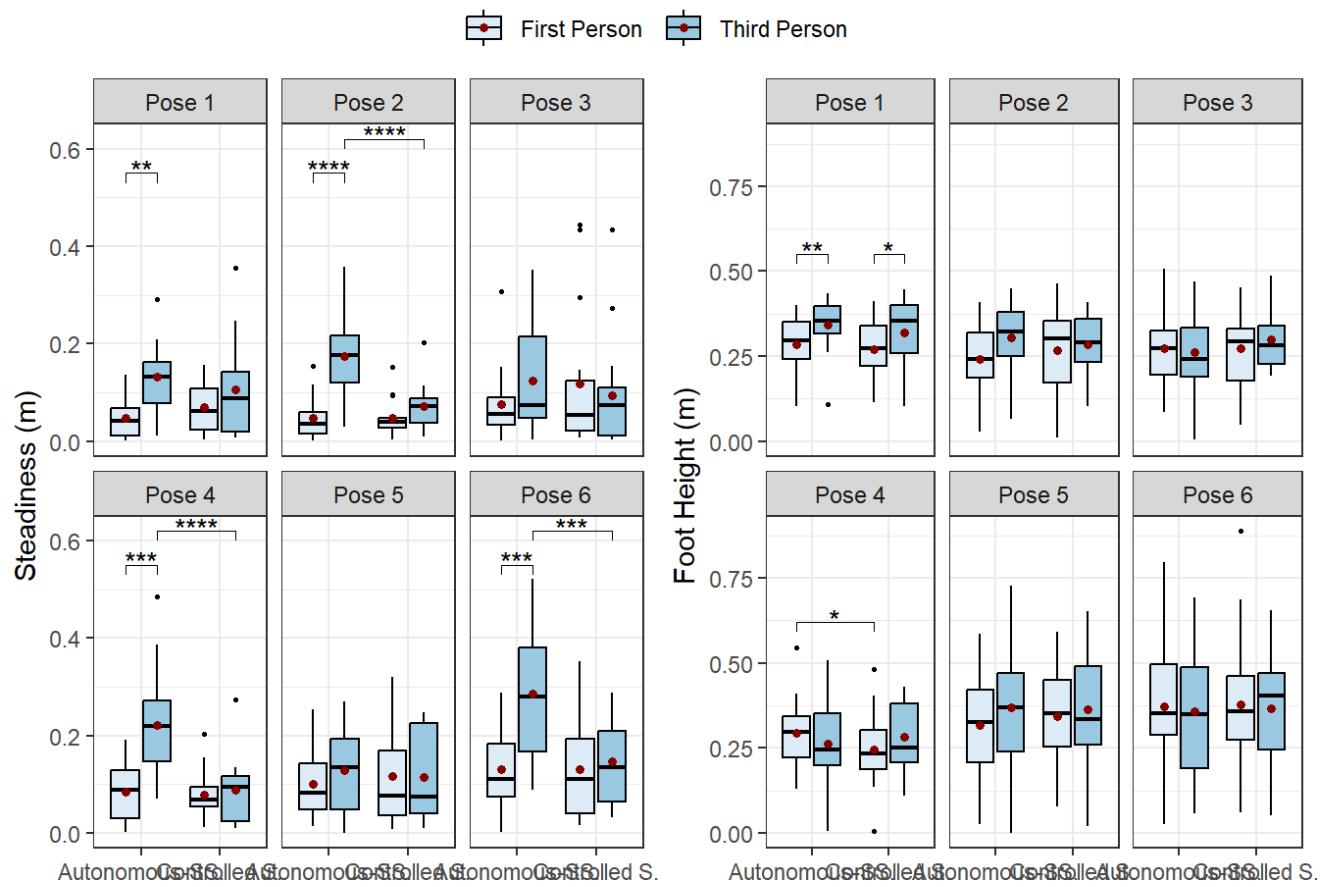
poseFootPlot <- poseFootPlot + stat_pvalue_manual(stat_footpose.test, label = "p.adj.signif", y.position = 0.55)

poseFootHeightPlot <- poseFootPlot + stat_pvalue_manual(stat_footpose1.test, label = "p.adj.signif", y.position = 0.62, )

poseFootHeightPlot
```



```
# Combine plots
ggarrange(poseSteadinessPlot, poseFootHeightPlot, ncol=2, nrow = 1, common.legend = TRUE)
```



```
##### Pose Visualization -- Number of Mistake #####
stat_mistake.test <- userPerformanceData %>%
  group_by(CoachingStyleName, PoseName) %>%
  pairwise_t_test(Mistake ~ Viewpoint, paired = TRUE, p.adjust.method = "bonf")

stat_mistake.test <- stat_mistake.test %>%
  filter(p < 0.05) %>%
  add_xy_position(x = "CoachingStyleName")

