Gender and Following Directions

Austin Doolittle, Bethany Keller, Daniel Alvarez

Research Question

Is there a gender bias in responding to audio directions?

Background

<u>New York Subway system:</u>

Humans are more likely to take **direction** from a man than a woman

“Stay clear of the closing doors”

Humans are more likely to take **information** from a woman than a man

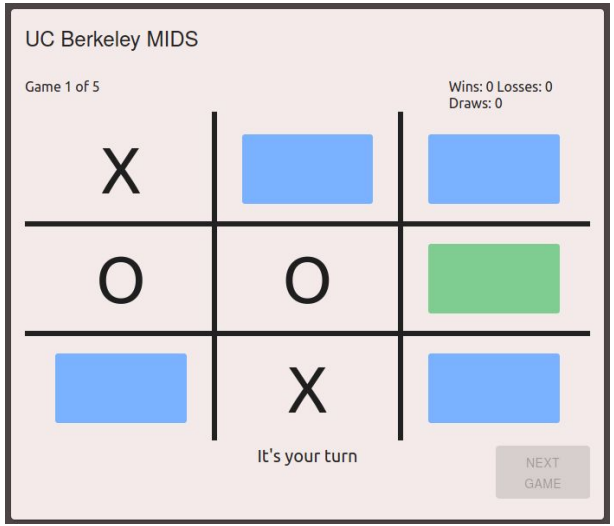
“Upcoming station is 181st St - Washington Heights”

Tic-Tac-Toe (with a twist)

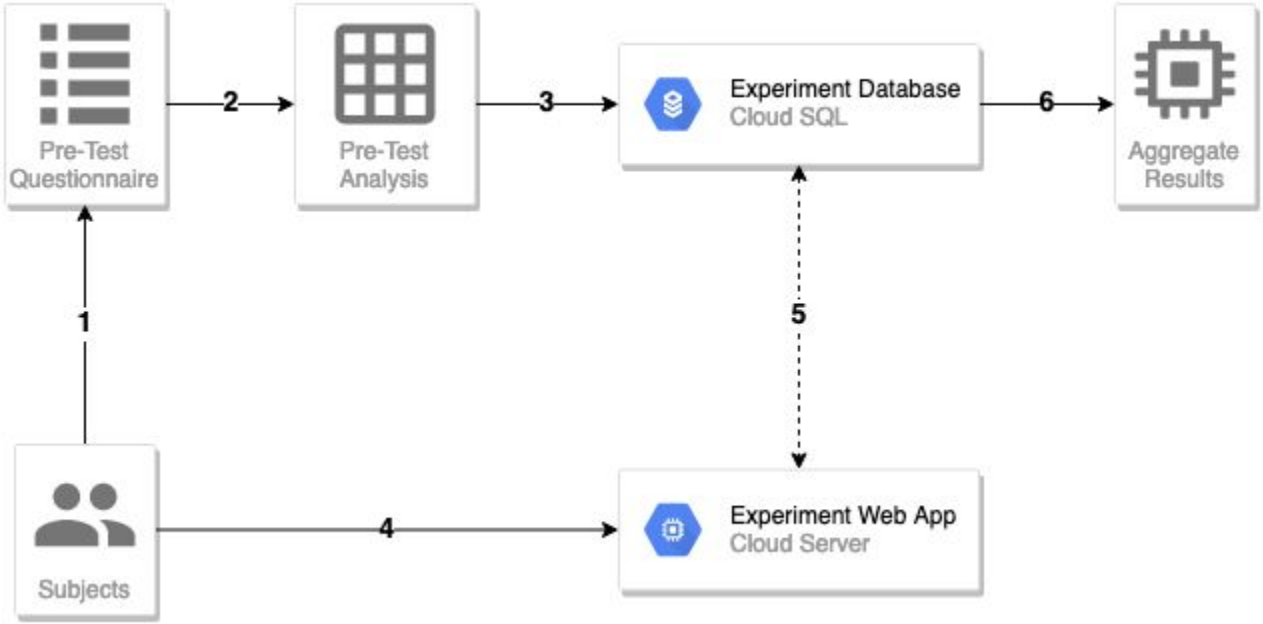
- Five games
- Suggested move is highlighted
- Treatment group gets audio directive

Female Voice

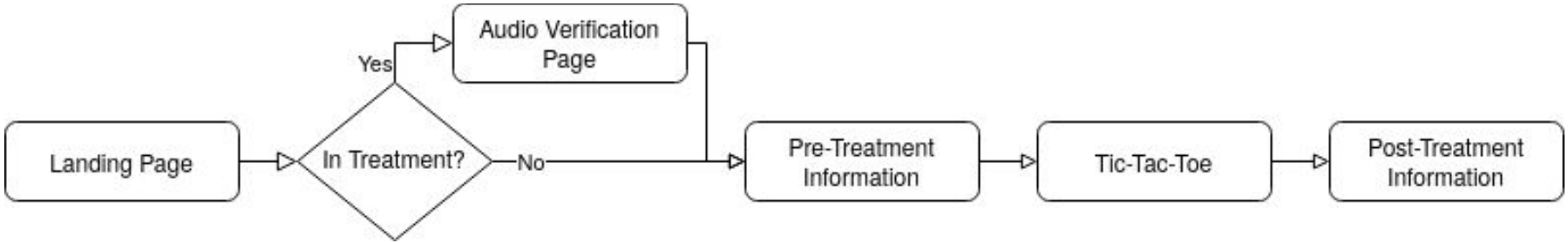
Male Voice



The Design


Pre-Test Questionnaire
2
Pre-Test Analysis
3
Experiment Database
Cloud SQL
6
Aggregate Results
1
5
Subjects
4
Experiment Web App
Cloud Server

