

# Experience on Elicited Risk: Hypothesis and Data Analysis

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## Data description

This dataset contains the result from 6 experimental sessions.

Session	N	Age	Women	G_1	G_2	CRT	Correct	G_Change	n_Even	Explore
1	21	20.76	0.52	4.10	4.76	1.86	0.90	0.67	12.14	0.86
2	11	20.36	0.55	3.18	3.64	1.82	11.73	0.45	11.45	0.82
3	21	19.71	0.67	3.52	3.67	1.76	10.38	0.14	11.86	0.86
4	20	19.65	0.55	4.45	4.20	2.20	11.30	-0.25	11.80	0.80
5	20	20.40	0.50	3.45	3.80	1.20	11.50	0.35	12.10	0.80
6	6	19.00	0.83	2.50	2.50	0.83	12.00	0.00	13.00	1.00

## Risk elicited

In this study, the Eckle and Grossman risk elicitation task was implemented before and after the participants experience 24 realizations of the tasks. These correspond with **Gamble.1** and **Gamble.2** variables. Next table show the 6 gambles presented to the participants; events **odd** and **even** are equally probable and they had to choose only one gamble.

Notice the expected payoff is increasing from Gamble 1 to 5, and then it decreases to 34 (the same as gamble 4), but in this case choosing gamble 6 clearly elicits risk loving preferences.

## Experience periods

The 24 experience periods correspond to realization of a gamble chosen. In the first 12, a gamble was pre-selected (variables **R1** to **R12**) and the participants throw two dice to determine the events (variables **E1** to **E12**) and wrote down the corresponding payoff (variables **P1** to **P12**). In the last 12, a gamble was chosen by the participants (variables **F1** to **F12**) and the participants throw two dice to determine the events (variables **EF1** to **EF12**) and wrote down the corresponding payoff (variables **PF1** to **PF12**). The 24 periods of realizations didn't affected the final payoff, but one of them (**Period.to.review**) was selected to check if they wrote down the correct payoff and then earned an extra dollar (**Correct.Payoff**).

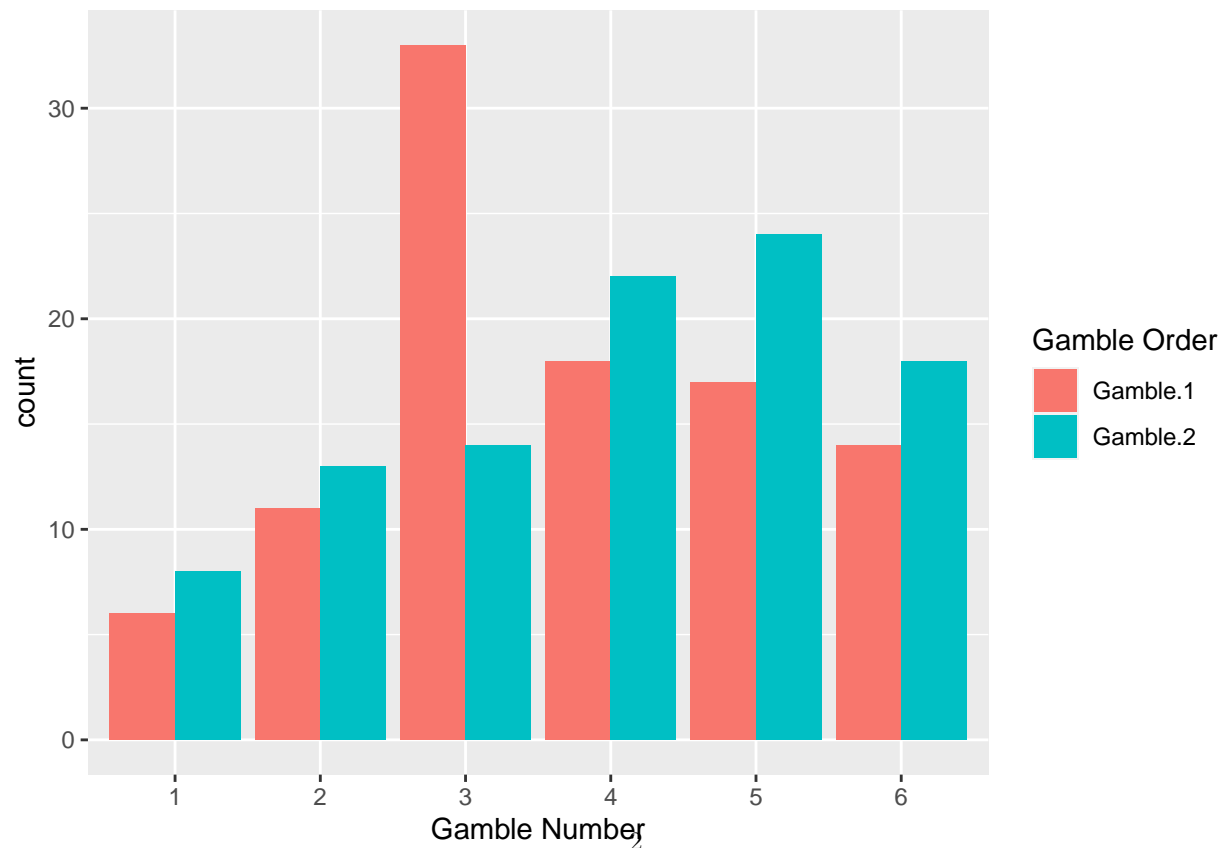
Potential Payments	Event	
Gamble	Odd	Even
1	28	28
2	36	24
3	44	20
4	52	16
5	60	12
6	66	2

Figure 1: Payoff table of the gambles as presented to the participants.

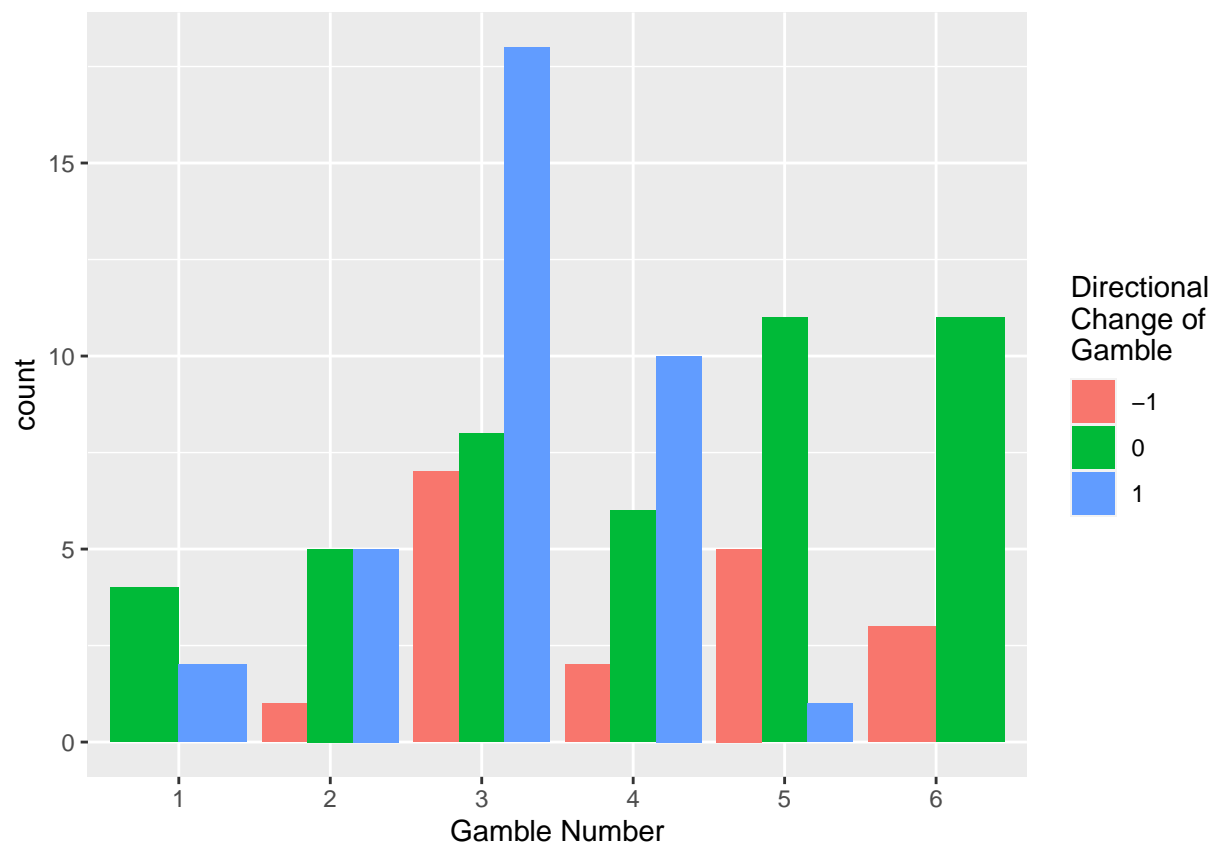
## Hypothesis

Participants display larger levels of risk tolerance

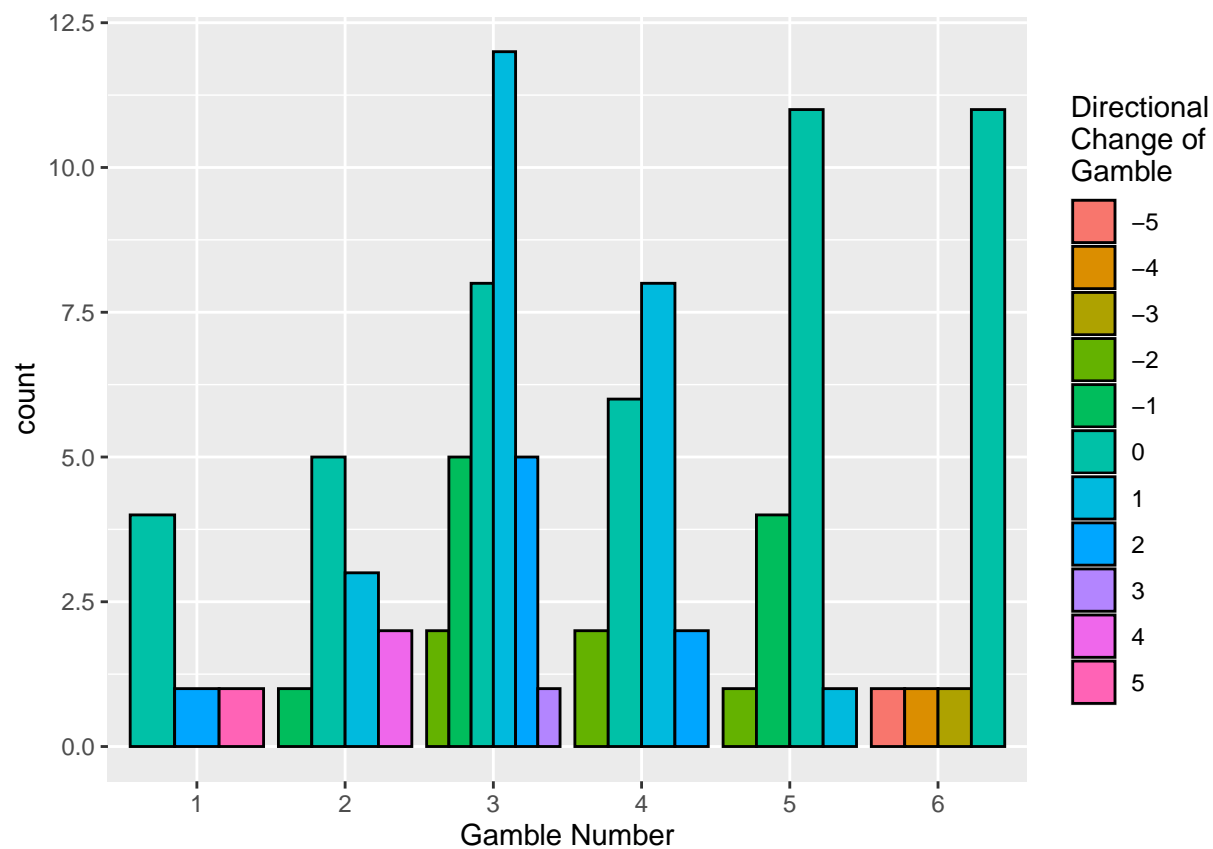
G2 - G1



The direction of the change is driven mostly by people choosing gamble 3 at the beginning and moving upwards.