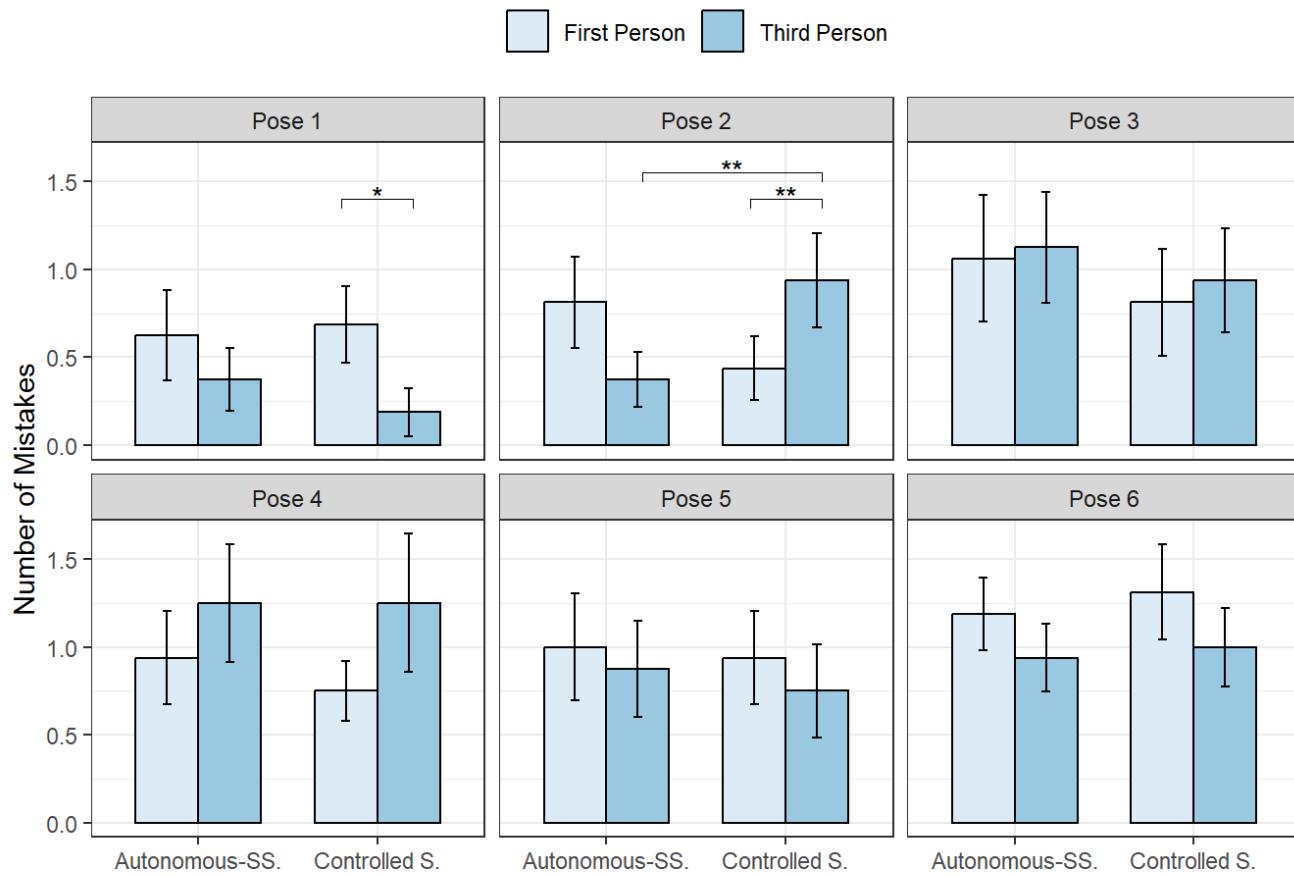
stat_mistake1.test <- userPerformanceData %>%
  group_by(Viewpoint, PoseName) %>%
  pairwise_t_test(Mistake ~ CoachingStyleName, paired = TRUE, p.adjust.method = "bonf")

stat_mistake1.test <- stat_mistake1.test %>%
  filter(p < 0.05) %>%
  add_xy_position(x = "CoachingStyleName", group = "Viewpoint")

poseMistakePlot <- ggbarplot(
  userPerformanceData, x = "CoachingStyleName", y = "Mistake",
  fill = "Viewpoint", color = "black", palette = "Blues", facet.by = "PoseName",
  position = position_dodge(0.7), #order = c("Controlled Style", "Autonomous-Supportive Style"),
  add = "mean_se", label = FALSE, lab.nub.digits = 2, lab.vjust = 4.2,
) +
  labs(x="", y = "Number of Mistakes") +
  theme_bw() +
  theme(legend.title = element_blank(), legend.background = element_rect(fill = "transparent", color = NA), legend.position = "top") # c(.873, .88)) axis.text.x = element_text(size = 12),

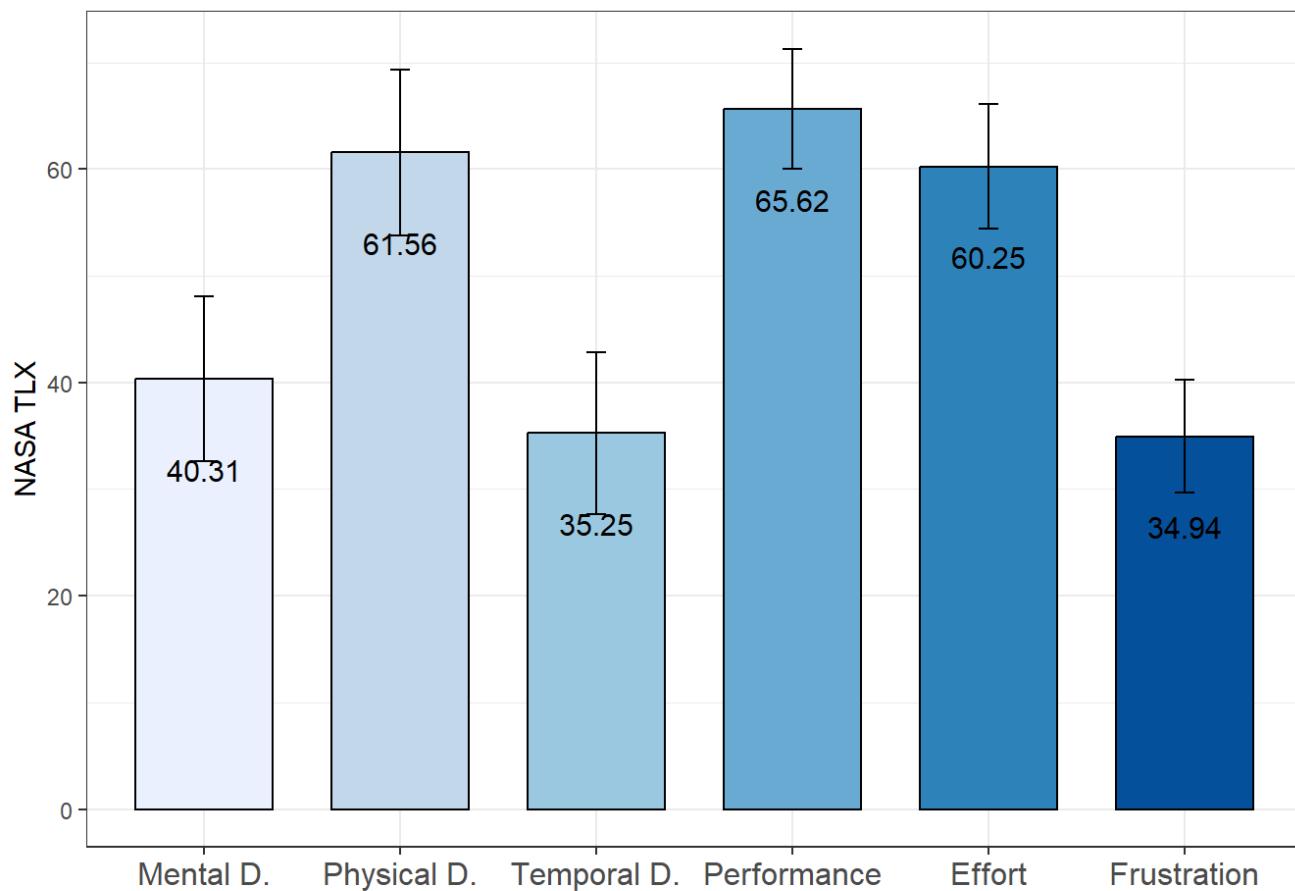
poseMistakePlot <- poseMistakePlot + stat_pvalue_manual(stat_mistake.test, label = "p.adj.signif",
y.position = 1.4, tip.length = .01)

