Binary Choice Analysis

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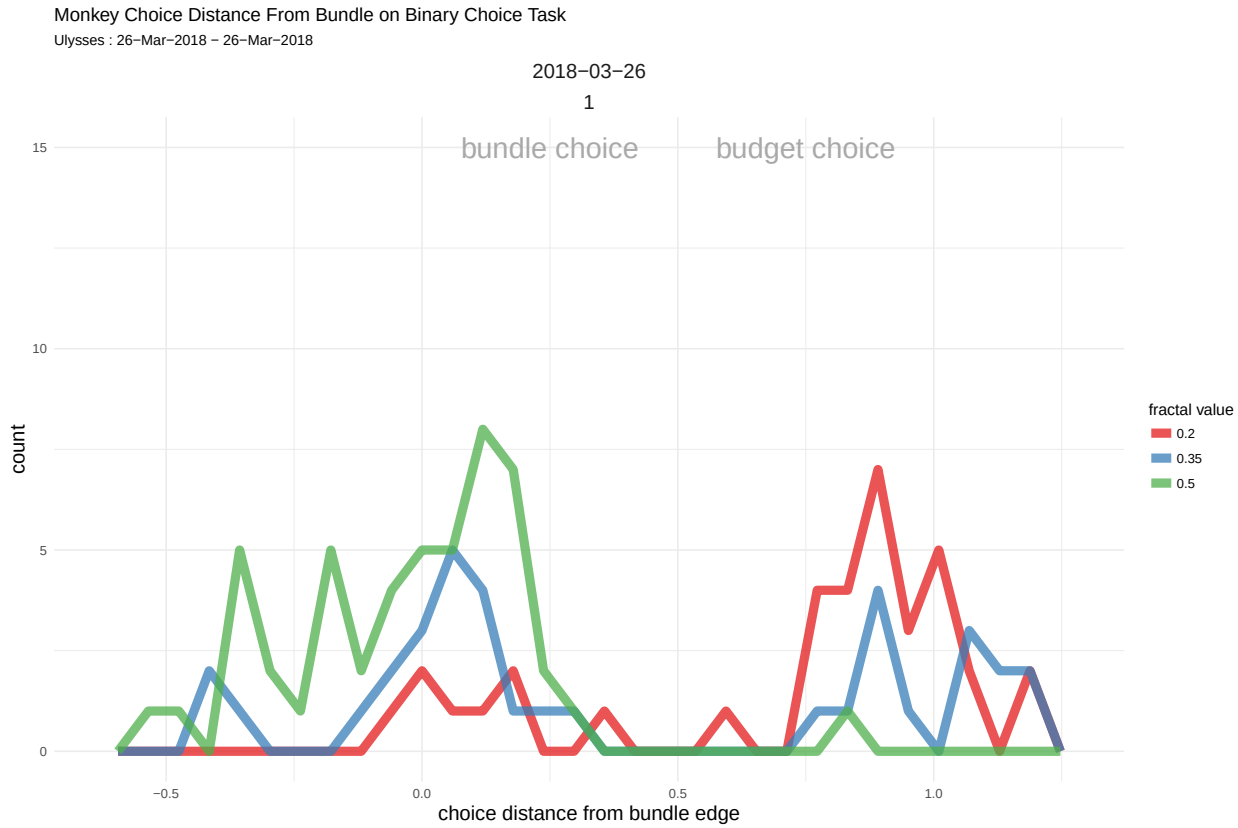
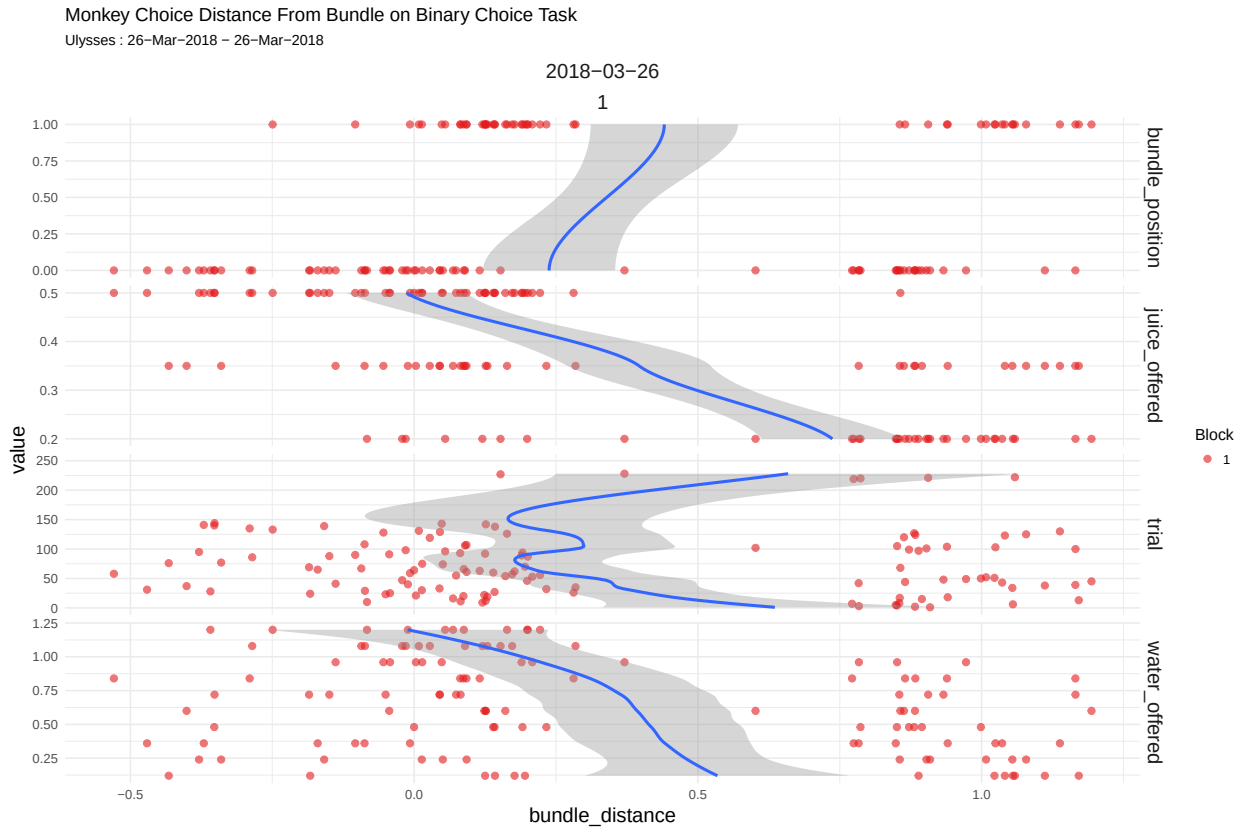
```
monkey <- "Ulysses"
today <- "26-Mar-2018"
look_back <- "26-Mar-2018"

start_trial <- 0
stop_trial <- "all"

merge_days <- TRUE
```

```
p1
```




```
p2
```




```
#generate a model of likelihood to choice for the fractal dependent on it's position,
#value and associated water
model <- glm(data = task_data,
             fractal_choice ~ bundle_position + water_offered + juice_offered + trial + date,
             family = "binomial")

#summarise the parameters
summary(model)
```

```
##
## Call:
## glm(formula = fractal_choice ~ bundle_position + water_offered +
##     juice_offered + trial + date, family = "binomial", data = task_data)
##
## Deviance Residuals:
##      Min        1Q    Median        3Q       Max
## -2.98942  -0.21994   0.06207   0.33535   2.21436
##
## Coefficients: (1 not defined because of singularities)
##                   Estimate Std. Error z value Pr(>|z|)
## (Intercept)     -12.174617   2.497990  -4.874 1.09e-06 ***
## bundle_position   0.427904   0.680358   0.629    0.529
## water_offered     6.446147   1.507640   4.276 1.91e-05 ***
## juice_offered    25.025270   4.850093   5.160 2.47e-07 ***
## trial             0.003692   0.005534   0.667    0.505
## date                   NA         NA      NA       NA
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 157.472  on 120  degrees of freedom
## Residual deviance:  61.046  on 116  degrees of freedom
##   (128 observations deleted due to missingness)
## AIC: 71.046
##
## Number of Fisher Scoring iterations: 7
```

```
#test for side bias with an exact binomial test
binom.test(c(nrow(task_data %>%
                    .[c(bundle_position != fractal_choice)]),
             nrow(task_data %>%
                    .[c(bundle_position == fractal_choice)])))
```

```
##
##  Exact binomial test
##
## data:  c(nrow(task_data %>% .[c(bundle_position != fractal_choice)]),     nrow(task_data %>% .[c(bun
## number of successes = 62, number of trials = 121, p-value = 0.8558
## alternative hypothesis: true probability of success is not equal to 0.5
## 95 percent confidence interval:
##  0.4198745 0.6042979
## sample estimates:
## probability of success
##              0.5123967
```

