Data_Summary

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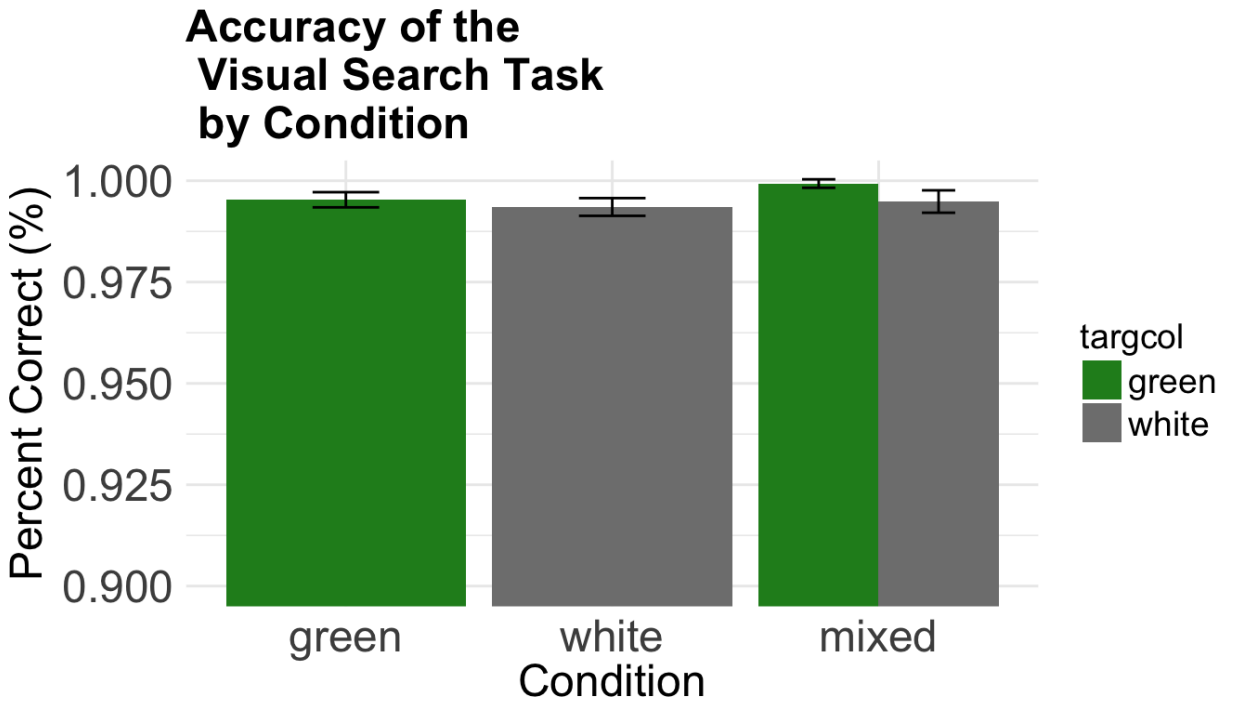
Contents

DRT Simple Task

1.a This is a plot for the accuracy of the visual search task (The proportion of trials in which a target was selected compared to a distractor.)

```
###Colors for plots
####Create a custom color scale
myColors <- c("forestgreen","grey50")
names(myColors) <- levels(clean$targcol)
colScale <- scale_colour_manual(name = "targcol",values = myColors)

acc.mean <- cleanac %>%
  group_by(condition, targcol) %>%
  summarise(perc_corr = mean(corr)*100)


datac <- summarySEwithin(cleanac, measurevar ="corr", withinvars = c("condition","targcol"), idvar = "su

accplot <- ggplot(datac, aes(x = condition, y=corr, fill = targcol)) +
  geom_bar(stat = "identity", position = "dodge") + theme_minimal() +
  my.axis.font + geom_errorbar(position=position_dodge(.9), width = .25,
                               aes(ymin=corr-ci, ymax=corr+ci)) +
  xlab("Condition") + coord_cartesian(ylim = c(.9, 1)) +
  scale_fill_manual(values=myColors) + ylab("Percent Correct (%)") +
  ggtitle("Accuracy of the \n Visual Search Task \n by Condition")
accplot
```




```
vis.ac <- lmer(corr~condition*targcol+(1|subid),data=cleanac)
Anova(vis.ac)
```

