

한국어 Hearing in Noise Test(HINT) 문장의 개발

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Development of Sentences for Korean Hearing in Noise Test(KHINT)

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ABSTRACT

Background and Objectives : Hearing in Noise Test (HINT) is a modified speech reception test using digitally recorded sentences. It is useful in assessing speech communication in noise. This test is easy to set up and to standardize by the commercialized HINT system. We aimed to develop sentences for the Korean HINT system so as to enable international comparative studies. **Subjects and Method** : Seven hundred fifty natural written sentences were prepared. They were digitally recorded by a professional voice actor, and long-term average spectrum of recorded sentences was calculated for masking noise. The performance-intensity test estimated the relationship between signal-to-noise ratio (S/N ratio) and percent word intelligibility by testing ten normal hearing adults. The next step was to equate the intelligibility of sentences when they were presented in masking noise at a fixed level, and 250 sentences were chosen. Individual phonemes in each sentence were counted after phonemic transcription using international phonemic alphabet. **Results** : Long-term speech spectrum of Korean sentences showed relatively lower level, especially in high tone, compared to other foreign languages. One dB change of SNR resulted in 9% word intelligibility change. Twenty five lists of ten sentences were formed by adjusting composition of sentences to obtain even phoneme distribution, which were had 9.21.1 syllables. **Conclusion** : Prepared sentences for the Korean HINT will be useful for assessing functional hearing activity as well as international cross-language studies. (Korean J Otolaryngol 2005;48:724-8)

KEY WORDS : Speech audiometry · Noise · Hearing test · Speech perception.

Connected Speech Test, City University of New York
topic - related sentences Speech Perception in Noise
Test

가 . ,
2-4)

(speech

reception test) Hearing in Noise Test(HINT)

가 .⁵⁾ HINT

(reception level)

가

가
가 .¹⁾

가

가

: 2004 8 14 / : 2005 3 16
: , 443 - 721 5

가 가 . HINT

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가 가

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House Ear Institute(Los Angeles, CA, USA) Ariel digital signal processing board, TMS320 processor AND 16-bit A/D converter 70 dB SPL long-term average spectrum (speech naturalness) Performance - intensity(PI) function (signal/noise=S/N) (Pentium, Sens V20, Samsung, Korea) sound card(Crystal WDM AC 97 Driver for ICH 4) (Aurical, Madsen Electronics, USA) calibration VU meter 0 dB VU가

Table 1. Modified international phonetic alphabet for Korean and example of transcription

Consonants						
	Nasal bilabial	Nasal alveolar	Nasal velar	Plosive bilabial lax	Plosive bilabial tense	Plosive bilabial aspirated
IPA symbol	m		ŋ	p	p'	p ^h
Type character	m	N	ng	p	pp	px
	Plosive bilabial unreleased	Plosive alveolar lax	Plosive alveolar tense	Plosive alveolar aspirated	Plosive alveolar unreleased	Plosive velar lax
IPA symbol	ɸ	t	t'	t ^h	t̚	k
Type character	p	t	tt	tx	T	k
	Plosive velar tense	Plosive velar aspirated	Plosive velar unreleased	Fricative alveolar lax	Fricative alveolar tense	Fricative postalveolar lax
IPA symbol	k'	k ^h	k̚	s	s'	ʃ
Type character	kk	kx	K	s	ss	sh
	Fricative postalveolar tense	Fricative glottal	Affricate alveolar-palatal lax	Affricate alveolar-palatal tense	Affricate alveolar-palatal aspirated	Lateral approximant
IPA symbol	ʃ'	h	tʃ	tʃ'	tʃ ^h	l
Type character	SH	h	c	cc	cx	l
Vowels						
	Front high	Front mid	Back high	Back mid	<Korean sentences >	
IPA symbol	i	e	u	ɤ	1) 가 .	
Tape character	i	E	l	A	2) 가 .	
	Back low	Back high	Back mid		3) 가 가 .	
IPA symbol	a	u	o		4) ?	
Type character	a	u	o		5) .	
	Diphthong	Diphthong	Diphthong	Diphthong	<IPA transcription >	
IPA symbol	j	jɤ	ju	ja	1) kl kakenln pulcxincAlata.	
Type character	ye	yA	yu	ya	2) sane kasA sacinll cciikAtta.	
	Diphthong	Diphthong	Diphthong	Diphthong	3) sAlapane kaUka issAyo.	
IPA symbol	jo	wi	wɤ	wa	4) ilpone kan cAKi issAyo?	
Type character	yo	wi	wA	wa	5) halmAnikke kamll satllyAtta.	
	Diphthong	Diphthong				
IPA symbol	w	wi				
Type character	wE	Wi				

1 m 65 dBA
 65 dBA
 S/N) 3 S/N(-7, -4, -2 dB)
 50 3
 S/N
 가 S/N
 S/N 1 dB
 가 10%
 가
 PI function 가 10%/1 dB
 10 S/N
 . 1
 가 70% PI function
 50% 가
 80%
 . 2 가 70% 가 65 dBA S/N
 가 250

(phonemic transcription and evaluation)

250 (international
 phonetic alphabet) 24가
 6)
 17가 가
 (Table 1). 가
 10 25
 가
 750 1 25 3
 . 2
 4.6 702
 4 가

longterm spectrum
 가 (Fig. 1).
 Performance intensity function
 PI function S/N
 가
 9%/1 dB SNR(signal to noise ratio) S/N
 1 dB 9%
 가 (Fig. 2). 1
 가 70% 가 750