```
#generate a model of likelihood to choice for the fractal dependent on it's position,
#value and associated water
model <- glm(data = dplyr::filter(task_data, block_no == max(block_no)),
             fractal_choice ~ bundle_position + water_offered + as.factor(juice_offered) + trial + date
             family = "binomial")

#summarise the parameters
summary(model)
```

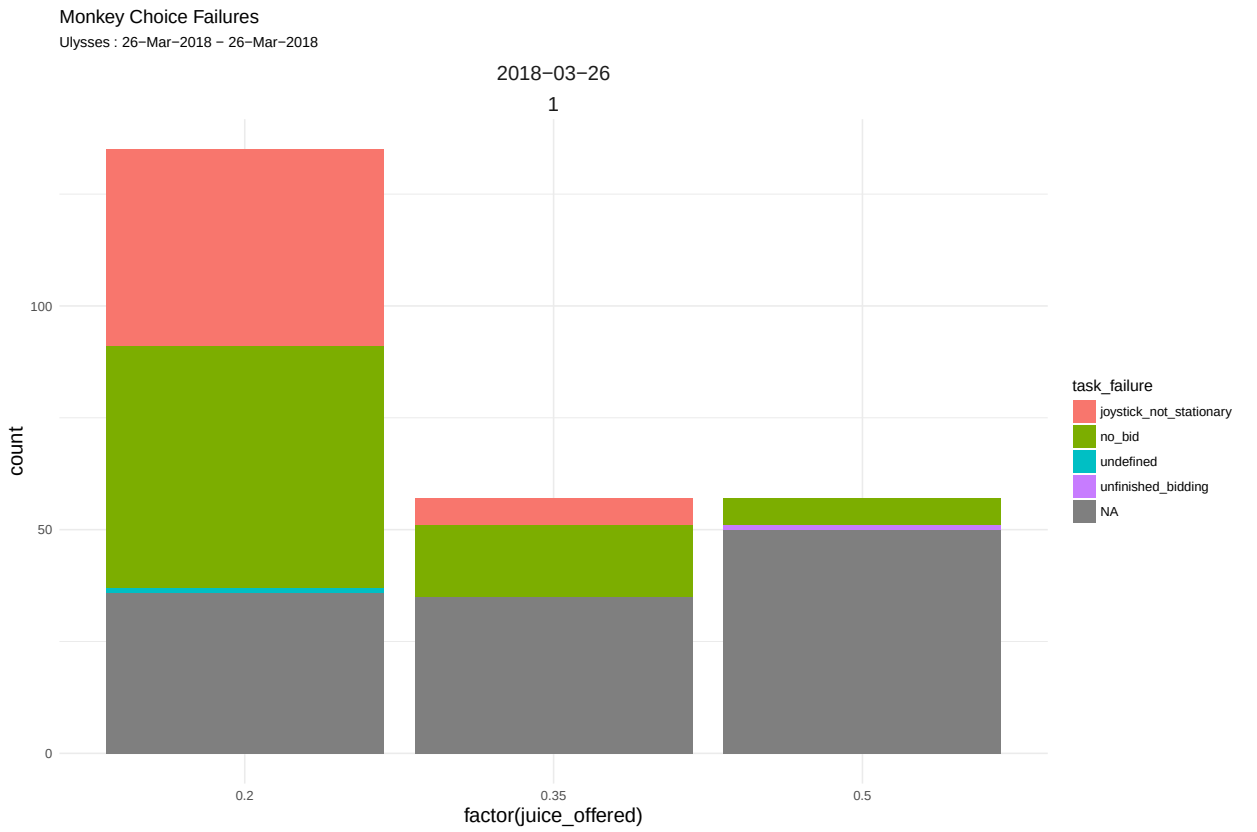
```
##
## Call:
## glm(formula = fractal_choice ~ bundle_position + water_offered +
##     as.factor(juice_offered) + trial + date, family = "binomial",
##     data = dplyr::filter(task_data, block_no == max(block_no)))
##
## Deviance Residuals:
##      Min        1Q    Median        3Q       Max
## -3.13406  -0.25233   0.05239   0.31819   