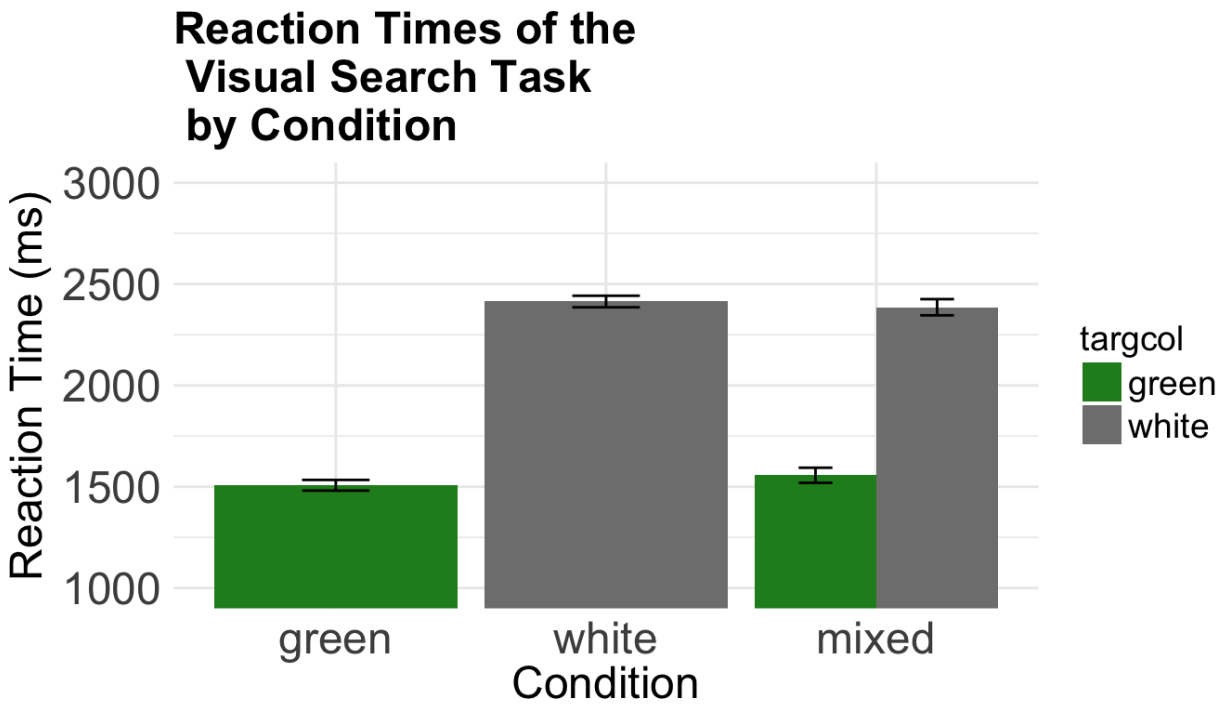
```
## Analysis of Deviance Table (Type II Wald chisquare tests)
##
## Response: corr
##                    Chisq Df Pr(>Chisq)
## condition         7.2690  2    0.02640 *
## targcol           6.0906  1    0.01359 *
## condition:targcol         0
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

The ANOVA here shows that the conditions of blocked and mixed difficulties impacted the accuracy. The difficulty of the target task itself also effected accuracy. However, there was no target color by condition interaction. Almost all groups were at ceiling for accuracy, meaning very few errors were produced, and the effect is very small.

condition	target color	percent correct	ci
green	green	0.9953	0.0018
mixed	green	0.9993	0.0010
mixed	white	0.9948	0.0027
white	white	0.9935	0.0021

```
datrt <- summarySEwithin(clean, measurevar ="rt1", withinvars = c("condition","targcol"), idvar = "subi

rtplot <- ggplot(datrt, aes(x = condition, y=rt1, fill = targcol)) +
  geom_bar(stat = "identity", position = "dodge") + theme_minimal() +
  my.axis.font + geom_errorbar(position=position_dodge(.9), width = .25,
                               aes(ymin=rt1-ci, ymax=rt1+ci)) +
```

```
  xlab("Condition") + coord_cartesian(ylim = c(1000, 3000)) +
  scale_fill_manual(values=myColors) + ylab("Reaction Time (ms)") +
  ggtitle("Reaction Times of the \n Visual Search Task \n by Condition")
rtplot
```




```
vis.ac <- lmer(rt1~condition*targcol*corr+(1|subid),data=clean)
Anova(vis.ac)
```

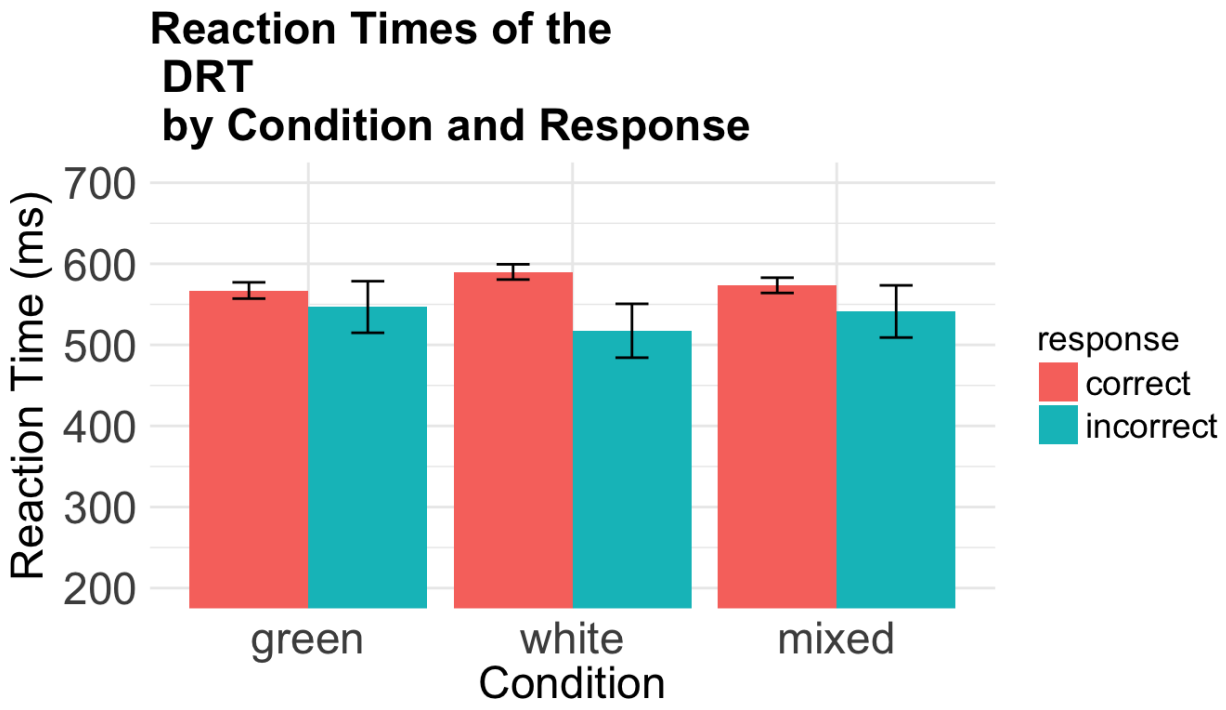
```
## Analysis of Deviance Table (Type II Wald chisquare tests)
##
## Response: rt1
##                            Chisq Df Pr(>Chisq)
## condition                 6.6690  2    0.03563 *
## targcol                1036.9009  1    < 2e-16 ***
## corr                      5.4530  1    0.01954 *
## condition:targcol                 0
## condition:corr            1.0067  2    0.60449
## targcol:corr              0.6065  1    0.43612
## condition:targcol:corr            0
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Reaction time was affected by whether the targets were blocked or mixed (condition), the target color was different, or whether the answer was correct or not. There were no interaction effects.