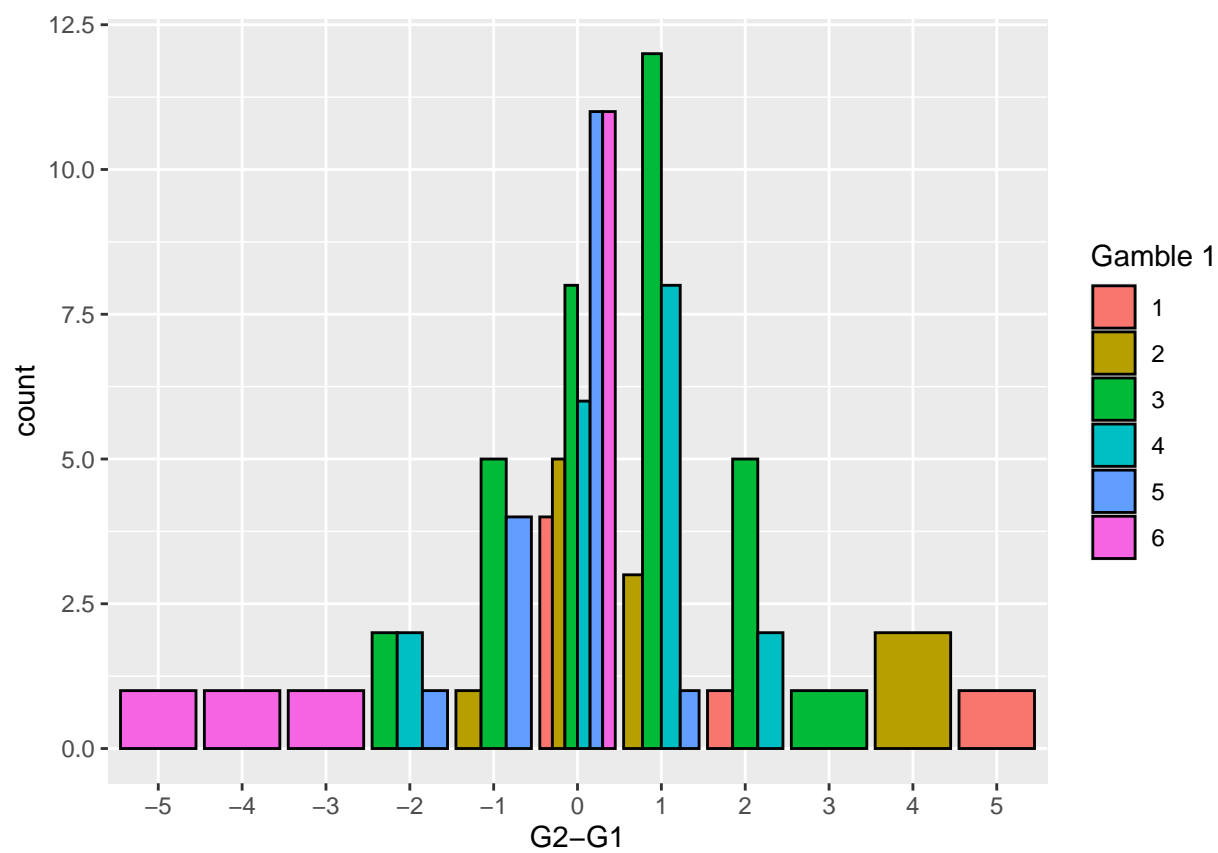
When analyzing the magnitude of the direction, it is clear that the main effect is driven by people moving from gamble 3 to gamble 4 (11 participants), and from gamble 4 to gamble 5 (8 participants).



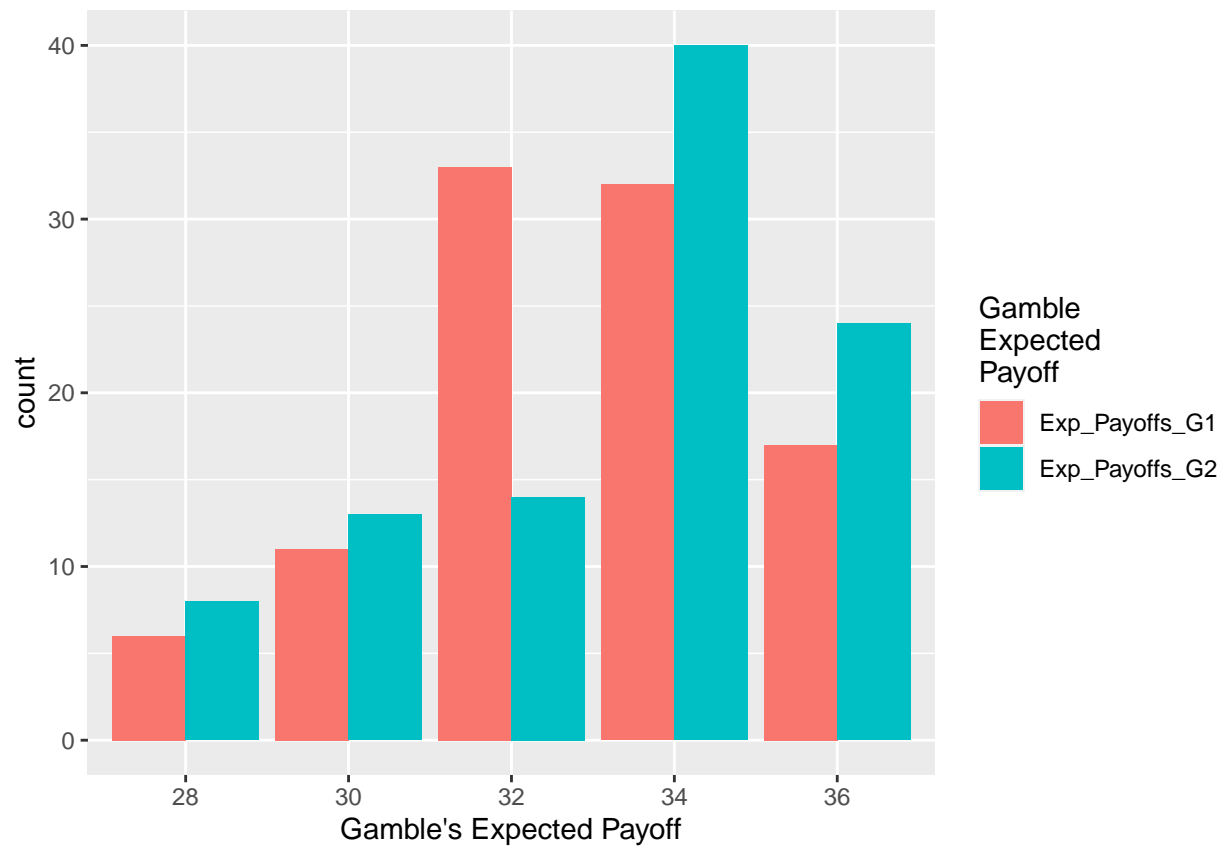
The Wilcox test shows that the difference is significant at 5% when analyzing the hypothesis that Gamble 2 is greater.

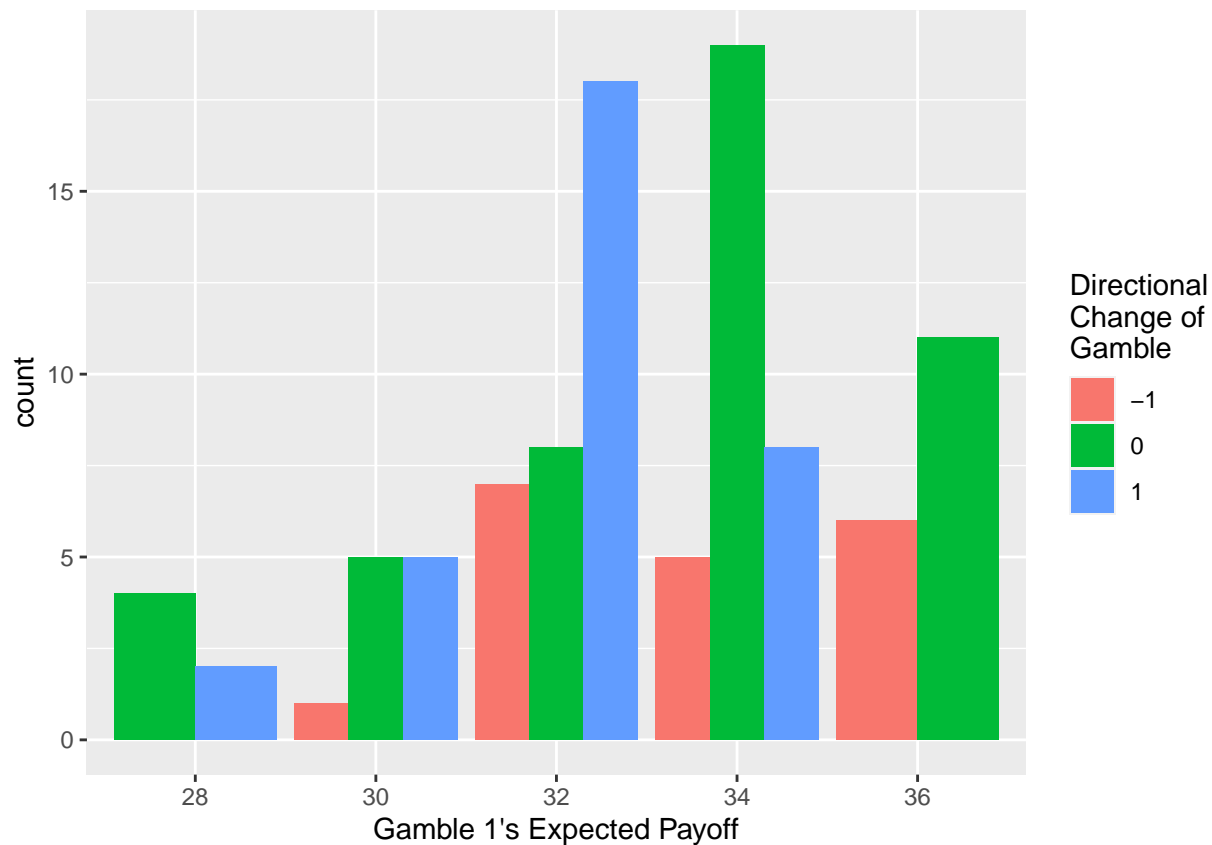
```
wilcox.test(x = ExperienceRisk_Sessions$simple_diff, alternative = "greater")
```

```
##
## Wilcoxon signed rank test with continuity correction
##
## data: ExperienceRisk_Sessions$simple_diff
## V = 952, p-value = 0.03143
## alternative hypothesis: true location is greater than 0
```



**EP1 - EP2**





The Wilcox test shows that the difference is significant at 10% when analyzing the hypothesis that Gamble 2 is greater.

```
wilcox.test(x = ExperienceRisk_Sessions$diff_Exp_Payoffs, alternative = "greater")
```

```
##
## Wilcoxon signed rank test with continuity correction
##
## data: ExperienceRisk_Sessions$diff_Exp_Payoffs
## V = 843.5, p-value = 0.07127
## alternative hypothesis: true location is greater than 0
```

