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Speech Science Research Centre

# **Acquisition of Dutch phonology: an overview**

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# Acquisition of Dutch phonology: an overview

Ineke Mennen, Clara Levelt & Ellen Gerrits

## 1. Overview

Dutch is a West-Germanic language spoken by most inhabitants of the Netherlands (approximately 16 million speakers). It is the official language of the Netherlands, Belgium, Suriname, Aruba, and the Dutch Antilles. It is thought to be spoken by around 24 million people worldwide ([http://en.wikipedia.org/wiki/Dutch\\_language](http://en.wikipedia.org/wiki/Dutch_language)). Dutch has many dialects which differ from Standard Dutch in their vocabulary, syntax, morphology and phonology. The Netherlands has a heterogeneous population with people from many different nationalities and as a consequence a wide variety of languages is spoken. The majority of the immigrant population is from Turkish descent, followed by Surinam, and Moroccan descent (source: Statistics Netherlands, [www.cbs.nl](http://www.cbs.nl)). See Appendix A for resources pertaining to Dutch.

## 2. Countries where Dutch is spoken

Dutch is spoken in the Netherlands, but also in parts of Belgium (specifically, in the northern part, the provinces of West-Vlaanderen and Oost-Vlaanderen, Antwerpen, Limburg and Brabant) and in former colonies of the Netherlands (Surinam, Aruba and the Dutch Antilles, where it is used in education and government; Indonesia, where there are some speakers and it is also used in some law codes). A second official language of the Netherlands is Frisian, which is spoken by approximately 350,000 native speakers in the province of Fryslân (Friesland). Afrikaans, a daughter language of Dutch, is spoken mainly in South Africa, and in Botswana, Zimbabwe and Namibia (Booij, 1995).

## 3. Components of Dutch

### 3.1. Consonants

Dutch has 23 consonants (including allophones and marginal consonants) and is most closely related to German (see Table 1). The /g/, /ʃ/ and /ʒ/ are put in parentheses because they only occur in loanwords and/or as allophones: [g] as allophone of /k/ before plosives, as in the Dutch word for *handkerchief* ['zɑgduk]; [ʃ] as allophone of /s/ before /j/, as in the Dutch word for *little mouse* ['mœysə]. The alveolars /t, n/ are also palatalized before /j/, so that they are realized as /ç, ɲ/ respectively as in the Dutch words for *doggie* ['hɔncə] and *carnation* ['ɑɲə]. Unlike English, the /p, t, k/ are voiceless unaspirated, and the /b, d/ are fully voiced (Gussenhoven, 1999). There is

considerable variation in the realization of the /r/ phoneme in Dutch (across dialects, sociolinguistic membership, styles, and phonological context). Some speakers use the voiced uvular fricative [ʁ], others the uvular trill [ʀ], alveolar trill [r] or tap [ɾ]. In post-vocalic contexts /r/ in some dialects tends not to be realized ('zero-realisation, or 'deletion') or is realized as an approximant [ɹ], and some speakers use an approximant even in initial onset position (Sebregts, Tops, van Bezooijen, van de Velde, van Hout, Willemys & Zonneveld, 2003). Devoicing of voiced fricatives is common in some dialects, so that /v/ is usually realized as [f], /z/ is usually realized as [s], and /ʒ/ is usually realized as [ʃ]. A glottal stop [ʔ] is often inserted before vowel-initial syllables (Gussenhoven, 1999).

Table 1. Consonants produced in Dutch

	Bilabial	Labiodental	Dental	Alveolar	Post alveolar	Retroflex	Palatal	Velar	Uvular	Phar	Glottal
Plosive	p b			t d	(c)			k (g)			
Nasal		m			n	(ɲ)		ŋ			
Trill											
Tap or flap				r							
Fricative		f v		s z	(ʃ) (ʒ)			χ			h
Lateral fricative											
Affricates											
Approx		ʋ					j				
Lateral approx				l							

Black = articulations judged impossible

Based on the International Phonetic Alphabet

Acknowledgement is made to the International Phonetic Association (c/o Department of Linguistics, University of Victoria, Victoria, British Columbia, Canada).