The Design

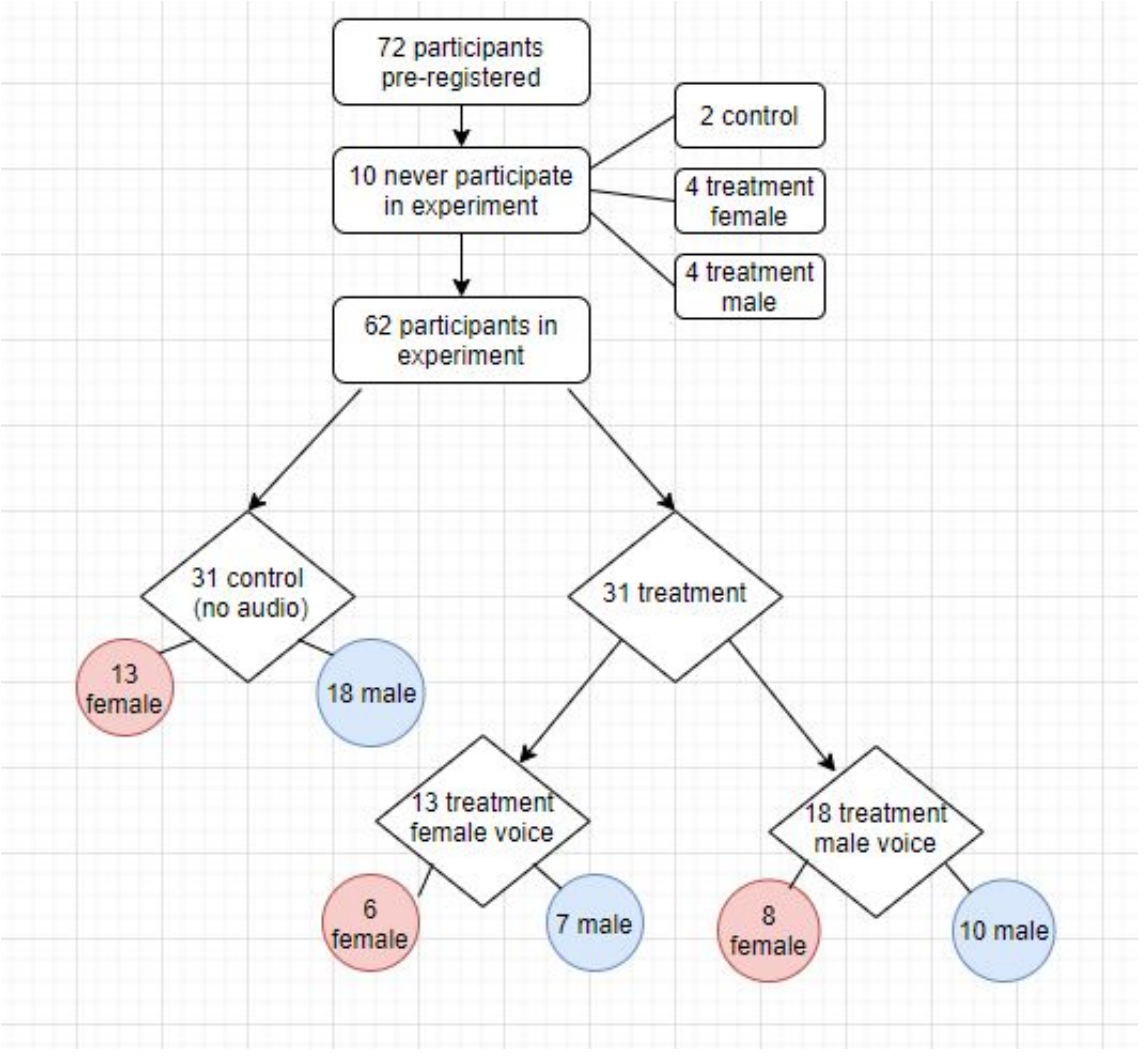

Landing Page
In Treatment?
Yes
Audio Verification Page
No
Pre-Treatment Information
Tic-Tac-Toe
Post-Treatment Information

