THE DEVELOPMENT OF A THAI WORD DISCRIMINATION BY PICTURE IDENTIFICATION TEST: PRELIMINARY FINDINGS

GAIL D. CHERMAK AND NUALNIPHA B. PHANIJPHAND*

Abstract

A Thai word discrimination by picture identification test was developed. Phonemic and tonemic contrasts comprised the fine and gross discriminations. Four lists of 25 words each were randomly assembled. Twelve normal hearing native adult Thai speakers served as subjects. The test was administered to each subject both auditorally and auditorally with the closed-set visual cues provided by the pictures. Pearson's product moment correlation coefficients revealed significant correlations between 2 and 3 pairs of lists only when presented in the combined auditory (closed-set)-visual mode and the auditory mode, respectively. Modifications need to be incorporated before this test is clinically reliable. Limitations of the present study in terms of subjects was discussed.

The understanding of speech requires the listener to discriminate and identify the units of a message. Word discrimination testing by picture identification, as well as verbal responding to orally presented materials, is well known in the practice of audiology in the United States of America and other western countries. Test materials and procedures in non-western countries are not as well as developed (Oyer, 1976).

In Thailand, audiology is just beginning to serve the needs of the people. The author will be the third audiologist in this country. One of the needs in terms of materials is a speech discrimination test for the non-verbal, uncooperative, or young patient. It is not feasible to utilize adult speech discrimination tests with children (3-6years) for several reasons:

(1) Considering their probable stage in language development, the test words are unfamiliar and auditory recognition is not possible. (Ross and Lerman, 1971)
(2) Articulatory development in the normal hearing child is often incomplete at this age which may result in unintelligible oral responses.

* Southern Illinois University, U.S.A.

(3) Written responses are not feasible due to their age. (Roes and Lerman, 1971)

A picture test similar to the WIPI (Word Intelligibility by Picture Identification), (Ross and Lerman, 1971) has been developed to meet the audiological need in Thailand for a word discrimination test for this population.

Procedures

A Thai word discrimination picture identification test was developed. The Words utilized are: (1) in common use in Thai daily life, (2) within the receptive vocabulary of this age group (3-4 years) and (3) easily communicated through pictures. The pictures were drawn by a Thai art student in Thailand.

Test Development

One hundred and fifty pictures, 6 per page, comprise the test. Each picture represents a monosyllabic word. Four lists of 25 words each were randomly assembled. Fine and gross discriminations per list were on the order of 60 per cent and 40 per cent, respectively. As Thai is a tonemic language[1], words contrasted on tonemic as well as consonant i dimensions. Vowels remained constant among the 6 words per page. Of the 21 Thai vowels[2], all were used except /a:y, o:y, uy, iw, ew, e:w/. Words with hose vowel phonemes primarily carry abstract meanings which are not feasible ior communication through pictures. There are 21 consonant phonemes, and 12 consonant clusters in the Thai language[3]. Initial consonant contrasts account for 52 per cent o£all fine discriminations incorporated in the test. All possible final consonant phonemes were utilized in the picture test. Final consonant contrasts account for 5 per cent of all fine discriminations and 25 percent of all gross discriminations, Tonemic contrasts account for 3 per cent of all fine discriminations. The remaining 15 per cent of gross discriminations was due to initial consonant contrasts.

Test Administration

Twelve, normal hearing native adult speakers of Thai served as subjects (X age=27; range=19 - 37 years). Prior to participation in this study each subject's hearing sensitivity was measured using a Beitone 200C Clinical audiometer. (The calibration of the instrument was checked prior to experimental use, ANSI '69, using a Bruel and Kjaer Sound Level Meter, Type 2203, and its associated Artificial Ear, Type 4152). Hearing sensitivity better than 15dB HL bilaterally at all octave frequencies from 25OHz - 8KHz was considered normal hearing for this study. Pure tone averages for the speech frequencies were calculated for

