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**).

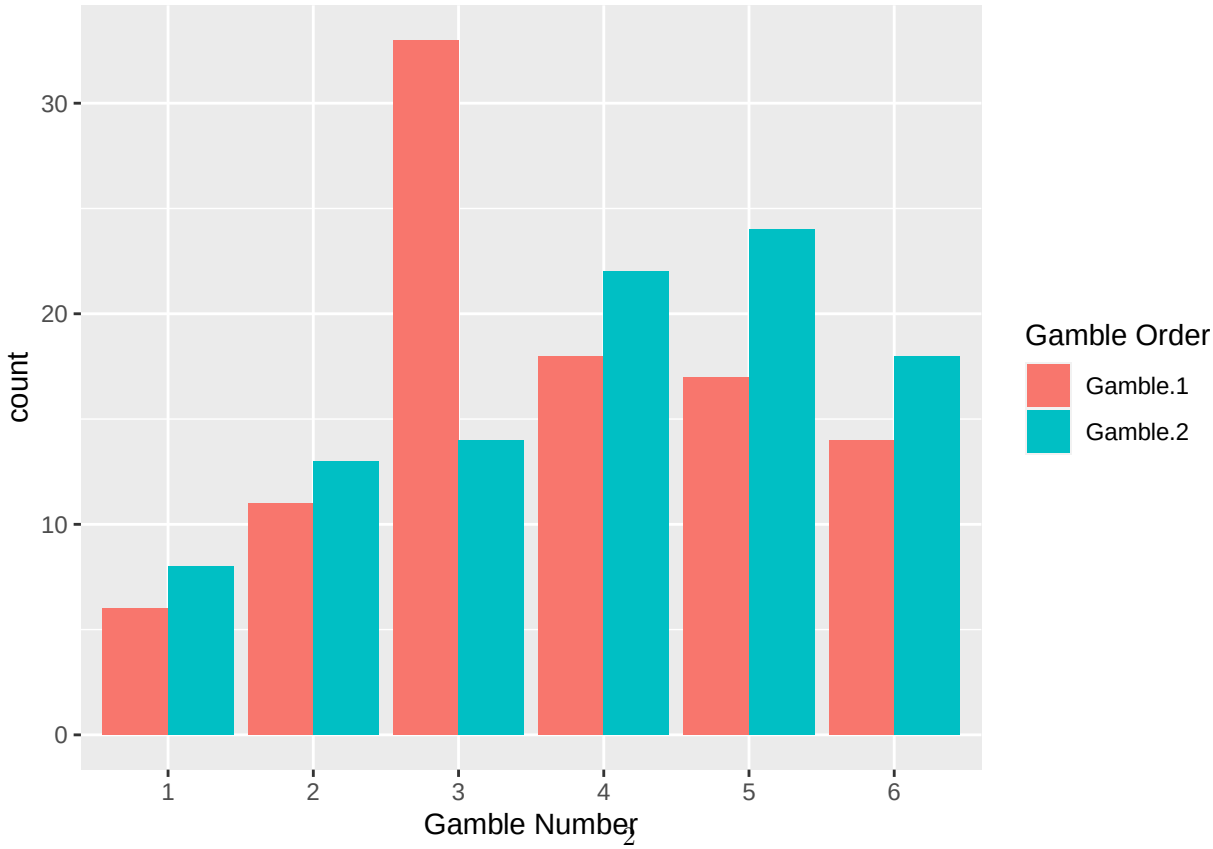
Potential Payments	Event	
Gamble	Odd	Even
1	28	28
2	36	24
3	44	20
4	52	16
5	60	12
6	66	2

