EXERCISE: EyeTyping vs. Singlefinger Instructions

Due Oct 22 at 8am **Points** 10 **Questions** 33 **Time Limit** None
Allowed Attempts Unlimited

Instructions

Experiment Description

In this experiment, students will work in pairs to evaluate the usability of an eye-typing interface and a single-finger-typing interface. For each interface, students will track correctness metrics and evaluate usability with the NASA TLX form.

In class: find a partner (each partner will perform the experiment and will have to submit individually)

Online: You can do this exercise in pairs with partners from your team, or with a friend, family member etc.

Preliminary requirements:

To understand the experiment, **please watch all the videos posted on canvas before you perform this activity!** The videos will demo the experiment, walkthrough metric calculations, and describe NASA TLX. It will significantly shorten the amount of time it takes to run through this activity and make it a whole lot easier.

General Instructions

- One student will assume the role of the typer and the other as the experimenter in both the experiments. **That is, the same person has to perform both eye typing and single finger typing.** After completion of both eye typing and single finger typing, reverse roles.
- Prepare a list of 4-5 letter words to use for both interfaces.

Use the words listed at the bottom of the document or come up with new words (or phrases) to make it interesting.

In the second trial, use the same word list as the first trial, and repeat the word list if needed.

- Flip a coin
- **Heads:** start with single finger typing interface

- **Tails:** start with eye typing interface
- For each interface, practice for one minute, then record a 5-minute trial. Please read the trial instructions below. Report results in Canvas.
- Repeat the experiment with reversed roles

Setup

Eye Typing

In-Person Mode Setup

On a transparent sheet, create a 3x3 grid with AEI, LNO, RST in alphabetic order (one may be provided for you if you are present in person).

The typer will hold the sheet up to view the letters alphabetically. The guesser sits opposite to the typer to see their eye movement through the transparent sheet.

Virtual Mode Setup

The team has to start a video call. The typer will have the alphabetical grid displayed on their screen, and the guesser will have the flipped version on their screen.

Download the typer image (https://drive.google.com/file/d/1Wc_VnNWkNR2JxvtNp_GJwUxOIsSeIVll/view?usp=sharing)

Download the guesser image (https://drive.google.com/file/d/1gQVNJTjACLrhvSYFiq5rDZW_aANwf9Mv/view?usp=sharing)

PROCEDURE

Eye-Tracking Trial

- The typer will look at a letter.
  The guesser will say and write the guessed letter.
  The typer will verbally confirm (“yes” or “no”).
  If the letter is incorrect, the guesser will mark an “X” and guess again.
  When the word is complete, the typer says “next word”.
- The guesser writes down all the characters guessed, both correct and incorrect.
  The typer should make sure to correct all mistakes.
- Try practicing for 1 minute. Then start a timer for 5 minutes, and begin typing.

If you need additional clarity, this is an example of the eye-typing trial:

The typer looks at the bottom row-middle column of her screen. The guesser predicts ‘S’. The typer says ‘yes’ if the guess is right and moves on to look at the next character.

The typer looks at the bottom row-right column of her screen. The guesser predicts ‘T’. The typer says ‘yes’.

The typer looks at the middle row-right column of her screen. The guesser predicts ‘O’. The typer says ‘yes’.

The typer looks at the middle row-center column of her screen. The guesser predicts ‘N’. The typer says ‘yes’.

The typer looks at the top row-center column of her screen. The guesser predicts ‘E’. The typer says ‘yes’.

The typer says ‘next word’ and continues the same process for a new word.

In the next example, the guesser predicts ‘T’, ‘A’, ‘L’ correctly.

Then the guesser incorrectly predicts ‘L’ as ‘R’. The typer says ‘No’.

The guesser marks X in the prediction and proceeds to predict ‘L’.

The guesser says ‘Yes’ and continues the rest of the word.

In the experiment, the guesser has to keep predicting the character till the typer says Yes. The wrong guesses are tracked as ‘X’.

Single-Finger Typing Trial

In-person Mode Setup

- Students need to use a laptop with a keyboard.
- The typer uses a single finger.
  The “guesser” records what the typer types, including incorrect letters.
  If the typer uses the backspace, the guesser records an X so that they can more easily do the metric calculations later.