combined steering with drt

```
drt.clean$condition <- recode_factor(drt.clean$condition,
                                     "1" = "practice","2" = "green","3" ="white", "4" = "mixed",
                                     .default = "NA")
```

```
drt.clean$response <- recode_factor(drt.clean$response, "1" = "correct", "-1" = "incorrect")

drtrt <- summarySEwithin(drt.clean, measurevar ="rt", withinvars = c("condition","response"), idvar = "

drtrt <- drtrt %>% filter(condition != "practice")

rtplot <- ggplot(drtrt, aes(x = condition, y=rt, fill = response)) +
  geom_bar(stat = "identity", position = "dodge") + theme_minimal() +
  my.axis.font + geom_errorbar(position=position_dodge(.9), width = .25,
                               aes(ymin=rt-ci, ymax=rt+ci)) +
  xlab("Condition") + coord_cartesian(ylim = c(200, 700)) + ylab("Reaction Time (ms)") +
  ggtitle("Reaction Times of the \n DRT \n by Condition and Response")
rtplot
```



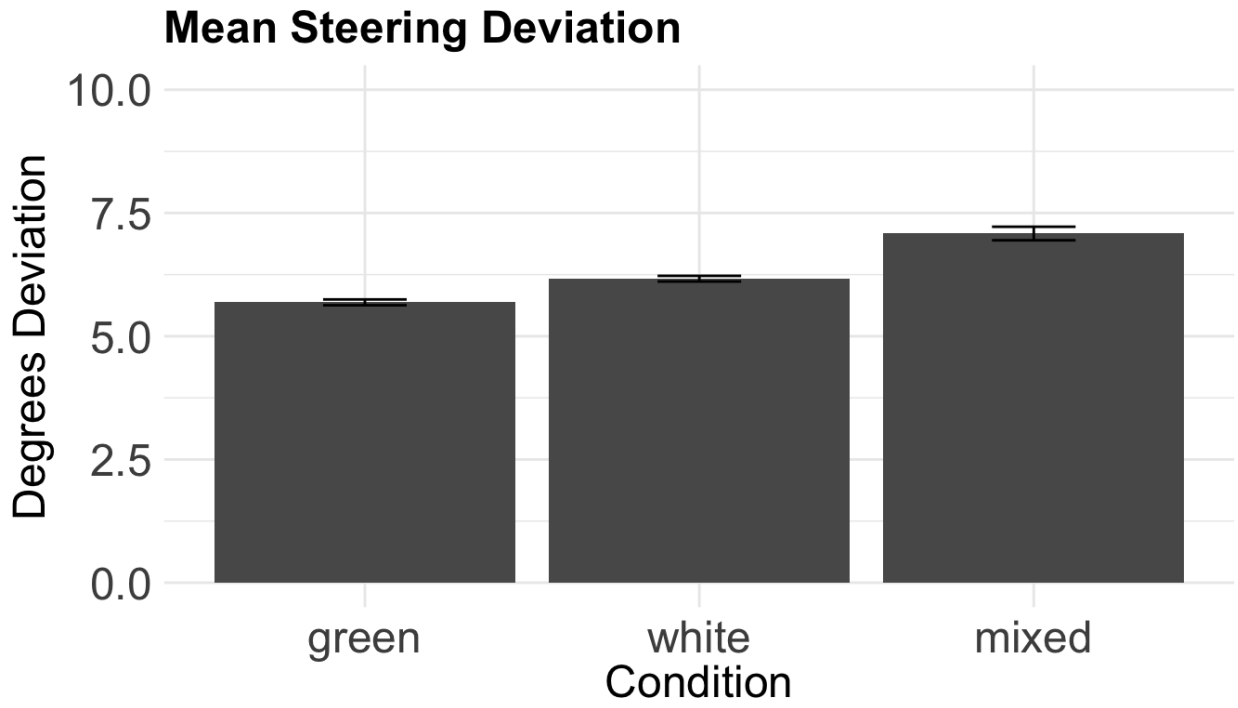

```
drt.rt <- lmer(rt~condition*response*mean.dev+(1|subid),data=drt.clean)
Anova(drt.rt)
```

```
## Analysis of Deviance Table (Type II Wald chisquare tests)
##
## Response: rt
##                                Chisq Df Pr(>Chisq)
## condition                   1942.1371  3  < 2.2e-16 ***
## response                      12.1271  1  0.0004969 ***
## mean.dev                       1.2296  1  0.2674931
## condition:response             6.1538  3  0.1043621
## condition:mean.dev            25.0049  3   1.54e-05 ***
## response:mean.dev              0.1357  1  0.7126094
## condition:response:mean.dev    1.7994  3  0.6150572
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

condition	response	rt	ci
green	correct	567.1133	10.026026
green	incorrect	546.7265	31.821575
mixed	correct	573.4649	9.423457
mixed	incorrect	541.2416	32.182574
white	correct	589.9847	9.402508
white	incorrect	517.4245	33.214033

Incorrect responses (where the participant responded to the light more than once) were faster on average than correct responses. The difficulty also affected reaction times. In addition, there was a difficulty (condition) by steering deviation interaction. We can see the effect of difficulty on steering below.