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

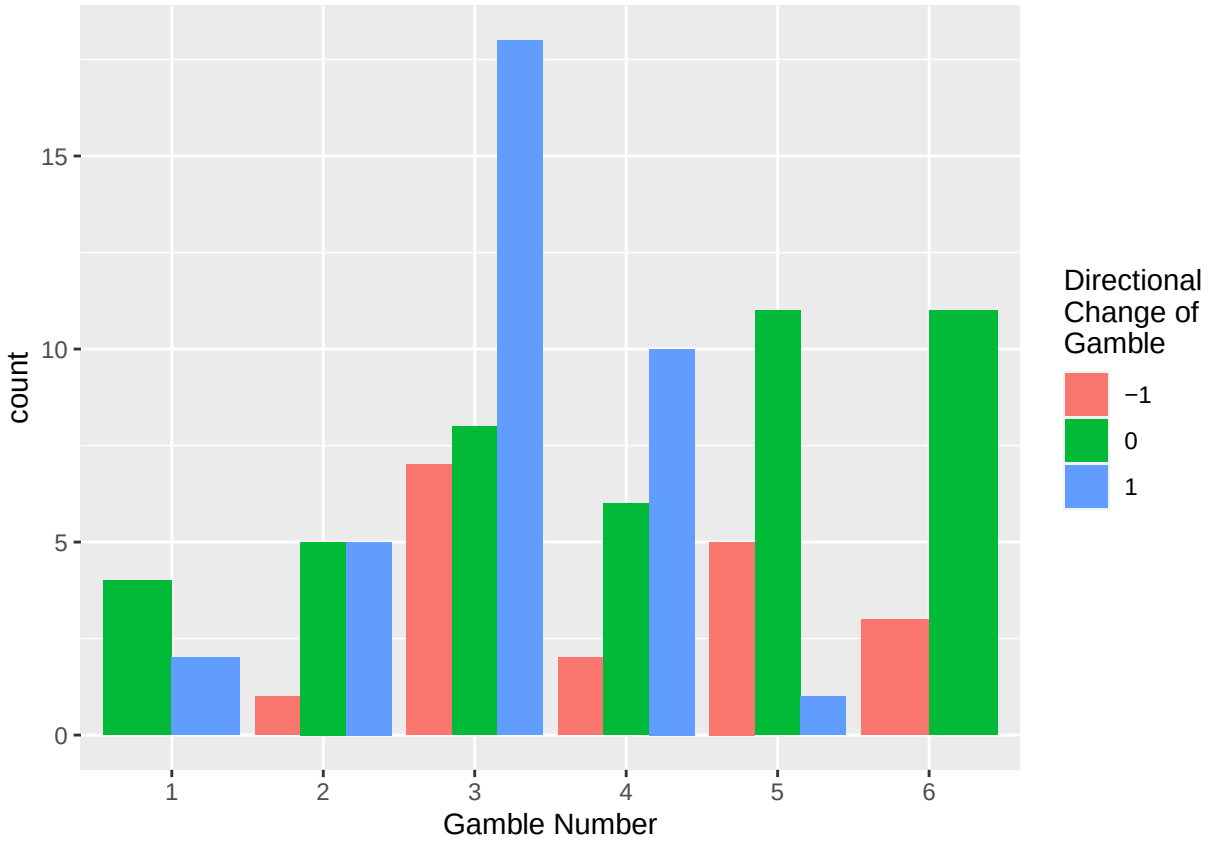
Hypothesis

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.

