

# Touch Type

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## 1. ABSTRACT

The Touch Type simulator intends to teach touch-typing skill by providing audio feedback for typing performance and body posture. The purpose of this study is to evaluate if the simulator can accomplish the goal by checking the user response. The study intended to evaluate if the users were able to distinguish different error sonification and understand continuous sonification of sound that changes based on body posture. Three middle school students, who cannot touch type but are familiar with the keyboard, participated in the study. The participants were made to use an existing Touch-Typing platform and then the simulator during the study. And the study concluded short interview with the participants. Based on the result of the study, the different error sounds were distinguishable, and users were able to interpret the sonification for body posture. However, the simulator still needs some improvements to make it to the next level.

## 2. INTRODUCTION

Typing is an important skill, especially for visually impaired people as it creates more learning and employment opportunities for them. There are several online platforms (Typio, JAWs) that provide audio instructions to help visually impaired people learn typing. However, users will face some issues while learning typing even with this technology like- a lack of feedback based on learners' performance. Additionally, learning typing requires investing a significant amount of time in front of computers. And maintaining healthy body posture for this long time is unrealistic. There have been many issues reported recently for spending a long time in front of computers like back pain, neck pain, shoulder pain, etc. There are some apps that track body posture in real time and plays alarmed sound unhealth posture is maintained for some time. However, there isn't any technology that focuses on Touch Type teaching along with health factors. Therefore, a proper sonification for teaching touch typing

which produces distinguishable different sonifications for different user error and also assist with maintaining healthy body posture can solve this issue. "Touch Type" aims at ensuring efficient, enjoyable, and healthy learning experiences for visually impaired people by considering users' performance (finger and hand movement) and body posture (back, neck, arm position) and sonifying proper instructions. However, the research questions I intended to answer during this study were:

- Question: Are the users able to differentiate between two different sounds?  
Explanation: Since the error beep sound is very short, it is important for users to understand what kind of mistakes they are making
- Question: Are the users able to identify what this background sound is referring to and take action accordingly while still hearing the lesson plan?  
Explanation: a continuous sound will be played mildly along with the lesson plan. So, it is important to understand whether users can identify that or not.

## 3. METHOD

### 3.1 Participants:

There were three user tests conducted for the evaluation of the simulators. All the participants were middle school students. They were already familiar with keyboard structure and unfamiliar with touch typing. The simulator aims at helping both visually impaired and regular people who are intending to learn touch typing. However, only beginner learners participated in this study.

### 3.2 Design and Procedure:

The study begins with explaining to each user the purpose of the project and getting their consent. So, users know that the simulator is trying to teach touch typing with sonification for the user's wrong response and body posture. The evaluation study

consists of two sections. In the first section, users were instructed to follow a lesson from the Typing.com website. This website has visual instructions along with audio instructions for typing lessons. For visual instructions there is a real-time visualization that shows what finger needs to be used for typing a particular key and audio instruction also includes the information. An example of audio instruction is – “Use your right index finger to type J” . This step helps to accomplish the following:

- Get the data of how the participant performs while typing based on the visual instructions.
- It will provide the users with more context since they are not very familiar with touch typing. Therefore, while using the simulator they are not confused since the simulator has some limitations.
- This experience helps them to compare the simulator with some actual platform of Touch Typing.

During the second wave of the study, the users were made to utilize touch type simulator. The same lesson plan that was used for the first wave of the study was played for this section as well. The participants were given a keyboard to follow the audio instructions and were instructed to pay attention to any additional sonification. Users were also instructed to follow the order of keys from the instructions. In order to produce an error sound for the wrong key, or wrong finger and to change the background sonification for wrong body posture, the manual mode of the simulator was used. Before the study began all the sounds were played separately for each user, so that they know what to expect. The manual mode has five buttons and a slider.

START: starts the lesson plan

KEY\_ERROR: play the error sound if the wrong key is pressed.

FINGER\_TYPE\_ERROR: play the error sound (milder than the Key\_error sound) if the wrong finger is used to press a key.

TRACK\_POSTURE: Starts playing the continuous background sound that changes based on the participant's body posture.

STRESS: After a certain time, the simulator plays a message saying participants need to take a break. The simulator intends to play it after 30 minutes of continuous practice to help users with a healthy practice. However, since the evaluation study used a comparatively short lesson plan, therefore this stress indicator wasn't used.

CONTROL\_POSTURE slider: This slider is used to control the Track\_Posture background sound to change manually.

Therefore, all these UIs were used to manually produce sonification based on participants' performance. So, when the experiment started, the START button was pressed to play the lesson plan and TRACK\_POSTURE button was pressed to start the continuous background audio. It was monitored if the users were pressing the right key and with the right finger as part of touch-typing instructions. Based on that error sounds were played. Additionally, when users were arching their backs or not maintaining a healthy posture, the slider was used to increase the volume. Data were collected during both of the study sections for each participant. Additionally, interviews were conducted at the end to collect some feedback about the simulator.