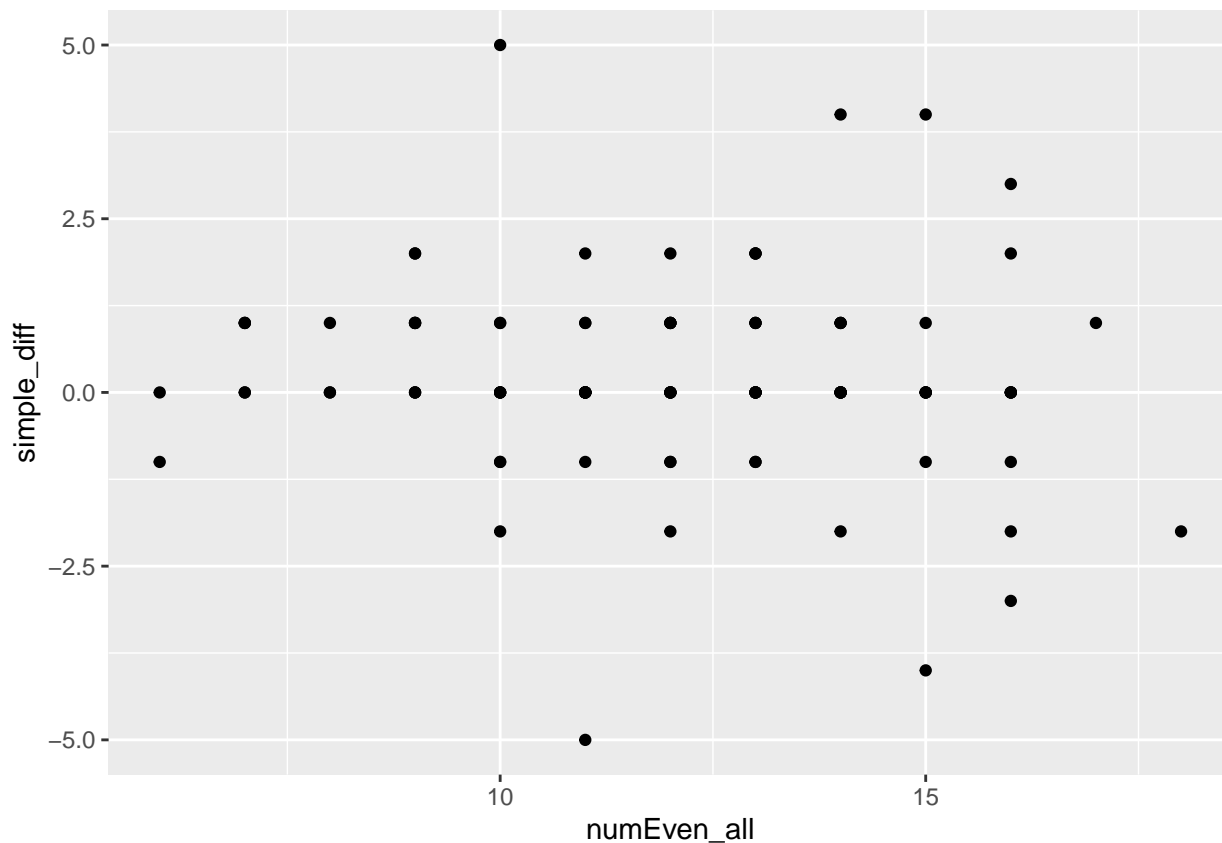
```
ExperienceRisk_Sessions %>% tabyl(Gamble.1, Gamble.2)
```

```
## Gamble.1 1 2 3 4 5 6
##          1 4 0 1 0 0 1
##          2 1 5 3 0 0 2
##          3 2 5 8 12 5 1
##          4 0 2 0 6 8 2
##          5 0 0 1 4 11 1
##          6 1 1 1 0 0 11
```

Larger number of Even events will make people changing downwards

Gamble 1 - Gamble 2

```
ggplot(data = ExperienceRisk_Sessions) +
  geom_point(aes(x=numEven_all, y=simple_diff))
```



```
m1 <- lm(simple_diff ~
  numEven_all,
  data = ExperienceRisk_Sessions)
summary(m1)
```

```
##
## Call:
## lm(formula = simple_diff ~ numEven_all, data = ExperienceRisk_Sessions)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -5.2898 -0.3865 -0.1448  0.7102  4.6619
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.82157    0.65065   1.263   0.210
## numEven_all -0.04834    0.05300  -0.912   0.364
##
## Residual standard error: 1.416 on 97 degrees of freedom
## Multiple R-squared:  0.008505, Adjusted R-squared:  -0.001716
## F-statistic: 0.8321 on 1 and 97 DF, p-value: 0.3639
```

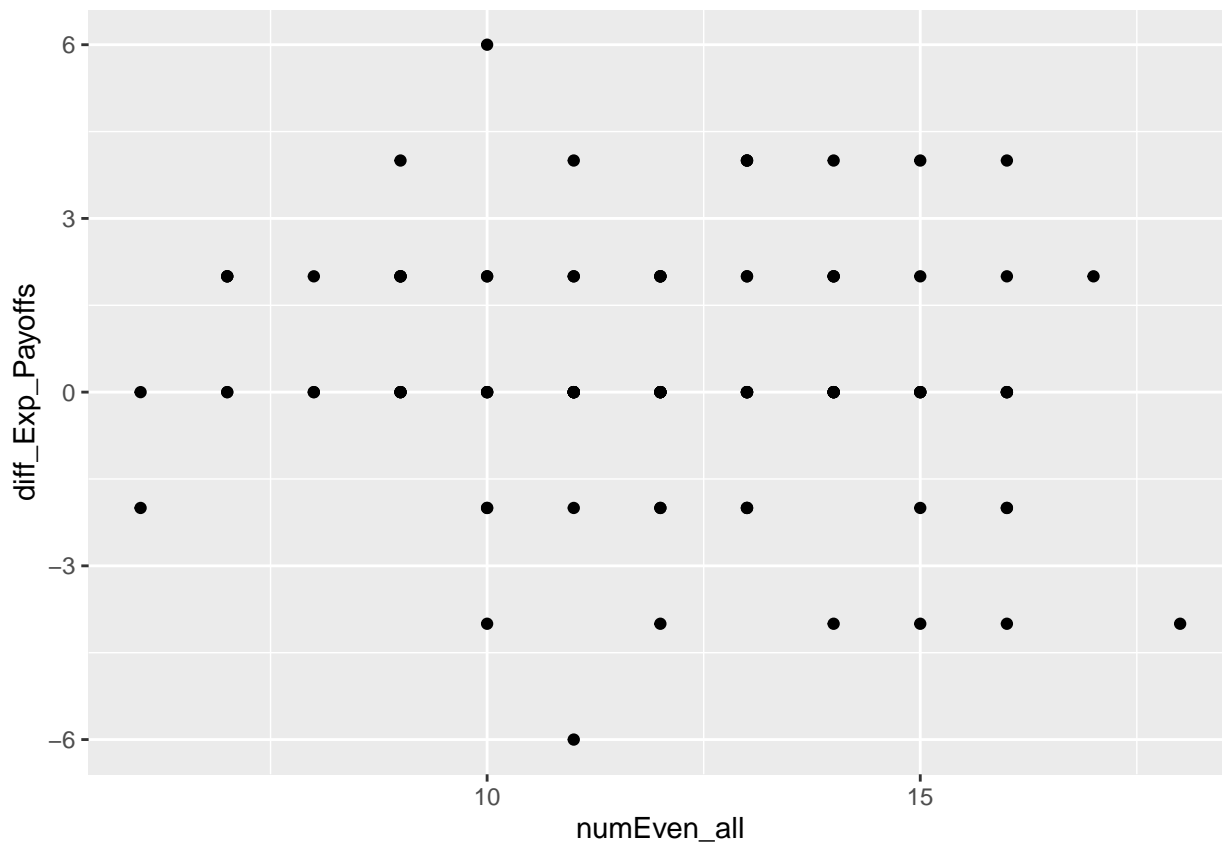
There is no significant effect of the overall number of events on the difference between Gamble 1 and 2.

```
m1 <- lm(simple_diff ~
  numEven_all,
  data = ExperienceRisk_Sessions %>% filter(sum_correct_payoffs>18) )
summary(m1)
```



```
##
## Call:
## lm(formula = simple_diff ~ numEven_all, data = ExperienceRisk_Sessions %>%
##   filter(sum_correct_payoffs > 18))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -5.0565 -0.0634 -0.0531  0.9401  3.9504
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.075413   0.663716   0.114   0.910
## numEven_all -0.001718   0.053839  -0.032   0.975
##
## Residual standard error: 1.299 on 71 degrees of freedom
## Multiple R-squared:  1.434e-05, Adjusted R-squared:  -0.01407
## F-statistic: 0.001018 on 1 and 71 DF,  p-value: 0.9746
```

### Expected Payoff 1 - Expected Payoff 2



```
##
## Call:
## lm(formula = diff_Exp_Payoffs ~ numEven_all, data = ExperienceRisk_Sessions)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -6.4129 -0.5960 -0.2298  1.4498  5.4955
```

```
##
## Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.41982    0.96026   1.479   0.142
## numEven_all -0.09154    0.07822  -1.170   0.245
##
## Residual standard error: 2.09 on 97 degrees of freedom
## Multiple R-squared:  0.01392,    Adjusted R-squared:  0.003758
## F-statistic:  1.37 on 1 and 97 DF,  p-value: 0.2447
```

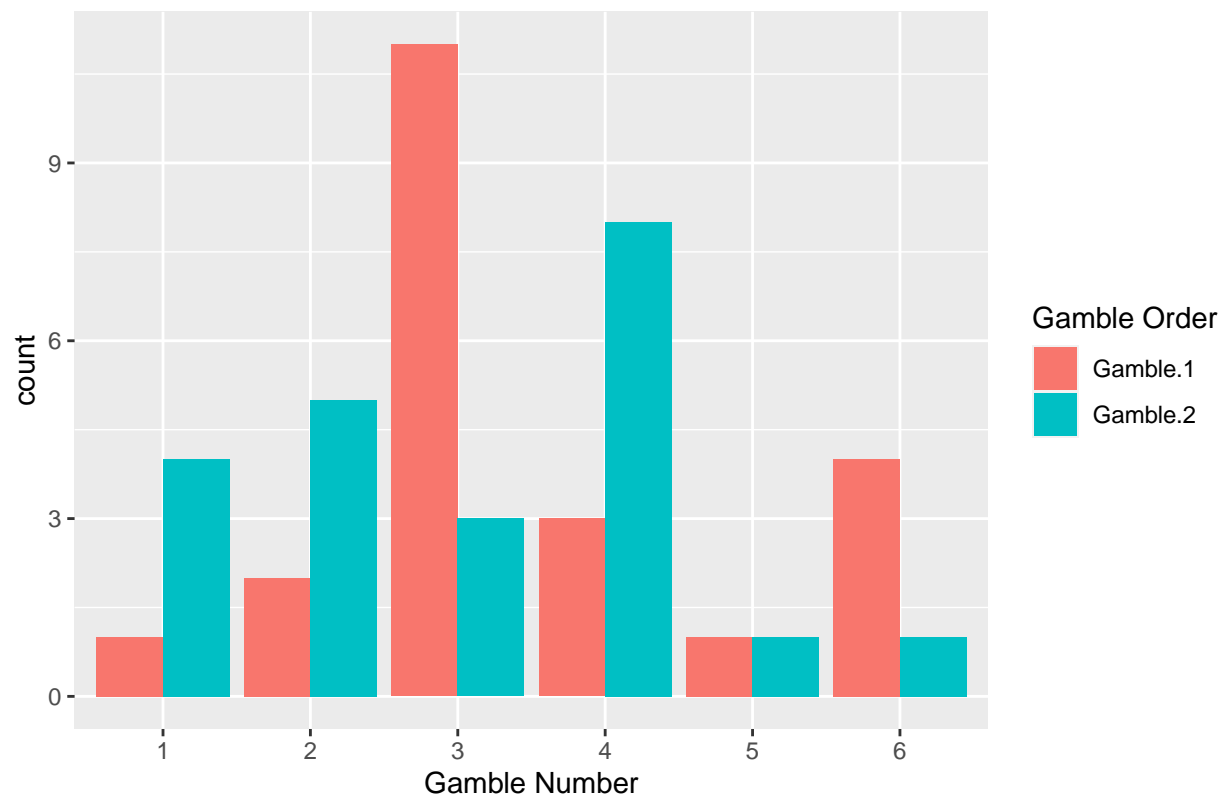
There is no significant effect of the overall number of events on the difference between Expected Payoffs in Gamble 1 and 2.