Subjects

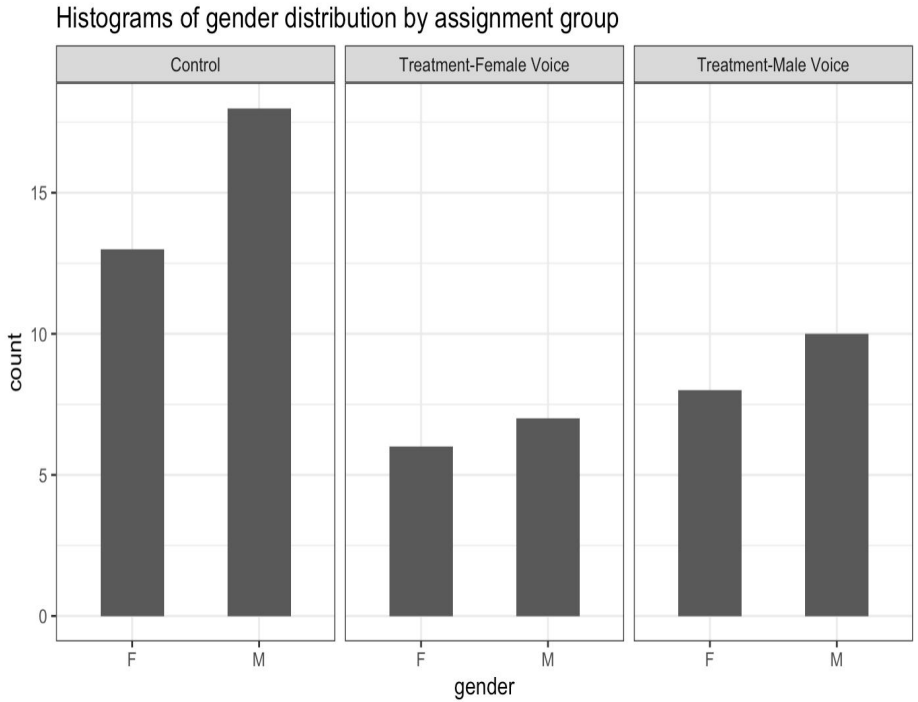
shutterstock.com • 428739817

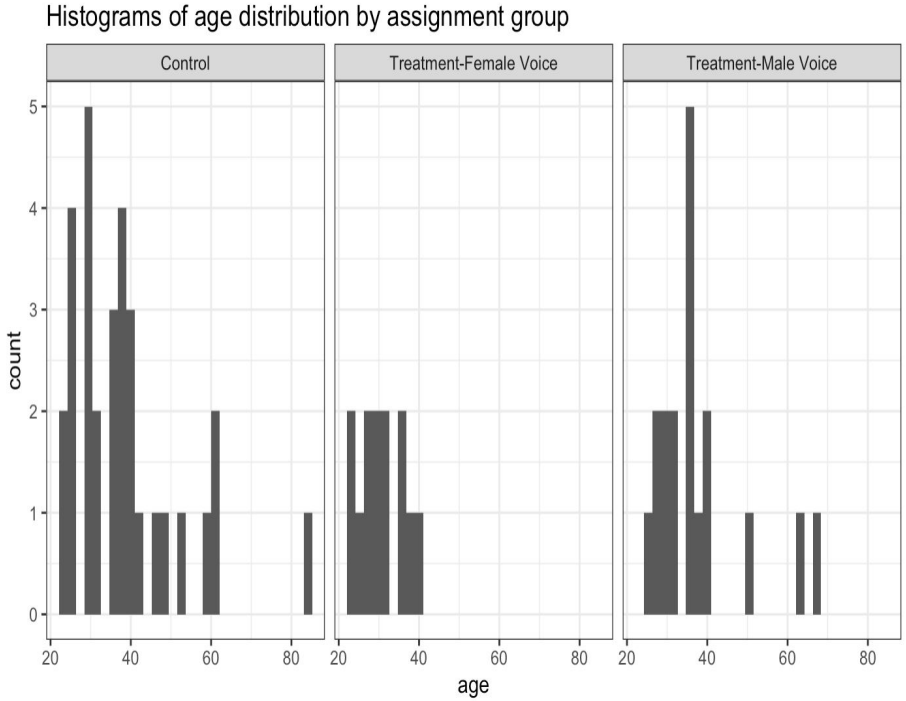
shutterstock.com • 278188052

Randomization



Covariate balance distribution





- Gender distribution is balanced across treatment assignment (by blocking)
- Age distribution is not as well balanced, though not deemed a large concern

Pilot Study

- Takeaways
  - Minor software bugs
  - Personal follow ups
  - Additional instruction

	Control	Treatment - male voice	Treatment - female voice
Assigned	4	3	2
Attriters	0	1	1
Total	4	2	1

The ATE and the Model

Average treatment effects expressed in potential outcomes:

$$E[Y_i(TM = 1)|D_i = 1] - E[Y_i(T = 0)|D_i = 0]$$

$$E[Y_i(TF = 1)|D_i = 1] - E[Y_i(T = 0)|D_i = 0]$$

Linear model

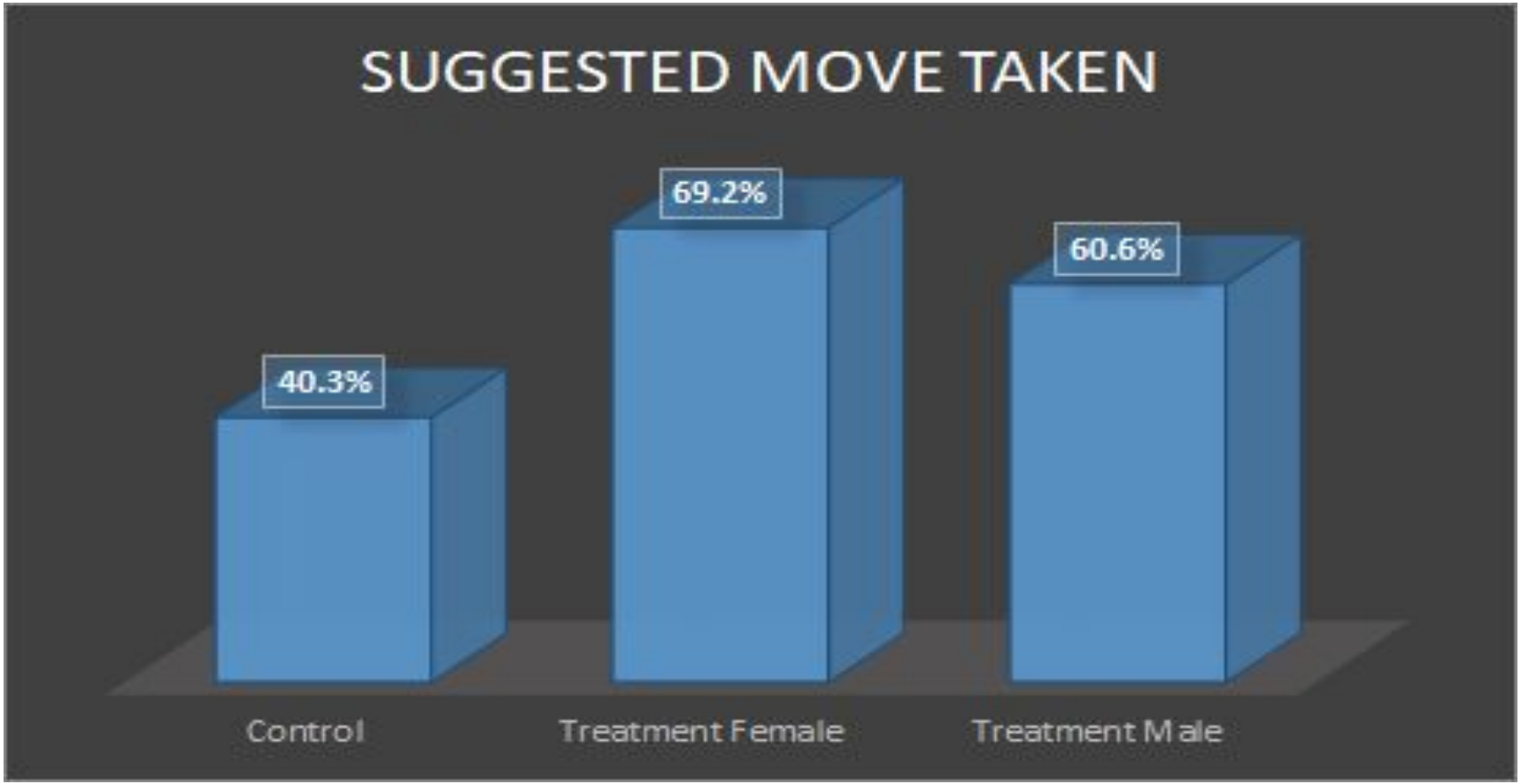
$$Y = \beta_1 maleaudio + \beta_2 femaleaudio + \beta_3 gender + \beta_4 age$$

Linear model with interaction terms

$$Y = \beta_1 maleaudio + \beta_2 femaleaudio + \beta_3 gender + \beta_4 age + \beta_k interactionterms$$

where Y is the proportion of responses that comply with the suggested move.