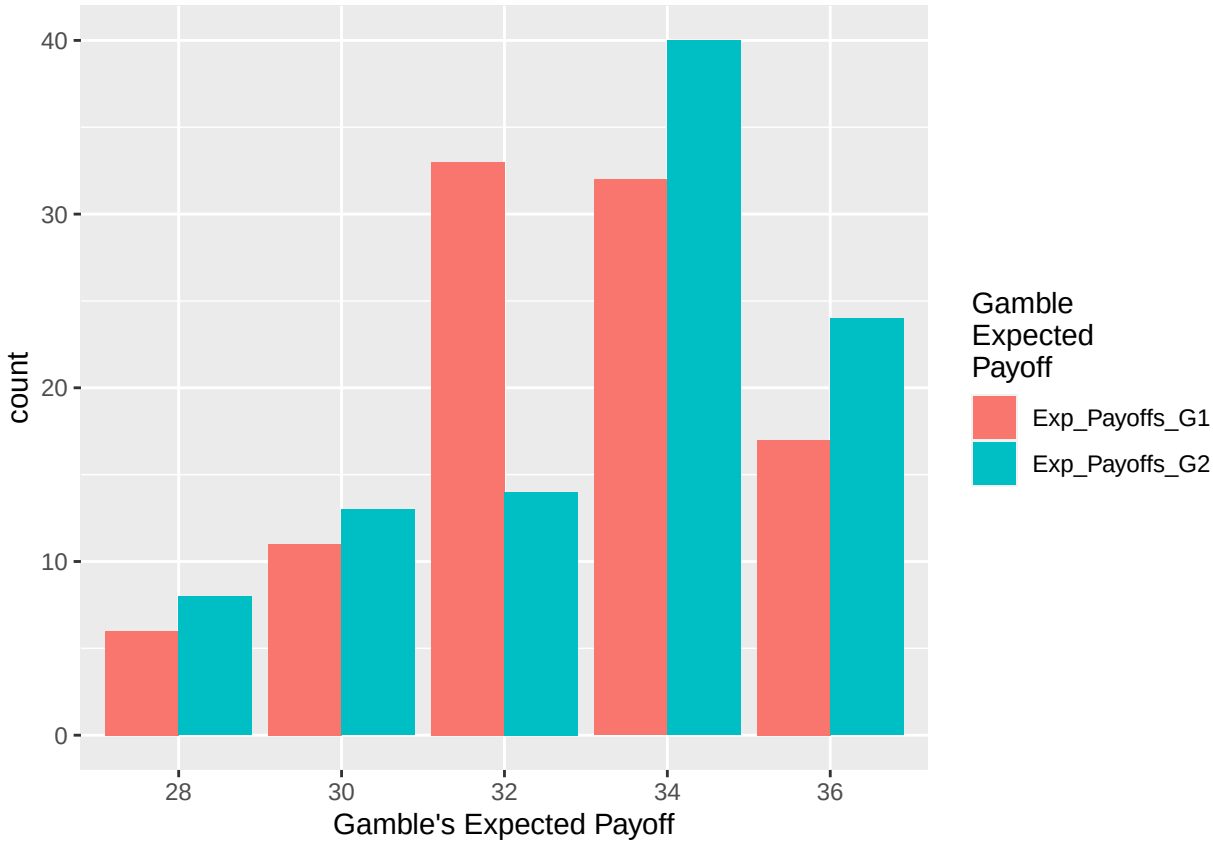


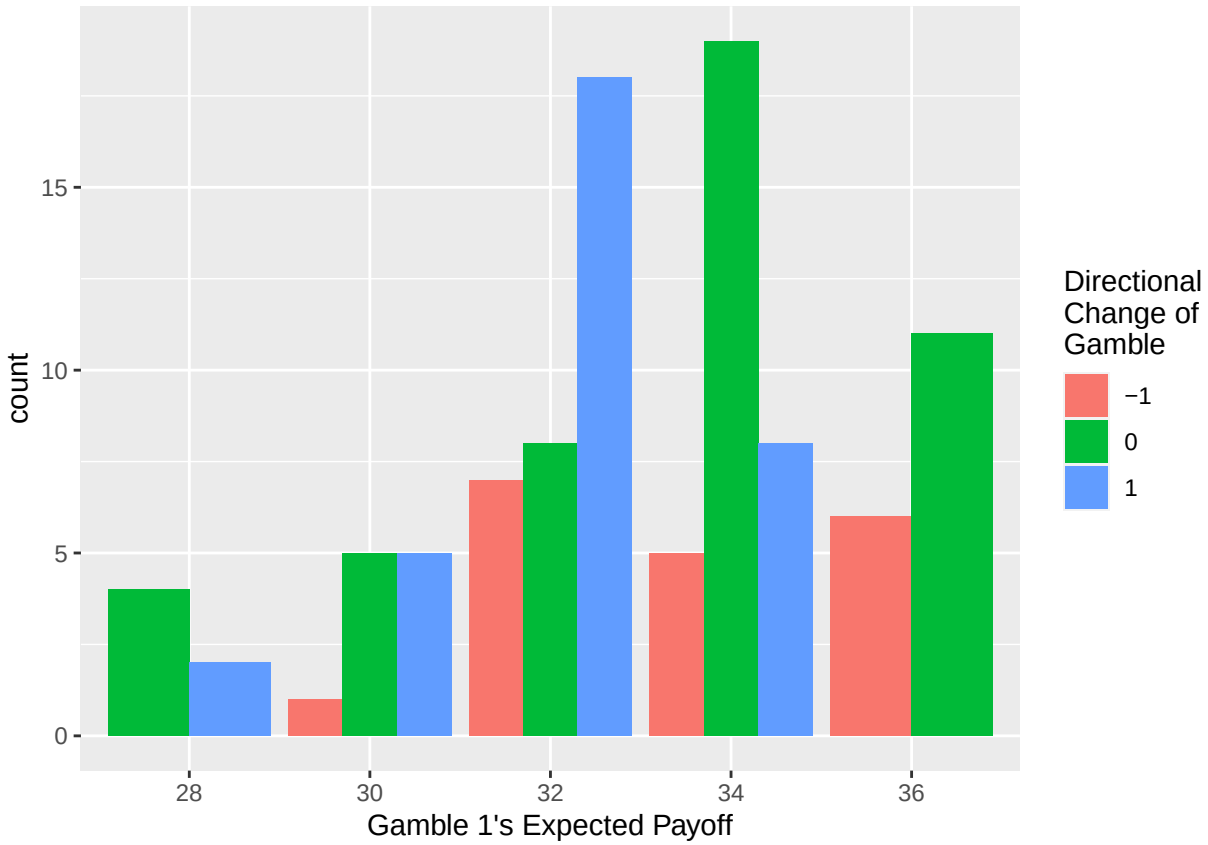
The Wilcox test shows that the difference is significant at 5% when analyzing the hypothesis that Gamble 2 is greater.

```
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
```

EP 1 - EP2


40
30
20
10
0
count
28
30
32
34
36
Gamble's Expected Payoff
Gamble
Expected
Payoff
Exp_Payoffs_G1
Exp_Payoffs_G2



