

Native and Non-native Vowel Discrimination in Dutch Learning Infants

Previous research has shown that speech perception changes from universal to language-specific during the first year of life, often referred to as perceptual narrowing (for a review see Maurer & Werker, 2014). For non-native vowels, a gradual decline has been reported between 4 and 12 months, with 10-month-old English-learning infants losing the ability to discriminate between vowels such as /u:/ and /y:/ (Polka & Werker, 1994). However, exceptions to this pattern have also been reported. For instance, Mazuka et al. (2014) found the same decline for /u:/ - /y:/ in Japanese 4- and 10-month-olds, but the reverse pattern for /i:/ - /e:/, which was discriminated at 10 but not 4 months. Furthermore, German infants aged 6-8 months and 10-12 months discriminated between a non-native /æ/ - /ɛ/ contrast, but only when they were trained on /æ/ (Polka & Bohn, 1996).

To provide further cross-linguistic evidence, this study compares native and non-native vowel discrimination in Dutch 6-, 8- and 10-month-olds, using the same non-native /æ/ - /ɛ/ contrast.

Infants in the three age groups (see Table 1) were tested on vowel discrimination using the hybrid visual fixation paradigm (Houston et al., 2007). The task consisted of a pre- and posttest to control for general attention, a habituation phase (12 trials) and a test phase containing 4 alternating and 8 non-alternating trials, with longer looking times to alternating trials indicating discrimination. Native vowels were /e:/ and /a:/, embedded in pseudo-words /fe:p/ and /fa:p/, non-native vowels were /æ/ and /ɛ/, embedded in pseudo-words /sæn/ and /sɛn/, produced by four different female speakers. Infants were trained on one of the two vowels (e.g., either /fe:p/ or /fa:p/ in the native condition and either /sæn/ or /sɛn/ in the non-native condition). Infants received either the native or non-native contrast first; order was counterbalanced, but not all infants completed both tasks due to behavior (crying, fussiness) or failure to habituate.

Results are reported in Table 2 and 3. Mixed model analyses with *Subject* as random factor and *Trial type* (alternating and non-alternating trials) *Age* (6, 8 or 10 months) and *TrainingStimulus* (trained on /fe:p/ or /fa:p/, /sæn/ or /sɛn/) as fixed factors revealed that infants showed good discrimination for the native contrast at all ages, regardless of which vowel was used for training. Discrimination of the non-native contrast declined between 6 and 8 months, but was regained at 10 months. There was no interaction between *Trialtype* and *TrainingStimulus*, as infants could discriminate regardless of whether training was with /æ/ or /ɛ/.

These results show that while a native vowel contrast can be discriminated by Dutch infants, there is a decline in discrimination of a non-native vowel contrast between 6 and 8 months of age, showing the familiar perceptual narrowing effect. However, regained discrimination of the non-native /æ/-/ɛ/ contrast was attested at 10 months of age, regardless of training stimulus. Such a U-shaped pattern (i.e. a decline followed by renewed discrimination) has not been reported before for monolinguals, and implications for theories of speech sound categorization will be discussed.

Table 1

No. of subjects, Mean Age and Drop-out Rate per Month (6, 8 & 10). Native and Non-native contrast

	Age	Age range	M age (SD)	n	No females	Drop out
Native	6	5.16 - 6.30	203 (9.7)	48	15	34%
	8	8.0 - 8.30	259 (6.5)	41	26	21%
	10	10.3 - 10.3	320 (12.9)	35	19	19%
Total				124	76	27%
Nonnative	6	5.16 - 7.6	201 (9.8)	54	25	30 %
	8	8.12 - 8.29	261 (8.3)	41	24	40 %
	10	10.13 - 11.1	325 (6.8)	39	20	30 %
Total				134	85	33 %
Total overall				258	161	30 %

Table 2

Mean Looking Time (Log₁₀) to Alternating and Non-Alternating Trials of the Native Contrast

Age (mos)	Alternating Trials		Non-Alternating Trials		Alt minus Nonalt	F	p	Cohen's d
	M	(SD)	M	(SD)				
6	8.93	0.76	8.71	0.68	0.22	21.642	< .001	.31
8	8.81	0.74	8.55	0.71	0.27	31.947	< .001	.36
10	8.83	0.79	8.51	0.73	0.32	33.727	< .001	.43
Total	8.90	0.77	8.63	0.73	0.27	105.67	< .001	.35

Table 3

Mean Looking Time (Log₁₀) to Alternating and Non-Alternating Trials of the Non-native Contrast

Age (mos)	Alternating Trials		Non-Alternating Trials		Alt minus Nonalt	F	p	Cohen's d
	M	(SD)	M	(SD)				
6	3.79	0.31	3.74	0.32	0.05	6.428	.011	.16
8	3.73	0.29	3.72	0.31	0.01	.340	.560	
10	3.81	0.31	3.71	0.28	0.10	21.303	< .001	.34
Total	3.79	0.32	3.74	0.31	0.05	25.405	< .001	.16

References

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