[1] Appendix A. [2] Appendix B. [8] Appendix C.

each subject's right ear. The PTA was used as a reference for the experimental **task.**

Each of 12 subjects was required to attend to a total of 8 lists[4], 25 words per list, 4 presented via live voice (auditory mode)[5], and 4 presented orally (live voice), utilizing the closed-set visual cues provided by the pictures (auditory-visual, combined presentation). Mode of response was pointing to the correct picture in the latter 4 conditions and writing down the word heard in the auditory conditions. All testing was accomplished in a double walled IAC sound treated booth. All stimuli were presented at 25 dB SL (re:PTA) to the subjects' right ear using a TDH-39 earphone mounted in an MX 41/AR cushion. Simultaneously, speech noise was presented to the subject's right ear at a signal to noise ratio (SNR) of-8 dB. Subjects were instructed to ignore the noise, listen to the word, and point to the appropriate picture or write down the appropriate word (all instructions were presented in Thai). Each stimulus was precedaed by the carrier phase 'point to' /ch'i: pay $\overset{A}{\text{thi}}$/ or'write down'/$k^h\overset{v}{\text{ian}}$ k^h am $\overset{A}{\text{wa}}$/. The order of experimental conditions was randomly determined prior to subject participation to control for learning and practice effects.

Each correct response received 4 percentage points. Discrimination scores in percentages served as measures. Means, standard deviations, Pearson product moment correlations, and confusion matrices aided in the analysis of the data.

Results

Word discrimination scores in percentages served as measures. Mean discrimination scores and standard deviations for 12 subjects under each of 8 conditions were calculated (see Table 1). Twelve Pearson's Product Moment

TABLE 1

Means in per cent correct and standard deviations for word discrimination in S experimental conditions, N = 12

Combined	Lists	X	S.D.
	1	97.33	3.55
	2	91.67	7.13
		92.33	8.27
	4	90.00	8.27
Auditory	1	87.67	10.85
	2	77.33	19.17
	3	77.00	16.72
	4	79.67	15.58

* The 4 lists in Thai and their English translations are found in Appendix D.

• It was reasoned that these lists might function in a manner similar to the Haskins kindergarten lists. (Haskins, 1949)

Correlation Coefficients were calculated to determine list equivalence (see Tables 2 and 3).

TABLE- 2

Pearson Product Moment Correlation Coefficients for 4 word lists presented in the auditory visual (picture) mode, N = 12

Lists	2	3	4
1	.08	.34	.40
2		.38	.65*
3			.77*

*P < .05

TABLE: 3

Pearson Product Moment Correlation Coefficients for 4 word lists presented auditorally, N = 12

Lists	2	3	4
1	.05	,21	.40
2		,53*	.66*
3			.59*

•P < .05

As can be seen in Table 1, word discrimination was better and variance was greater in the combined (auditory and closed-set visual) mode. A total of 5 correlations were found to be significant at the .05 level of confidence; two of these were among the auditory-visually presented lists and 3 among the auditorally presented lists.

Confusion matrices revealed the following information as seen in Table 4: (1) tonemic errors averaged across lists accoun ted tor 7.7 per cent of errors in the auditory mode and 15.8 per cent of errors n the combined mode; (2) vowel errors averaged across lists accounted for 17.3 ; er cent of errors in the auditory mode and 4.6 per cent of errors in the combined mode; (3) initial consonant errors averaged across lists accounted for 28.7 per cent of errors in the auditory mode and 48.1 per cent of errors in the combined mode; (4) final consonant errors averaged across lists accounted for 46.4 per cent of errors in the auditory mode and 31.6 per cent of errors in the combined mode.