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
```

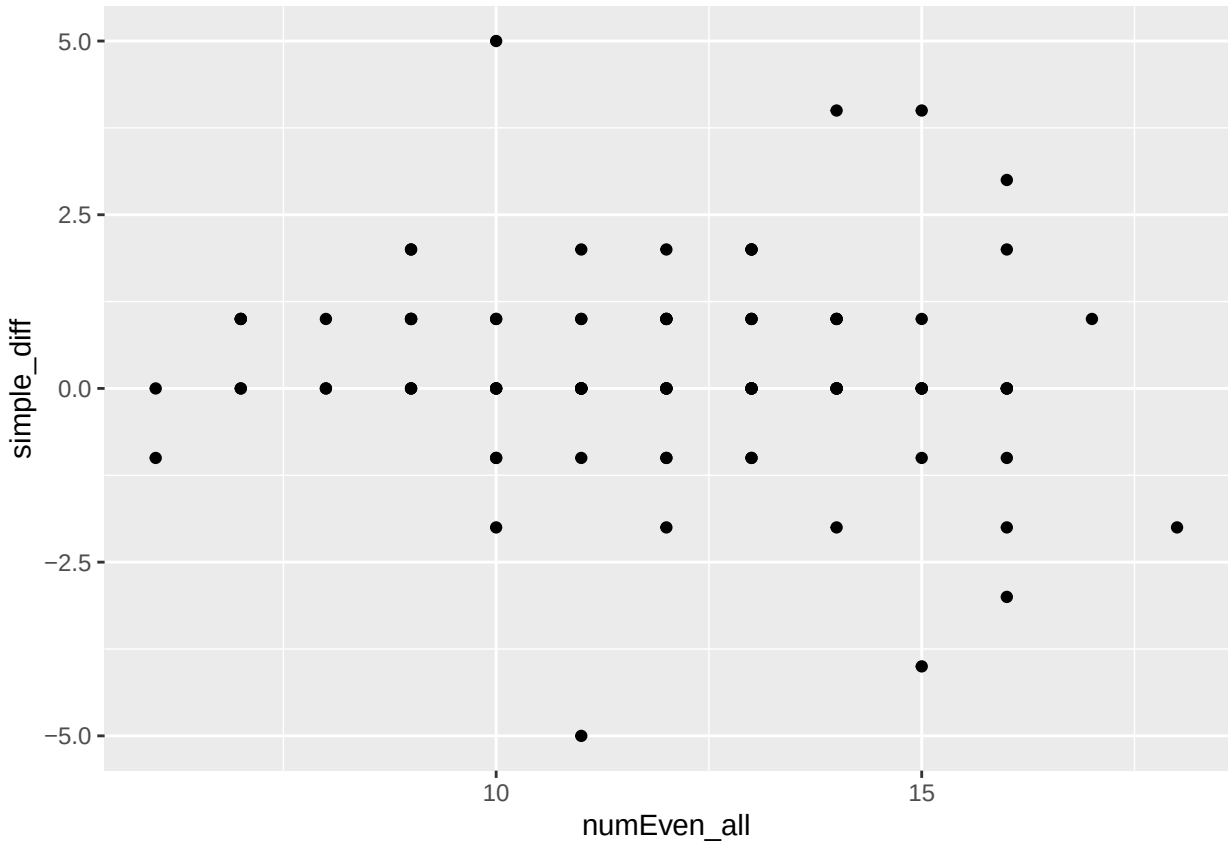
```
ExperienceRisk_Sessions %>% tabyl(Gamble.1,Gamble.2)
```

```
##  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))
```

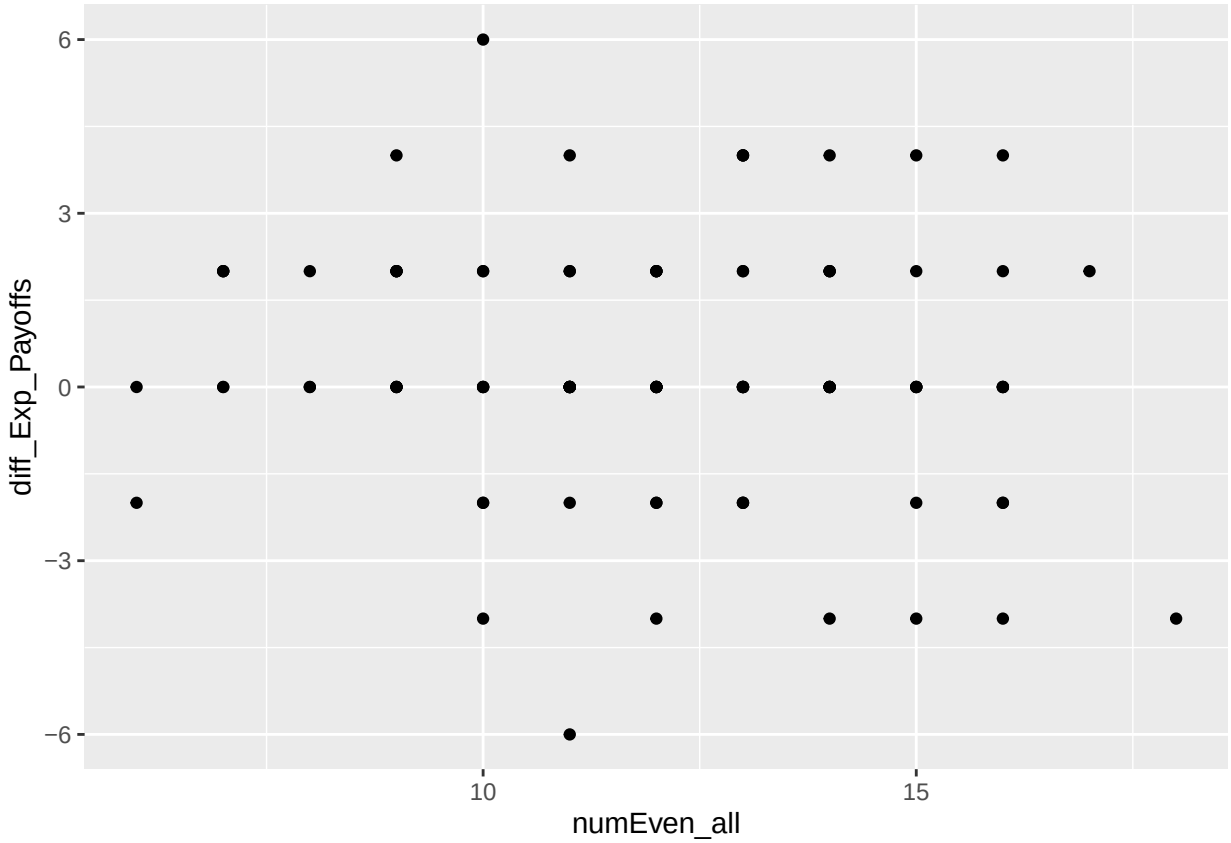