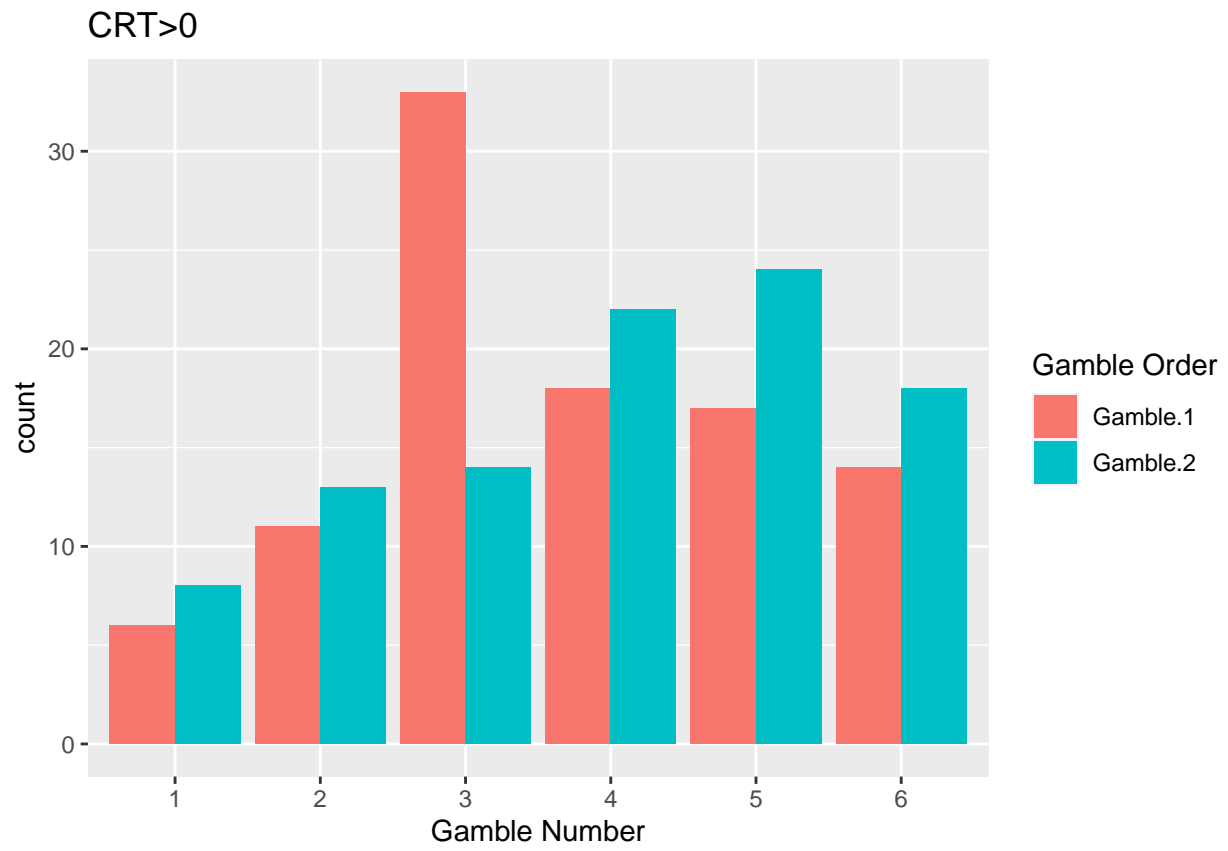
## CR predicting more changes

```
ExperienceRisk_Sessions %>%
  mutate(G1 = factor(Gamble.1),
         CRT = factor(CR.Payoff)) %>%
  tabyl(G1,CRT)
```

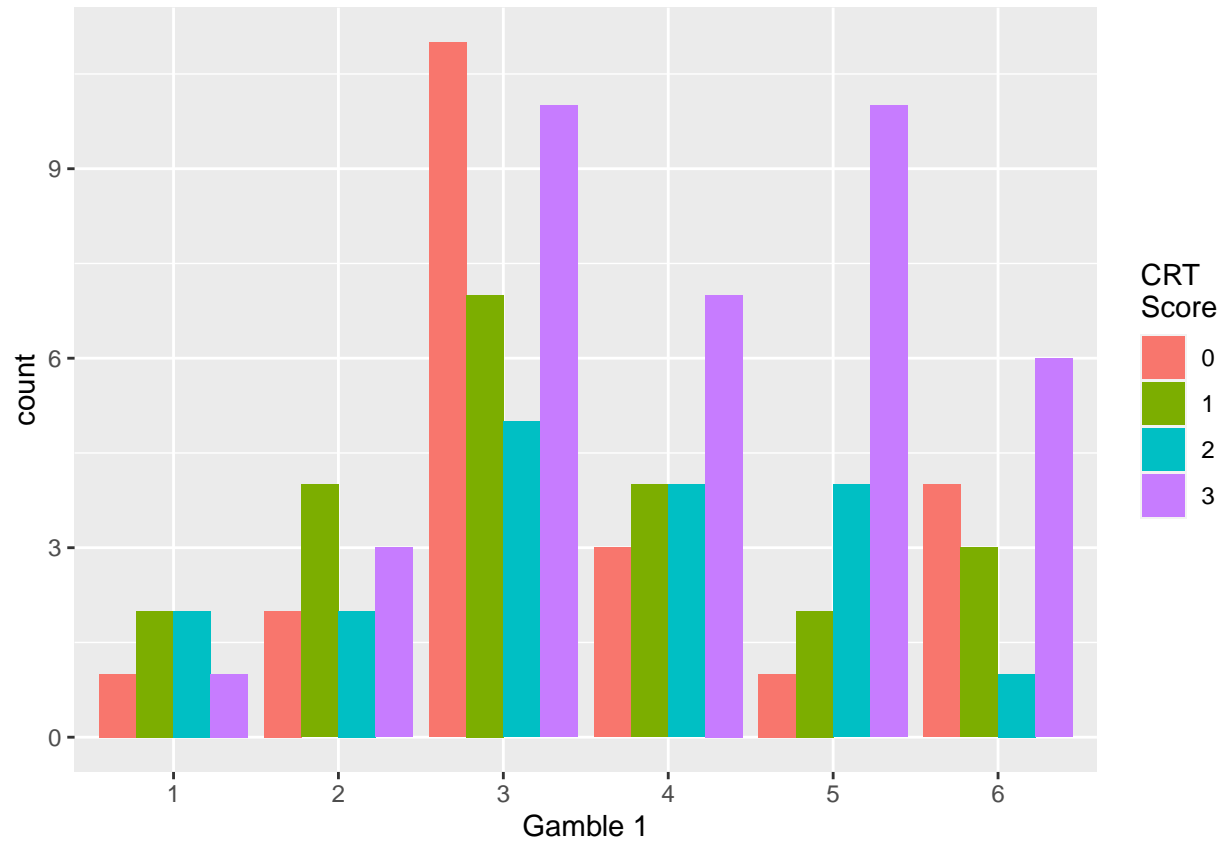
```
##  G1  0 1 2 3
##    1  1 2 2 1
##    2  2 4 2 3
##    3 11 7 5 10
##    4  3 4 4 7
##    5  1 2 4 10
##    6  4 3 1 6
```

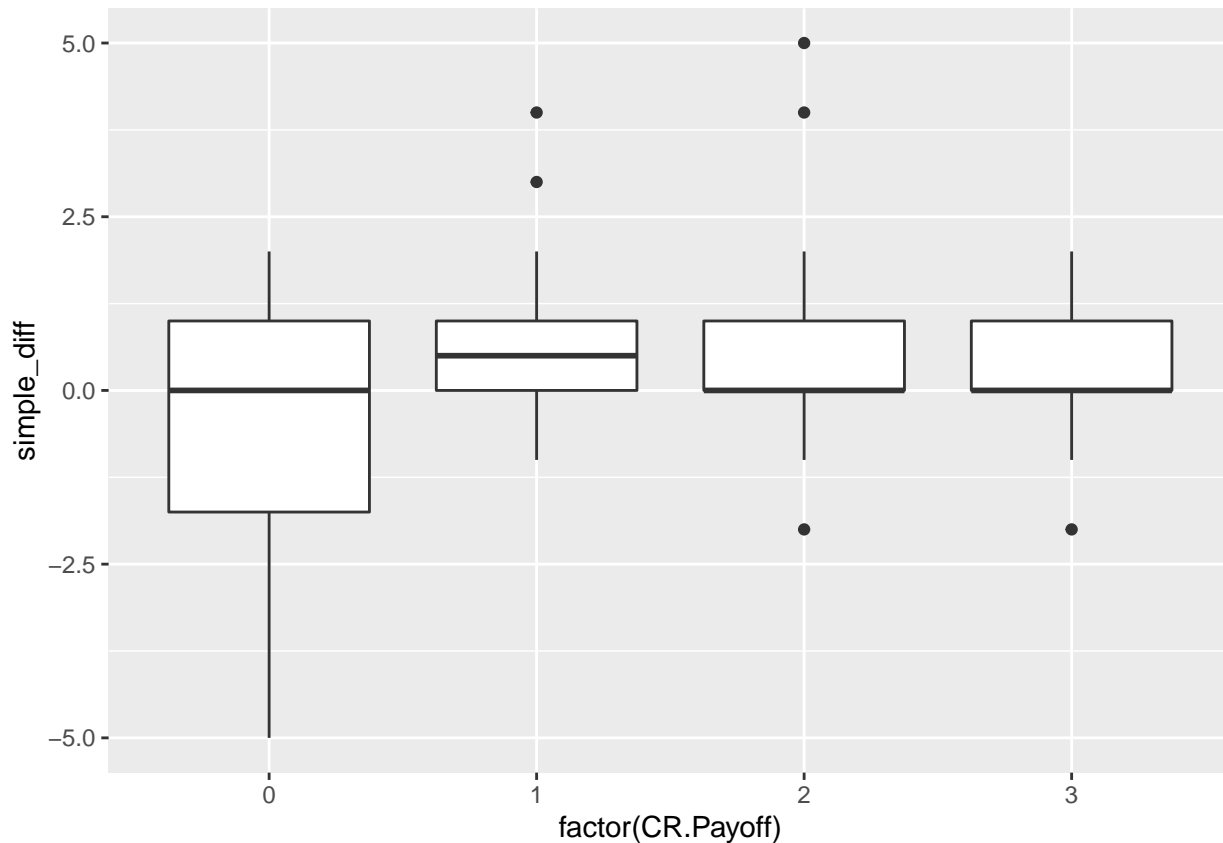
CRT=0





G2 - G1





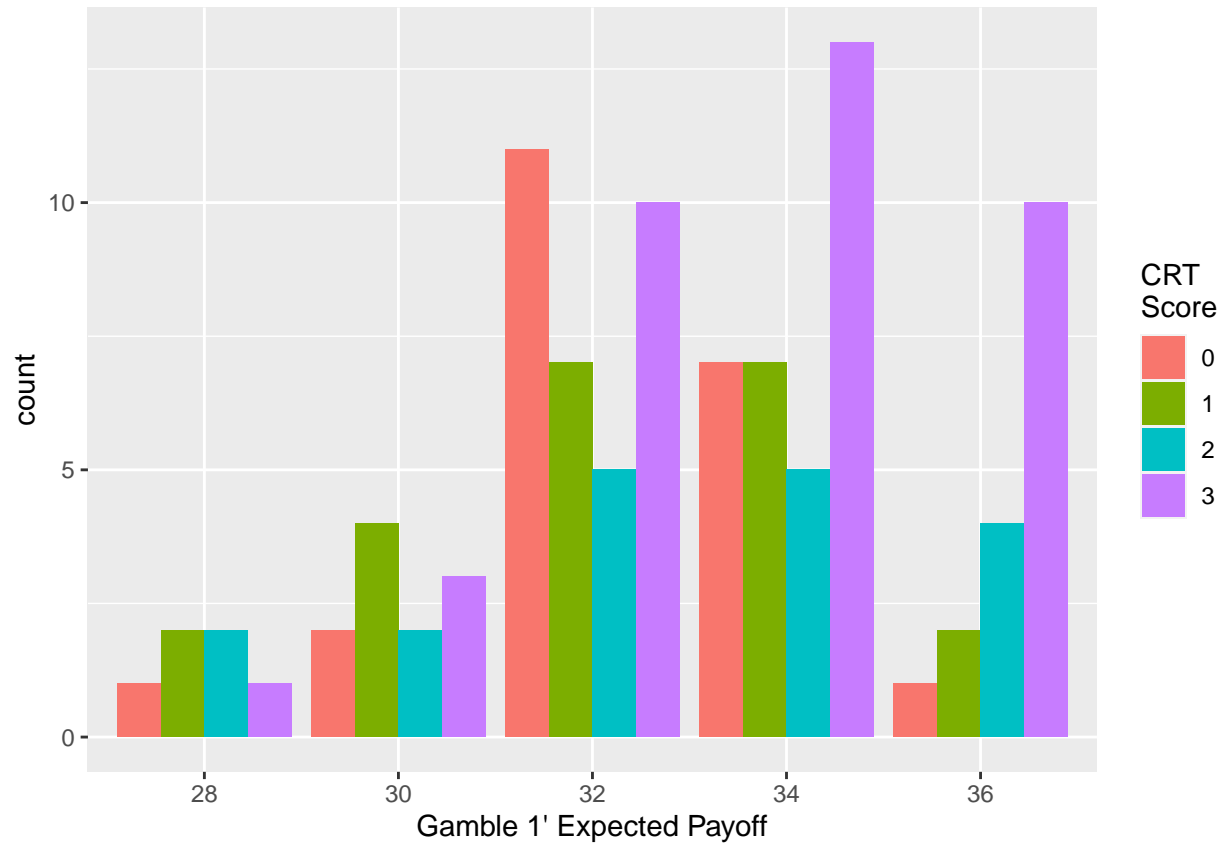
```
##
## Call:
## lm(formula = simple_diff ~ CR.Payoff > 0, data = ExperienceRisk_Sessions)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -4.4091 -0.4805 -0.4805  0.5195  4.5195
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -0.5909     0.2876  -2.054  0.04262 *
## CR.Payoff > 0TRUE    1.0714     0.3261   3.285  0.00142 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.349 on 97 degrees of freedom
## Multiple R-squared:  0.1001, Adjusted R-squared:  0.09085
## F-statistic: 10.79 on 1 and 97 DF,  p-value: 0.001419
```