Mean response to suggested move



Regression analysis for all moves

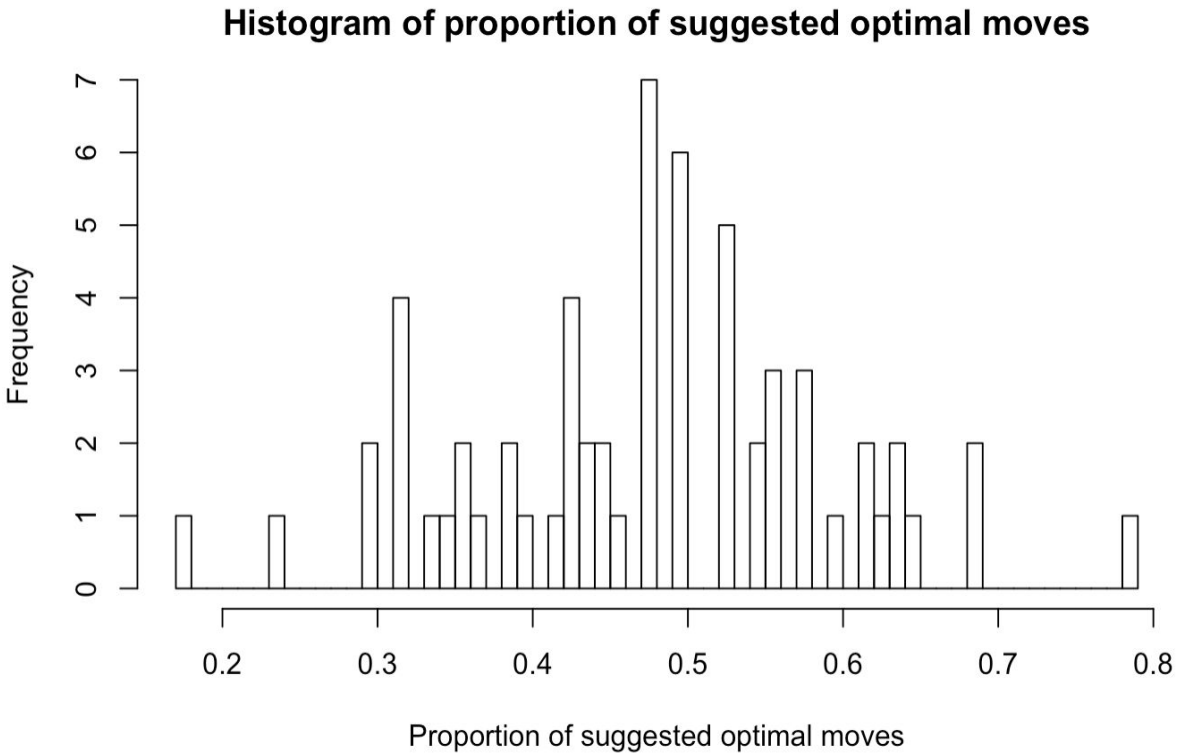
	Dependent variable:				
	comply_rate				
	(1)	(2)	(3)	(4)	(5)
as.factor(assignment_status)TF	0.289***	0.260***	0.260***	0.233	0.233
	(0.075)	(0.077)	(0.080)	(0.377)	(0.408)
as.factor(assignment_status)TM	0.203***	0.202***	0.202***	0.022	0.022
	(0.061)	(0.057)	(0.060)	(0.276)	(0.298)
genderM		0.059	0.059	-0.031	-0.031
		(0.050)	(0.053)	(0.059)	(0.064)
age		-0.004**	-0.004*	-0.004*	-0.004*
		(0.002)	(0.002)	(0.002)	(0.002)
as.factor(assignment_status)TF:genderM				0.181	0.181
				(0.144)	(0.156)
as.factor(assignment_status)TM:genderM				0.202	0.202
				(0.126)	(0.136)
as.factor(assignment_status)TF:age				-0.002	-0.002
				(0.014)	(0.015)
as.factor(assignment_status)TM:age				0.002	0.002
				(0.006)	(0.007)
Constant	0.403***	0.525***	0.525***	0.568***	0.568***
	(0.030)	(0.092)	(0.096)	(0.090)	(0.097)
SE	Robust	Robust	Clustered	Robust	Clustered
Observations	62	62	62	62	62

- Positive, significant response effect for both gendered audio suggestions
- Response effect to female audio suggestion is stronger***

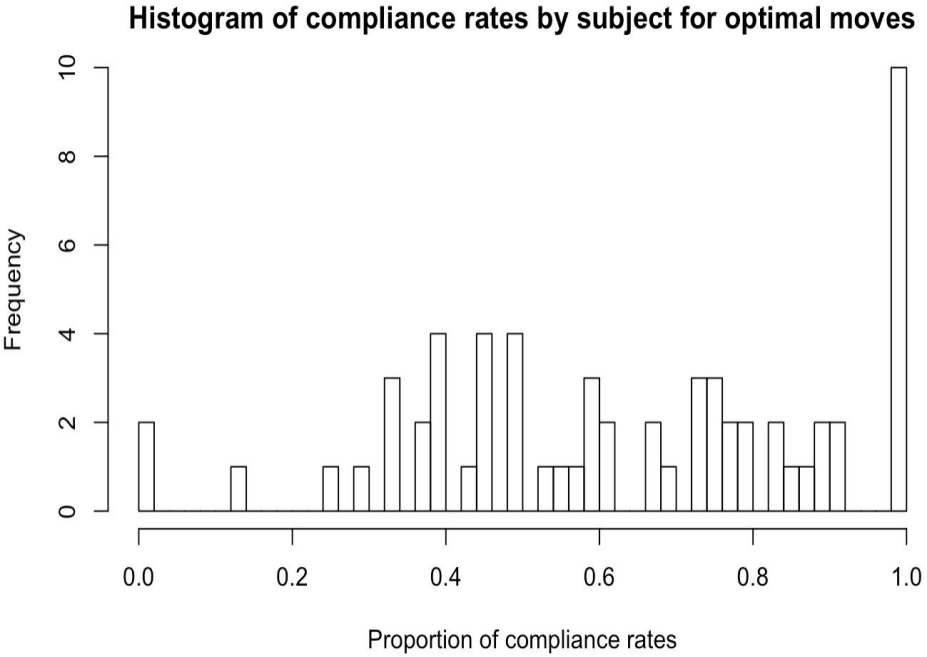
Disentangle game play from gender audio response