2.28487
##
## Coefficients: (1 not defined because of singularities)
##                                Estimate Std. Error z value Pr(>|z|)
## (Intercept)                   -6.698980   1.650324  -4.059 4.92e-05 ***
## bundle_position                0.395591   0.687430   0.575 0.564977
## water_offered                  6.185261   1.481074   4.176 2.96e-05 ***
## as.factor(juice_offered)0.35   3.193386   0.921399   3.466 0.000529 ***
## as.factor(juice_offered)0.5    7.686337   1.519365   5.059 4.22e-07 ***
```

```
## trial                          0.003018   0.005533   0.546 0.585395
## date                                NA         NA      NA       NA
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 157.472  on 120  degrees of freedom
## Residual deviance:  60.274  on 115  degrees of freedom
##   (128 observations deleted due to missingness)
## AIC: 72.274
##
## Number of Fisher Scoring iterations: 7
```

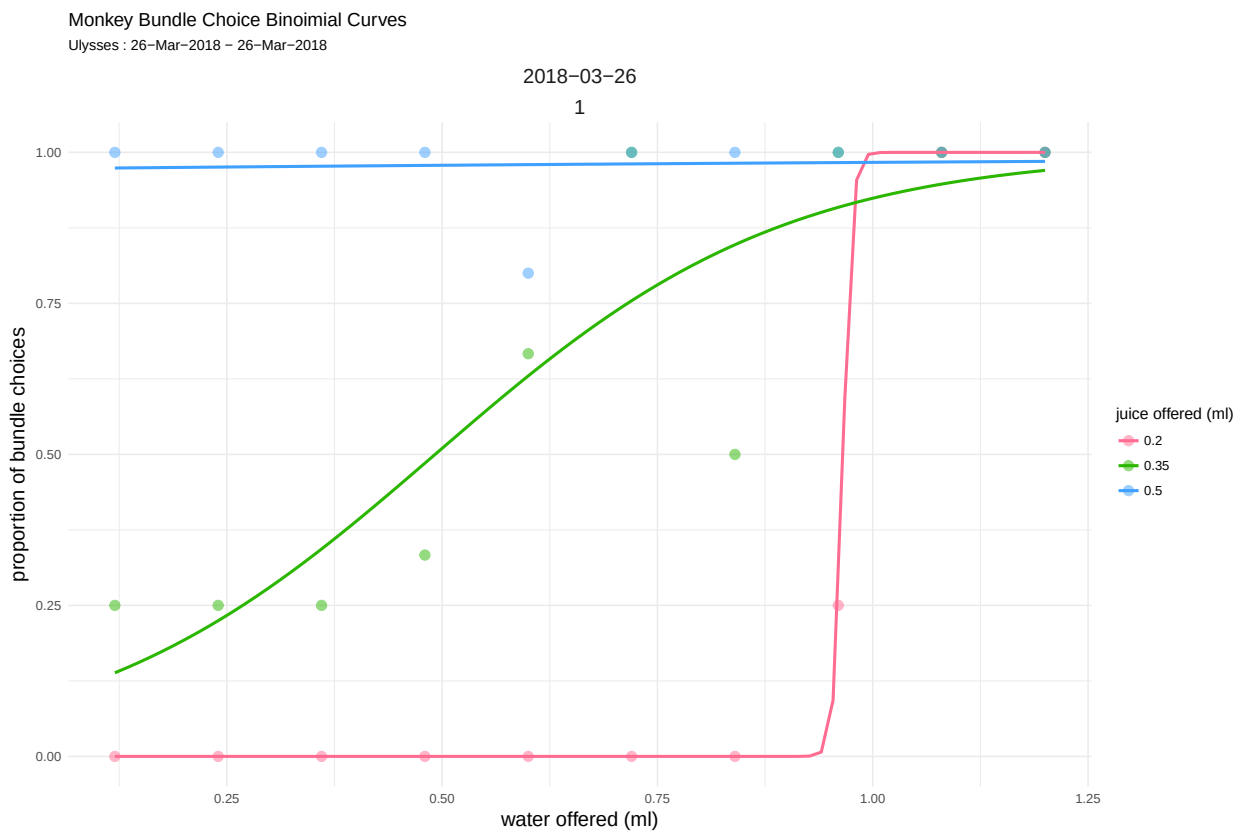
```
#test for side bias with an exact binomial test
binom.test(c(nrow(task_data %>%
                    .[c(bundle_position != fractal_choice & block_no == max(block_no))]),
             nrow(task_data %>%
                    .[c(bundle_position == fractal_choice & block_no == max(block_no))])))
```

```
##
##  Exact binomial test
##
## data:  c(nrow(task_data %>% .[c(bundle_position != fractal_choice &     block_no == max(block_no))])
## number of successes = 62, number of trials = 121, p-value = 0.8558
## alternative hypothesis: true probability of success is not equal to 