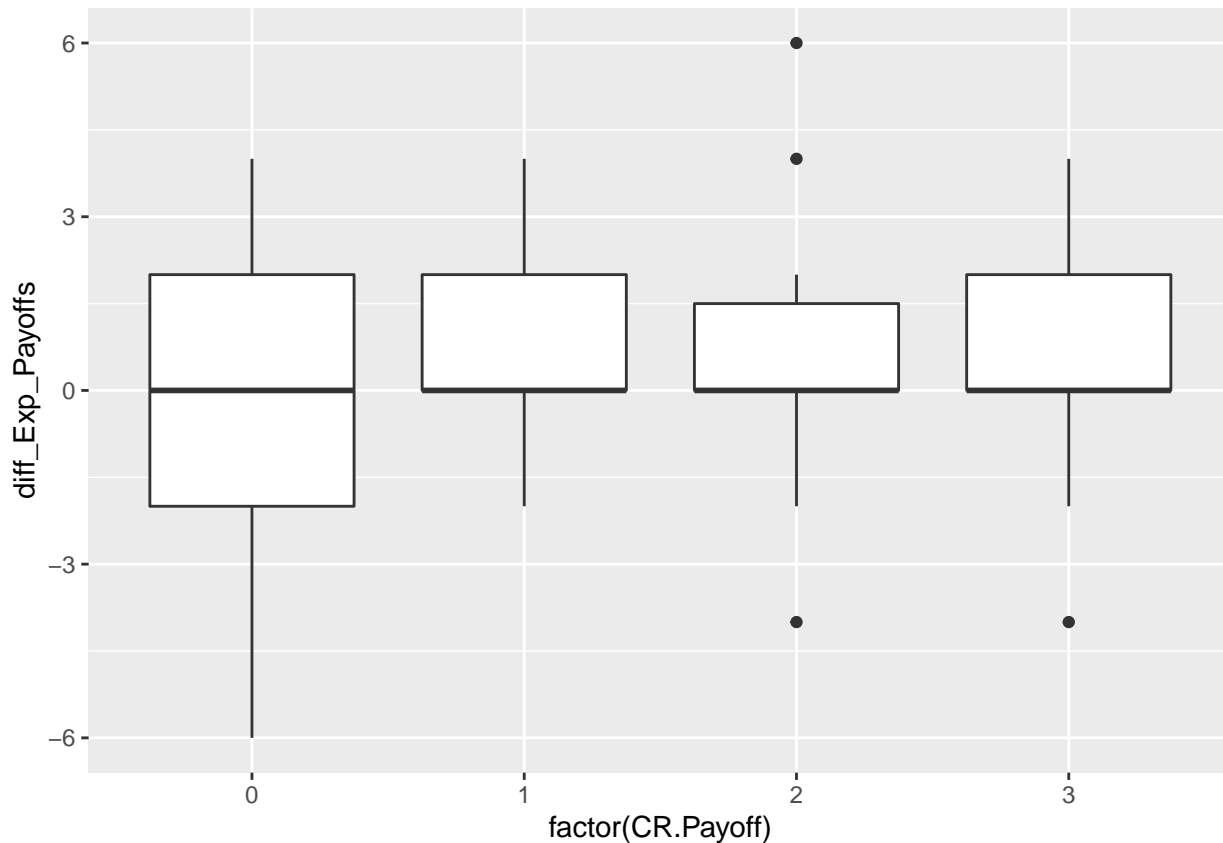
There is an effect of the CR when considering a dummy for having achieved at least one point in the test. If people got at least one point, they will increase by one the number of the gamble they chose. This effect is not longer significant if the regression include all the levels of CRT as regressors.

```
##
## Call:
## lm(formula = simple_diff ~ CR.Payoff, data = ExperienceRisk_Sessions)
##
## Residuals:
```

```
##      Min      1Q  Median      3Q      Max
## -4.9463 -0.4667 -0.1197  0.7068  4.7068
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.05375    0.24828  -0.216   0.829
## CR.Payoff    0.17350    0.11955   1.451   0.150
##
## Residual standard error: 1.407 on 97 degrees of freedom
## Multiple R-squared:  0.02125,    Adjusted R-squared:  0.01116
## F-statistic: 2.106 on 1 and 97 DF,  p-value: 0.1499
```

## EP2 - EP1





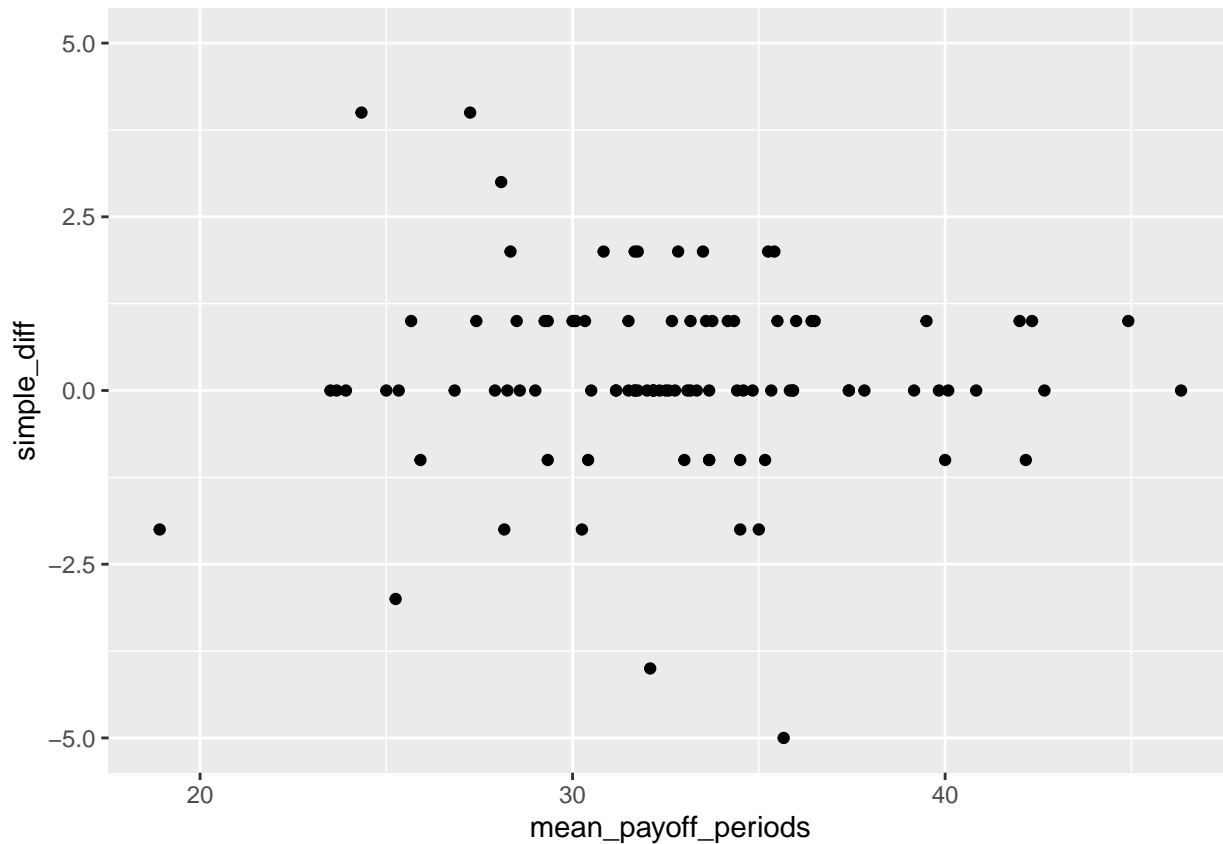
```
##
## Call:
## lm(formula = diff_Exp_Payoffs ~ CR.Payoff > 0, data = ExperienceRisk_Sessions)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -5.3636 -0.5974 -0.5974  1.4026  5.4026
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -0.6364     0.4349  -1.463   0.147
## CR.Payoff > 0 TRUE    1.2338     0.4931   2.502   0.014 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.04 on 97 degrees of freedom
## Multiple R-squared:  0.06062,    Adjusted R-squared:  0.05094
## F-statistic:  6.26 on 1 and 97 DF,  p-value: 0.01403
```

Like in the difference between the gamble chosen first and second, there is an effect of the CR when considering a dummy for having achieved at least one point in the test. If people got at least one point, they will increase by one the number of the gamble they chose.

## Effects of history

```
ggplot(data = ExperienceRisk_Sessions) +
  geom_point(aes(x=mean_payoff_periods,y=simple_diff))
```

```
## Warning: Removed 2 rows containing missing values (geom_point).
```



```
m1 <- lm(diff_Exp_Payoffs ~
  mean_payoff_periods,
  data = ExperienceRisk_Sessions %>% filter(CR.Payoff!=0) )
summary(m1)

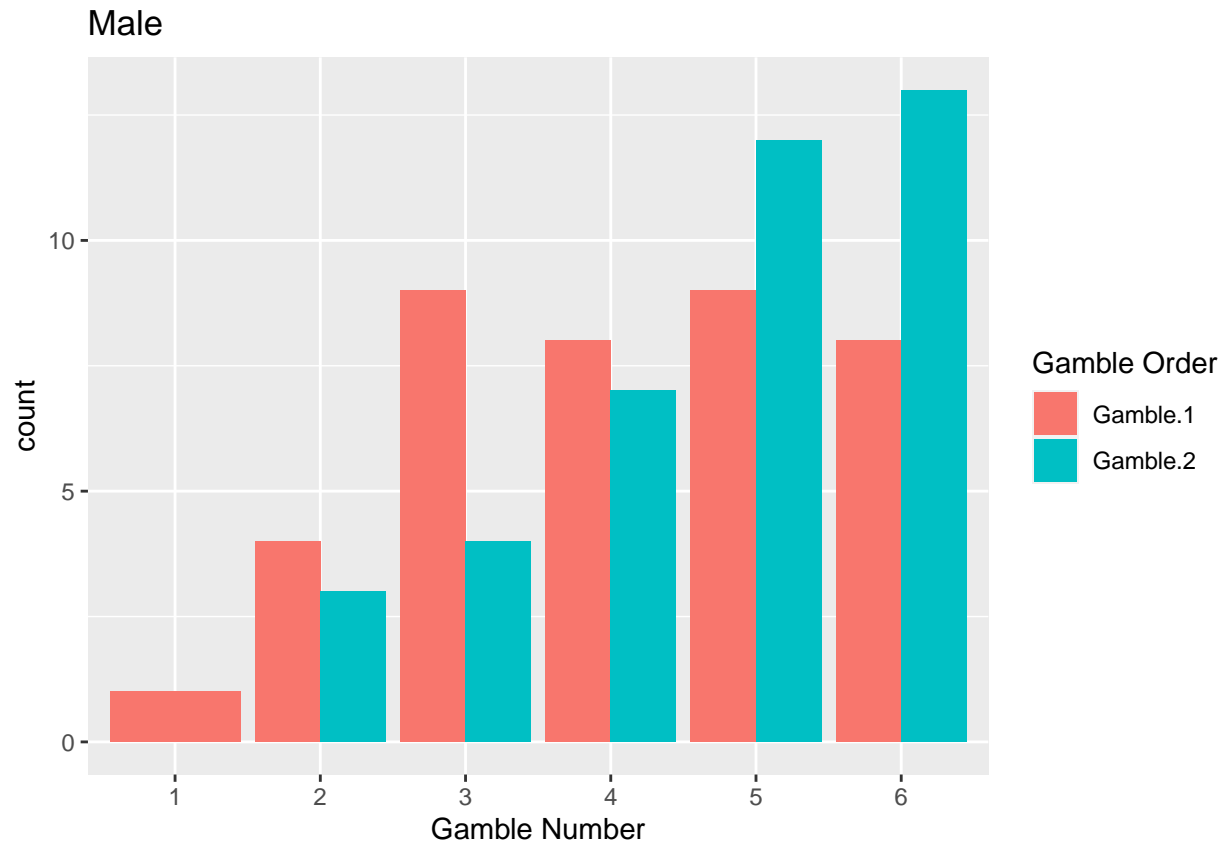
##
## Call:
## lm(formula = diff_Exp_Payoffs ~ mean_payoff_periods, data = ExperienceRisk_Sessions %>%
##   filter(CR.Payoff != 0))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -4.5889 -0.5784 -0.4768  1.4713  3.4895
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      1.06255     1.35849   0.782   0.437
## mean_payoff_periods -0.01681     0.04063  -0.414   0.680
##
## Residual standard error: 1.753 on 73 degrees of freedom
## (2 observations deleted due to missingness)
## Multiple R-squared:  0.00234,    Adjusted R-squared:  -0.01133
## F-statistic: 0.1712 on 1 and 73 DF,  p-value: 0.6802
```

