The Effects of Taking a Quiz on Zoom

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Introduction

Part 01

Background

Overview of the project

With remote learning and schooling becoming the norm this past year, teacher’s have had to relax or get creative with how they administer their tests and assessments.

- What’s the best way to distribute a remote assessment?
- Does having a camera on during a test/quiz affect a student's performance?
- Will having people sit on a call improve or worsen student scores?

Example: BA865 Final Exam

Hypothesis

Our team is split on which treatment would lead to better outcomes (faster times and higher scores)...

- One on hand, removing time constraints and the need for cameras may **relieve pressure** and allow students to perform better.
- On the other, students may **take tests more seriously** with the presence of a remote proctor and their cameras on.

We also suspect that **certain characteristics of the participants might affect the treatment effects** (e.g. English native speakers might score better than those who are not).

Experiment Design

Treatments (N = 61)

1. Treatment (N = 32) → Students take a proctored assessment on Zoom with cameras on
2. Control (N = 29) → Students take an unproctored assessment

Outcomes

1. Score (i.e. how many questions did they get correct)
2. Time taken to complete assessment
3. Number of Clicks

Blocking Randomization

- Education
- Gender
- English native speaker

Preliminary Survey & Quiz

Preliminary Survey

Demographic information

- Gender
- Age
- Education Level
- English as first language
- Preferred Time

Assessment

- Multiple choice questions
- 21 brain-teaser/logic questions
- 15 minutes to complete, on average
- Example:

Sarah is older than Emily. Emily and Julia are both older than Lauren. Maggie is not the youngest.

Which one of these five girls is the youngest?

a) Emily
b) Maggie
c) Lauren
d) Cannot say

Data

ResponseId <chr>	Quiz_Timer <dbl>	Click <int>	score <int>	genderMale <int>	age <int>	education <int>	english1 <int>	treatment <int>
R_3qdFrptt2liUU0n	681.973	28	12	1	1	2	0	1
R_2wnLT1jWElzy9w9	1710.179	39	14	1	1	2	0	0
R_2w5d2aO0nge9Pc6	113.755	22	13	1	3	2	0	0
R_e5S5Gh8REeeJiwN	827.600	28	14	1	1	2	1	0
R_27p0gUnn5hDZ2O	1551.289	27	16	0	1	2	0	0
R_1dn6NNSfx5CWvOs	700.334	75	11	1	2	1	1	0

Blocking Check

```
english = lm(english1 ~ treatment ,data=data)
ed = lm(education ~ treatment,data=data)
age = lm(age ~ treatment,data=data)
gender = lm(genderMale ~ treatment,data=data)
```

Blocking Check Variable	Difference	Mean Treatment	Mean Control	P-value
Age	-0.07650862	1.40625	1.482759	.7148
Education	-0.07435345	1.71875	1.793103	.6133
Gender	-0.0549569	0.53125	0.5862069	.6723
English native speaker	0.1584052	0.46875	0.3103448	.2125

Interpretation: Proper randomization was done in our experiment.

Analysis

Part 02

Regression Analysis

Score | Time | Clicks ~ Treatment

ATE: The average treatment effect for score is 0.94, while the average treatment effect for time spent is -57.4 seconds. These two treatment effects are not statistically significant. The ATE for number of clicks is -13.6 and this effect is statistically significant

	reg_score <chr>	reg_time <chr>
Dependent Var.:	score	Quiz_Timer
(Intercept)	15.31*** (0.4354)	912.8*** (76.74)
Zoom_treatment	0.9397 (0.5909)	-57.37 (93.41)

	reg_click <chr>
Dependent Var.:	Click
(Intercept)	48.03*** (5.790)
Zoom_treatment	-13.57* (6.523)

Interpretation: The treatment has much fewer clicks than the control group. This could show that by taking the quiz on Zoom, participants felt more confident to their initial answer to questions.

Regression Analysis with Covariates

Score | Time ~ Treatment + gender + educational level + english as first language

ATE: After we put educational level, gender, English into our regression, even though there are some slight differences for “score” and “quiz time”, these effects are not statistically significant.

	reg_score <chr>	reg_time <chr>
Dependent Var.:	score	Quiz_Timer
(Intercept)	15.31*** (0.4354)	912.8*** (76.74)
Zoom_treatment	0.9397 (0.5909)	-57.37 (93.41)

	reg_score_cov <chr>	reg_time_cov <chr>
Dependent Var.:	score	Quiz_Timer
(Intercept)	15.23*** (1.318)	936.5*** (163.8)
Zoom_treatment	0.7347 (0.6181)	-53.53 (98.59)
genderMale	-0.5095 (0.6245)	-75.08 (105.4)
education	0.0158 (0.6067)	18.56 (69.02)
English_first_langague	1.124. (0.6609)	-41.62 (103.0)

Heterogeneity Effects

Part 03

English Native Speaker & Non Native Speaker

	score	time
Dependent Var.:	score	Quiz_Timer
(Intercept)	15.55*** (0.5248)	911.9*** (93.26)
Zoom_treatment	-0.4324 (0.7457)	-3.213 (123.3)
English_first_langague	-0.7722 (0.9507)	2.836 (170.4)
Zoom_treatment x English_first_langague	3.188** (1.164)	-116.5 (200.2)
S.E. type	Heteroskeda.-rob.	Heterosked.-rob.
Observations	61	61
R2	0.19542	0.02001

CATE results:

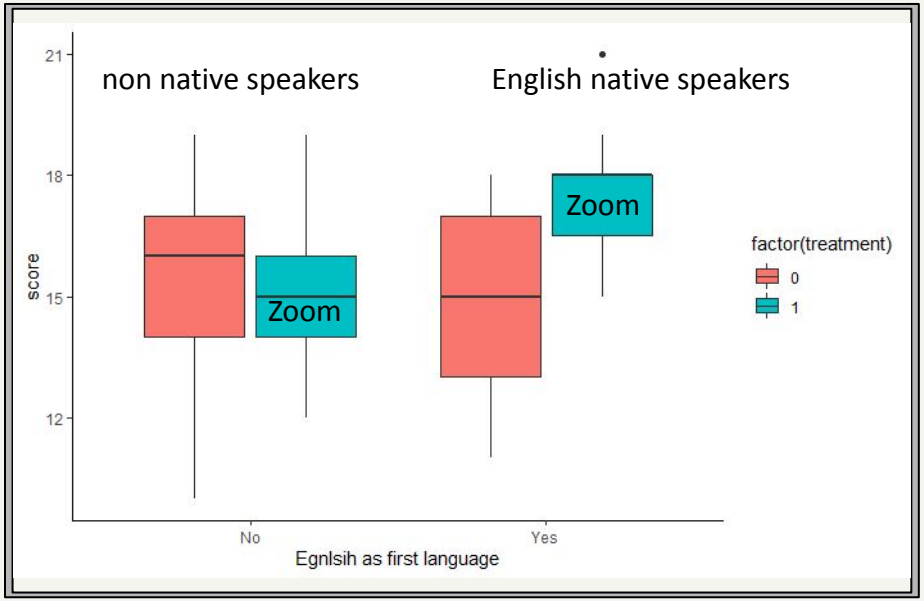
- The CATE on **score** for english native speakers is **2.76**
- The CATE on **score** for non-english native speakers is **-0.4324**

English Native Speaker & Non Native Speaker

Interesting Findings

- **For English native speakers, taking a quiz in Zoom could increase their score by about 2.8 points.**
- **For a non-English native speaker, taking a quiz on Zoom might not help their performances or even slightly bring down their score by 0.43 points.**
- **Total score: 21 Mean score: 15.8**

Boxplot (score)



Age Group : 20-25 years old and 25 + years old

	score	time
Dependent Var.:	score	Quiz_Timer
(Intercept)	15.55*** (0.4478)	1,047.5*** (92.60)
Zoom_treatment	0.4935 (0.6852)	-216.9. (110.7)
age_above_25	-0.7722 (1.095)	-434.0*** (118.6)
Zoom_treatment x age_above_25	1.507 (1.324)	522.2** (173.8)
S.E. type	Heteroskeda.-rob.	Heteroskedas.-rob.
Observations	61	61
R2	0.06333	0.16595

CATE results:

- The CATE on **time** for those who are above 25 yrs old is **305 seconds.**
- The CATE on **time** for those who are 20-25 yrs old is **- 217 seconds.**

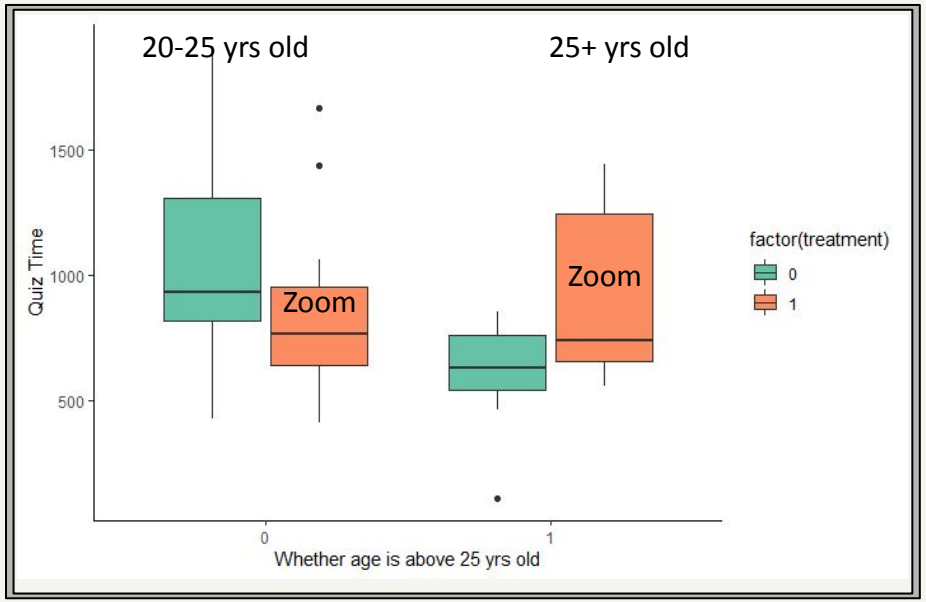
Age Group : 20-25 years old and 25 + years old

Results

- **For participants who are 20-25 years old, taking a quiz in Zoom could decrease their quiz time by about 217 seconds (3.6 minutes).**
- **For participants who are above 25 years old, taking a quiz in Zoom could increase their quiz time by about 305 seconds (5 minutes).**

Mean quiz time: 15 minutes

Boxplot (time)



Future Considerations & Conclusion

Taking a quiz over Zoom does not cause statistically significant differences in score or time taken. But, heterogeneous effects for age and English as a first language may exist.

Future Considerations:

- Split treatment into 2 arms
  - Zoom w/o camera on
  - Zoom w/ camera on
- Heterogeneous effects could be coincidental
  - Look more into p-hacking