## 4. RESULT

The study consists of two sections. The data consists of the performance based on some factors for each three users during both sections and the final interview. And based on the collected data, an evaluation of the simulator was conducted. Here are some raw data collected during the study.

Table 1: During the first section while users use Typio.com

facts	User 1	User 2	User 3
Ability to follow the lesson	Able	Able	confused at first, then started caching up
Hand position	Used both	Started with one hand,	Used both hands to Type

	hands Type	then changed to both hand in the middle	
Finger Instruction	Used the finger instructions for key at first, however during the middle started using random fingers	Completely ignored finger instructions at first. When started use both hands, randomly following finger instruction	Tried, but was getting it wrong randomly.
Body posture	healthy	Used wrong hand posture	A little impatient, continuously changing posture.

During the second section, where the simulator was used, the data was collected based on

Table 2: During the section while users use Touch Type simulator.

facts	User 1	User 2	User 3
Ability to follow the lesson	Able	Able	Able
Hand position	Used both hands Type	Started with one hand, then changed to both hands immediately when background sound volume is increased (initially	Used both hands to Type

		was confused, I had to tell her why)	
Finger Instruction	Had hard time to follow the finger instructions at first. Understood from Key_Error sound, then later followed successfully	Had hard time to follow the finger instructions throughout the entire lesson	Almost followed, but was getting it wrong randomly.
Body posture	healthy	Rectified hand posture	Initially was moving back, the increased volume of background track_posture sound alarmed her, then maintained health posture throughout the session.

During both sessions, all the users were able to follow the key lesson plan almost perfectly. It's the hand, body posture and finger position they were struggling with.

At the end, there was open-ended interview with the users about how they felt about the simulator. Based on the interview,

User 1:

"I liked the first platform in the sense that you can see what video with the lesson voice what key you have to type and what finger you have to use. They were less strict about fingers though. The second platform was playing error for the wrong finger

which helped, but it was hard to follow with just an audio lesson”.

User 2:

“I think the background sound was helpful in reminding the posture. Also, the error sounds for finger and key were helpful, but I was having a little hard time separating them, maybe with practice it will be better.”

User 3:

“The error sound was easily distinguishable after hearing it for few times. But the background sound was a little distracting in my opinion.”

The result of the study for both sections helps to evaluate the quality of features of the simulator and what can be improved.

## 5. DISCUSSION

Based on the interview, it seems that both error sound was hard to distinguish for one user, while other users were able to distinguish them. If we compare the results of that user for both sessions of the study, it seems the user seems to catch up with the context or instructions after some time when she becomes comfortable with the platform.

And one user (user 3) commented the background track\_posture sound was distracting. But this was the only user for which the slider of track\_posture sound had to change the most. That might be the reason for the distraction. Therefore, the sound to successful in bringing attention to maintain a healthy posture.

Based on collected data and interviews, the research questions can be addressed this way:

- The key\_error sound and finger\_error sound were distinguishable during the lesson plan.
  - The background track\_posture continuous sound was identifiable by the users and users were able to take action based on that.
- However, the simulator still has some weaknesses that need to be addressed based on the study results.
- Users mentioned that without visual instructions, it's hard to follow what fingers to use to press a key just by following an audio lesson. While it won't be necessary for visually impaired people, for other learners' visual presentation might be very important.

- The lesson plan needs to be more beginner-friendly and with series. Since a user mentioned that in order to be comfortable with different error sounds, more practice is required. If more beginner-friendly lesson that used repeated letters might have helped users become familiar with the platform more than the lesson.
- For users who needs more reminder to maintain body posture, the background sound will change frequently for them which indeed might be distracting.

## 6. CONCLUSION

In today's world, everything is being controlled by technology. Computers are one of the most significant elements of the tech world. And in order to cope with this advanced and competitive world, touch typing skill can be beneficial. Generally, touch typing skill is introduced to students during middle or high school depending on different factors. While learning a new skill, it is important to receive continuous and clear feedback. For touch typing, the focus are in three things – Accuracy, Speed, and Finger maintenance. And the goal is to be able to type without looking at keyboard. As mentioned before, most of the touch typing platforms focus on Accuracy and speed. However, “Touch Type” simulator aims to provide additional feedback on finger key performance and body posture. And based on the study, even though the simulator still needs to be improved, it accomplishes to provide clear intended distinguishable feedback based on typing performance and body posture.

- Some potential next steps to take this platform next level can be:
- Adding visual instructions to make it inclusive for all types of users
- Better organized, user-friendly, sequential lesson plan
- Increase the time constraints between sensor checks for body posture, so the track\_posture sound changes less frequently and users don't get distracted.

More user tests could help to gain insights from different perspectives. However, with the implementations of these, this simulator can be a great platform to help people learn Touch Typing efficiently while maintaining great health.