### 3.2. Vowels and diphthongs

Dutch has 17 vowel sounds consisting of 14 monophthongs and 3 diphthongs (Booij, 1995). In table 2 a classification of the seventeen Dutch vowels is given. These vowels can be divided into a set of tense vowels /i, y, u, e:, ø:, o:, a:/, a set of lax vowels /ɪ, ɛ, ɔ, ʏ, ʌ/, a reduced vowel /ə/, and diphthongs /ɛi, œy, ʌu/. Some vowels are marginal and occur only in loanwords, specifically /i:/ as in [ana'li:sə] *analysis*, [y:] as in [sɛntri'fy:ʒə] *spindryer*, [u:] as in ['ru:ʒə] *rouge*, [ɛ:] as in ['sɛ:rə] *conservatory*, [i:] as in ['frœ:lə] *gentlewoman*, and [ɔ:] as in ['zɔ:nə]. These marginal vowels are always long.

Table 2. Vowels produced in Dutch

	Front	central	Back	diphthongs
close	i(:), y(:)		u(:)	
close-mid	ɪ, e(:), ʏ, ø(:)	ə	o(:)	
open-mid	ɛ(:)		ɔ(:)	
open			œ:, a(:), ʌ	ɛi, œy, ʌu

### 3.3. Phonotactic restrictions

#### 3.3.1. Syllables

Allowable syllable structures can be described in the formula C(0-3)VC(0-4), so that a syllable in Dutch consists of a vowel preceded by zero to three consonants, and followed by zero to four consonants. The smallest allowable syllable consists of a vowel only, usually a diphthong (e.g., [ɛi] *egg*, [œy] *onion*). The Dutch language is known for the fact that it can ‘glue’ words together to form very long words and there is little restriction as to the number of syllables in a word.

#### 3.3.2. Consonants and consonant clusters

Any consonant except /ŋ/ can occur in syllable-initial position. Similarly, any consonant except /h/ can occur word-finally. There are some language-specific restrictions on the possible combinations of consonants. For example, /h/ never occurs in syllable-initial clusters. Syllable-initial clusters never have two sonorant consonants, i.e. combinations of nasals with liquids or glides (e.g. [nl]), or liquids with glides ([lj]) are not allowed in syllable-initial position. There is only a very restricted set of three-element clusters. Where a syllable onset has three consonants, the first consonant is always /s/. Where a syllable ends in more than two consonants, the final consonants are always coronal /t/ and /s/ as in the Dutch word for *autumn* [herfst]. Dutch can have many consecutive consonantal phones, as exemplified in the Dutch word for *cry of fear* [ˈɑŋstsχreʊ] which has a total of six consecutive consonantal phonemes. For a full account of phonotactic constraints the reader is referred to Booij (1995).

### 3.4. Tones

Standard Dutch does not use tones to differentiate meaning. However, in some Southern Dutch dialects (many Limburgian dialects) a lexical tone contrast is used alongside intonation. In these dialects two types of tones are used, the so-called *punch tone* and *drag tone*, also referred to as Accent 1 and Accent 2 respectively (cf. Schmidt, 1986; Gussenhoven & van der Vliet, 1999; Gussenhoven & Aarts, 1999). Examples are the words for *rinse* [ˈspø:lə] versus *play* [ˈspø:lə], and *territory* [ʔəˈbe:t] versus *set of teeth* [ʔəˈbe:t], where Accent 2 is marked [ˀ] before the syllable concerned. Some segmentally identical words rely on tones to distinguish singular from plural. These words have Accent 1 in the plural and Accent 2 in the singular. Examples are the words for *leg* [bɛin], *horse* [pe:rt], and *stone* [stɛin].

### 3.5. Stress and intonation

As most European languages, Dutch is a stress accent language. In Dutch main stress falls on either the antepenult, penult or final syllable of a word as long as the penult is open, as in the Dutch words for *elephant* [ˈo:li:fant], *pyjamas* [pi:ˈja:ma:], and *crocodile* [ˌkro:ko:ˈdi:l] respectively. However, if the penult is closed it will fall on the

penult or final syllable, as in the Dutch words for the color *orange* [o:'rɑŋə], and *raspberry* [ˌfrɑm'bo:s] respectively. In composite words, secondary stress is often present. There are only few minimal pairs where stress is the only difference between words, for example in the Dutch words for *canon* ['ka:nɔn] and *cannon* [ka:'nɔn] (Gussenhoven, 1999).

The intonation system of Dutch is extremely similar to that of English. Dutch has a total number of 8 pitch accents which when they are combined with boundary tones generate a total of 24 nuclear intonation contours (Gussenhoven, 2005). The 8 pitch accents are H\* (high level from the accented syllable), H\*L (high fall from the accented syllable), !H\*L (low fall from accented syllable, also called downstepped fall), L\* (low level from the accented syllable), L\*H (rise from low from the accented syllable), L\*HL (rise fall from accented syllable), L\*!HL (low rise fall from accented syllable), and H\*!H (vocative chant). Gussenhoven, Rietveld, Kerkhoff, and Terken (2003) have developed an interactive training course for the transcription of Dutch intonation, called ToDI (Transcription of Dutch Intonation), which is available on the internet (see Appendix A).

