

# **A Comparison of The Listening Speed of The Korean TTS for The Blind**

:Based on their screen reader experiences

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# Introduction

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- **Is there a development of TTS regarding the listening speed of the blind?**
  - Few research studies regarding the listening speed of the blind
    - Asakawa and Ino's study
      - ⇒ **Listening speed of the Japanese TTS for the blind**
    - Our Previous Study
      - ⇒ **Didn't consider the participant's screen reader experiences**
  - Our **New Study**
    - Focused on listening speed considering screen reader experiences and sentence familiarity
    - Classifying the participant's group into **an advanced group** and **a novice group** depending on their screen reader experiences

# Related Works

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- **Asakawa and Ino's study**
  - Examined the fastest and the most suitable listening speed of the Japanese TTS for the blind
  - Advanced blind tester could listen to the sentences at speeds 1.6 times faster than the highest rate of the tested TTS engine
  - Highest rate often changes depending on the difficulty of the sentences and words

# Related Works

## ■ Our previous study

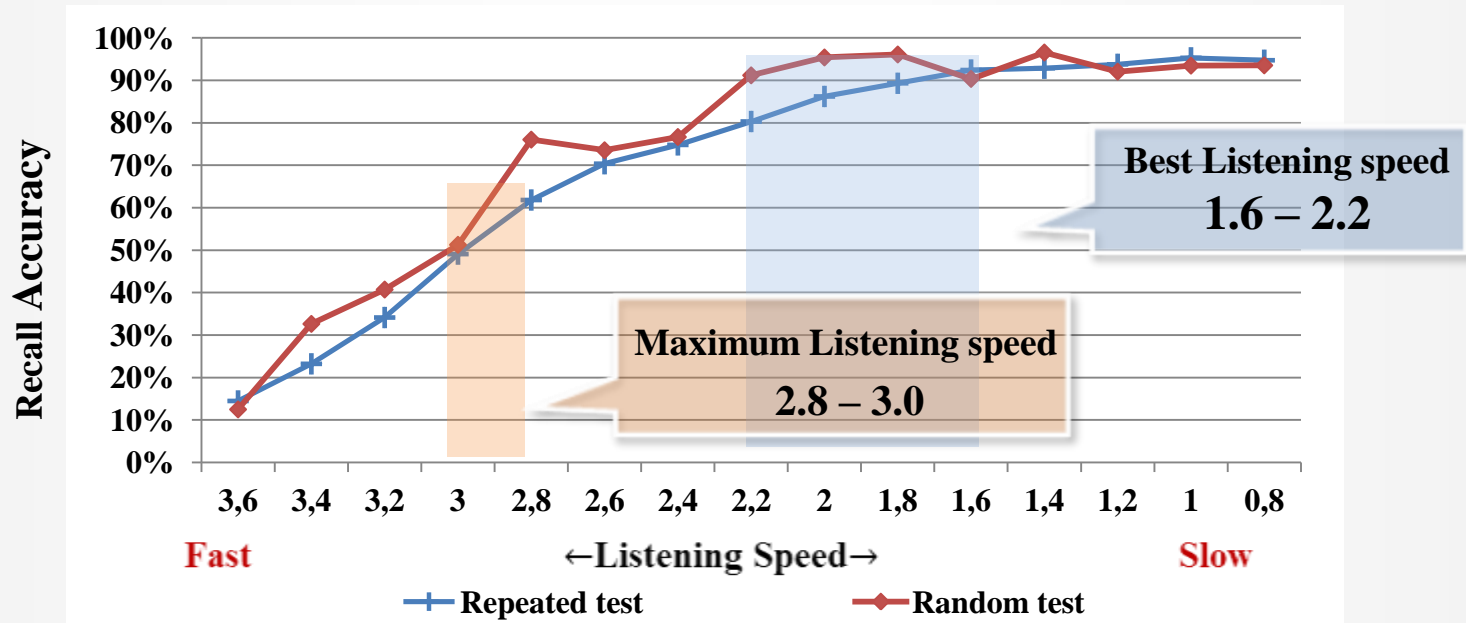


Figure 1. The Recall Accuracy depending on The Listening Speed

- Participant's recall accuracy tended to increase as the listening speed decreased
- **Maximum Listening Speed:** The fastest speed to catch the overall meanings of sentence briefly(50%)
- **Best Listening Speed:** The fastest speed to catch the meanings of sentence exactly(90%)
- Participants could recognize
  - About 50% of the content of sentences at speeds 2.8-3.0 times of normal speed
  - About 90% of the content of sentences at speeds 1.6-2.2 times of normal speed

# Methodology

## ■ Participants

- 10 participants who were blind (aged from 23 to 63, 3 females and 7 males)
- **Advanced group vs Novice group**
  - Depending on their screen reader experiences
  - Each group has 5 participants