poseMistakePlot + stat_pvalue_manual(stat_mistake1.test, label = "p.adj.signif", y.position = 1.5
5, tip.length = .01)
```



```
#####
# TLX Questionnaire Data Visualization #####
TLX_Data$TypeName <- mapvalues(TLX_Data$type, from = c("Mental Demand", "Physical Demand", "Temporal Demand", "Performance", "Effort", "Frustration"), to = c("Mental D.", "Physical D.", "Temporal D.", "Performance", "Effort", "Frustration"))

#TLX
ggbarplot(
  TLX_Data, x = "TypeName", y = "Score",
  fill = "TypeName", palette = "Blues",
  position = position_dodge(.75),
  add = "mean_se", label = TRUE, lab.nub.digits = 2, lab.vjust = 4.5, #Lab.size = 3,
) +
  labs(x="", y = "NASA TLX") +
  theme_bw()+
  theme(axis.text.x = element_text(size = 12), legend.title = element_blank(), legend.background =
element_rect(fill = "transparent", color = NA), legend.position = "none") # c(.890, .88))
```

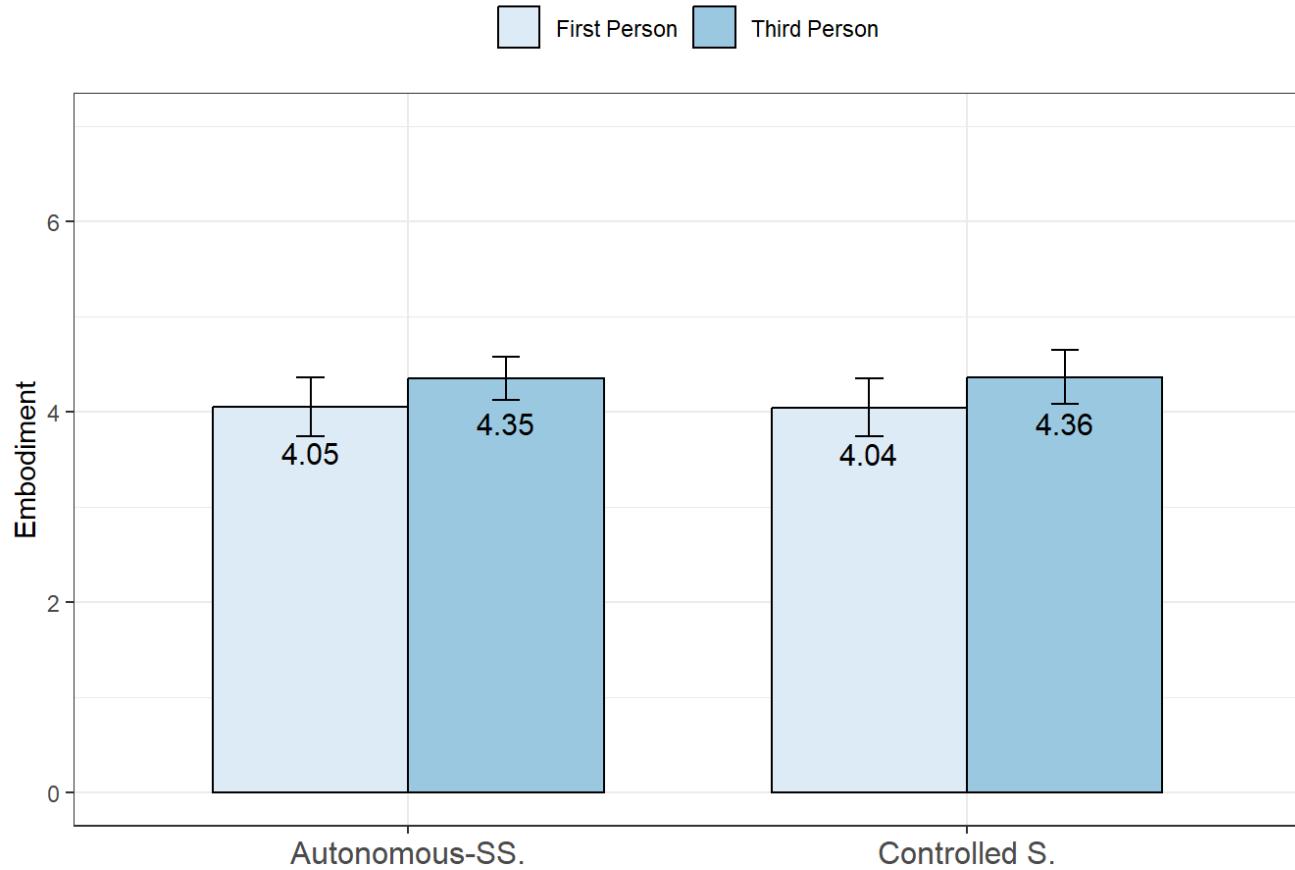