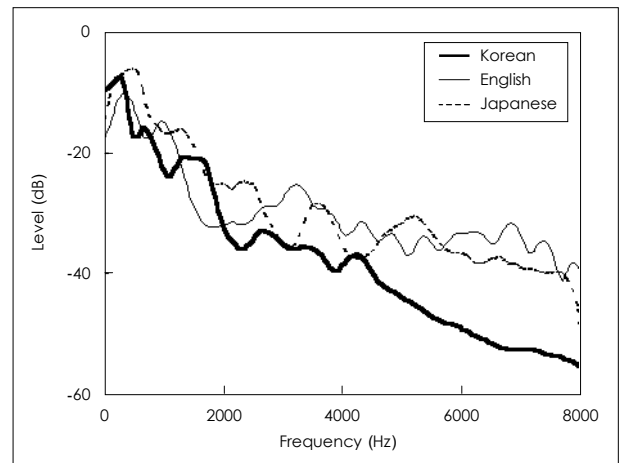


Fig. 1. Long-term speech spectrum curve of recorded sentences, used as masking speech noise. Korean shows relatively lower level, especially in high tone, comparing with other foreign languages.

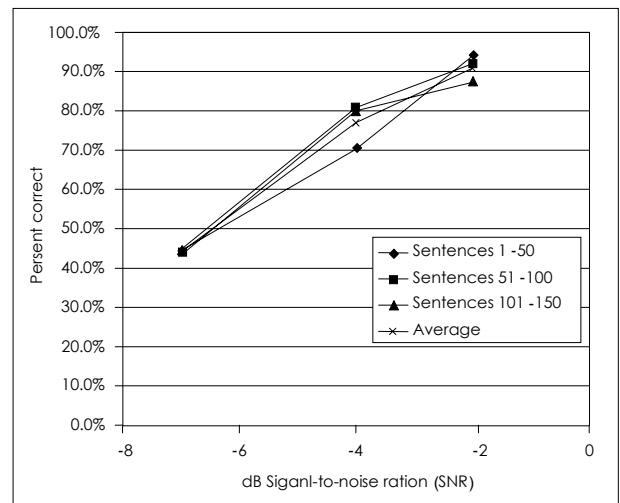


Fig. 2. Performance-Intensity function curve showing the relationship between signal-to-noise ratio (SNR) and percent word intelligibility in the sentences. The slope of this function is calculated in percent intelligibility change/dB SNR change, which is approximately 9%/1 dB S/N.

14% 105 , PI func-
 tion (9%/1 dB SNR) 2 가 HINT (speech
 가 70% 가 noise)
 20% 150 (Fig. 3). 가
 가 70% 80% 가
 250 가
 1.1 3.2 ± 0.6 9.2 ± 가
 (16.5) (Table 2). 가 HINT (speech reception test)
 6 (spondee word)
 HINT 10 25 가
 6 가

Hearing in Noise Test(HINT)

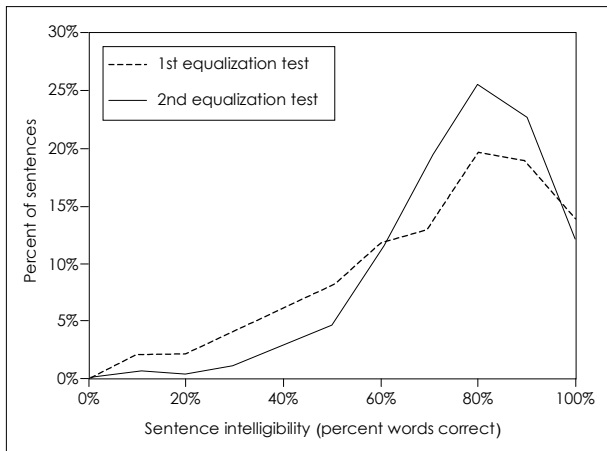


Fig. 3. Distribution curve of sentence intelligibility in masking noise at 65 dBA. Approximately 20% of sentences show 70% of sentence intelligibility after 1st equalization test and adjustment of sentence signal level.

Table 2. Examples of Korean, English and Japanese sentences of hearing in noise test

Korean	English	Japanese
가	A/the boy fell from a/the window.	朝ご飯を食べて 元気に 出かけた.
가	A/the wife helped her husband.	ばっさり 髪を 切って さっぱりした.
가 가	Big dogs can be dangerous.	音楽に 合わせて 楽しく 踊る.
?	Her shoes are/were very dirty.	トラックに 荷物を 積んで 引っ越した.
가	A/the player lost a/the shoe.	歯磨きを 忘れると虫歯に なる.
가	Somebody stole the money.	やっと 町の 明かりが 見えて きた.
가	A/the fire is/was very hot.	夏は 麦藁帽子が 必要だ.
?	She's drinking from her own cup.	起きたら すぐに ラジオ 体操を します.
가	A/the picture came from a/the book.	窓から ぼんやり 景色を 眺めた.
가	A/the car is/was going to fast.	お盆休みは 全国 静かです.

가
 가 HINT (11)
 10
 9)10)
 Speech Perception in Noise Test가
 HINT
 HINT
 가
 가 가
 HINT
 : . . .
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 2003
 (2003 - 042 - D00167)

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