```
drtrt <- summarySEwithin(drt.clean, measurevar ="mean.dev", withinvars = c("condition"), idvar = "subid

drtrt <- drtrt %>% filter(condition != "practice")

rtplot <- ggplot(drtrt, aes(x = condition, y=mean.dev)) +
  geom_bar(stat = "identity", position = "dodge") + theme_minimal() +
  my.axis.font + geom_errorbar(position=position_dodge(.9), width = .25,
                               aes(ymin=mean.dev-ci, ymax=mean.dev+ci)) +
  xlab("Condition") + coord_cartesian(ylim = c(0, 10)) + ylab("Degrees Deviation") +
  ggtitle("Mean Steering Deviation")
rtplot
```




```
drt.rt <- lmer(mean.dev~condition+(1|subid),data=drt.clean)
Anova(drt.rt)
```

condition	mean.dev	ci
green	5.687147	0.059
mixed	7.083614	0.137

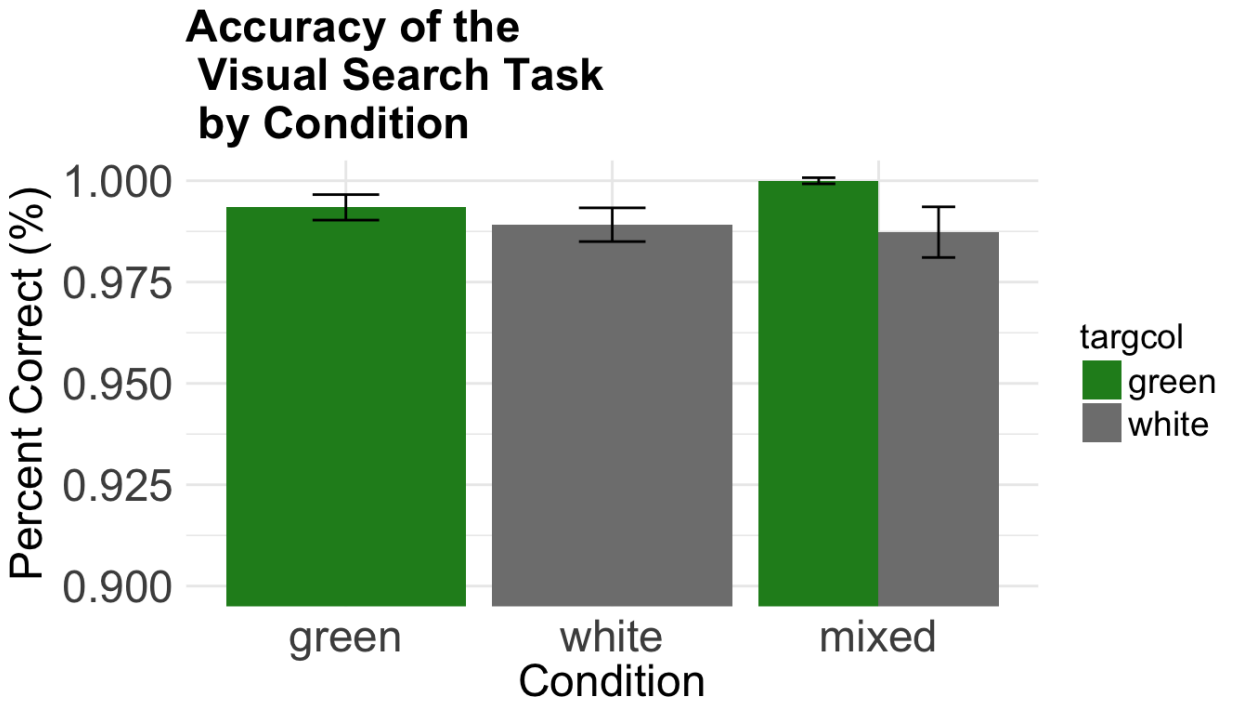
condition	mean.dev	ci
white	6.167213	0.057

Alone, the effects of the difficulty of the visual task changed the steering deviation so that (1) at the easiest difficulty, steering was best (2) at the highest difficulty, steering was slightly worse, but (3) when participants didn't know whether to expect easy or difficult trials, steering was the worst. Interestingly, the DRT was not sensitive to this phenomenon.

DRT Choice Task Data

1.a This is a plot for the accuracy of the visual search task (The proportion of trials in which a target was selected compared to a distractor.)

```
###Colors for plots
####Create a custom color scale
myColors <- c("forestgreen","grey50")
names(myColors) <- levels(clean.choice$targcol)
colScale <- scale_colour_manual(name = "targcol",values = myColors)
clean.choice <- clean.choice %>%
  dplyr::filter(subid != "01", subid != "02", subid != "03")
clean.choiceac <- clean.choiceac %>%
  dplyr::filter(subid != "01", subid != "02", subid != "03")

acc.mean <- clean.choiceac %>%
  group_by(condition, targcol) %>%
  summarise(perc_corr = mean(corr)*100)


datac <- summarySEwithin(clean.choiceac, measurevar ="corr", withinvars = c("condition","targcol"), idva

accplot <- ggplot(datac, aes(x = condition, y=corr, fill = targcol)) +
  geom_bar(stat = "identity", position = "dodge") + theme_minimal() +
  my.axis.font + geom_errorbar(position=position_dodge(.9), width = .25,
                               aes(ymin=corr-ci, ymax=corr+ci)) +
  xlab("Condition") + coord_cartesian(ylim = c(.9, 1)) +
  scale_fill_manual(values=myColors) + ylab("Percent Correct (%)") +
  ggtitle("Accuracy of the \n Visual Search Task \n by Condition")
accplot
```