TABLE: 4

Distribution of Tonemic and Phonemic Errors (vowel, initial consonant and final consonant), expressed in number of errors and per cent of errors for each of the four lists in two experimental conditions. Auditory and combined auditory-visual (pictured N = 12

	List 1		List: 2		List 3		List: 4		Mean (x)	
	Aud.	Cbd.	Aud.	Cbd.	Aud	Cbd.	Aud.	Cbd.	Aud.	Cbd.
1. Total Number of Tonemic Errors	4	3	3	0	13	6	8	3	7.0	3.0
2. Total Number of Vowel Errors	12	0	15	0	20	3	13	2	15.0	1.2
3. Total Number of Initial Consonant Errors	19	5	23	11	29	11	29	15	25.0	10.5
4. Total Number of Final Consonant Errors	26	2	48	11	45	6	44	10	40	7.2
5. Total Number of Errors	61	10	89	22	107	26	94	30	87.0	22.0
6. Per cent of Total Errors due to Tonemic Confusion	6.6	30.0	3.4	0.0	12.2	23.1	8.5	10.0	7.7	15.7
7. Per cent of Total Errors due to Vowel Confusion	19.7	0.0	16.9	0.0	18.7	11.5	13.8	6.7	17.3	4.5
8. Per cent of Total Errors due to Initial Consonant Confusion	31.2	50.0	25.8	50.0	27.1	42.3	30.9	50.0	28.7	48.0
9. Per cent of Total Errors due to Final Consonant Confusion	42.6	20.0	53.9	50.0	42.1	23.1	46.8	33.3	46.4	31.6
10. Total Errors in Percentage	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Discussion

The present results indicate that the greatest percentage of errors in the discrimination of monosyllabic words was due to initial consonant confusion and final consonant confusion in the combined and auditory conditions, respectively. Although vowels remained constant among the six words represented by pictures, per page, vowel confusion accounted for 4.5 per cent of the total errors in the combined mode. In the auditory mode, vowel confusion caused considerably more errors (17.3 per cent). Tonemic contrasts accounted for 3 per cent of the fine discriminations in the test; however, tonemic confusion was relatively great, 15.7 per cent and 7.7 per cent in the combined and auditory modes, respectively. Whereas, initial consonant contrasts accounted for 67 per cent of the discriminations (52 per cent of all fine discriminations and 15 pet cent of all gross discrimination), errors due to initial consonant confusion was 48 per cent in the combined and 28.7 per cent in the auditory mode. Final consonant contrasts accounted for 30 per cent of all discriminations (25 per cent of gross discriminations and 5 per cent of all fine discrimination); errors due to

final consonant confusion was 46.0 per cent in the auditory mode and 31.6 per cent in the combined mode. It is apparent that tonemic confusion and final consonant confusion provided proportionately more trouble for the subject.

Correlation coefficients indicate that in its present form the Thai word discrimination by picture identification test is not useful clinically. Although the significant correlation between lists 2 and 4, 2 and 3, and 3 and 4 were fair to good (in terms of magnitude), these were the only correlations found to be significant. The lack of significant correlations may be due in part to the small sample (N=12), the small number of test items (N=25), and the small variance, especially in the combined mode of presentation.

The test in its present form may produce different correlations if administered to the intended population. Children between the ages of 3-6 possess less well developed language and auditory perceptual skills than the adults used in the present study (Maccoby, 1967). Some researchers contend that children display different modes of linguistic processing (Brown and Bellugi, 1964; Klima and Bellugi, 1966). Therefore, it is imperative that young Thai children serve as subjects for this test instrument. The second author will conduct such a study upon returning to Thailand.

It was observed that several pictures were confusing for the subjetcs and therefore should be re-drawn for future use These pictures include: (1) the hole; (2) the roll of cloth material; (3) the dam; (4) the crooked line; (5) the representation of the adjective deep.

Summary and Conclusions

A Thai word discrimination by picture identification test was developed. Inter-form equivalence was poor as assessed by Pearson's Product Moment Correlation Coefficients. Confusion matrices revealed a disproportionate amount of confusion caused by tonemic and final consonant contrasts in the combined (auditory-visual) and auditory modes of presentation. Prior to the clinical utilization of this test modifications must be made to establish inter-form reliability and more proportionate dispersion of errors. In addition, the utilization of Thai children as subjects may provide different results.