```
m1 <- lm(simple_diff ~
           numEven_all,
         data = ExperienceRisk_Sessions)
summary(m1)
```

```
##
## 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.

Excpected 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.

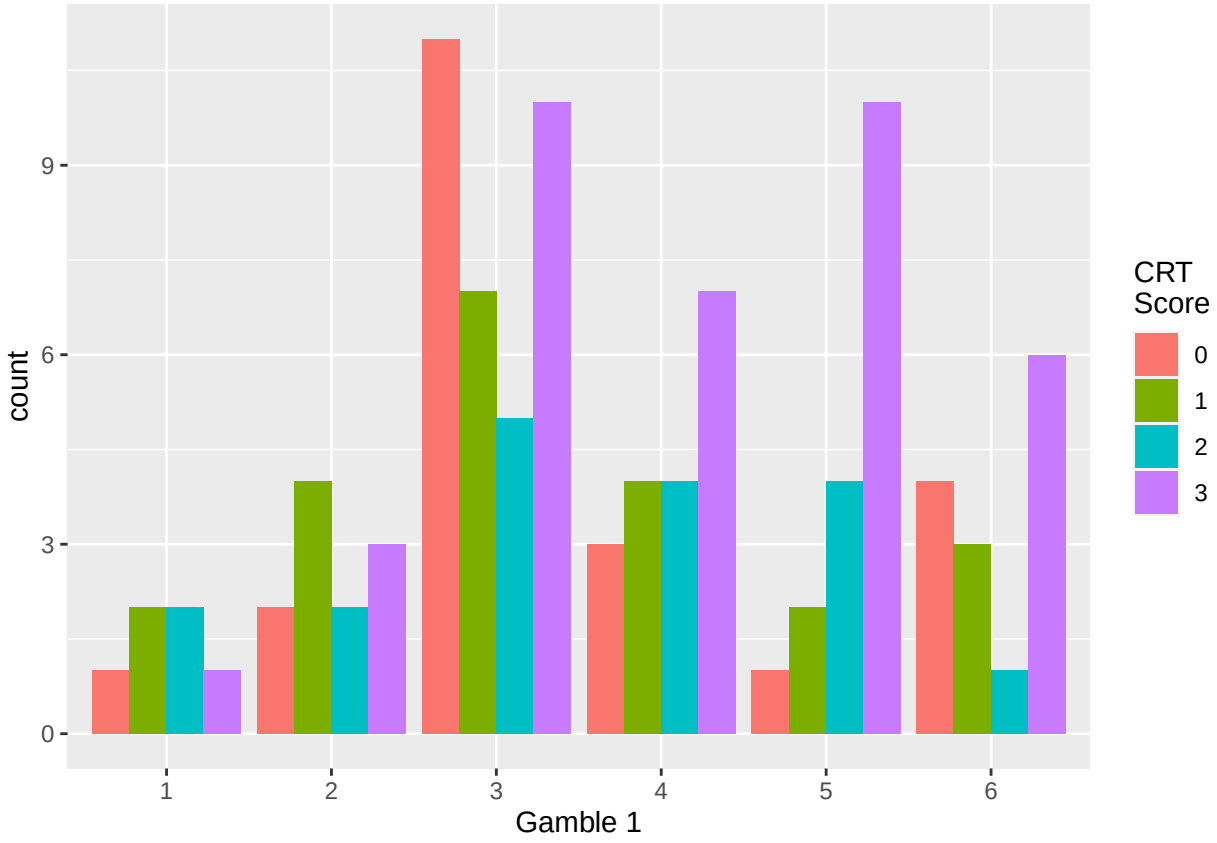
CR predicting more changes

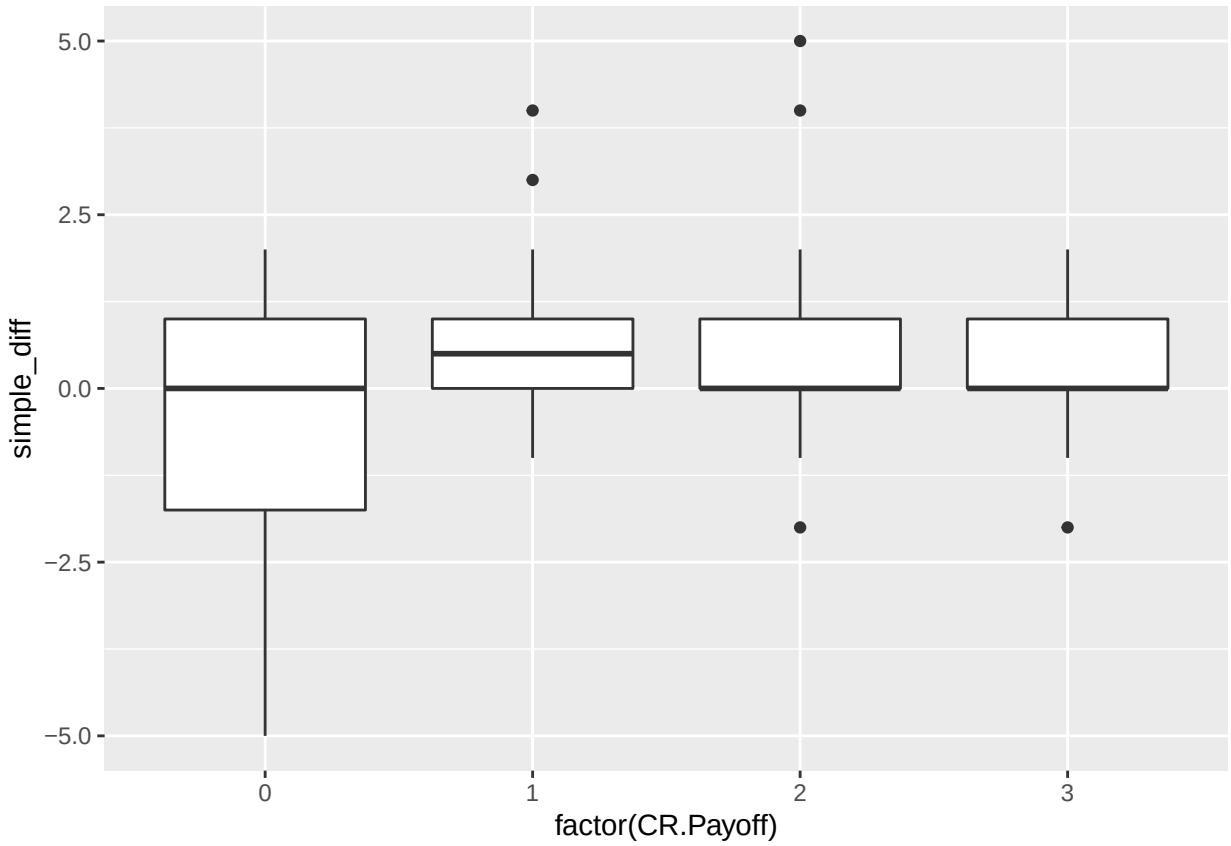
```
ExperienceRisk_Sessions %>%
  mutate(G1 = factor(Gamble.1),
         CRT = factor(CR.Payoff)) %>%
```

```
