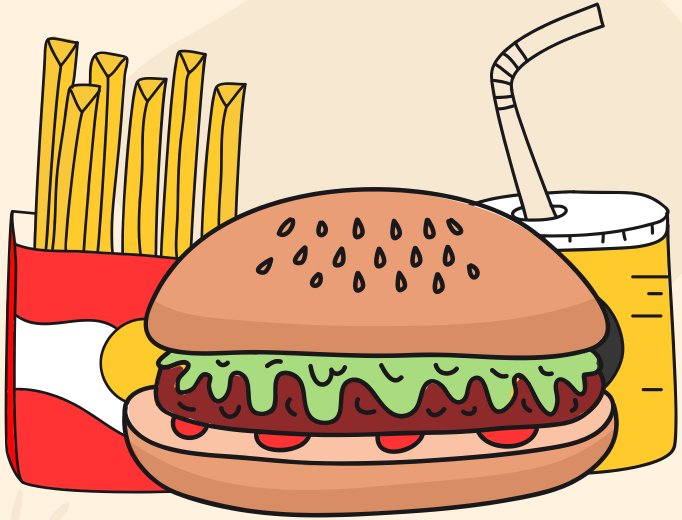

Do Images of Dishes for Online Menus Affect the Willingness of the Younger Generation to Order Foods?

Team 3:
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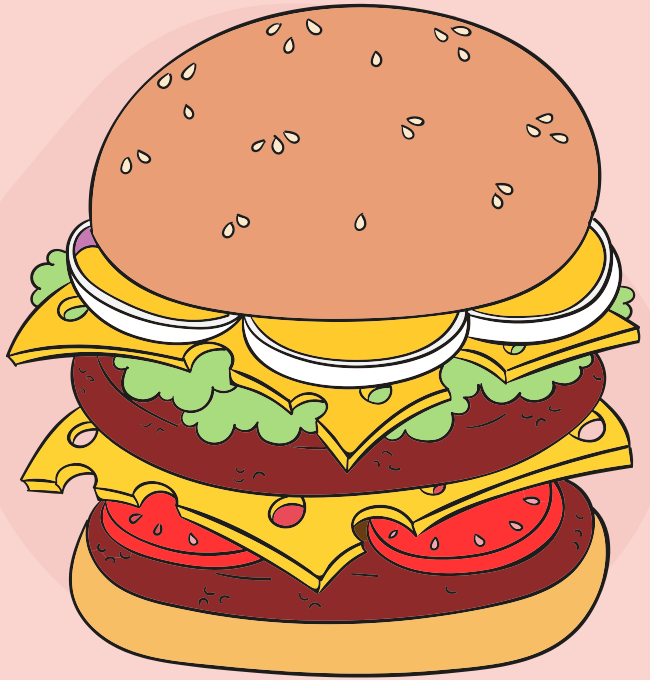
Agenda

1. Introduction
2. Method
3. Data Analysis
4. Limitations
5. Conclusion

INTRODUCTION

1. Have you ever struggled to order food when browsing the food delivery app?

2. Pictures vs. non-pictures



Method

1. Participants

2. Randomization

3. Procedure

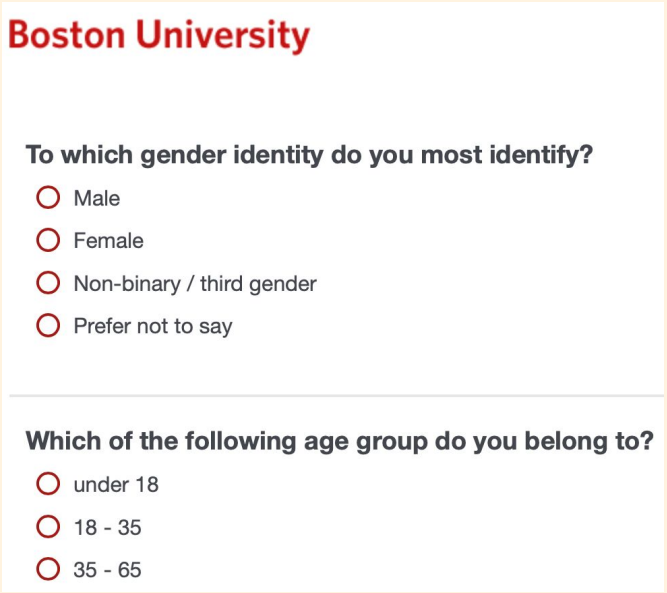
4. Randomization Checks

Participants

Step1

Basic Information Form

- Instagram Stories
- Directly reach out (Family, friends, classmates...)