### 3.6. Writing system

Dutch is written in the Latin alphabet. Dutch spelling is not transparent with no one-to-one correspondence between sounds and letters. This is particularly obvious in the vowels, where there are only five vowel letters (i, u, e, o, and a) for the fourteen Dutch vowels (excluding the diphthongs). The spelling of long vowels is particularly complicated. Spelling of consonants is more transparent, with the only complication being the use of double graphemes to indicate single consonants (*ch* for /χ/ and *ng* for /ŋ/) (Booij, 1995).

## 4. Varieties of Dutch

There is a large number of regional variants of Dutch, and it is thought that there are as much as 28 different dialects. The most obvious division is that between northern and southern varieties. Particularly, the southern varieties tend to have a full set of voiced fricatives [v, z, ɣ], whereas the northern varieties often only have [v, z] or only [z] (Gussenhoven, 1999). Furthermore, the southern varieties (i.e. south of the rivers Rhine and Meuse) have the velar fricative contrast [x, ɣ], whereas north of the rivers there is no such contrast with only a voiceless fricative, which in contrast to the southern varieties is uvular [χ]. The phoneme /r/ is often alveolar in Amsterdam, the north-east of the Netherlands and parts of Belgium, although there is a lot of individual variation in the pronunciation of /r/. Elsewhere /r/ is often uvular (Gussenhoven, 1999). In the south (including Belgium) the [v] is realized as [w] or [β].

## 5. Typical acquisition of Dutch

Appendix B contains a summary of studies of the acquisition of Dutch.

### 5.1. Acquired sounds

#### 5.1.1. Consonants

Consonants are acquired in a certain order, depending on their position in the syllable (Beers, 1995; Fikkert, 1994). Certain consonants appear early in onsets and late in codas, and vice versa. Table 3 contains age of acquisition data for Dutch in initial and final position, according to the > 75% criterion, from a study by Beers (1995).

Table 3. Age of acquisition for Dutch consonants

Consonant	Initial consonants	Final consonants
	Beers (1995)	Beers (1995)
p	1;3-1;8	1;3-1;8
b	2;3-2;5	NA
m	1;3-1;8	2;3-2;5
v	2;3-2;5	NA
n	1;3-1;8	2;3-2;5
ŋ	not determined	not determined
h	2;0-2;2	NA
w	NA	NA
j	1;3-1;8	NA
t	1;3-1;8	2;0-2;2
d	2;8-3;0	NA
k	1;9-1;11	1;9-1;11
g	not determined	not determined
χ	2;0-2;2	2;0-2;2
f	2;3-2;5	not determined
l	2;6-2;8	not determined
ʒ	not determined	NA
ʃ	not determined	not determined
tʃ	not determined	not determined
dʒ	not determined	not determined
s	2;0-2;2	2;0-2;2
z	not determined	not determined
r	2;6-2;8	not determined
v	2;8-3;0	NA
ð	NA	NA
θ	NA	NA
c	not determined	not determined
ɲ	not determined	not determined

NA = Not applicable, i.e. sound does not occur in Dutch in that position

#### 5.1.2. Consonant clusters

Table 4 contains order of acquisition data for classes of initial consonant clusters from 8 children from a study by Fikkert (1994).



Table 4. Age of acquisition for onset cluster types.

Onset clusters	child 1	child 2	child 3	child 4	child 5	child 6	child 7	child 8
plosive + liquid	1;8	*	1;6	2;2	2;3	2;0	*	1;10
fricative + liquid	2;4	*	1;7	2;2	*	2;0	*	*
plosive + nasal	*	*	*	*	*	*	*	*
Fricative + nasal	*	*	*	*	*	2;1	*	*
plosive + glide	2;2	*	1;11	*	2;0	1;11	*	*
fricative + glide	*	*	*	*	*	2;1	*	*
/s/ + plosive	*	2;9	2;0	2;5	2;4	2;0	2;0	*
/s/ + fricative	*	*	2;1	2;5	*	*	*	*
/s/ + plosive + liquid	*	*	*	*	*	*	*	*