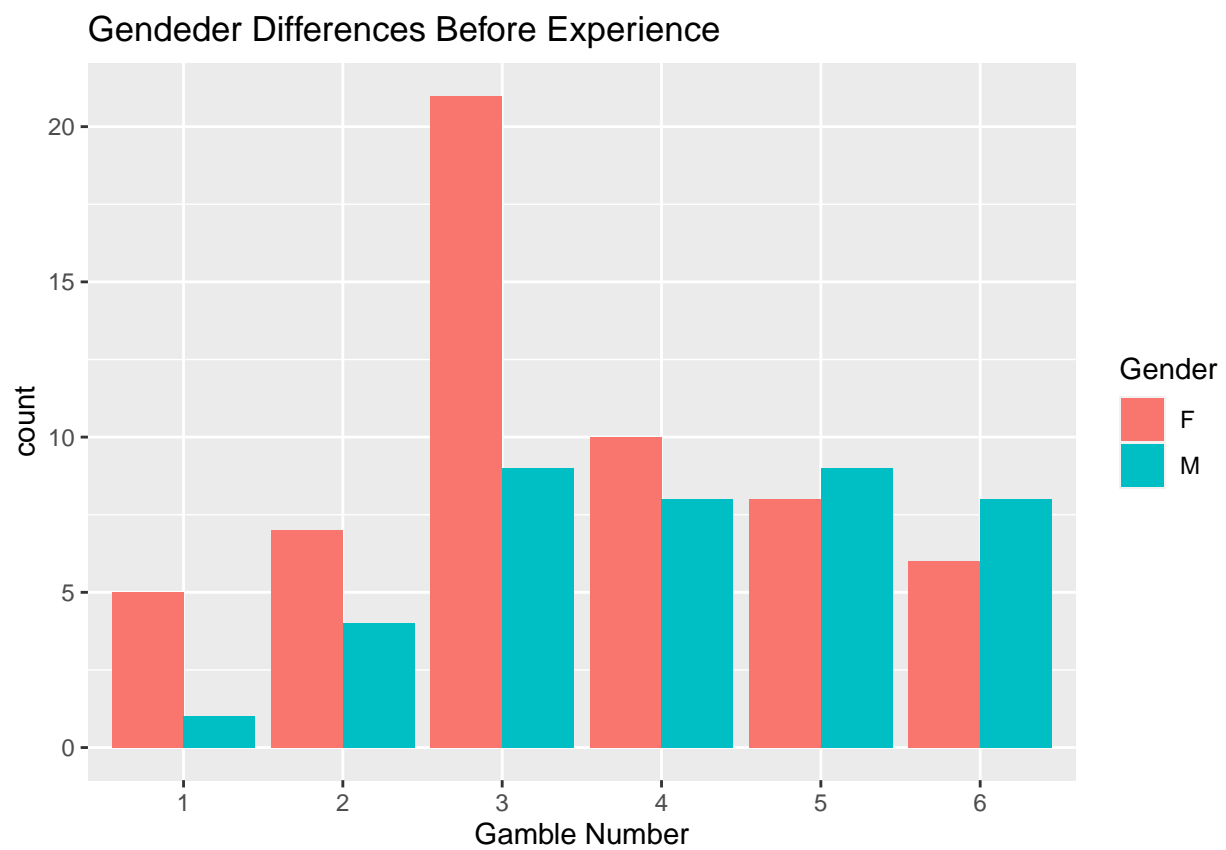
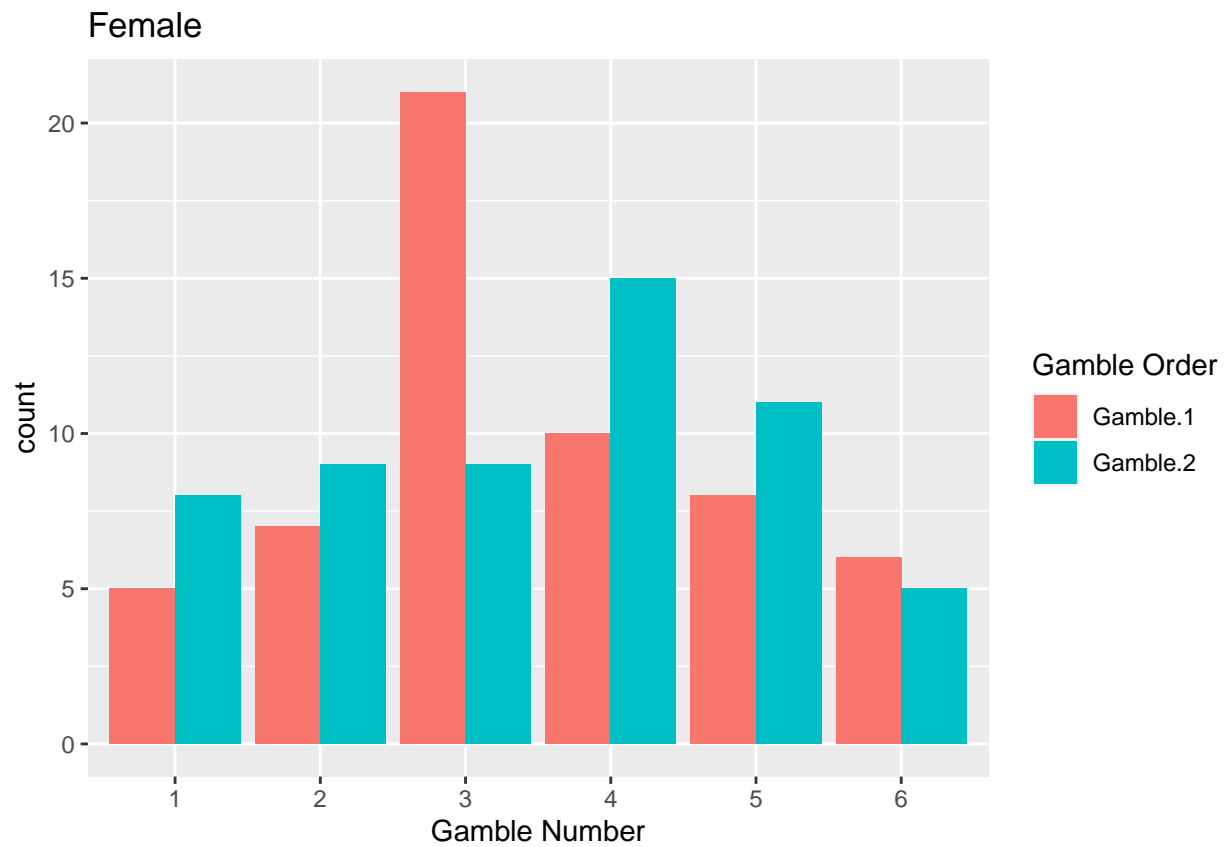


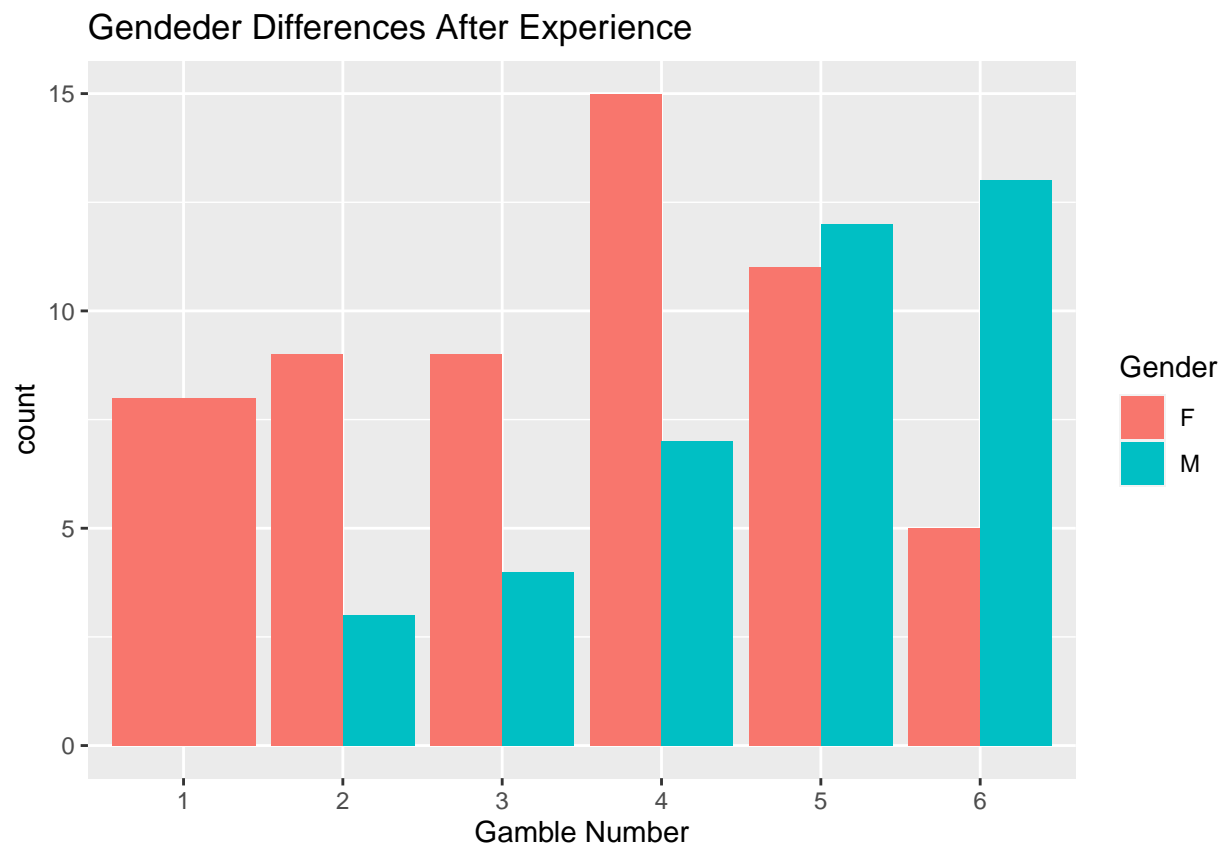
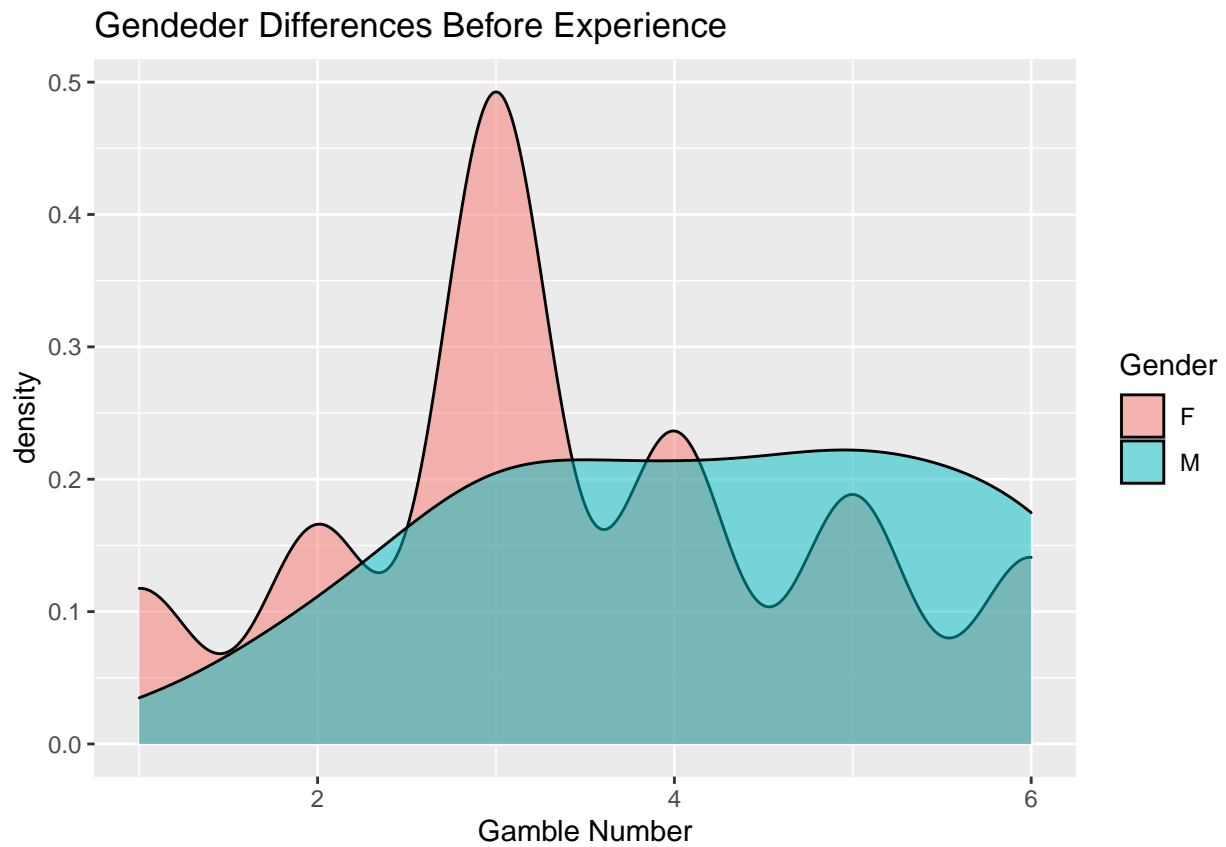
## Gender differences