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
```

G2 - G1





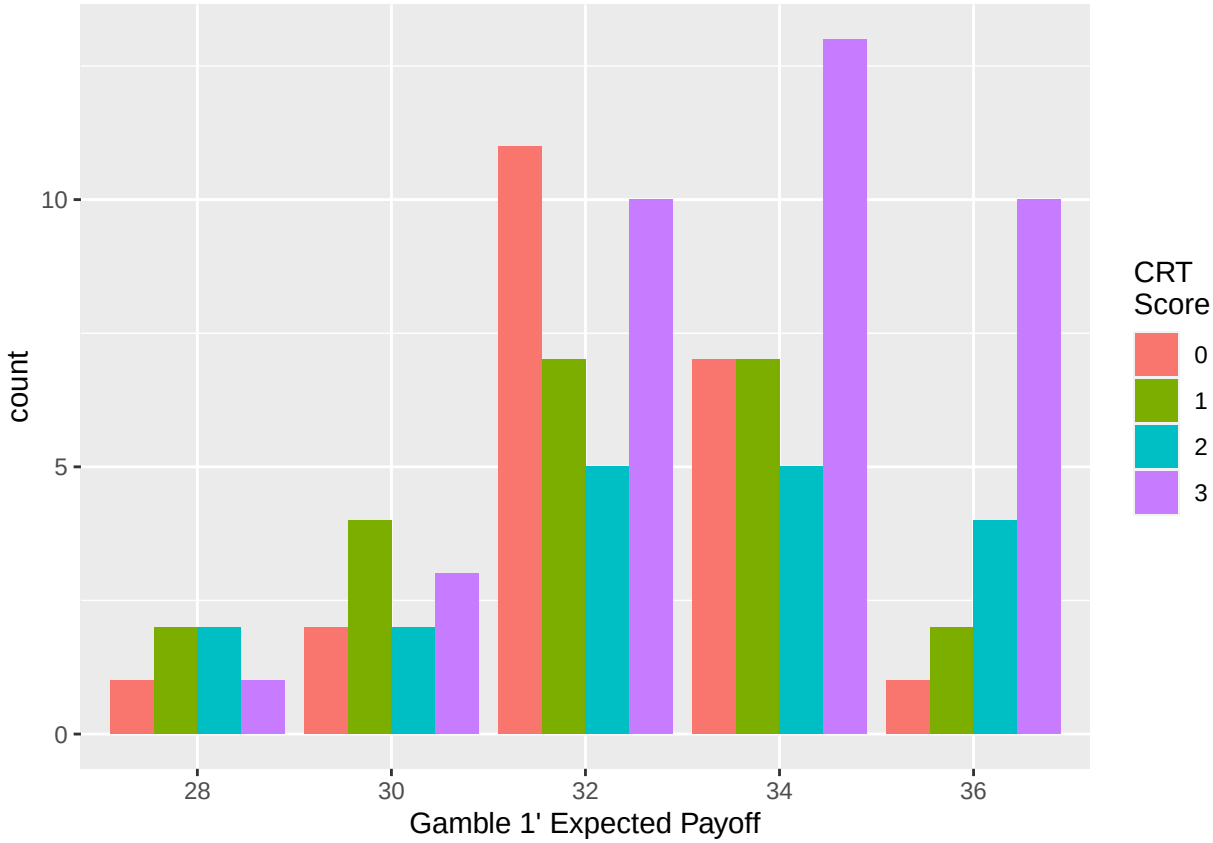

```
##
## Call:
## lm(formula = simple_diff ~ CR.Payoff > 0, data = ExperienceRisk_Sessions)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.4091 -0.4805 -0.4805  0.5195  4.5195
##
## Coefficients:
##                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)        -0.5909     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
```