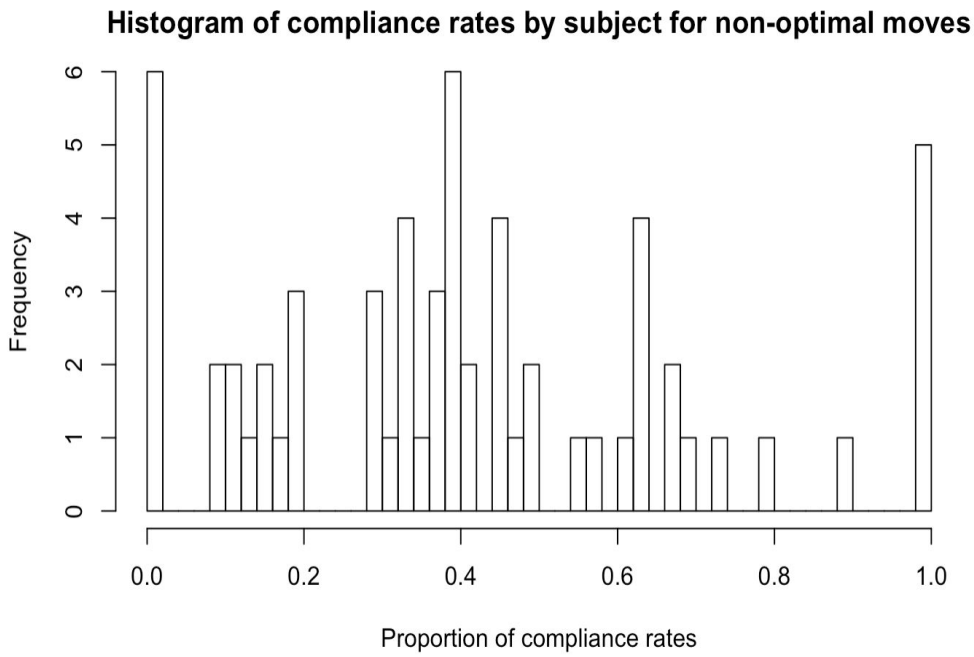
- Subjects received:
  - 555 optimal moves
  - 611 non-optimal moves

- Roughly normal distribution of proportion of suggested optimal moves received by subject

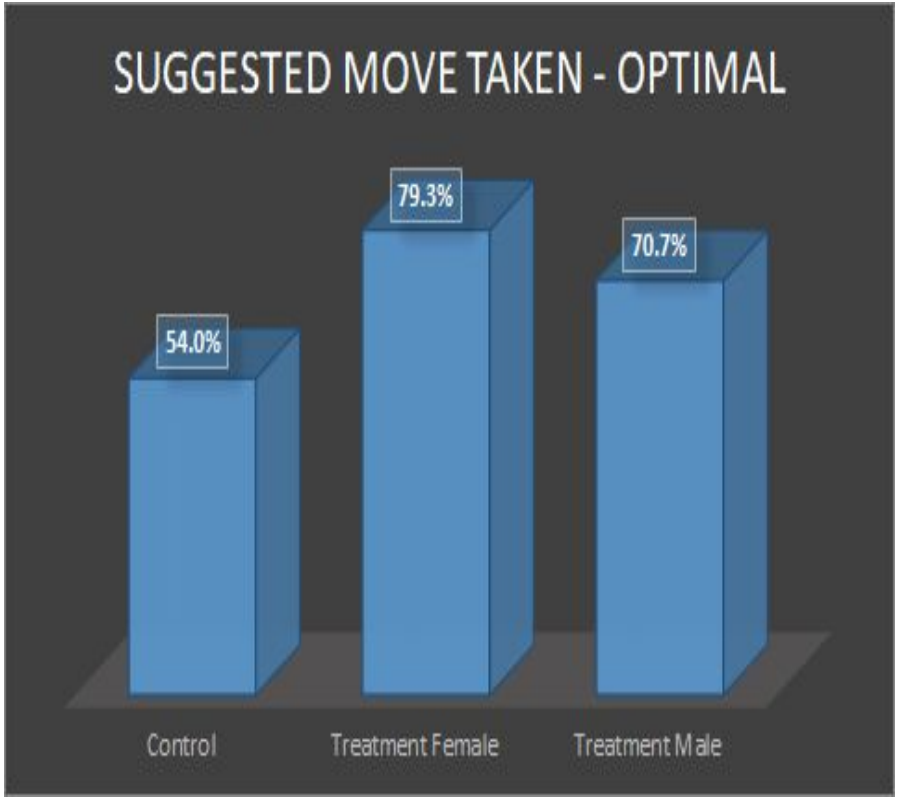


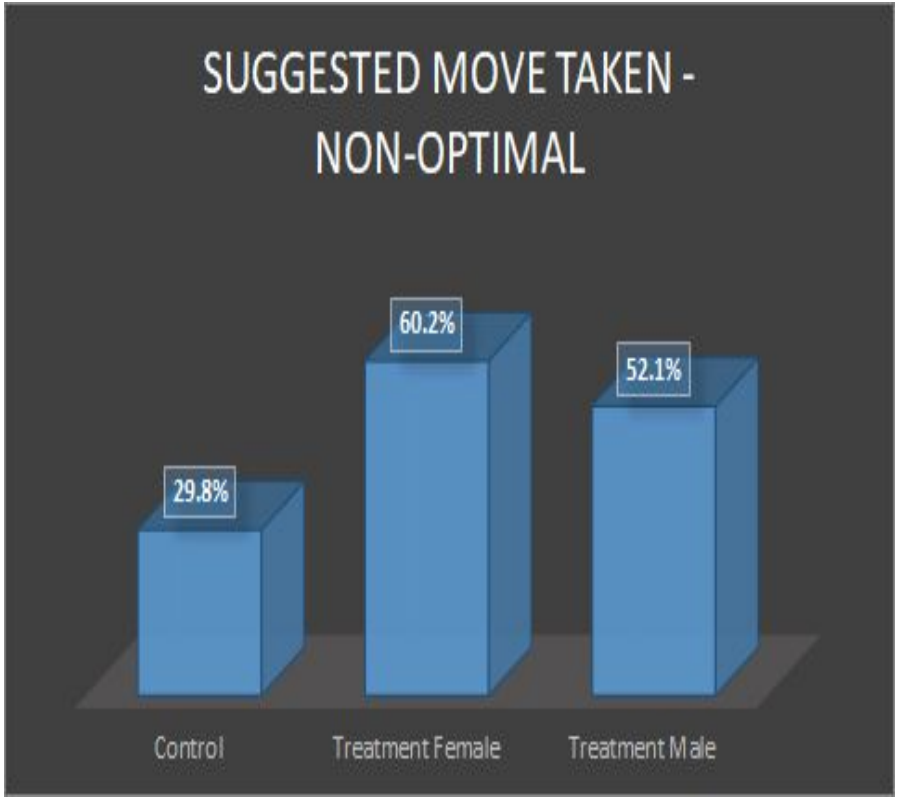
Response to optimal vs non-optimal suggestions