Virtual Mode Setup

- The team opens a shared word document.
- The typer uses a single finger.
  The “guesser” records what the typer types, including incorrect letters.
  If the typer uses the backspace, the guesser records an X so that they can more easily do the metric calculations later.

Procedure for Single-Finger Typing Trial

- The typer uses a single finger to type words from the word list. The “guesser” records what the typer types, including incorrect letters. If the typer uses the backspace, the guesser records an X instead of backspace so you can factor errors into the metrics.
- Try practicing for 1 minute. Then start a timer for 5 minutes, and begin typing.

Reporting Results

At the end of the experiment, each team must enter the following results on Canvas.

The guesser needs to calculate the following metrics for both experiments: Note that the time for each experiment is 5 minutes (300 seconds).

- Words Per Minute, WPM = (T - 1) / time * 60 * 1 / 5
  - T is the number of letters typed, including remaining errors (since all errors should have been corrected, T should be equal to the number of correctly typed letters)
  - Time is the number of seconds (which should be 300)
  - 1 / 5 converts characters to words, because the average length of English words is about 5 characters
- Adjusted Words Per Minute, AdjWPM = WPM * (1 - U)^a
  - This should be the same as WPM if all errors were corrected
  - U is the uncorrected error rate (0%)
  - A is the error tolerance, which in this case is defined as a = 1
- Minimum String Distance Error Rate
  - Keys Stroke Per Character = |InputStream| / |Transcribed Text|
  - |InputStream| = number of correct and incorrect keystrokes including spaces
  - |Transcribed Text| = number of keys transcribed (correct keys + spaces)
- Gestures Per Character
  - Same as keystrokes per character above, but also include the yes/no verbal confirmation gestures in the input stream
- Total Error Rate = [(INF + IF) / (C + INF + IF)] * 100%
  - INF is the number of incorrect keystrokes not fixed (should be zero)
  - IF is the number of incorrect keystrokes that are fixed
  - C is the number of correct keystrokes including spaces
- Not Corrected Error Rate = [INF / (C + INF + IF)] * 100%
  - This should be zero if you corrected all errors
- Corrected Error Rate = [IF / (C + INF + IF)] * 100%
- Accuracy = 100% - Total Error Rate

The typer needs to fill out the NASA TLX Values for both experiments.

Refer to the scale mentioned in the below link and qualify your experiences. Please note that the scale for Performance goes in the opposite direction (i.e., Good to Poor) to the other metrics.

NASA TLX links:

https://drive.google.com/file/d/1KL33zKPXer62bHkOYXdIlujHnuM9fGpa/view?usp=sharing (https://drive.google.com/file/d/1KL33zKPXer62bHkOYXdIlujHnuM9fGpa/view?usp=sharing)

Word List Ideas

NAIL	STORE	STONE	SAIL	SINE
REST	STALE	STEEL	STEAL	STATE
TONER	LONER	NOTE	SOIL	TALE
ALIEN	TEARS	LAST	LION	ALERT
ALONE	LEAST	LEASE	SORE	RANT
LOAN	RAIN	STREET	TAIL	NORSE
TARE	SNORE	SAINT	TORE	SANE
RENTAL	LENS	NOSE	STARE	ROAST
LANE	NEST	TONAL	INTO	LENT
TOIL	TALL	SLOT	LATE	LINE
LEAN	NEAT	TORN	STALL	LINT

Take the Quiz Again

Attempt History

	Attempt	Time	Score
KEPT	Attempt 2	58 minutes	10 out of 10
LATEST	Attempt 2	58 minutes	10 out of 10
	Attempt 1	3,237 minutes	9 out of 10 *

* Some questions not yet graded

Correct answers are hidden.

Score for this attempt: **10** out of 10
Submitted Oct 21 at 11:53pm
This attempt took 58 minutes.

Question 1

0.5 / 0.5 pts

Who was your partner for this experiment? Please provide both **first and last** names.

Your Answer:

Hargopal Choudhry

Single Finger Typing Metrics

Please report values of your **partner's** metrics, i.e. when they were performing the experiment/typing and you were keeping track of data.