```
#####
# Mid Questionnaire Data Visualization #####
#####
```

#Embodiment

```
Mid_plot1 <- ggbarplot(
  MidQuestion_Data, x = "Coaching.Style", y = "Embodiment",
  fill = "Viewpoint", palette = "Blues", order = c("Autonomous-SS.", "Controlled S."),
  position = position_dodge(.7),
  ylim = c(0, 7),
  add = "mean_se", label = TRUE, lab.nb.digits = 2, lab.vjust = 2.5, #Lab.size = 3,
) +
  labs(x="", y = "Embodiment") +
  theme_bw()+
  theme(axis.text.x = element_text(size = 12),legend.title = element_blank(), legend.background =
  element_rect(fill = "transparent", color = NA), legend.position = "top") # c(.890, .88))
```

Mid\_plot1

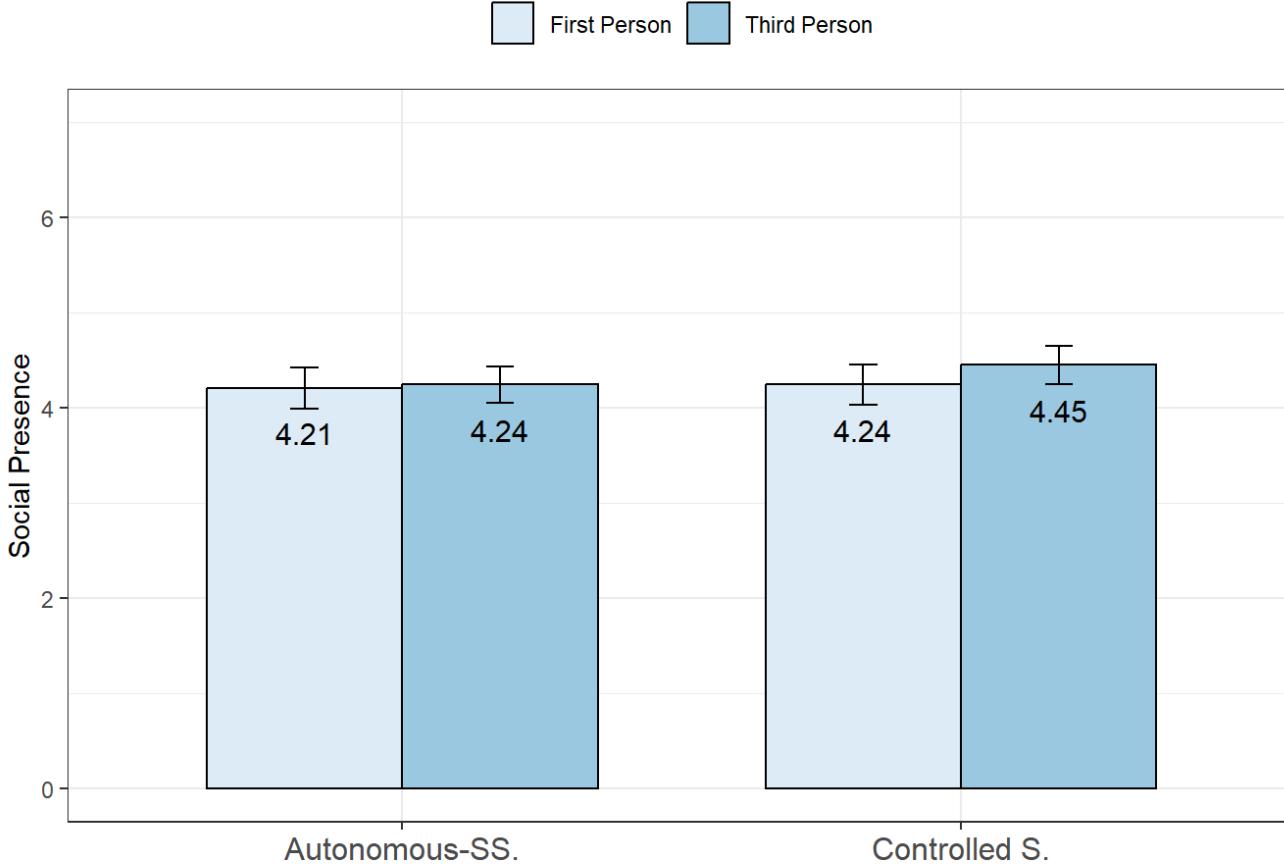


