



# Reward Systems in Games

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# Background & Motivation

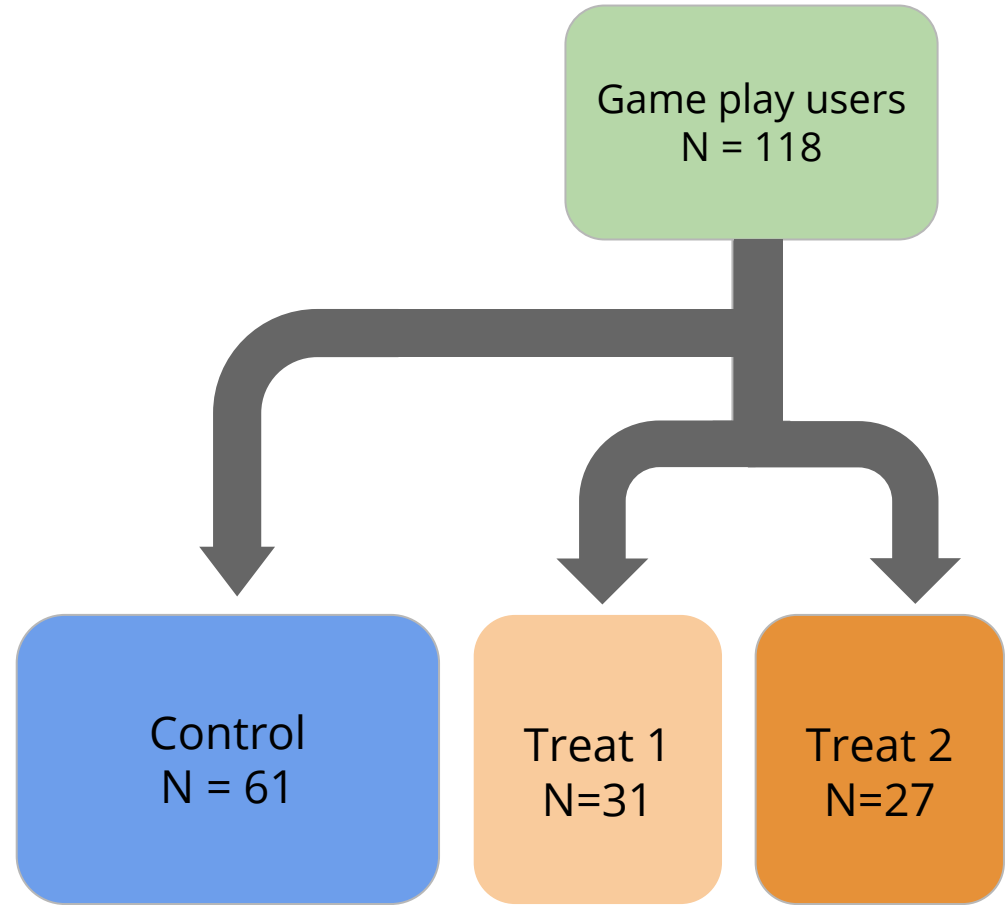
- Do reward systems affect user engagement?
  - Does knowing the purpose of the rewards system affect consumer behavior?
- Can success of apps/games be attributed to the reward system they implement, or are they successful because people actually like the content?



# Experiment

- Create a game
- Split players into 3 randomized groups for a between-subjects design:
  - Group 1 (50%): control
  - Treatment:
    - Group 2 (25%): treatment with disclaimer
    - Group 3 (25%): treatment without disclaimer
- Hypothesis: Treatment and disclaimers should affect behavior
- Null: No differences between groups

Experimental group	R X O
Control group	R - O



# Game

Landing page: <https://ashqtan.github.io/testing.github.io>

Control group: <https://ashqtan.github.io/testing.github.io/docs/1.html>

Treatment 1: <https://ashqtan.github.io/testing.github.io/docs/2.html>

Treatment 2: <https://ashqtan.github.io/testing.github.io/docs/3.html>

Original game: <https://linjat.snellman.net/#fp>

# Data Collection - Google Analytics

## User Report

[INSIGHTS](#)

Mar 22, 2021 - Mar 31, 2021



Client ID  
1268607249.1616397175

BigQuery Client ID  
5448626647539925879

Date Last Seen  
Mar 22, 2021

Device Category  
desktop

Device Platform  
web

### Acquisition

Date  
Mar 22, 2021

Channel  
Direct

Source / Medium  
(direct)/(none)

Campaign  
(not set)

[Return to User Explorer Report](#)[Delete User](#)

Sessions (LTV)

1

Sessions (Current): 1

Session Duration (LTV)

00:15:48

Session Duration (Current): 00:15:48

Revenue (LTV)

\$0.00

Revenue (Current): \$0.00

Transactions (LTV)

0

Transactions (Current): 0

Goal Completions (LTV)

0

Goal Completions (Current): 0

Goal Value (LTV)

\$0.00

Goal Value (Current): \$0.00

Goal 1 (LTV)

0

Goal 1 (Current): 0

Filter by

Sort by

[Create Segment](#)

4 selected

Descending

[Expand All](#)[Collapse All](#)[Export](#)