Question 2

0.3 / 0.3 pts

Words per minute for your partner's Single Finger Typing experiment:

5.72

Question 3

0.3 / 0.3 pts

Adjusted words per minute for your partner's Single Finger Typing experiment:

5.72

Question 4

0.3 / 0.3 pts

Minimum string distance error rate for your partner's Single Finger Typing experiment:
(Should be 0% if all errors were corrected)

0

Question 5

0.3 / 0.3 pts

Keystrokes per character for your partner's Single Finger Typing experiment:

3.28

Question 6

0.3 / 0.3 pts

Gestures per character for your partner's Single Finger Typing experiment:

3.28

Question 7

0.3 / 0.3 pts

Total error rate for your partner's Single Finger Typing experiment:

9.96

Question 8

0.3 / 0.3 pts

Not corrected error rate for your partner's Single Finger Typing experiment:

0

Question 9

0.3 / 0.3 pts

Corrected error rate for your partner's Single Finger Typing experiment:

9.96

Question 10

0.3 / 0.3 pts

Accuracy for your partner's Single Finger Typing experiment:

90.04

Question 11

0.25 / 0.25 pts

Upload your partner's Single finger spelling NASA TLX pdf file

TLXScale for Hargopal.pdf (https://gatech.instructure.com/files/45530331/download)

Question 12

0.3 / 0.3 pts

NASA TLX: Mental Demand for your partner's Single Finger Typing experiment:

50

Question 13

0.3 / 0.3 pts

NASA TLX: Physical Demand for your partner's Single Finger Typing experiment:

30

Question 14

0.3 / 0.3 pts

NASA TLX: Temporal Demand for your partner's Single Finger Typing experiment:

20

Question 15

0.3 / 0.3 pts

NASA TLX: Performance for your partner's Single Finger Typing experiment:

90

Question 16

0.3 / 0.3 pts

NASA TLX: Effort for your partner's Single Finger Typing experiment:

30

Question 17

0.3 / 0.3 pts

NASA TLX: Frustration for your partner's Single Finger Typing experiment:

90

Eye Typing Metrics

Please report values of your **partner's** metrics, i.e. when they were performing the experiment/typing and you were keeping track of data.

Question 18

0.3 / 0.3 pts

Words per minute for your partner's Eye Typing experiment:

3.96

Question 19

0.3 / 0.3 pts

Adjusted words per minute for your partner's Eye Typing experiment:

3.96

Question 20

0.3 / 0.3 pts

Minimum string distance error rate for your partner's Eye Typing experiment:
(Should be 0% if all errors were corrected)

0

Question 21

0.3 / 0.3 pts

Keystrokes per character for your partner's Eye Typing experiment:

1.11

Question 22

0.3 / 0.3 pts

Gestures per character for your partner's Eye Typing experiment:

1.11

Question 23

0.3 / 0.3 pts

Total error rate for your partner's Eye Typing experiment:

10.48

Question 24

0.3 / 0.3 pts

Not corrected error rate for your partner's Eye Typing experiment:

0

Question 25

0.3 / 0.3 pts

Corrected error rate for your partner's Eye Typing experiment:

10.48

Question 26

0.3 / 0.3 pts

Accuracy for your partner's Eye Typing experiment:

89.52

Question 27

0.25 / 0.25 pts

Upload your partner's Single finger spelling NASA TLX pdf file

TLXScale for hargopal eyetyping.pdf (https://gatech.instructure.com/files/45530339/download)

Question 28

0.3 / 0.3 pts

NASA TLX: Mental Demand for your partner's Eye Typing experiment:

60

Question 29

0.3 / 0.3 pts

NASA TLX: Physical demand for your partner's Eye Typing experiment:

30

Question 30

0.3 / 0.3 pts

NASA TLX: Temporal demand for your partner's Eye Typing experiment:

40

Question 31

0.3 / 0.3 pts

NASA TLX: Performance for your partner's Eye Typing experiment:

80

Question 32

0.3 / 0.3 pts

NASA TLX: Effort for your partner's Eye Typing experiment:

50

Question 33

0.3 / 0.3 pts

NASA TLX: Frustration for your partner's Eye Typing experiment:

30

Quiz Score: **10** out of 10