0.5
## 95 percent confidence interval:
##  0.4198745 0.6042979
## sample estimates:
## probability of success
##              0.5123967
```

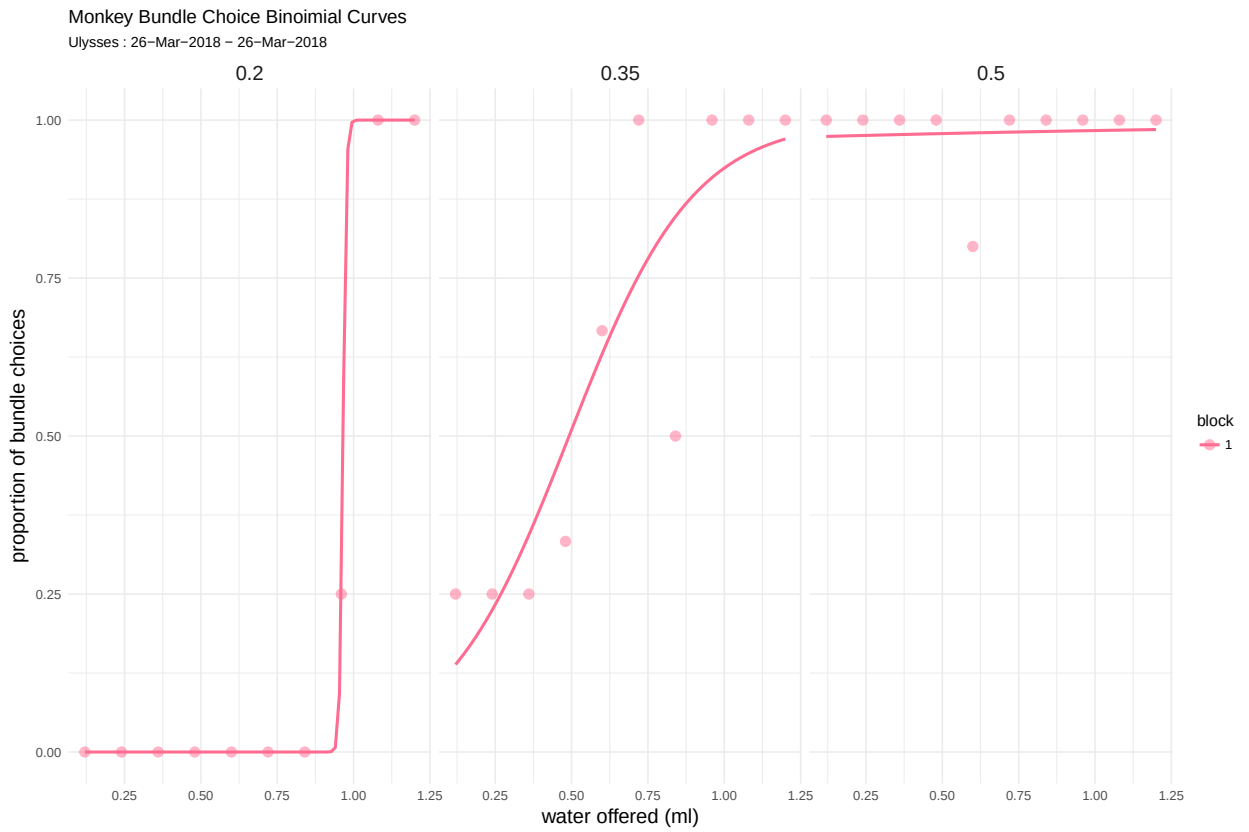
```
p3
```


Monkey Choice Failures
Ulysses : 26−Mar−2018 − 26−Mar−2018
2018−03−26
1
100
50
0
count
0.2
0.35
0.5
factor(juice_offered)
task_failure
joystick_not_stationary
no_bid
undefined
unfinished_bidding
NA

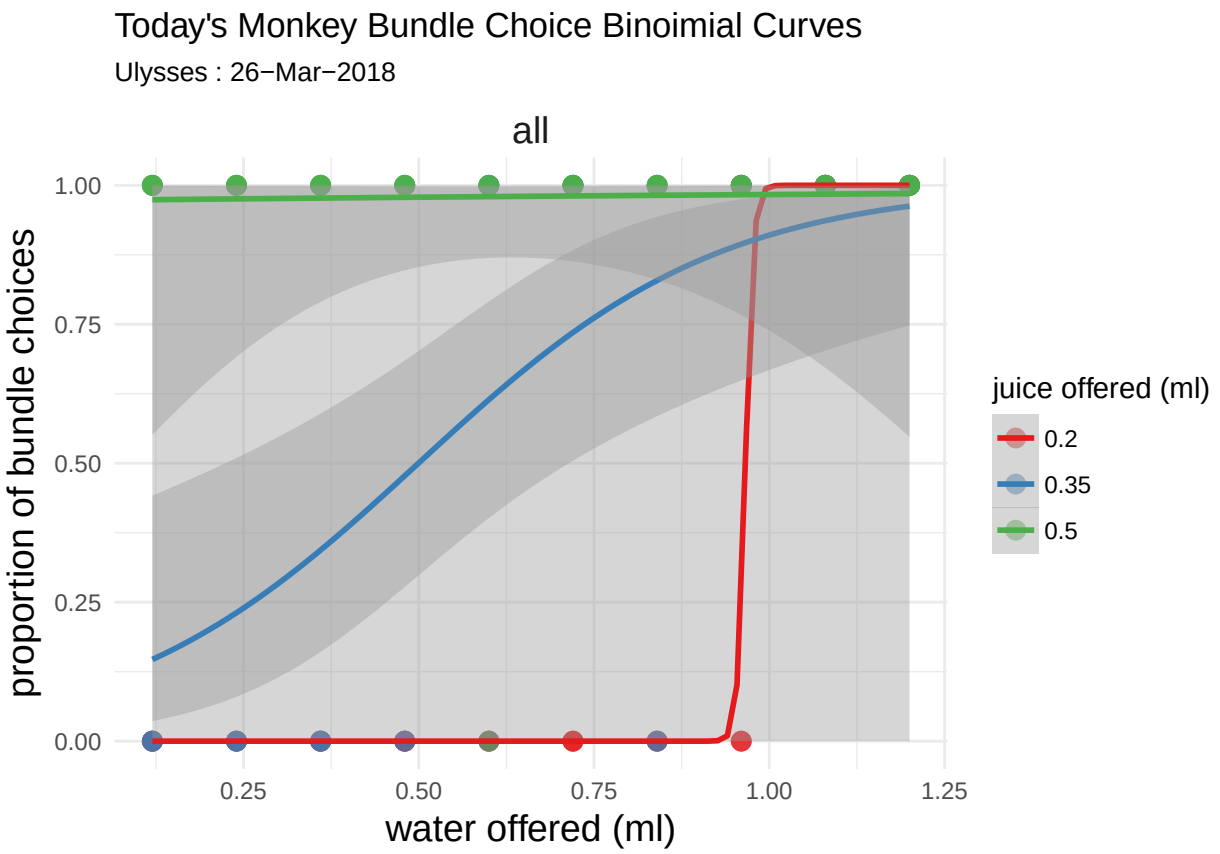
```
p4
```


Monkey Bundle Choice Binoimial Curves
Ulysses : 26−Mar−2018 − 26−Mar−2018
2018−03−26
1
proportion of bundle choices
water offered (ml)
juice offered (ml)
0.2
0.35
0.5
1.00
0.75
0.50
0.25
0.00
0.25
0.50
0.75
1.00
1.25

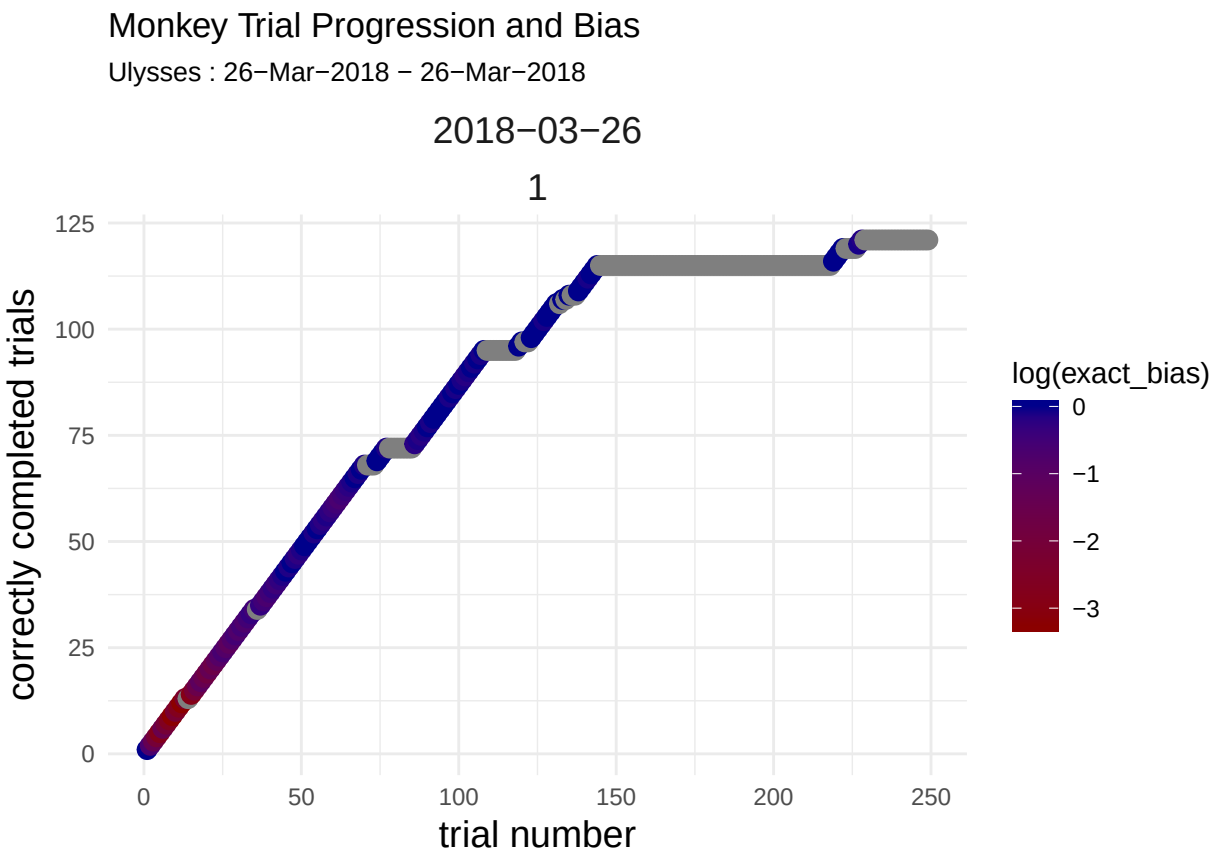
```
p5
```


Monkey Bundle Choice Binoimial Curves
Ulysses : 26−Mar−2018 − 26−Mar−2018