	The using period of a screen reader	The average time of using a screen reader a day
 Advanced group	10 years	3 hours
	10 years	10 hours
	1 year	13-14 hours
	10 years	More than 14 hours
	More than 10 years	More than 14 hours
 Novice group	X	X
	X	X
	X	X
	X	X
	1-2 years	4 hours

Table 1. participants' screen reader experiences

# Methodology

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## ▪ **Listening Speed**

- The standard speed 1.0 means 285.96 syllables per minute which is similar to the Korean's ordinary communication speed of 300.00 syllables per minute
- 15 different speeds (0.8, 1.0 ... 3.4, 3.6)
- Range=0.8-3.6

## ▪ **Evaluation Method**

- Repeated test
  - Same sentences for different speeds
- Random test
  - Different sentences for different speeds

# Methodology

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## ▪ Evaluation process





# Results (1/2)

## Repeated test results for sentence familiarity(10 sets)

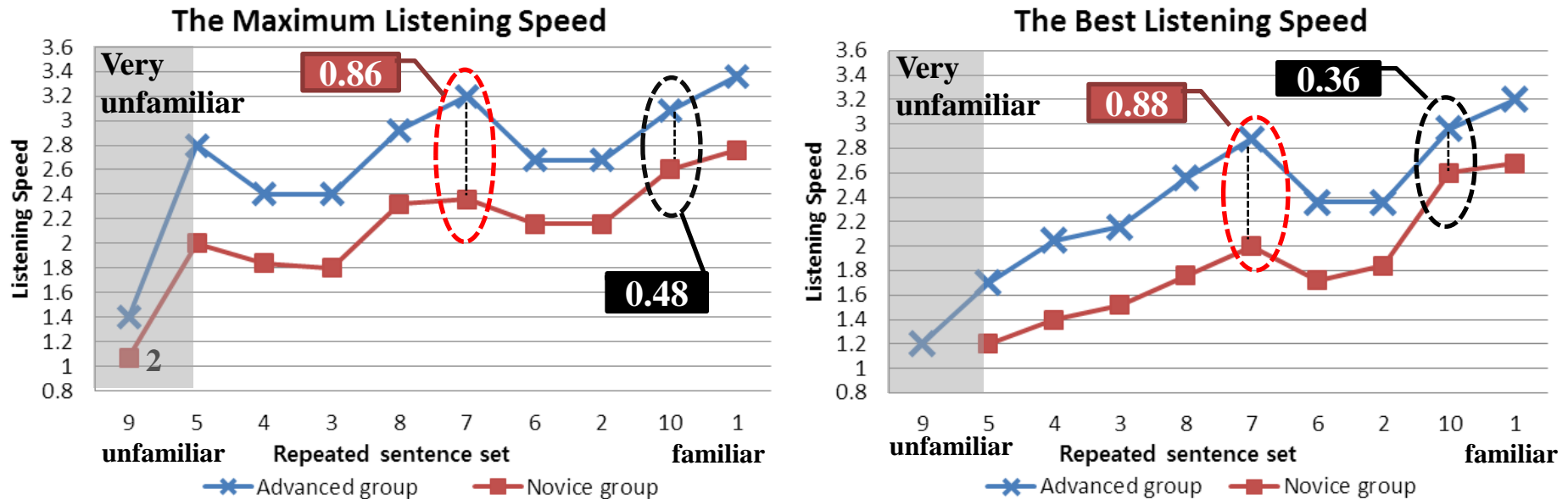


Figure 2. The Maximum and Best Listening Speed for the Repeated Sentence Set

- The advanced group's listening speed was faster than that in the novice group
- The biggest difference was found at the sentence containing computer terms(#7)
- The smallest difference was found at the familiar Korean proverbs(#10)
- Listening speeds of the sentences containing abbreviation of English words(#3) or proper nouns(#4) or numbers(#6) were relatively slow