```

Mid_plot2 <- ggbarplot(
  MidQuestion_Data, x = "Coaching.Style", y = "Social_Presence",
  fill = "Viewpoint", palette = "Blues", order = c("Autonomous-SS.", "Controlled S."),
  position = position_dodge(.7),
  ylim = c(0, 7),
  #ylim = c(-3, 3),
  add = "mean_se", label = TRUE, lab.nub.digits = 2, lab.vjust = 2.5, #lab.size = 3,
) +
  labs(x="", y = "Social Presence") +
  theme_bw()+
  theme(axis.text.x = element_text(size = 12),legend.title = element_blank(), legend.background =
element_rect(fill = "transparent", color = NA), legend.position = "top") # c(.890, .88))

```

Mid\_plot2



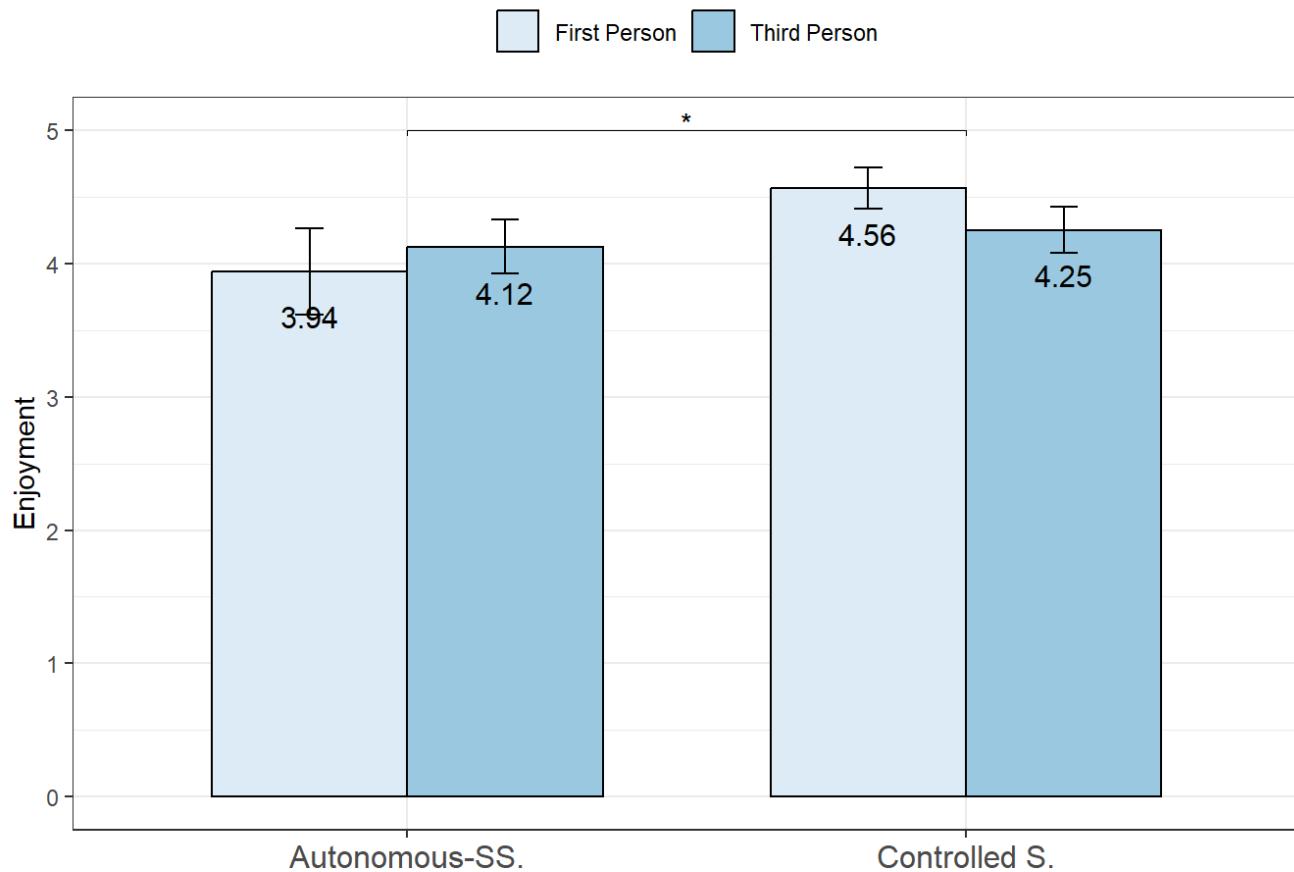
```
##### Enjoyment
stat_enjoyment.test <- MidQuestion_Data %>%
  pairwise_t_test(Enjoyment ~ Coaching.Style, paired = TRUE, p.adjust.method = "bonf")

stat_enjoyment.test <- stat_enjoyment.test %>%
  filter(p < 0.05) %>%
  add_xy_position(x = "Coaching.Style")

Mid_plot3 <- ggbarplot(
  MidQuestion_Data, x = "Coaching.Style", y = "Enjoyment",
  fill = "Viewpoint", palette = "Blues", order = c("Autonomous-SS.", "Controlled S."),
  position = position_dodge(.7),
  ylim = c(0, 5),
  add = "mean_se", label = TRUE, lab.nb.digits = 2, lab.vjust = 2.5, #lab.size = 3,
) +
  labs(x="", y = "Enjoyment") +
  theme_bw()+
  theme(axis.text.x = element_text(size = 12),legend.title = element_blank(), legend.background =
element_rect(fill = "transparent", color = NA), legend.position = "top") # c(.890, .88))

Mid_plot3 <- Mid_plot3 + stat_pvalue_manual(stat_enjoyment.test, label = "p.adj.signif", y.position = 5, tip.length = .01)