Mean response to optimal vs non-optimal suggestions





Regression analysis for optimal moves

	Dependent variable:			
	comply_rate			
	(1)	(2)	(3)	(4)
as.factor(assignment_status)TF	0.195**	0.195**	0.288	0.288
	(0.085)	(0.081)	(0.465)	(0.350)
as.factor(assignment_status)TM	0.152**	0.152**	0.045	0.045
	(0.072)	(0.068)	(0.435)	(0.314)
genderM	-0.011	-0.011	-0.122	-0.122
	(0.064)	(0.060)	(0.095)	(0.092)
age	-0.007**	-0.007***	-0.006	-0.006**
	(0.003)	(0.003)	(0.004)	(0.003)
as.factor(assignment_status)TF:genderM			0.232	0.232
			(0.178)	(0.155)
as.factor(assignment_status)TM:genderM			0.224	0.224*
			(0.147)	(0.135)
as.factor(assignment_status)TF:age			-0.007	-0.007
			(0.015)	(0.011)
as.factor(assignment_status)TM:age			-0.001	-0.001
			(0.012)	(0.008)
Constant	0.830***	0.830***	0.854***	0.854***
	(0.138)	(0.122)	(0.161)	(0.126)
SE	Robust	Clustered	Robust	Clustered
Observations	62	62	62	62
R2	0.264	0.264	0.314	0.314

- Positive, significant response effect for both gendered audio suggestions
- Effect sizes for optimal suggestions are smaller

Regression analysis for non-optimal moves

	Dependent variable:			
	comply_rate			
	(1)	(2)	(3)	(4)
as.factor(assignment_status)TF	0.333***	0.333***	0.160	0.160
	(0.101)	(0.096)	(0.669)	(0.485)
as.factor(assignment_status)TM	0.226***	0.226***	0.052	0.052
	(0.070)	(0.067)	(0.467)	(0.356)
genderM	0.117*	0.117*	0.057	0.057
	(0.064)	(0.061)	(0.075)	(0.073)
age	-0.002	-0.002	-0.002	-0.002
	(0.003)	(0.002)	(0.003)	(0.003)
as.factor(assignment_status)TF:genderM			0.127	0.127
			(0.230)	(0.188)
as.factor(assignment_status)TM:genderM			0.139	0.139
			(0.206)	(0.176)
as.factor(assignment_status)TF:age			0.003	0.003
			(0.025)	(0.018)
as.factor(assignment_status)TM:age			0.003	0.003
			(0.010)	(0.007)
Constant	0.273**	0.273**	0.323**	0.323***
	(0.118)	(0.107)	(0.150)	(0.118)
SE	Robust	Clustered	Robust	Clustered
Observations	62	62	62	62
R2	0.325	0.325	0.339	0.339

- Positive, significant response effect for both gendered audio suggestions
- Effect sizes are larger as compared to all suggested moves

Do effects dwindle over time by game?

	Dependent variable:				
	comply_rate				
	(1)	(2)	(3)	(4)	(5)
as.factor(assignment_status)TF	0.292**	0.293***	0.216*	0.286***	0.220**
	(0.126)	(0.100)	(0.114)	(0.099)	(0.107)
as.factor(assignment_status)TM	0.254***	0.208**	0.160**	0.224**	0.146
	(0.094)	(0.089)	(0.079)	(0.096)	(0.089)
genderM	0.011	0.060	-0.020	0.104	0.141*
	(0.082)	(0.076)	(0.076)	(0.079)	(0.076)
age	-0.003	-0.003	-0.004	-0.003	-0.007***
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)
Constant	0.446***	0.529***	0.580***	0.424***	0.627***
	(0.144)	(0.170)	(0.144)	(0.146)	(0.136)
Games	Game1	Game2	Game3	Game4	Game5
SE	Clustered	Clustered	Clustered	Clustered	Clustered
Observations	62	62	62	62	61
R2	0.183	0.203	0.146	0.213	0.242