APPENDIX A

Thai Tonemes

The five Thai Tonemes are high, mid, low, rising and falling, represented by the following symbols marked on top of the vowel phonemes:

1. The "mid" tone, no symbol representation.
2. The "high" tone, represented by / '/ .
3. The "low" tone, represented by / * /.
4. The "rising" tone, represented by /$^{v/}$
5. The "falling" tone, represented by /$^{A/}$.

APPENDIX B

Thai Vowels

Classified by Shape of Lips, and Height and Place of the Tongue

	Unrounded Front		Central		Rounded Back	
High	/ i /	/i:/	/w / / w : /		*Inl*	*lu:l*
Mid	*/e /	/e:/	/ə/	/ə:/	*lot*	*lo:l*
Low	/se/ l	/əe:/	/ a /	/ a : /	*/o/*	*lo:l*

*/:/ indicates vowel length, which is significant in Thai.

The three Thai diphthongs are / ia, wa, ua /. The Thai semi-vowels include / w / and / y /.

APPENDIX C

Thai Consonants

Classified according to Manner and Place of Articulation

Manner of Articulation \ Place of Articulation	Bi-labial	Labio-dental	Apico-alveolar	Alveo-palatal	Dorso-velar	Glottal
1. Stop:						
(a) Voiced	*Ibl*	—	*/d/*	—	—	/ /
(b) Voiceless Aspirated	*/ph/*	—	*/th/*	/ch/	/kh/	—
(c) Voiceless Unaspirated	*/p/*	—	*/t/*	/ c /	/k/	—
2. Fricative, voiceless	—	*/f/*	/ s /	—	—	/ h /
3.. Nasal:	/m/	—	*/n/*	—	/ /	—
4. Lateral:	—	—	*/l/*	—	—	—
S. Flap:	—	—	—	*/r/*	—	—
6. Semi-vowel:	/ w /	—	—	*/y/*	— -	—

• The /h/ that accompanies the voiceless stops / p,t,c,k / is the aspiration ; h /. There are ten consonant clusters functioning with / r,l /. They are / pr—, ph r—, pl—, ph 1—, tr—, th r—, kr—, kh r—, kl—, kh 1— /. The consonant clusters with / w / are / kw—and kh w— /. These, clusters never occur finally. There are only nine final consonant phonemes: /—p, —t, *V* —k —n, —m, —n, —3, —w, —y /.

APPENDIX D

1.. Thai Word Discrimination Picture Identification Test

Item	List 1	List 2	List 3	List 4
1	/ŋu:/	/hŭ:/	/pu:/	/mŭ:/
2	/ŋa:/	/bà:/	/mă:/	/hâ:/
3	/ca:n/	/bâ:n/	/kʰwă:n/	/rá:n/
4	/kʰwa:y/	/wâ:y/	/ya:y/	/dâ:y/
5	/pèt/	/dèk/	/hèt/	/bèt/
6	/rwa/	/sŭa/	/sùa/	/ŋùa/
7	/pʰ^wan/	/rwan/	/dwat/	/cʰ^wak/
8	/pʰát/	/wát/	/hàk/	/kàt/
9	/tʰà:t/	/hà:p/	/kwà:t/	/krà:p/
10	/tʰɔ́:ŋ/	/klɔ:ŋ/	/sɔ̌:ŋ/	/kʰlɔ:ŋ/
11	/caw/	/tàw/	/kʰâ:w/	/wâ:w/
12	/cʰɔ́:n/	/mɔ̌:n/	/nɔ̌:n/	/nɔ:n/
13	/ŋɔ́?/	/kɔ́k/	/pɔ̀:k/	/kɔ̀?/
14	/kʰ^iaw/	/kʰ^ian/	/kʰ^iaw/	/kʰ^iaŋ/
15	/mót/	/rót/	/kʰrók/	/hòk/
16	/klûay/	/kʰùat/	/mùat/	/kruay/
17	/kày/	/kʰòy/	/lày/	/fay/
18	/hɔ̌y/	/kɔ̂y/	/rɔ́y/	/sɔ̂y/
19	/tó?/	/hŏ:n/	/lɔ́:n/	/kʰ^ɔ:n/
20	/hì:p/	/mî:t/	/klî:p/	/kʰrî:p/
21	/rôm/	/lóm/	/kʰon/	/pʰ^om/
22	/wæ̌:n/	/kʰ^æ:n/	/wèŋ/	/wæ̂n/
23	/pu:n/	/rûk/	/mûk/	/pʰ^uŋ/
24	/cæ:w/	/kâ:w/	/hâw/	/tʰ^æw/
25	/cʰ^ù:p/	/lû:k/	/plù:k/	/cùk/