Mid_plot3
```



```
#Difficulty
```

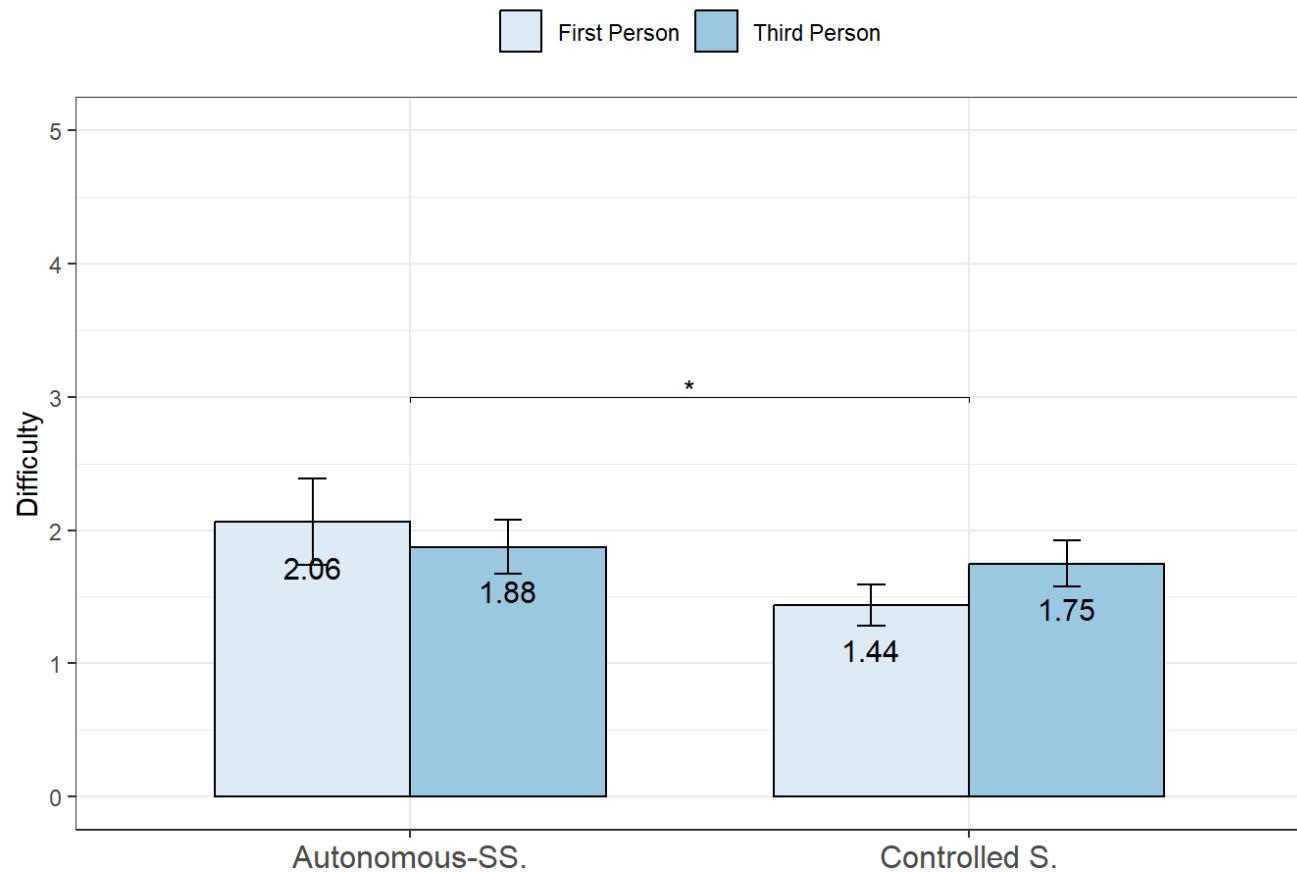
```
stat_difficulty.test <- MidQuestion_Data %>%
  pairwise_t_test(Difficulty ~ Coaching.Style, paired = TRUE, p.adjust.method = "bonf")

stat_difficulty.test <- stat_difficulty.test %>%
  filter(p < 0.05) %>%
  add_xy_position(x = "Coaching.Style")

Mid_plot4 <- ggbarplot(
  MidQuestion_Data, x = "Coaching.Style", y = "Difficulty",
  fill = "Viewpoint", palette = "Blues", order = c("Autonomous-SS.", "Controlled S."),
  position = position_dodge(.7),
  ylim = c(0, 5),
  add = "mean_se", label = TRUE, lab.nb.digits = 2, lab.vjust = 2.5, #lab.size = 3,
) +
  labs(x="", y = "Difficulty") +
  theme_bw()+
  theme(axis.text.x = element_text(size = 12),legend.title = element_blank(), legend.background =
element_rect(fill = "transparent", color = NA), legend.position = "top") # c(.890, .88)

Mid_plot4 <- Mid_plot4 + stat_pvalue_manual(stat_difficulty.test, label = "p.adj.signif", y.position = 3, tip.length = .01)

Mid_plot4
```



```
#Perception

stat_perception.test <- MidQuestion_Data %>%
  pairwise_t_test(PerceptionCoach ~ Coaching.Style, paired = TRUE, p.adjust.method = "bonf")

stat_perception.test <- stat_perception.test %>%
  filter(p < 0.05) %>%
  add_xy_position(x = "Coaching.Style")

stat_perception.test11 <- MidQuestion_Data %>%
  group_by(Viewpoint) %>%
  pairwise_t_test(PerceptionCoach ~ Coaching.Style, paired = TRUE, p.adjust.method = "bonf")

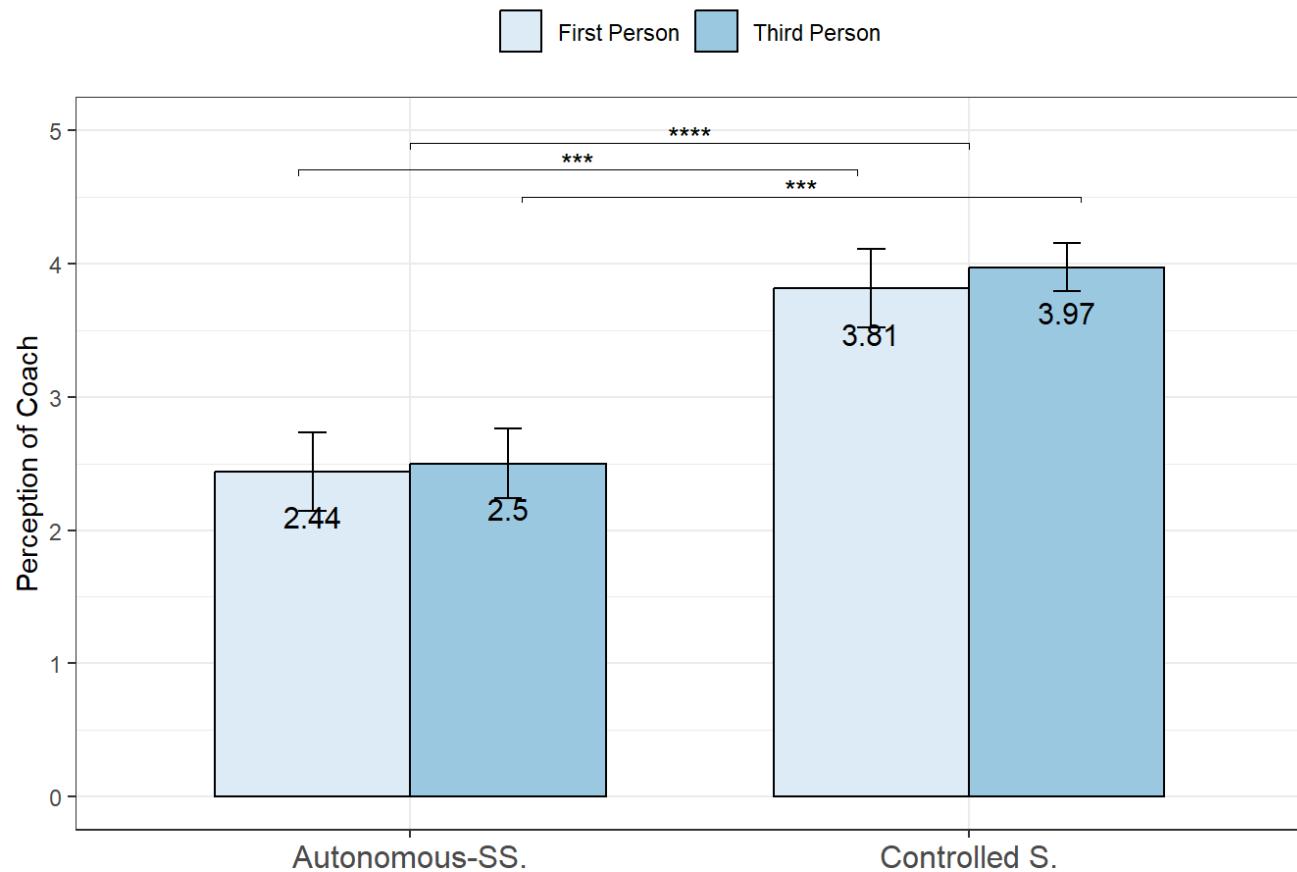
stat_perception.test1 <- stat_perception.test11 %>%
  filter(p < 0.05, Viewpoint == "First Person") %>%
  add_xy_position(x = "Coaching.Style", group = "Viewpoint")