```
vis.ac <- lmer(corr~condition*targcol+(1|subid),data=clean.choiceac)
Anova(vis.ac)
```

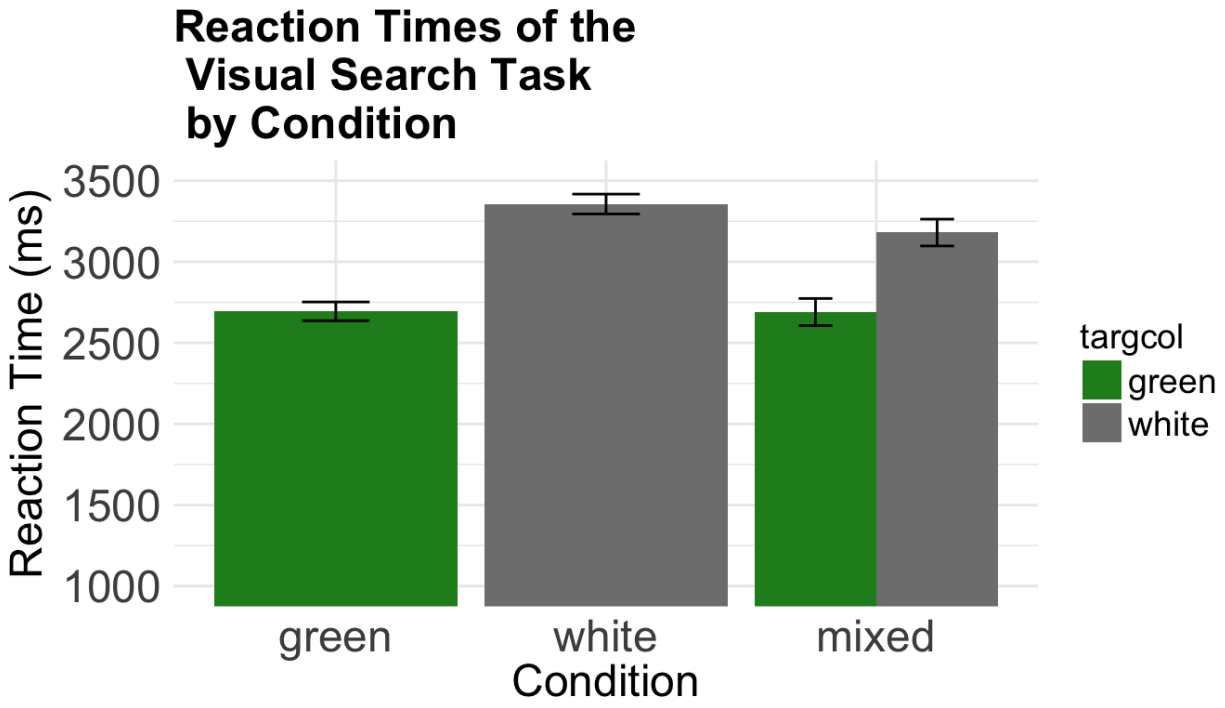
```
## Analysis of Deviance Table (Type II Wald chisquare tests)
##
## Response: corr
##                    Chisq Df Pr(>Chisq)
## condition          5.905  2  0.0522087 .
## targcol           14.374  1  0.0001498 ***
## condition:targcol         0
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

The ANOVA here shows that the conditions of blocked and mixed difficulties did not impact the accuracy. We have a significant effect of the target color, and it didn't matter whether the targets were blocked or mixed.

condition	target color	percent correct	ci
green	green	0.9932	0.0030
mixed	green	1.0000	0.0007
mixed	white	0.9875	0.0059
white	white	0.9897	0.0038

```
datrt <- summarySEwithin(clean.choice, measurevar ="rt1", withinvars = c("condition","targcol"), idvar =

rtplot <- ggplot(datrt, aes(x = condition, y=rt1, fill = targcol)) +
  geom_bar(stat = "identity", position = "dodge") + theme_minimal() +
  my.axis.font + geom_errorbar(position=position_dodge(.9), width = .25,
                               aes(ymin=rt1-ci, ymax=rt1+ci)) +
  xlab("Condition") + coord_cartesian(ylim = c(1000, 3500)) +
```

```
  scale_fill_manual(values=myColors) + ylab("Reaction Time (ms)") +
  ggtitle("Reaction Times of the \n Visual Search Task \n by Condition")
rtplot
```




```
vis.ac <- lmer(rt1~condition*targcol*corr+(1|subid),data=clean.choice)
Anova(vis.ac)
```