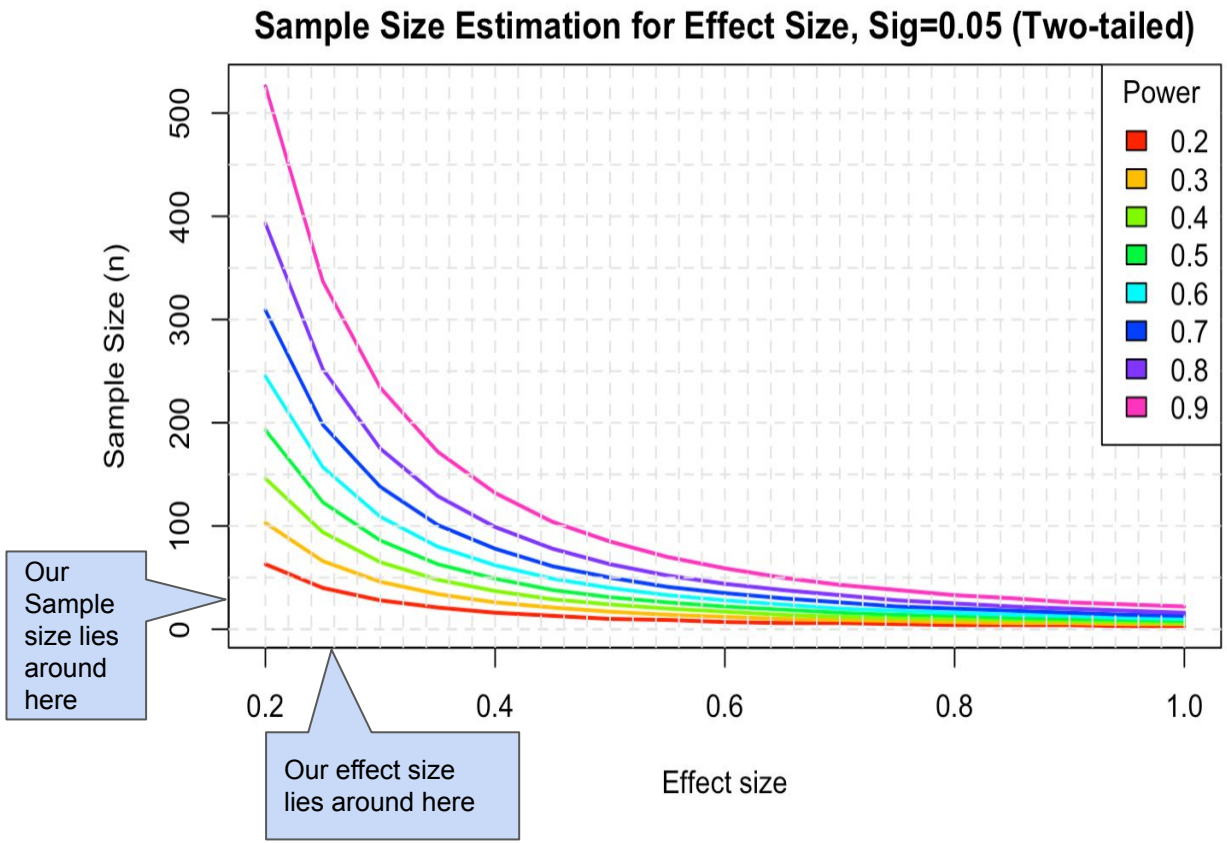
- Positive, significant audio response effects persist over game play
- No clear pattern evidencing dwindling strength of effect

Do effects dwindle over time by move?

	Dependent variable:		
	comply_rate		
	(1)	(2)	(3)
as.factor(assignment_status)TF	0.365***	0.299***	0.268**
	(0.107)	(0.094)	(0.105)
as.factor(assignment_status)TM	0.220**	0.287***	0.155**
	(0.103)	(0.080)	(0.072)
genderM	0.066	0.105	-0.021
	(0.081)	(0.067)	(0.069)
age	-0.001	-0.007***	-0.006**
	(0.004)	(0.003)	(0.003)
Constant	0.340**	0.525***	0.647***
	(0.164)	(0.128)	(0.129)
Move Order No.	Move 1	Move 2	Move 3
SE	Clustered	Clustered	Clustered
Observations	62	62	62
R2	0.205	0.369	0.234
Adjusted R2	0.149	0.324	0.181

- Positive, significant response effect for both gendered audio suggestions
- Strength of effect declines across move order for female audio treatment
- No pattern evidenced for male audio treatment

Do we have enough power to be convincing?



- Our study lacks power
  - ~11% power for the observed male audio treatment effect
  - ~12% power for the observed female audio treatment effect
- We would have to collect 6x to 10x our study's sample size to achieve at least 50% power

The Punch Line

Positive, statistically significant effects for both male and female voice treatments

The effect is stronger for the **female** voice directive

People Do Listen

If you want someone to follow a directive - add audio

Next Steps

- Replicate study with more participants to validate results
- Suggest no time lapse in between pre-test and experiment
- Block on age as well as gender

Questions for Peers

- Would the results be different if we had a directive versus a game?
- Why did we choose a tic-tac-toe game to measure the effect of compliance to suggested voice directions?
- Was there anything in the experimental design that might have clued people in to listening to the voice?

Maybe she should have just stuck with her feminine voice...

https://www.youtube.com/watch?v=PL6Id4qDKNI