stat_perception.test2 <- stat_perception.test11 %>%
  filter(p < 0.05, Viewpoint == "Third Person") %>%
  add_xy_position(x = "Coaching.Style", group = "Viewpoint")

Mid_plot5 <- ggbarplot(
  MidQuestion_Data, x = "Coaching.Style", y = "PerceptionCoach",
  fill = "Viewpoint", palette = "Blues", order = c("Autonomous-SS.", "Controlled S."),
  position = position_dodge(.7),
  ylim = c(0, 5),
  add = "mean_se", label = TRUE, lab.nb.digits = 2, lab.vjust = 2.5, #lab.size = 3,
) +
  labs(x="", y = "Perception of Coach") +
  theme_bw() +
  theme(axis.text.x = element_text(size = 12), legend.title = element_blank(), legend.background =
element_rect(fill = "transparent", color = NA), legend.position = "top") # c(.890, .88)

Mid_plot5 <- Mid_plot5 + stat_pvalue_manual(stat_perception.test, label = "p.adj.signif", y.position = 4.9, tip.length = .01)
Mid_plot5 <- Mid_plot5 + stat_pvalue_manual(stat_perception.test1, label = "p.adj.signif", y.position = 4.7, tip.length = .01)
Mid_plot5 <- Mid_plot5 + stat_pvalue_manual(stat_perception.test2, label = "p.adj.signif", y.position = 4.5, tip.length = .01)

Mid_plot5
```



```
#Recommendation

stat_recommend.test <- MidQuestion_Data %>%
  pairwise_t_test(Recommendation ~ Coaching.Style, paired = TRUE, p.adjust.method = "bonf")

stat_recommend.test <- stat_recommend.test %>%
  filter(p < 0.05) %>%
  add_xy_position(x = "Coaching.Style")

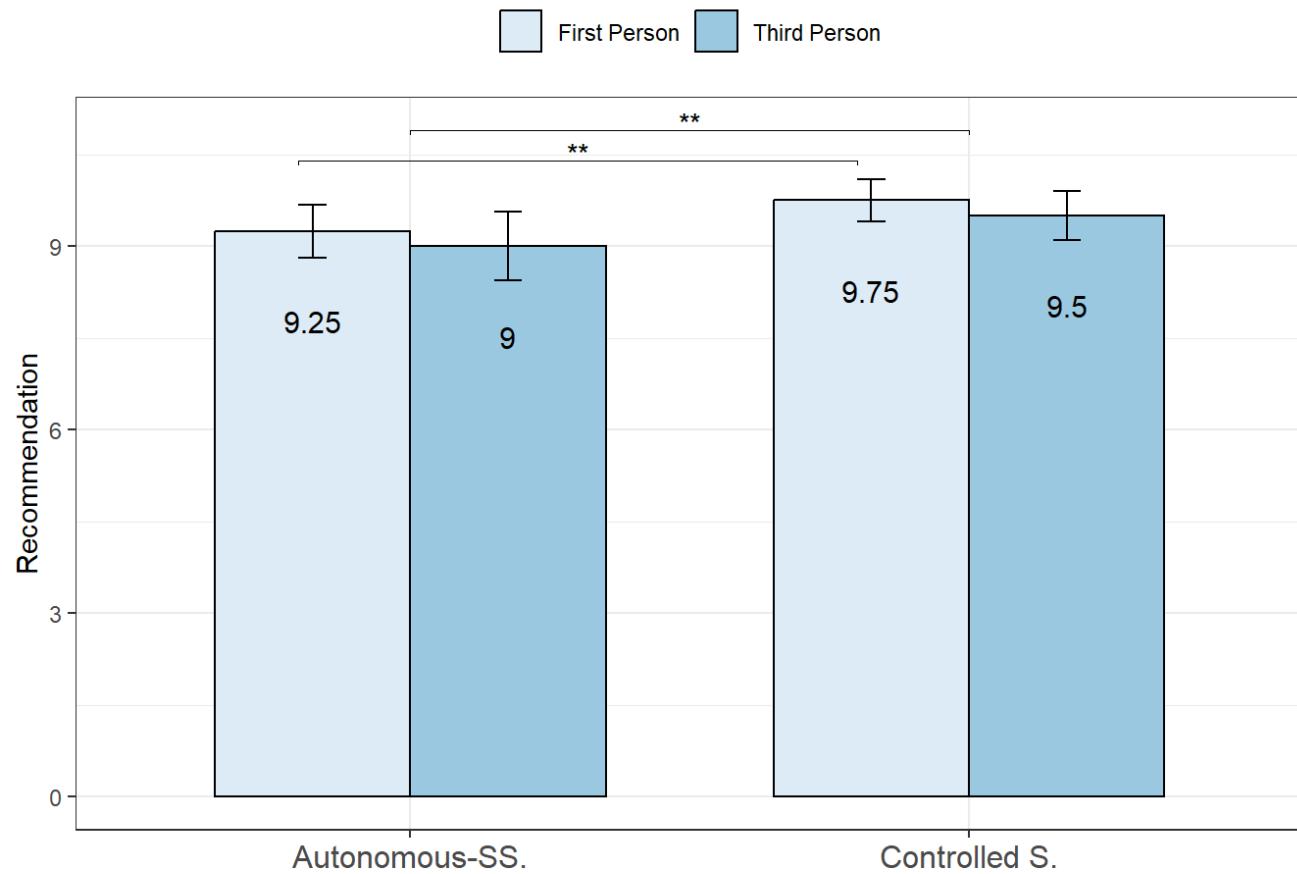
stat_recommend.test1 <- MidQuestion_Data %>%
  group_by(Viewpoint) %>%
  pairwise_t_test(Recommendation ~ Coaching.Style, paired = TRUE, p.adjust.method = "bonf")