APPENDIX D

2. English Translation of Thai Word List

Item	List 1	List 2
1.	Snake	Ear
2.	Tusk (animal's)	Shoulder
3.	Dish	Home
4.	Buffalo	A manner of respect
5.	Duck	Child (general)
6.	Boat	Tiger
7.	Friend	House
8.	Fan	Buddhist temple
9.	Tray	A basket carrier
10.	Stomach	Drum
11.	Stove	Tortoise
12.	Spoon	Pillow
13.	A kind of fruit	Water tap
14.	Green	Write
15.	Ant	Vehicle
16.	Banana	Bottle
17.	Chicken	Egg
18.	Shell fish	Little finger
19.	Table	Howl
20.	Box	Knife
21.	Umbrella	Fall
22.	Ring	Arm
23.	Gun	Building
24.	Paddle	Glass
25.	Incense stick	Child (of parents')

APPENDIX D

3. English Translation of Thai Word List

Item	List 3	List 4
1.	Crab	Pig
2.	Dog	Five
3.	Axe	Store
4.	Grandmother	Thread
5.	Mushroom	Fish hook
6.	Mat	Sweat
7.	Boil	String
8.	Break (v)	Bite
9.	Sweep	A manner of great respect
10.	Two	Canal
11.	Rice	Kite
12.	Worm	Sleep (v)
13.	Peel	Island
14.	Fang	Cutter
15.	Grinding pot	Spill
16.	Mustache	Cone
17.	Shoulder	Fire
18.	Hundred	Neklace
19.	Bald	Falling trees (action)
20.	Petal	Fin
21.	Person	Hair (on head only)
22.	Part of something broken off	Eye glasses
23.	Ink	Bee
24.	Water chestnut	Row
25.	Plant (v)	Top knot

REFERENCES

Brown, R. and Bellugi, U., Three Processes in the Child's Acquisition of Syntex. In F. Linneberg (Ed.), *New Directions in the Study of Language*. (Cambridge: M.I.T. Press, 1964), 131-161.

Haskins, H. L., *A Phonetically Balanced Tes; of Speech Discrimination for Children, M.* A. Thesis, Northwestern University, 1949.

Klima, E. S. and Bellugi, U., Syntactic Regularities in the Speech by Children, In J. Lyons and R. J. Wales (Eds.). *Psycholinguistics Paper: The Proceedings of the 1966 Edinburgh Conference*. (Edinburgh University Press, 1966), 133-220.

Maccoby, E. E., Selective Auditory Attention in children. *Advanced Child Development Behaviour*, 3, 1967, 99-124.

Oyer, H. J., *Communication for the Hearing Handicaped.. An Inernational Perspective* (Baltimore, Maryland: University Park Press. 1976).

Ross, M. and Lerman, J., *Word Intelligibility by Pictest Identification*. (Pittsburgh: Stanwix House, 1971).

Ross, M. and Lerman, J., A Picture Identification Test for Hearing Impaired Children. *Journal of Speech and Hearing Research*, 13, 1970.