Mar 22, 2021

1 session

12:29 AM

15:48



Direct

416

2



12:29 AM



Event click\_track on click\_track



12:29 AM



Event click\_track on click\_track



12:29 AM



Event click\_track on click\_track



12:29 AM



Event click\_track on click\_track



12:28 AM



Event click\_track on click\_track



12:28 AM



Event click\_track on click\_track



12:28 AM



Event click\_track on click\_track



12:28 AM



Event click\_track on click\_track



12:28 AM



Event click\_track on click\_track

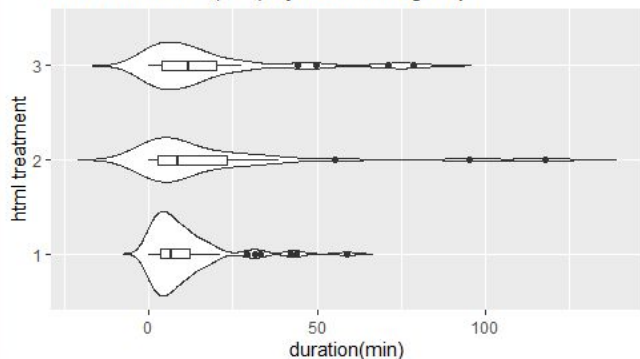
# Variables

- Duration (min)\*\*\*
- Html
- Clicks
- Done
- Font
- Clicks\_normalize
  - Clicks - Font

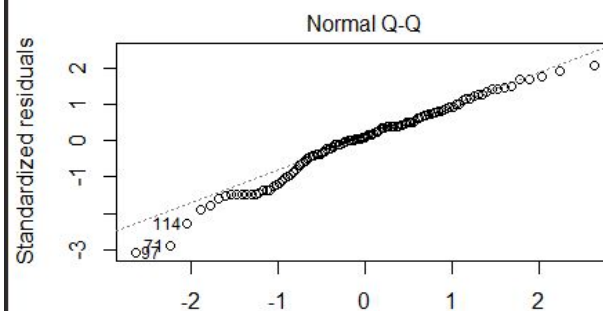
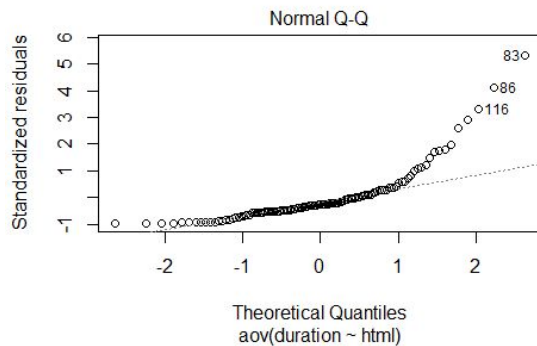
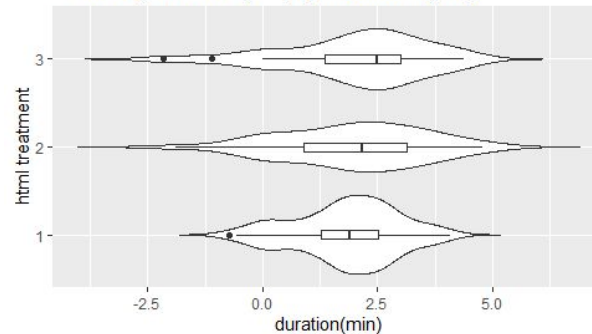
\*\*\* = outcome variable

# Analysis (Visuals)

Plot of duration(min) by treatment group



Plot of log duration(min) by treatment group



# Analysis + ATE

Dependent variable:		
	log_duration	
	(1)	(2)
html2	0.146 (0.300)	-0.115 (0.205)
html3	0.178 (0.314)	-0.130 (0.217)
clicks_normalize		0.002*** (0.0003)
done		0.067*** (0.008)
Constant	1.823*** (0.174)	0.861*** (0.144)
Observations	119	119
R2	0.004	0.550
Adjusted R2	-0.014	0.534
Residual Std. Error	1.359 (df = 116)	0.922 (df = 114)
F Statistic	0.211 (df = 2; 116)	34.780*** (df = 4; 114)
=====		
Note: *p<0.1; **p<0.05; ***p<0.01		

- Models
  - $\text{lm}(\log(\text{duration}) \sim \text{html})$
  - $\text{lm}(\log(\text{duration}) \sim \text{html} + \text{clicks\_normalize} + \text{done})$
- Treatment variables are not significant
- # of clicks, # of done is directly related to duration
- Low R2 score

$$\text{ATE} = \text{mean\_duration}(\text{treatment}) - \text{mean\_duration}(\text{control}) = \mathbf{7.3 \text{ minutes}}$$



# Results (Visualizations)

- Underwhelming results

```
```{r}
# Linear models
res.aov <- aov(log_duration ~ html, data = d)
summary(res.aov)
```
```

|           | Df  | Sum Sq | Mean Sq | F value | Pr(>F) |
|-----------|-----|--------|---------|---------|--------|
| html      | 2   | 0.78   | 0.3907  | 0.211   | 0.81   |
| Residuals | 116 | 214.37 | 1.8481  |         |        |

Splitting into html  
1,2,3

```
```{r}
# Linear models
res.aov <- aov(log_duration ~ html, data = d)
summary(res.aov)
```
```

|           | Df  | Sum Sq | Mean Sq | F value | Pr(>F) |
|-----------|-----|--------|---------|---------|--------|
| html      | 1   | 0.77   | 0.7671  | 0.419   | 0.519  |
| Residuals | 117 | 214.39 | 1.8324  |         |        |

Combining html 2 and 3

# Conclusion

- Why no significant results?
  - Incorrect assumptions regarding power (40% - 90%)?
    - Insufficient sample size
    - Differences in variance
    - Effect size
  - Problematic study design?
    - Study reward
    - Limited variables
    - Not how most people typically play games
- What do our results suggest?
  - Reward systems are less effective than we think
  - More sophisticated reward systems are potentially more effective

# Questions