stat_recommend.test1 <- stat_recommend.test1 %>%
  filter(p < 0.05) %>%
  add_xy_position(x = "Coaching.Style", group = "Viewpoint")

Mid_plot6 <- ggbarplot(
  MidQuestion_Data, x = "Coaching.Style", y = "Recommendation",
  fill = "Viewpoint", palette = "Blues", order = c("Autonomous-SS.", "Controlled S."),
  position = position_dodge(.7),
  ylim = c(0, 10.9),
  add = "mean_se", label = TRUE, lab.nb.digits = 2, lab.vjust = 4.5, #Lab.size = 3,
) +
  labs(x="", y = "Recommendation") +
  theme_bw()+
  theme(axis.text.x = element_text(size = 12),legend.title = element_blank(), legend.background =
element_rect(fill = "transparent", color = NA), legend.position = "top") # c(.890, .88)

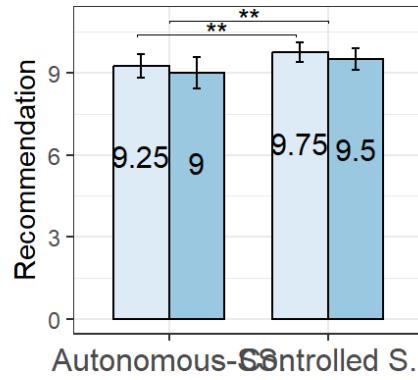
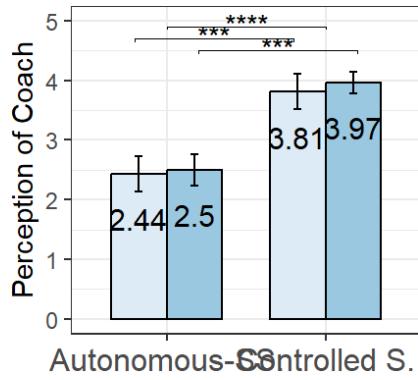
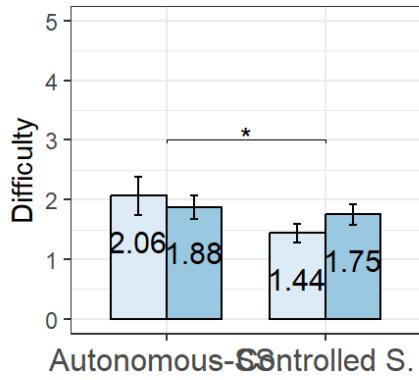
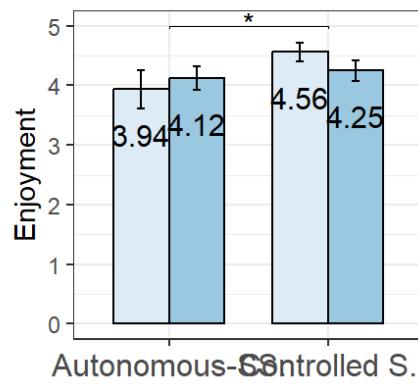
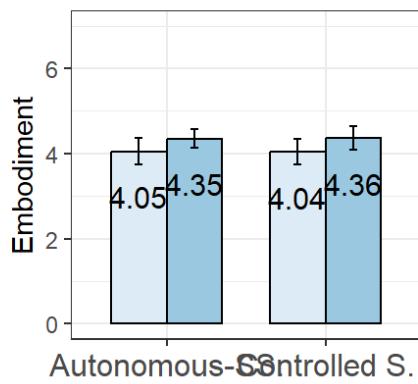
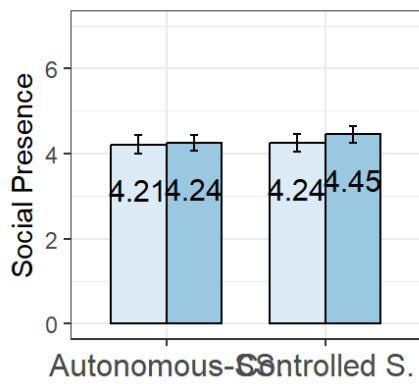
Mid_plot6 <- Mid_plot6 + stat_pvalue_manual(stat_recommend.test, label = "p.adj.signif", y.position = 10.9, tip.length = .01)
Mid_plot6 <- Mid_plot6 + stat_pvalue_manual(stat_recommend.test1, label = "p.adj.signif", y.position = 10.4, tip.length = .01)

Mid_plot6
```



```
# Combine plots
ggarrange(Mid_plot2, Mid_plot1, Mid_plot3, Mid_plot4, Mid_plot5, Mid_plot6, ncol=3, nrow = 2, common.legend = TRUE)
```

First Person      Third Person



```
# Combine plots for Mid_plot2 and Mid_plot1
#ggarrange(Mid_plot2, Mid_plot1, ncol=2, nrow = 1, common.Legend = TRUE)
```