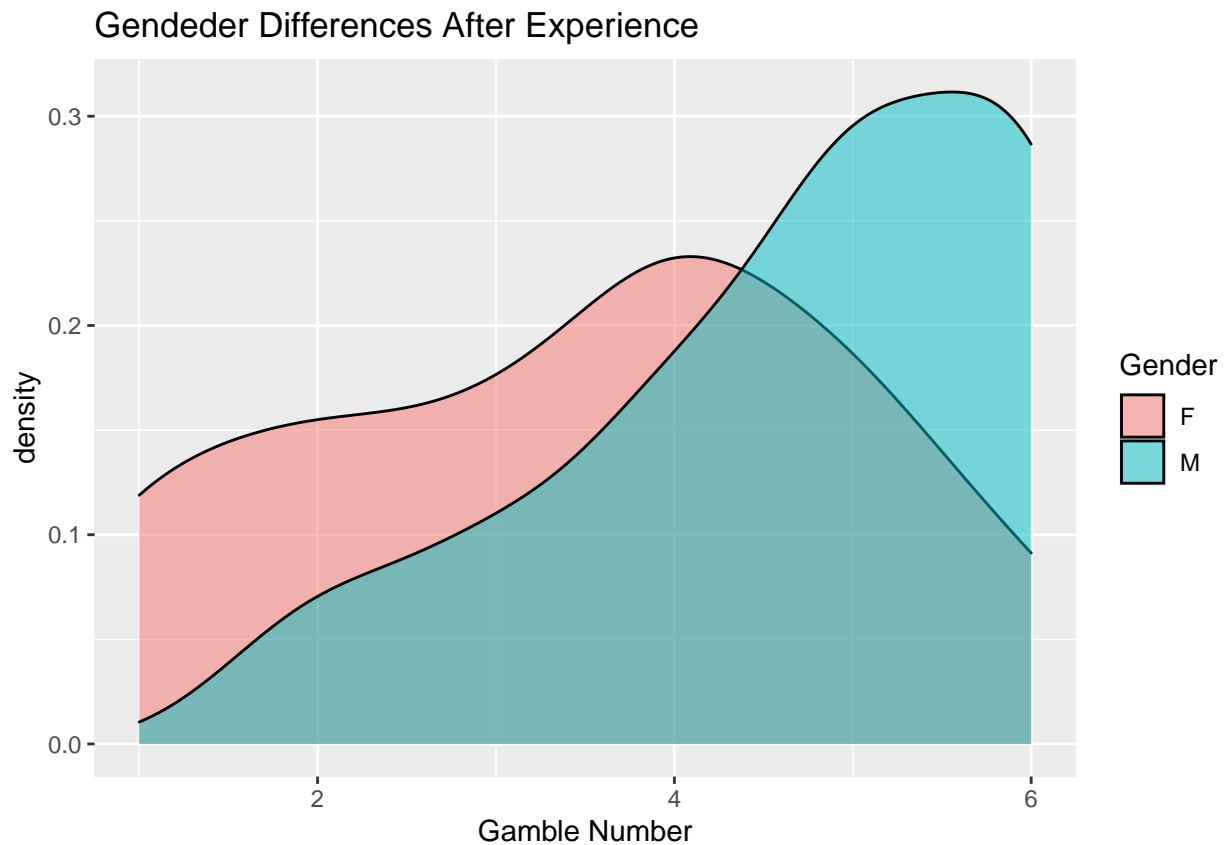
Male and Female participants moved in the expected direction; both moved towards higher gambles. However, both distributions are different.

The distribution of gamble choices among men changes towards gamble 6; risk loving. At the beginning, before the experience the distribution was more or less homogeneous between gambles 3 to 6.









## Regression

G2- G1

EP2- EP1

**CRT = 0**

```
ggplot(data = ExperienceRisk_Sessions %>%
  filter(CR.Payoff!=0) %>%
  select(Gamble.1,Gamble.2) %>%
  gather("Gamble_Order","Gamble") ) +
  geom_bar(aes(x = factor(Gamble),fill = Gamble_Order),position="dodge")+
  labs(x = "Gamble Number", fill = "Gamble Order",title="Distribution when CRT is not zero")
```

Table 1:

	<i>Dependent variable:</i>	
	simple_diff	
	(1)	(2)
Gamble.1	−0.550*** (0.093)	−0.531*** (0.087)
GenderM	0.792*** (0.267)	0.846*** (0.252)
CR.Payoff	0.245** (0.113)	0.268** (0.104)
sum_correct_payoffs	−0.062** (0.027)	−0.061*** (0.021)
numEven_all	−0.014 (0.045)	
explore	−0.282 (0.380)	
Session	−0.006 (0.099)	
Constant	3.225*** (0.980)	2.656*** (0.571)
Observations	96	96
R <sup>2</sup>	0.363	0.358
Adjusted R <sup>2</sup>	0.312	0.330
Residual Std. Error	1.178 (df = 88)	1.162 (df = 91)
F Statistic	7.149*** (df = 7; 88)	12.690*** (df = 4; 91)

*Note:*

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Table 2:

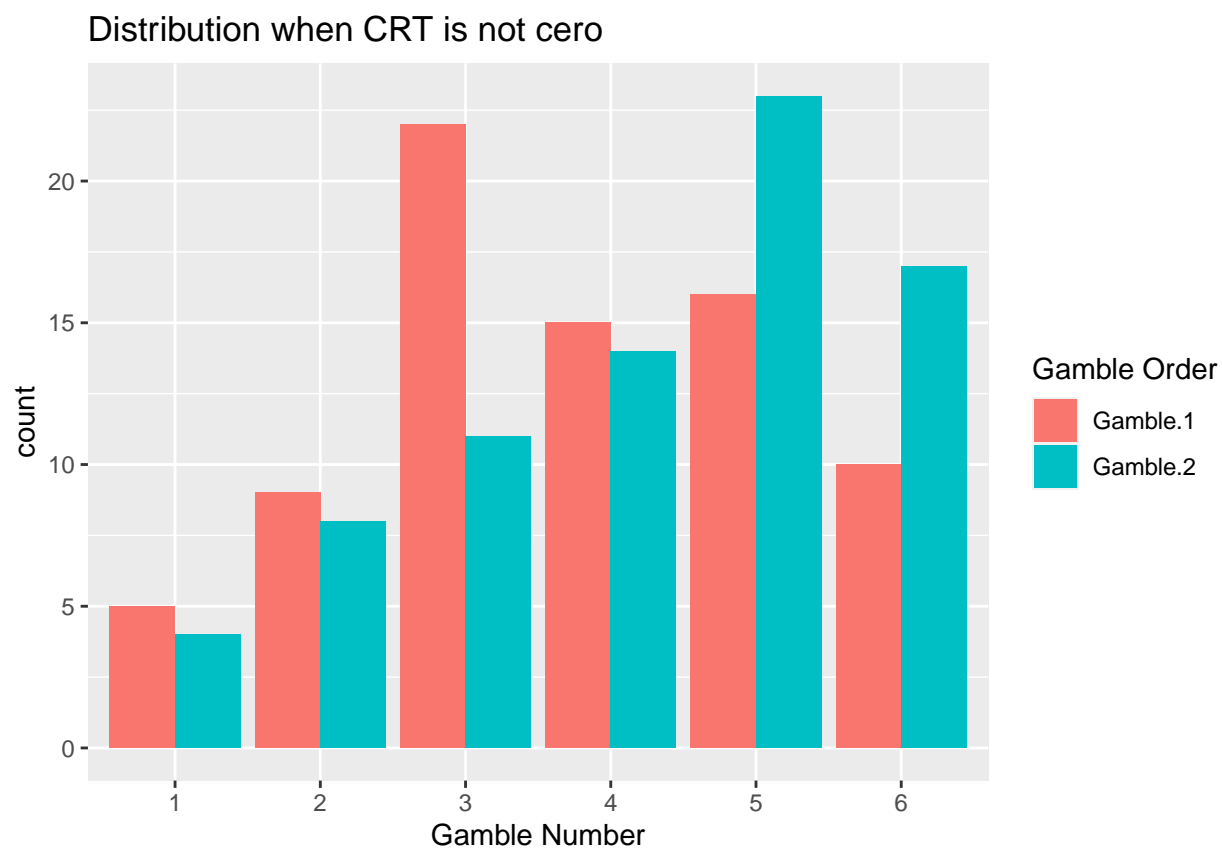
	<i>Dependent variable:</i>
	Gamble.2
middle	0.520*** (0.091)
GenderM	2.120** (0.877)
CR.Payoff1	1.967*** (0.742)
CR.Payoff2	2.520*** (0.770)
CR.Payoff3	2.280*** (0.679)
even1	1.420** (0.663)
GenderM:CR.Payoff1	-1.227 (1.286)
GenderM:CR.Payoff2	-1.620 (1.175)
GenderM:CR.Payoff3	-1.533 (1.059)
GenderM:even1	-2.400* (1.242)
CR.Payoff1:even1	-0.867 (0.908)
CR.Payoff2:even1	-2.620** (1.077)
CR.Payoff3:even1	-1.691** (0.849)
GenderM:CR.Payoff1:even1	2.803 (1.689)
GenderM:CR.Payoff2:even1	3.113* (1.708)
GenderM:CR.Payoff3:even1	2.546* (1.470)
Constant	1.360** (0.578)
Observations	22 96
R <sup>2</sup>	0.543
Adjusted R <sup>2</sup>	0.451
Residual Std. Error	1.148 (df = 79)

Table 3:

	<i>Dependent variable:</i>	
	diff_Exp_Payoffs	
	(1)	(2)
Gamble.1	−0.772*** (0.142)	−0.593*** (0.136)
GenderF	−2.235 (1.998)	
GenderM	−1.445 (2.027)	
GenderPNTS	−3.529 (2.382)	
CR.Payoff	0.276 (0.171)	
sum__correct__payoffs	−0.082** (0.041)	−0.079** (0.032)
numEven__all	−0.048 (0.069)	
explore	−0.830 (0.580)	
Session	−0.011 (0.150)	
Constant	7.611*** (2.129)	4.121*** (0.871)
Observations	99	99
R <sup>2</sup>	0.328	0.197
Adjusted R <sup>2</sup>	0.261	0.181
Residual Std. Error	1.801 (df = 89)	1.895 (df = 96)
F Statistic	4.837*** (df = 9; 89)	11.803*** (df = 2; 96)

*Note:*

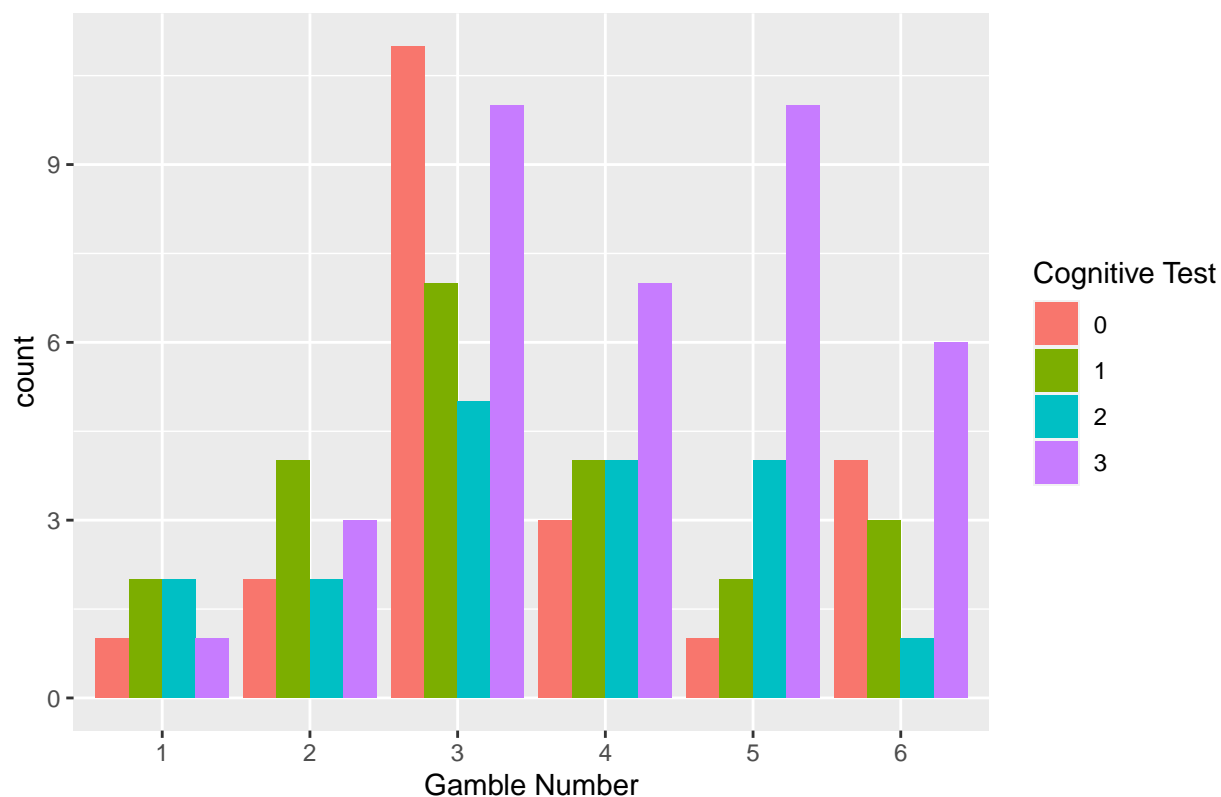
\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01



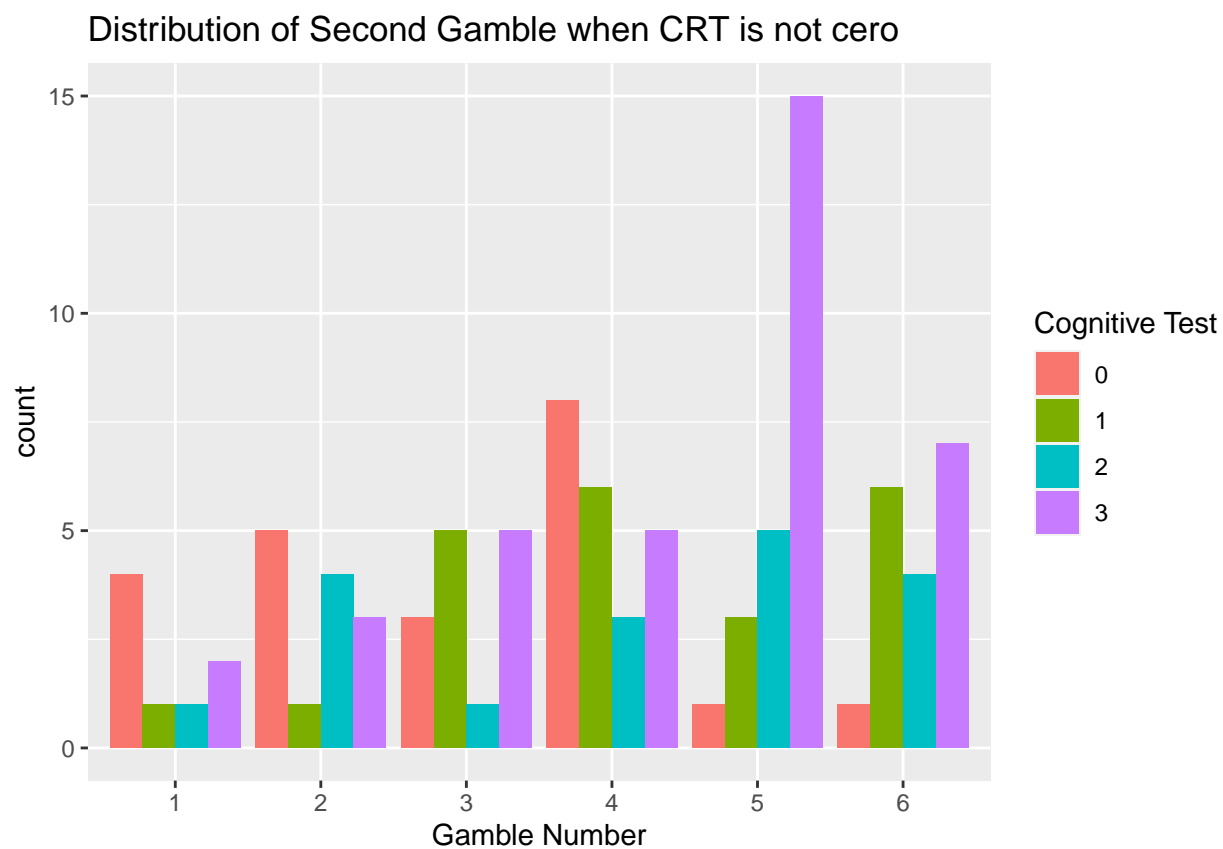
```
ggplot(data = ExperienceRisk_Sessions %>%
  select(Gamble.1, CR.Payoff) ) +
  geom_bar(aes(x = factor(Gamble.1),
    fill = factor(CR.Payoff)),
    position="dodge") +
  labs(x = "Gamble Number",
    fill = "Cognitive Test",
    title = "Distribution of First Gamble when CRT is not zero")
```



Distribution of First Gamble when CRT is not cero



```
ggplot(data = ExperienceRisk_Sessions %>%
  select(Gamble.2, CR.Payoff) ) +
  geom_bar(aes(x = factor(Gamble.2),
    fill = factor(CR.Payoff)),
    position="dodge") +
  labs(x = "Gamble Number",
    fill = "Cognitive Test",
    title = "Distribution of Second Gamble when CRT is not cero")
```



```
ggplot(data = ExperienceRisk_Sessions %>%
  select(simple_diff, CR.Payoff) ) +
  geom_density(aes(x = simple_diff,
    fill = factor(CR.Payoff==0)),
    alpha=0.5)+
  labs(x = "G2-G1",
    fill = "CRT=0",
    title="Distribution of Change when CRT is not zero")
```

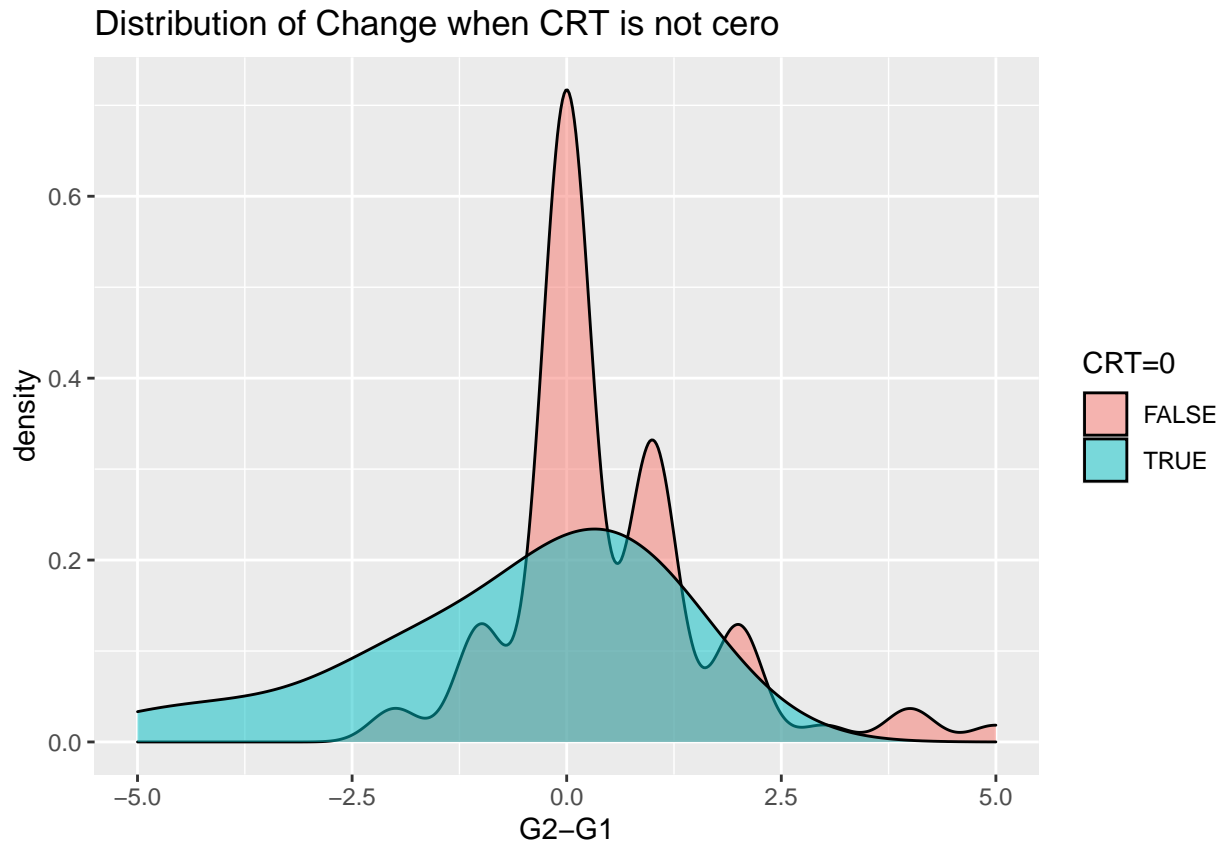


Table 4: Expected Payoff among Females with CRT=0

	<i>Dependent variable:</i>
	diff_Exp_Payoffs
Gamble.1	−0.692* (0.352)
less_than_12_even	−2.551* (1.217)
Constant	2.145 (1.402)
Observations	16
R <sup>2</sup>	0.400
Adjusted R <sup>2</sup>	0.308
Residual Std. Error	2.105 (df = 13)
F Statistic	4.332** (df = 2; 13)

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

### effect of history

```
ggplot(data = ExperienceRisk_Sessions %>%
  filter(CR.Payoff!=0) ) +
```

```
geom_point(aes(x=mean_payoff_periods,y=simple_diff))
```

```
## Warning: Removed 2 rows containing missing values (geom_point).
```