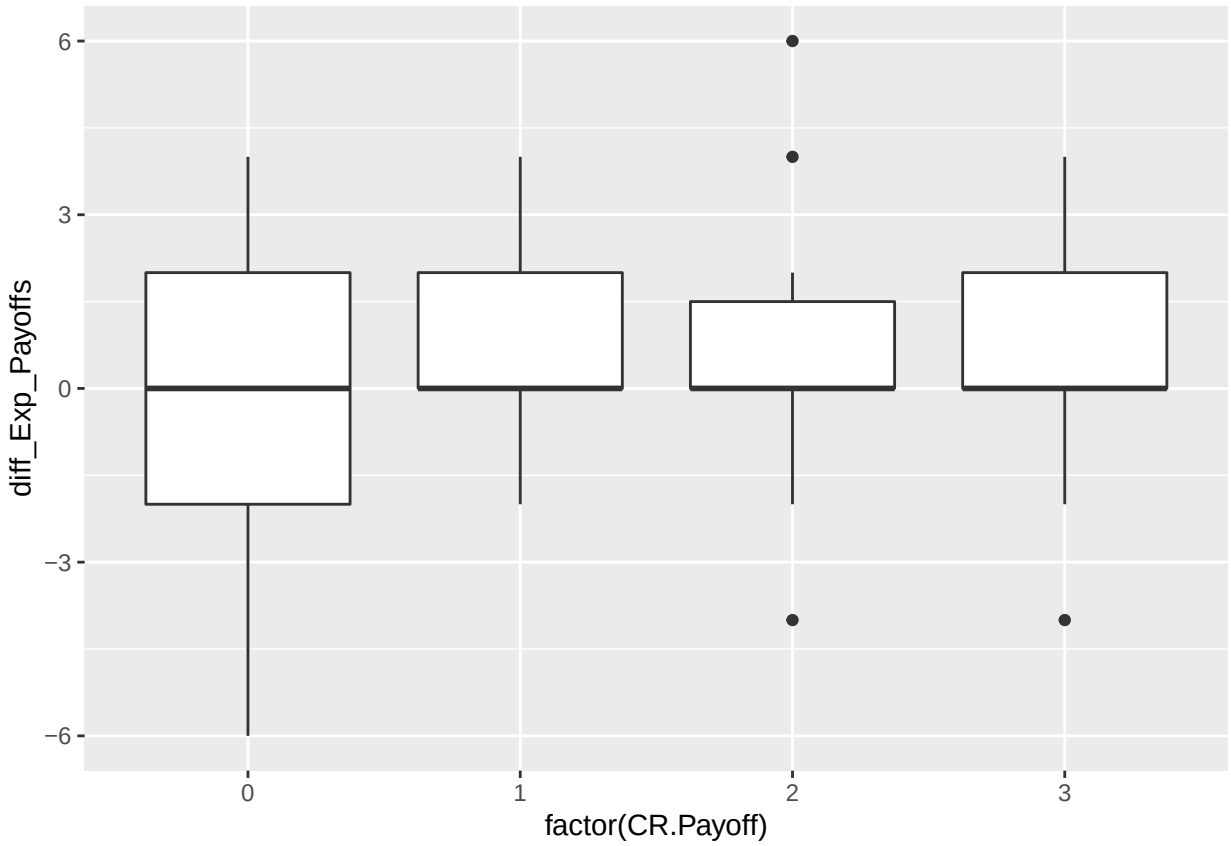
There is an effect of the CR when considering a dummy for having achieved at least one point in the test. If people got at least one point, they will increase by one the number of the gamble they chose. This effect in not longer significant if the regression include all the levels of CRT as regressors.

```
##
## 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 > 0TRUE   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.

Gender differences

Regression

G2- G1