Boston University

To which gender identity do you most identify?

- Male
- Female
- Non-binary / third gender
- Prefer not to say

Which of the following age group do you belong to?

- under 18
- 18 - 35
- 35 - 65

Randomization

Step2

- 158 forms were collected
- 6 people were excluded as outliers
- Remained 89 women and 63 men
- Blocked by gender
- Rand() function in excel

	Control	Treatment	
Men	30	30	
Women	30	30	
			120

Procedure

Step3

Survey Questions Design

Number	Question	Restaurant Category
Q1	Which of the following menu seems to be more attractive to you?	Brunch
Q2	Which of the following menu seems to be more attractive to you?	Italian
Q3	Which of the following menu seems to be more attractive to you?	Korean
Q4	Which of the following menu seems to be more attractive to you?	Chinese bbq
Q5	Which of the following menu seems to be more attractive to you?	Japanese Ramen

Table 1

Procedure

Step3

Boston University

Which of the following menu might seem to be more attractive to you?

- ○ Carmelina's
- ○ Trattoria Il Panino

Boston University

Which of the following menu seems to be more attractive to you?

- ○ Carmelina's
- ○ Trattoria Il Panino

Procedure

Variable	Explanation
Treatment	Assign participants either in a treatment group(1) which are shown the image of the menu, and the control group(0) which are not shown image of the menu.
Start_time	The date and time that each participants start the survey. ("2021-11-30 21:17:29 UTC").
time_of_day	Survey start times are extracted from survey start time,and the all the time are rounded to either on closest hour or 30 mins (12:40 rounded to 12:30, 12:20 rounded to 12:00)
eating_time	Eating time are created based on the time_of _day that the participants take the survey. We would like to know if participants take the survey during the eating time. (eating time is 1 if survey is taken between 11a-1p or 6p-8p, and 0 if it is taken at other time).
Duration	Duration of the survey in seconds.
Gender	Male(0) and Female (1).
age_group	Below 18 (0) and 18-35 (1)
brunch/italian_res/korean_res/bbq/ramen	Five type of restarants are designed in the experiments. In treatment, 1 means that the participants choose the menu with a image and 0 is that without an image. In control, 1 means that participant choose the menu without a image which corresponding to the menu in treatment group which has an image, 0 means that the participant choose the second menu.

Randomization Checks

```
lm(formula = Treatment ~ gender, data = data)
```

```
Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)  5.00e-01   1.46e-01    3.44  0.00082 ***
gender      -3.65e-16   9.21e-02    0.00  1.00000
```

```
lm(formula = Treatment ~ Duration, data = data)
```

```
Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 4.926e-01  4.793e-02  10.277   <2e-16 ***
Duration    3.867e-05  7.047e-05   0.549    0.584
```

```
lm(formula = Treatment ~ eating_time, data = data)
```

```
Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)   0.5047     0.0487   10.36   <2e-16 ***
eating_time  -0.0431     0.1480   -0.29     0.77
```

- Gender, duration and eating_time
- All 3 P values are way larger than 0.1
- Cannot reject Null hypothesis at 90% significant level
- Treatment and control groups bear same characteristics

Data analysis

Preprocessing

- Convert values of each questions from (1,2) to (1,0)
- Deal with start_time column
  - Dining hours: 11am-1pm, 6pm - 8pm

Regression

- The main effect of the treatment
- Gender v. outcome
- Duration v. outcome
- Dining hour v. outcome
- Covariates

Data analysis

The main effect of the treatment on the order willingness

- Relationship between treatment and each outcome is positive

	reg1 <chr>	reg2 <chr>
Dependent Var.:	brunch	italien_res
(Intercept)	0.6429*** (0.0403)	0.4643*** (0.0475)
Treatment	0.3301*** (0.0588)	0.4006*** (0.0694)
S.E. type	IID	IID
Observations	158	158
R2	0.16801	0.17607
Adj. R2	0.16267	0.17079

reg3 <chr>	reg4 <chr>	reg5 <chr>
korean_res	bbq	ramen
0.1905*** (0.0384)	0.4048*** (0.0411)	0.3214*** (0.0465)
0.7149*** (0.0561)	0.5682*** (0.0601)	0.5164*** (0.0680)
IID	IID	IID
158	158	158
0.51038	0.36410	0.26994
0.50725	0.36002	0.26526