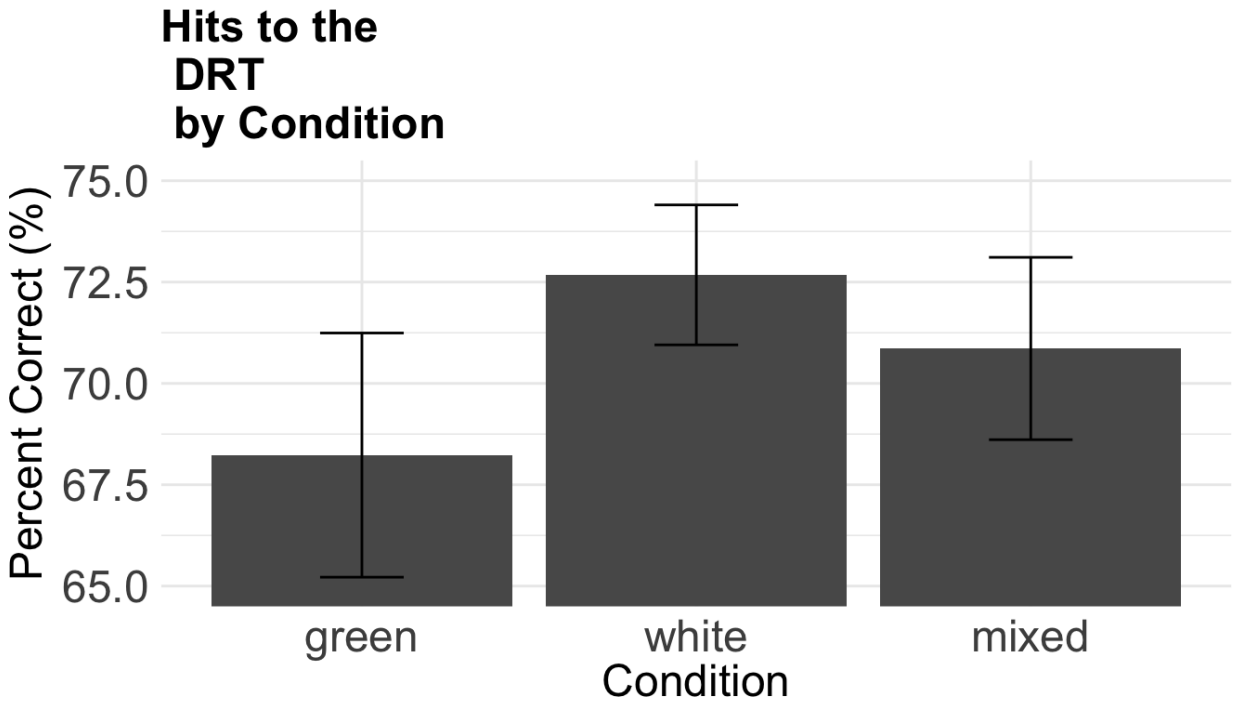
```
## Analysis of Deviance Table (Type II Wald chisquare tests)
##
## Response: rt1
##                          Chisq Df Pr(>Chisq)
## condition              14.5131  2  0.0007055 ***
## targcol                78.1753  1  < 2.2e-16 ***
## corr                    7.0844  1  0.0077758 **
## condition:targcol               0
## condition:corr          8.0654  2  0.0177267 *
## targcol:corr                    0
## condition:targcol:corr          0
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Reaction time was affected by whether the targets were blocked or mixed (condition), the target color was different, or whether the answer was correct or not. There was also an interaction of condition and correct/incorrect responses.

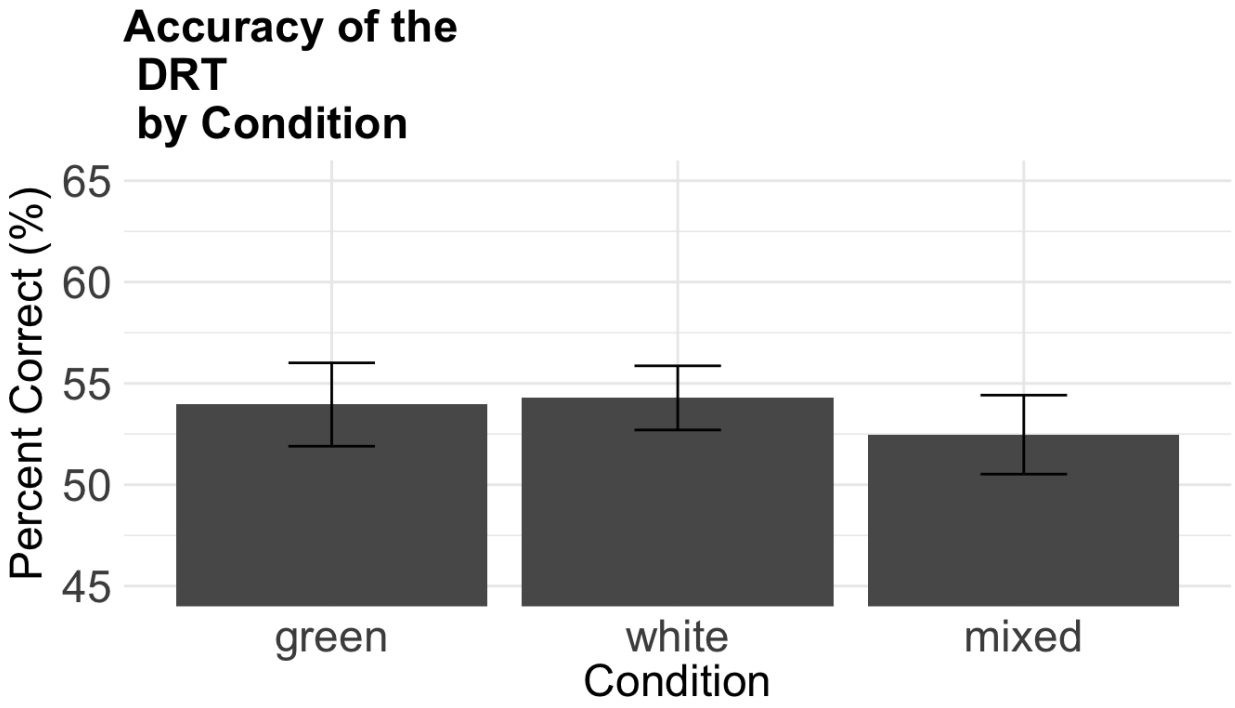
condition	target color	reaction time	ci
green	green	2694	57.76
mixed	green	2689	83.87
mixed	white	3180	82.75
white	white	3356	61.23

correct drt vs missed drts