\* Repeated sentences set number 9 was excluded from this evaluation

# Results (2/2)

## ■ Random test results for sentence familiarity(5 sets)

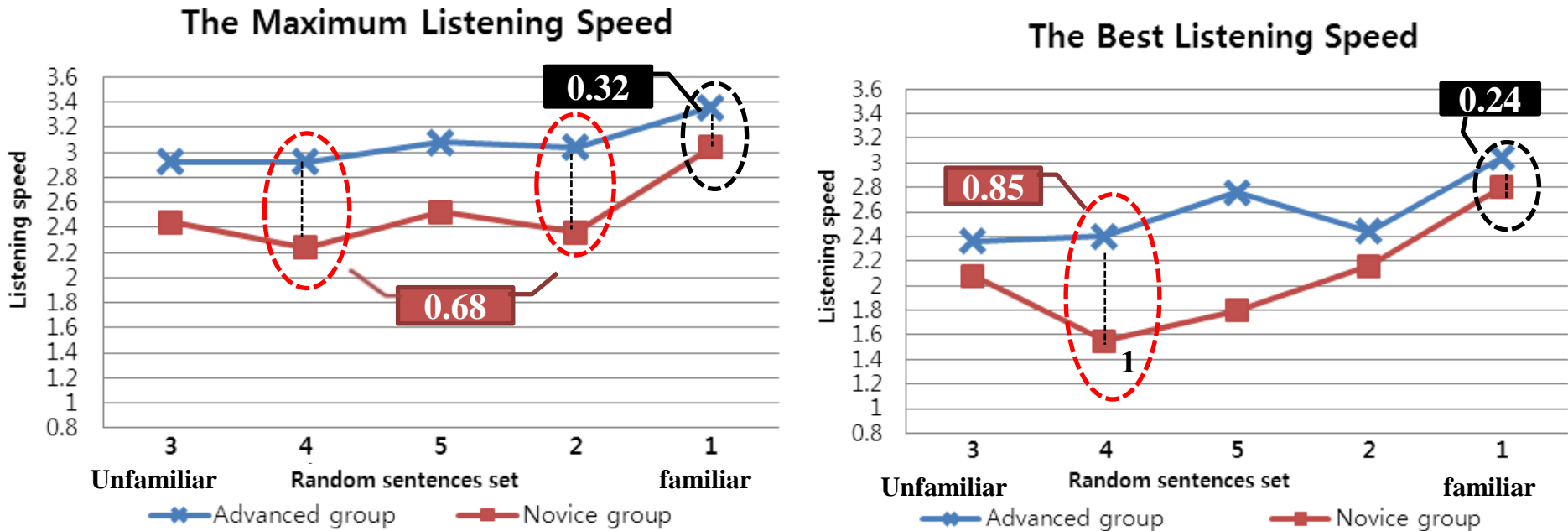


Figure 3. The Maximum and Best Listening for the Random Sentence Set

- The advanced group's listening speed was faster than that in the novice group
- The biggest difference was found at the sentences containing academic jargons(#4)
- The smallest difference was found at the familiar Korean proverbs(#1)
- Sentence set number 2 consisted of sentences containing computer terms

# Conclusion

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- Positive correlations between participants' screen reader experiences and their listening speeds of the Korean TTS
- The difference in the listening speeds between the advanced group and the novice group was related to the familiarity of sentences
- Providing slower rates at the proper nouns or numbers or abbreviation of English words may help blind users to access information more accurately
- Our findings provide TTS developers and special educators meaningful information on the auditory information processing abilities of the blind with a variety of TTS experiences

**THANK YOU  
FOR LISTENING!**

# APPENDIX. A

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## - Repeated Sentence Sets

(Some maybe a bit odd when translated into English)

- ① Little strokes fell great oaks
- ② Three men can make an imaginary tiger
- ③ The LG team chalked up their nine consecutive victories over the SK team
- ④ We are lending “Hansone Braille” to applicants
- ⑤ This is the customized support page that based on the smart design
- ⑥ The total number of stations are 15 stations and it takes 36 minutes
- ⑦ Nowadays, the site was unstable because of the cyber hacking
- ⑧ New paradigm is required such as the universal learning design
- ⑨ There is no rest for a family with many children
- ⑩ One ill word asks another

# APPENDIX. A

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## - **Random Sentence Sets**

- ① Familiar Korean proverbs
- ② Sentences containing computer terms
- ③ Unfamiliar Korean proverbs
- ④ Sentences containing academic jargons
- ⑤ Sentences containing abbreviation of English words or numbers

# APPENDIX. B

## Methodology of The Previous Study(1/2)

### ▪ **Participants**

- 5 participants who have used a screen reader in their daily lives(aged from 35 to 50, 2 females and 3 males)

### ▪ **Sentence Sets**

- 17 sentence sets<sup>1)</sup>
- Familiarity on sentences

### ▪ **Evaluation method**

- Repeated test
  - Same sentences for different speeds
- Random test
  - Different sentences for different speeds

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<sup>1)</sup> 2 sets for an exercise, 10 sets for a repeated test, and 5 sets for a random test

# APPENDIX. B

## Methodology of The Previous Study(2/2)

- **Objective Recall Accuracy**
- **Listening Speed**
  - Range=0.8-3.6<sup>3)</sup>, SD=0.2
  - **Maximum Listening Speed**
    - At least 50% correctly recalled speed
  - **Best Listening Speed**
    - At least 90% correctly recalled speed

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<sup>3)</sup>The standard speed 1.0 means 285.96 syllables per minute which is similar to the Korean's ordinary communication speed of 300.00 syllables per minute