```
##
## Call:
## lm(formula = simple_diff ~ Gamble.1 + Gender + CR.Payoff + sum_correct_payoffs +
##     numEven_all + explore + Session, data = ExperienceRisk_Sessions)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.0045 -0.6958  0.0631  0.6691  3.2018
##
## Coefficients:
##                      Estimate Std. Error t value Pr(>|t|)
## (Intercept)          4.089205   1.389483   2.943  0.00414 **
## Gamble.1            -0.549477   0.092866  -5.917    6e-08 ***
## GenderF             -0.793239   1.303916  -0.608  0.54450
## GenderM              0.002582   1.323100   0.002  0.99845
## GenderPNTS          -1.471727   1.554736  -0.947  0.34640
## CR.Payoff            0.235479   0.111754   2.107  0.03792 *
## sum_correct_payoffs -0.063396   0.026990  -2.349  0.02105 *
## numEven_all         -0.017510   0.044902  -0.390  0.69750
## exploreTRUE         -0.291125   0.378841  -0.768  0.44425
## Session              0.002647   0.098078   0.027  0.97853
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.175 on 89 degrees of freedom
## Multiple R-squared:  0.3734, Adjusted R-squared:   0.31
## F-statistic: 5.893 on 9 and 89 DF,  p-value: 2.016e-06
```

```
##
## Call:
## lm(formula = simple_diff ~ Gamble.1 + CR.Payoff + sum_correct_payoffs,
##     data = ExperienceRisk_Sessions)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.4219 -0.7887  0.2079  0.7093  3.1137
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)          2.72003    0.56493   4.815 5.55e-06 ***
## Gamble.1            -0.46530    0.08883  -5.238 9.74e-07 ***
## CR.Payoff            0.30164    0.10626   2.839  0.00554 **
## sum_correct_payoffs -0.06276    0.02084  -3.012  0.00333 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.222 on 95 degrees of freedom
## Multiple R-squared:  0.2769, Adjusted R-squared:  0.2541
## F-statistic: 12.13 on 3 and 95 DF,  p-value: 8.657e-07
```

EP2- EP1

```
##
## Call:
## lm(formula = diff_Exp_Payoffs ~ Gamble.1 + Gender + CR.Payoff +
##     sum_correct_payoffs + numEven_all + explore + Session, data = ExperienceRisk_Sessions)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.2058 -1.0601  0.2447  1.1497  3.7060
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)          7.61063    2.12875   3.575 0.000568 ***
## Gamble.1            -0.77226    0.14227  -5.428 4.88e-07 ***
## GenderF             -2.23505    1.99766  -1.119 0.266221
## GenderM             -1.44464    2.02705  -0.713 0.477908
## GenderPNTS          -3.52898    2.38193  -1.482 0.141988
## CR.Payoff            0.27614    0.17121   1.613 0.110320
## sum_correct_payoffs -0.08229    0.04135  -1.990 0.049648 *
## numEven_all         -0.04789    0.06879  -0.696 0.488134
## exploreTRUE         -0.83020    0.58040  -1.430 0.156106
## Session             -0.01088    0.15026  -0.072 0.942463
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.801 on 89 degrees of freedom
## Multiple R-squared:  0.3285, Adjusted R-squared:  0.2605
## F-statistic: 4.837 on 9 and 89 DF,  p-value: 2.891e-05
```

```
##
## Call:
## lm(formula = diff_Exp_Payoffs ~ Gamble.1 + sum_correct_payoffs,
##     data = ExperienceRisk_Sessions)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.6621 -1.1138  0.3879  1.3379  3.5585
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)          4.12094    0.87052   4.734 7.59e-06 ***
## Gamble.1            -0.59313    0.13580  -4.368 3.17e-05 ***
## sum_correct_payoffs -0.07917    0.03198  -2.476    0.015 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.895 on 96 degrees of freedom
## Multiple R-squared:  0.1974, Adjusted R-squared:  0.1806
## F-statistic:  11.8 on 2 and 96 DF,  p-value: 2.612e-05
```

CRT = 0

```
##
## Call:
```

```
## lm(formula = diff_Exp_Payoffs ~ Gamble.1 + less_than_12_even,
##     data = ExperienceRisk_Sessions %>% filter(CR.Payoff == 0 &
##         Gender == "F"))
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -4.070 -1.470  0.243  1.930  2.481
##
## Coefficients:
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)             2.1449     1.4016   1.530   0.1499
## Gamble.1               -0.6916     0.3525  -1.962   0.0715 .
## less_than_12_evenTRUE  -2.5514     1.2168  -2.097   0.0561 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.105 on 13 degrees of freedom
## Multiple R-squared:  0.3999, Adjusted R-squared:  0.3076
## F-statistic: 4.332 on 2 and 13 DF,  p-value: 0.03617
```