```
drt.ac$condition <- recode_factor(drt.ac$condition,"1" = "practice","2" = "green","3" ="white", "4" = "

drt.meanhit <- drt.ac %>%
  filter(response != -1) %>%
  dplyr::group_by(subid,condition) %>%
  dplyr::summarise(mean_ac_hits = mean(response)*100) %>%
  filter(condition != "practice", subid != "03", mean_ac_hits > 50)

drthit <- summarySEwithin(drt.meanhit, measurevar ="mean_ac_hits", withinvars = c("condition"), idvar =

drt.meanac <- drt.ac %>%
  filter(response != 0) %>%
  mutate(response = ifelse(response == "-1", 0,1)) %>%
  dplyr::group_by(subid,condition) %>%
  dplyr::summarise(mean_ac = mean(response)*100) %>%
  filter(condition != "practice", subid != "03")

drtac <- summarySEwithin(drt.meanac, measurevar ="mean_ac", withinvars = c("condition"), idvar = "subid

hitplot <- ggplot(drthit, aes(x = condition, y=mean_ac_hits)) +
  geom_bar(stat = "identity",position = "dodge") + theme_minimal() +
  my.axis.font + geom_errorbar(width = .25,
                               aes(ymin=mean_ac_hits-ci, ymax=mean_ac_hits+ci)) +
  xlab("Condition") + coord_cartesian(ylim = c(65, 75)) +
  scale_fill_manual(values=myColors) + ylab("Percent Correct (%)") +
  ggtitle("Hits to the \n DRT \n by Condition")
hitplot
```



```
drt.hit <- lmer(mean_ac_hits~condition+(1|subid),data=drt.meanhit)
Anova(drt.hit)


acplot <- ggplot(drtac, aes(x = condition, y=mean_ac)) +
  geom_bar(stat = "identity",position = "dodge") + theme_minimal() +
  my.axis.font + geom_errorbar(width = .25,
                               aes(ymin=mean_ac-ci, ymax=mean_ac+ci)) +
  xlab("Condition") + coord_cartesian(ylim = c(45, 65)) +
  scale_fill_manual(values=myColors) + ylab("Percent Correct (%)") +
  ggtitle("Accuracy of the \n DRT \n by Condition")
acplot
```



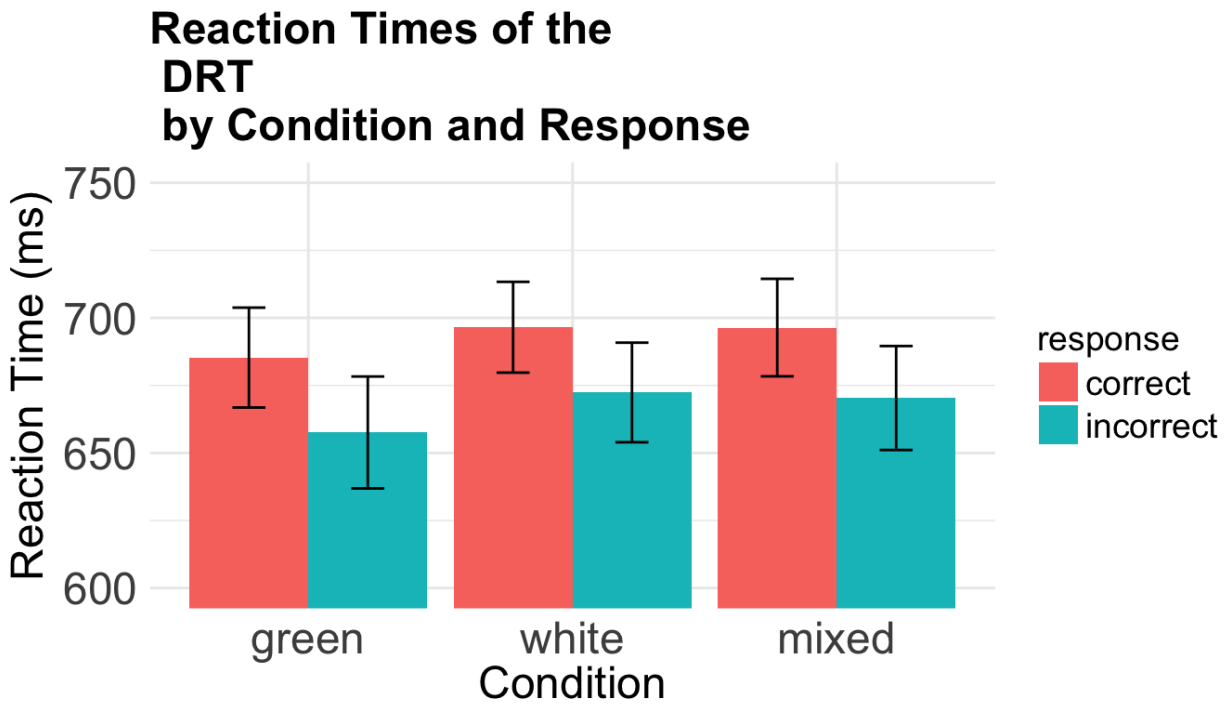

```
drt.ac1 <- lmer(mean_ac~condition+(1|subid),data=drt.meanac)
Anova(drt.ac1)
```

Hits to the DRT correctly predicted the steering deviation across the 3 conditions.

combined steering with drt

```
drt.clean.choice$condition <- recode_factor(drt.clean.choice$condition,"1" = "practice","2" = "green","3
drt.clean.choice$response <- recode_factor(drt.clean.choice$response, "1" = "correct", "-1" = "incorrec

drtrt <- summarySEwithin(drt.clean.choice, measurevar ="rt", withinvars = c("condition","response"), id

drtrt <- drtrt %>% filter(condition != "practice", response != "miss")

rtplot <- ggplot(drtrt, aes(x = condition, y=rt, fill = response)) +
  geom_bar(stat = "identity", position = "dodge") + theme_minimal() +
  my.axis.font + geom_errorbar(position=position_dodge(.9), width = .25,
```