- P < .05, so we can reject the null, and it is statistically significant

P-value:

	P-value
reg1(brunch)	8.8864e-08
reg2(italien_res)	4.0664e-08
reg3(korean_res)	< 2.2e-16
reg4(bbq)	< 2.2e-16
reg5(ramen)	2.6551e-12

Data analysis

The effect of gender on the outcome

- Gender has positive relationship with brunch and italian restaurants

	reg6 <chr>	reg7 <chr>
Dependent Var.:	brunch	italien_res
(Intercept)	0.7458*** (0.0964)	0.5024*** (0.1137)
gender	0.0320 (0.0563)	0.0926 (0.0664)
S.E. type	IID	IID
Observations	158	158
R2	0.00206	0.01231
Adj. R2	-0.00433	0.00598

reg8 <chr>	reg9 <chr>	reg10 <chr>
korean_res	bbq	ramen
0.6180*** (0.1197)	0.6733*** (0.1129)	0.6147*** (0.1190)
-0.0575 (0.0699)	-0.0015 (0.0659)	-0.0319 (0.0695)
IID	IID	IID
158	158	158
0.00431	3.21e-6	0.00134
-0.00207	-0.00641	-0.00506

- P > .05, so we cannot reject the null, and there is no statistically significant differences

P-value:

	P-value
reg6(brunch)	0.57098
reg7(italian_res)	0.16514
reg8(korean_res)	0.41249
reg9(bbq)	0.98216
reg10(ramen)	0.64748

Data analysis

The effect of dining hour on the outcome

- Dining hour has positive relationship with Japanese and Italian restaurants

	reg11 <chr>	reg12 <chr>
Dependent Var.:	brunch	italien_res
(Intercept)	0.8028*** (0.0339)	0.6408*** (0.0401)
eating_time	−0.0528 (0.1066)	0.1092 (0.1261)
S.E. type	IID	IID
Observations	158	158
R2	0.00157	0.00478
Adj. R2	−0.00483	−0.00160

reg13 <chr>	reg14 <chr>	reg15 <chr>
korean_res	bbq	ramen
0.5141*** (0.0421)	0.6620*** (0.0396)	0.5634*** (0.0419)
0.1109 (0.1322)	0.0880 (0.1245)	−0.0009 (0.1316)
IID	IID	IID
158	158	158
0.00449	0.00319	2.87e−7
−0.00189	−0.00320	−0.00641

- P > .05, so we cannot reject the null, and there is no statistically significant differences

P-value:

	P-value
reg11(brunch)	0.62088
reg12(italian_res)	0.38811
reg13(korean_res)	0.40286
reg14(bbq)	0.48061
reg15(ramen)	0.99467

Data analysis

The effect of duration on the outcome

- Duration has positive relationship with Ramen, Italian, Korean, bbq

	reg16 <chr>	reg17 <chr>
Dependent Var.:	brunch	italian_res
(Intercept)	0.7751*** (0.0401)	0.6605*** (0.0452)
Duration	-6.35e-7 (5.89e-5)	3.19e-5 (6.65e-5)
S.E. type	IID	IID
Observations	120	120
R2	9.84e-7	0.00195
Adj. R2	-0.00847	-0.00651

reg18 <chr>	reg19 <chr>	reg20 <chr>
korean_res	bbq	ramen
0.5288*** (0.0479)	0.6577*** (0.0455)	0.6050*** (0.0468)
2.38e-5 (7.04e-5)	3.23e-6 (6.69e-5)	1.71e-5 (6.89e-5)
IID	IID	IID
120	120	120
0.00097	1.98e-5	0.00052
-0.00750	-0.00845	-0.00795

- P > .05, so we cannot reject the null, and there is no statistically significant differences

P-value:

	P-value
reg16(brunch)	0.99142
reg17(italian_res)	0.63175
reg18(korean_res)	0.73587
reg19(bbq)	0.96156
reg20(ramen)	0.80471