0.2
0.35
0.5
proportion of bundle choices
1.00
0.75
0.50
0.25
0.00
0.25
0.50
0.75
1.00
1.25
water offered (ml)
block
1

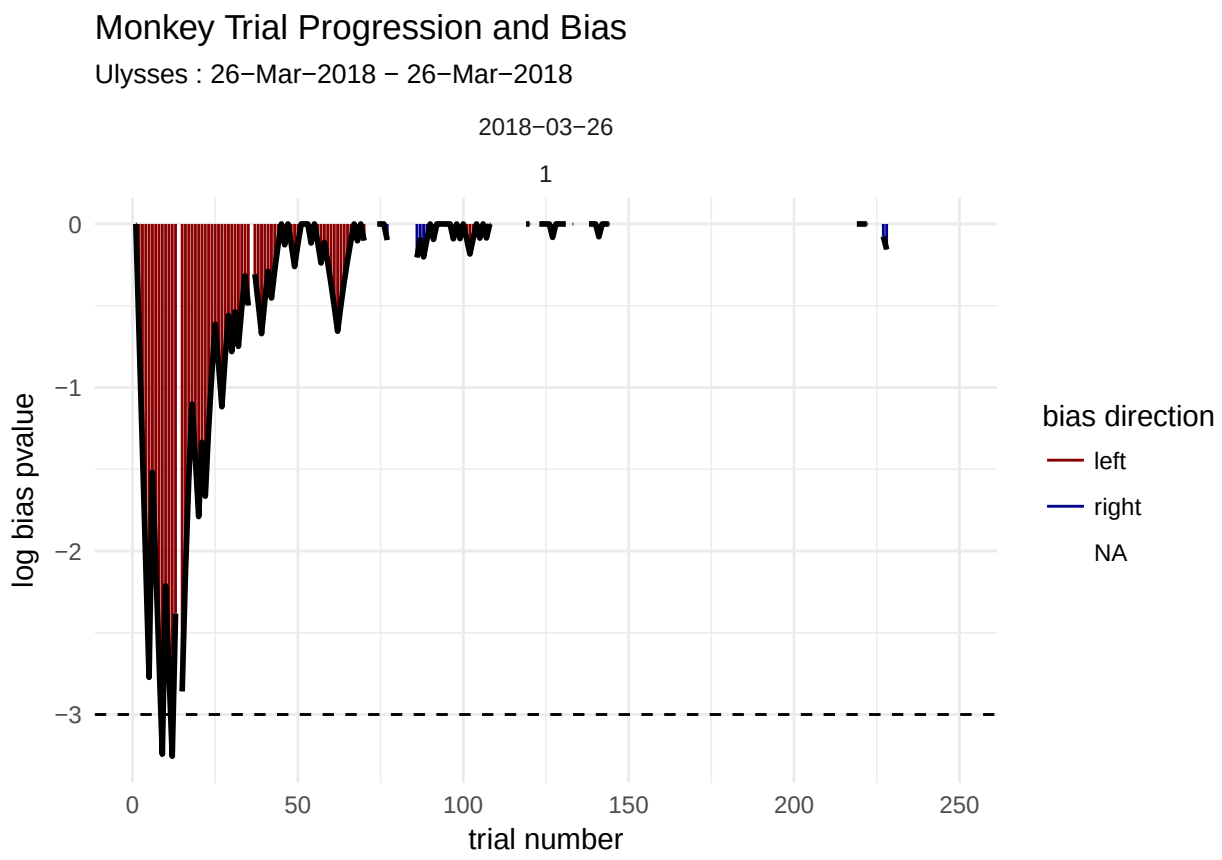
p6


Today's Monkey Bundle Choice Binoimial Curves
Ulysses : 26−Mar−2018
all
proportion of bundle choices
1.00
0.75
0.50
0.25
0.00
0.25
0.50
0.75
1.00
1.25
water offered (ml)
juice offered (ml)
0.2
0.35
0.5

```
p7
```


Monkey Trial Progression and Bias
Ulysses : 26−Mar−2018 − 26−Mar−2018
2018−03−26
1
correctly completed trials
trial number
0
25
50
75
100
125
0
50
100
150
200
250
log(exact_bias)
0
−1
−2
−3

```
p8
```


Monkey Trial Progression and Bias
Ulysses : 26−Mar−2018 − 26−Mar−2018
2018−03−26
1
log bias pvalue
0
−1
−2
−3
0
50
100
150
200
250
trial number
bias direction
left
right
NA