```
                              aes(ymin=rt-ci, ymax=rt+ci)) +
  xlab("Condition") + coord_cartesian(ylim = c(600, 750)) + ylab("Reaction Time (ms)") +
  ggtitle("Reaction Times of the \n DRT \n by Condition and Response")
rtplot
```



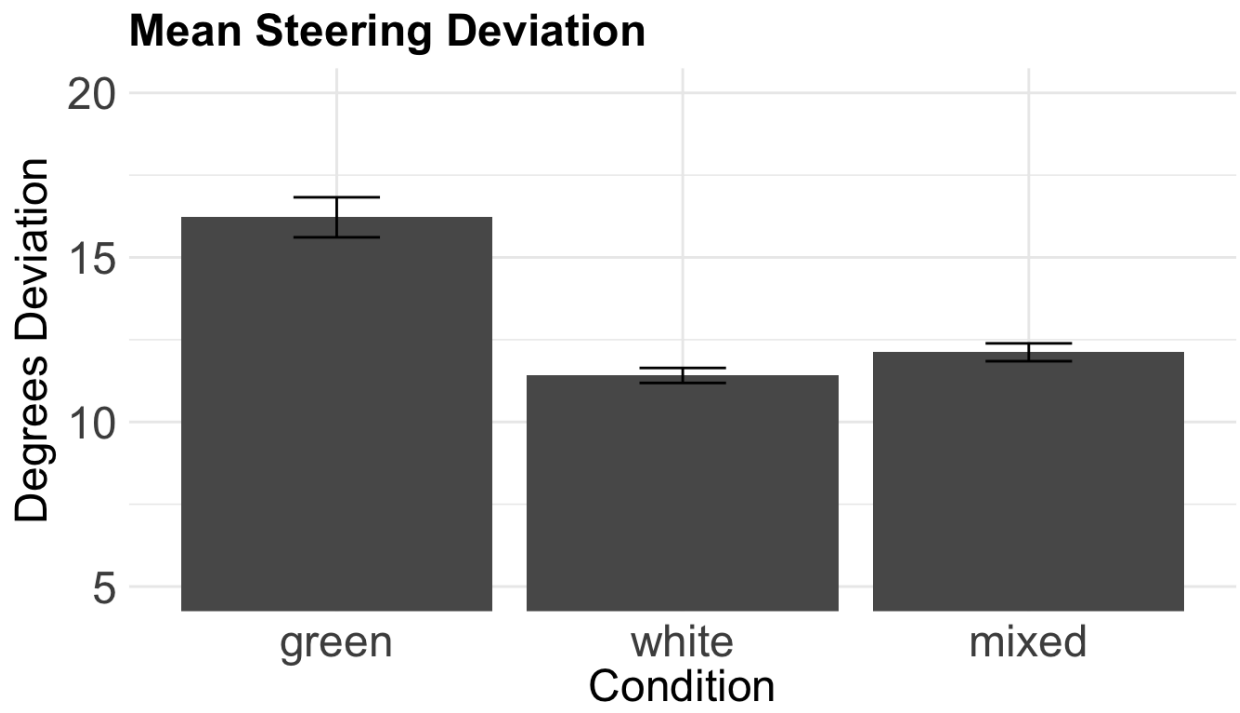

```
drt.rt <- lmer(rt~condition*response*mean.dev+(1|subid),data=drt.clean.choice)
Anova(drt.rt)
```

```
## Analysis of Deviance Table (Type II Wald chisquare tests)
##
## Response: rt
##                               Chisq Df Pr(>Chisq)
## condition                  376.6056  3    < 2e-16 ***
## response                   246.2230  2    < 2e-16 ***
## mean.dev                     0.2521  1    0.61561
## condition:response          16.6251  6    0.01076 *
## condition:mean.dev           8.0471  3    0.04505 *
## response:mean.dev            0.5400  2    0.76338
## condition:response:mean.dev  5.9518  6    0.42861
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

condition	response	rt	ci
green	correct	685	18
green	incorrect	657	20
mixed	correct	696	18
mixed	incorrect	670	19
white	correct	696	16
white	incorrect	672	18

Incorrect responses (where the participant responded to the light more than once) were faster on average than correct responses. The difficulty (condition) also affected reaction times. In addition, there was a difficulty (condition) by response interaction. We can see the effect of difficulty on steering below.

```
drtrt <- summarySEwithin(drt.clean.choice, measurevar ="mean.dev", withinvars = c("condition"), idvar =

drtrt <- drtrt %>% filter(condition != "practice")

rtplot <- ggplot(drtrt, aes(x = condition, y=mean.dev)) +
  geom_bar(stat = "identity", position = "dodge") + theme_minimal() +
  my.axis.font + geom_errorbar(position=position_dodge(.9), width = .25,
                               aes(ymin=mean.dev-ci, ymax=mean.dev+ci)) +
  xlab("Condition") + coord_cartesian(ylim = c(5, 20)) + ylab("Degrees Deviation") +
  ggtitle("Mean Steering Deviation")
rtplot
```




```
drt.rt <- lmer(mean.dev~condition+(1|subid),data=drt.clean.choice)
Anova(drt.rt)
```

condition	mean.dev	ci
green	16.13	0.60
mixed	11.73	0.27
white	11.46	0.22

Alone, the effects of the difficulty of the visual task changed the steering deviation so that (1) at the easiest difficulty, steering was the worst (2) at the highest difficulty, steering was the best, and (3) when participants didn't know whether to expect easy or difficult trials, steering was in between. In this case, participants may have been overloaded for the 3 tasks, and so priority could be given to a task that they thought they could complete.

```
clean.choiceac %>%
  group_by(subid, condition) %>%
  dplyr::summarise(trials_completed = n())
```

```
## Source: local data frame [60 x 3]
## Groups: subid [?]
##
##     subid condition trials_completed
##    <fctr>    <fctr>            <int>
## 1      04     green              160
## 2      04     white              160
## 3      04     mixed              160
## 4      05     green              160
## 5      05     white              120
## 6      05     mixed              160
## 7      06     green              115
## 8      06     white              105
## 9      06     mixed              123
## 10     07     green              127
## # ... with 50 more rows
```