Data analysis

The effect of covariates on the outcome

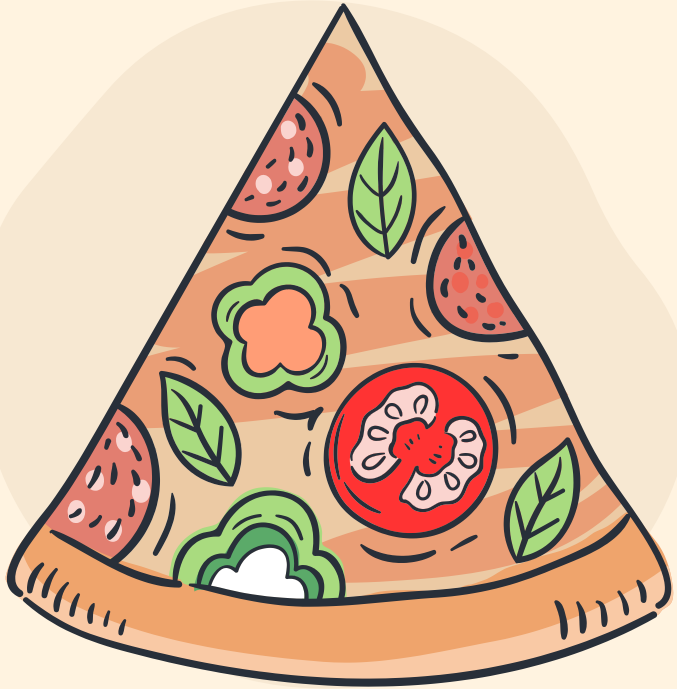
Covariates:
gender+Duration+eating_time

- We want to know whether our covariates can improve the regression in someway
- The results show that our SE does not decrease

	reg21 <chr>	reg22 <chr>
Dependent Var.:	brunch	italian_res
(Intercept)	0.6171*** (0.1157)	0.3611** (0.1330)
Treatment	0.3830*** (0.0691)	0.4002*** (0.0794)
gender	−0.0148 (0.0699)	0.0655 (0.0803)
Duration	−1.53e−5 (5.37e−5)	9.55e−6 (6.17e−5)
eating_time	−0.0783 (0.1112)	0.0497 (0.1278)
S.E. type	IID	IID
Observations	120	120
R2	0.21491	0.18621
Adj. R2	0.18760	0.15790

reg23 <chr>	reg24 <chr>	reg25 <chr>
korean_res	bbq	ramen
0.3302** (0.1101)	0.4650*** (0.1118)	0.3878** (0.1326)
0.6999*** (0.0657)	0.6183*** (0.0668)	0.4837*** (0.0792)
−0.1015 (0.0665)	−0.0803 (0.0675)	−0.0164 (0.0801)
9.7e−6 (5.1e−5)	−9.68e−6 (5.18e−5)	9.34e−7 (6.15e−5)
0.0325 (0.1057)	0.0604 (0.1074)	0.0282 (0.1274)
IID	IID	IID
120	120	120
0.50278	0.43216	0.24573
0.48548	0.41241	0.21949

Limitations

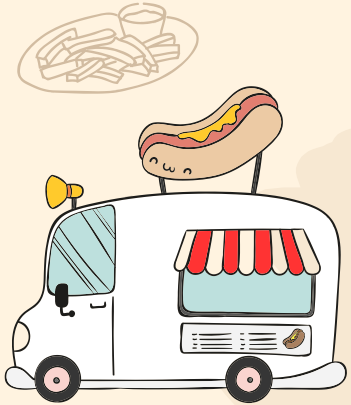


- Location bias
- Time bias
- Sample size

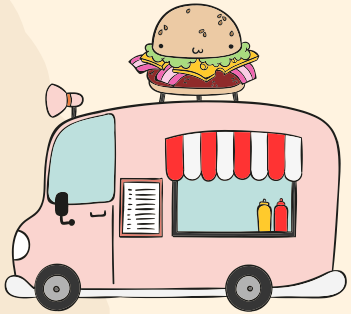
Conclusion

- Treatment does have impact on the outcome
- We add the covariates such as gender and duration, and the results show no effect on our outcome
- Due to the limitations of our experiment, this study is not perfect
- We need to collect more data and implement better experiments to get more accurate and persuasive results

THANKS!



Q&A



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