\* = age of acquisition could not be determined

### 5.1.3. Vowels and diphthongs

The place of articulation of vowels appears to present no developmental problems: target front vowels are front and target back vowels are back from the outset (Levelt, 1994). Front rounded vowels are acquired late (Beers, 1995; Levelt, 1994). In terms of vowel height, Levelt (1994) shows that the high and low vowels, /i, u, a, ʌ/, are attempted and acquired first (around the mean age of 1;5), followed by the high-mid vowels /e, ɪ, o, ɔ/. The low-mid vowel /ɛ/ is the most problematic vowel for Dutch children during development. It is attempted relatively late and is error-prone (Levelt, 1994). In terms of vowel length, Fikkert (1994) shows that initially, long and short vowels are used almost interchangeably (e.g. short target /a/ is substituted by long /a/ and vice versa, short /ɔ/ substituted by long /o/ and vice versa, etc.). Even in CV syllables, where short vowels are not allowed in the adult language, children readily produce short vowels. Vowel length is mastered between 2;0 and 2;5 (Fikkert, 1994). Levelt (2000) shows that the highly frequent schwas in Dutch are often replaced by full vowels in child language, mostly /a/, /ɑ/ or /ɪ/, in phrase-final position, resulting in forms like [ˈlopa] for the Dutch adult target for *to walk* /ˈlopə/, and [ˈχota] for *big* /ˈχrotə/. Schwa strengthening is persistent and can still be found in the productions of children around the age of 2;5. Table 5 lists the order of acquisition of individual vowels as determined by Beers (1995), according to the 75% criterion.

Table 5. Age of acquisition of vowels

Vowel	Beers (1995)
i	1;3-1;8
u	1;3-1;8
a	1;3-1;8
ɪ	1;3-1;8
ɛ	1;3-1;8
ɔ	1;9-1;11
ɑ	1;9-1;11
e	1;11-2;2
o	1;11-2;2
ʏ	3;0-3;2

## 5.2. Percent correct

### 5.2.1. Consonants

To date there is no study of percentage of consonants produced correctly.

### 5.2.2. Consonant clusters

Jongstra (2003) determined the following error percentages in the production of 5562 instances of word-initial consonant clusters (from a total of 23,167 instances), produced by 34 children between the ages of 1;11 and 3;4.

Table 6. Percentage correct for initial consonant clusters.

Consonant cluster	Percentage correct	Consonant cluster	Percentage correct
kn	17.51	br	46.99
sʃ	21.05	tr	47.08
sn	25.58	kv	49.90
dr	32.28	pr	54.77
sw	33.94	st	55.81
sk	36.07	kr	58.46
fr	38.67	fl	61.20
tw	38.82	sl	62.29
sp	42.15	bl	62.77
sm	43.10	pl	73.60
xl	45.39	kl	73.68
xr	45.44	<b>Total</b>	45.86

### 5.2.3. Vowels

Table 7 shows the mean percentages correct for Dutch vowels from a study by Levelt (1994) of six children between the ages of 1;6 and 2;4. Front rounded vowels and diphthongs were not included in this study:

Table 7. Percentage correct for Dutch vowels

Vowel	Percentage correct
i	94
u	91
a	93
ɑ	87
o	81
ɔ	80
ɪ	74
e	68
ɛ	63

### 5.3. Phonological processes

The most recent study of phonological processes in Dutch children was conducted by Beers (1995). Simplification processes that are commonly used by Dutch children of 1;3 to 1;11 years of age are cluster reduction, final consonant deletion, devoicing and weak syllable deletion. Other common processes are reduplication, assimilation, gliding, and stopping. Beers found that final consonant deletion, reduplication, and assimilation showed a sharp decline in their occurrence between 2;0 and 2;5 years followed by a slower decline up to age 4. The occurrence of cluster reduction and weak syllable deletion increased sharply between 1;3 and 2;6 years with a sharp decrease between 2;6 and 3;0 years. After age 3;0 these processes show a steady decline. Until age 3;0 years devoicing was the most frequent substitution process. After that age it rapidly declined which reflects the acquisition of the voice contrast.

### 5.4. Intelligibility

To date there is no study of intelligibility of Dutch children.

### 5.5. Phonetic inventory

Fikkert (1994) presents the phonetic inventory of consonants in terms of classes of sounds for nine children acquiring Dutch. Four groups are discerned according to the order in which the different phoneme classes are produced over time in onset position.

Table 8. Phonetic inventory in onset position

Group I					Group II			Group III			Group IV	
Class	Age				Class	Age		Class	age		Class	Age
	ch1	ch2	ch3	ch4		Ch5	ch6		ch7	ch8		ch9
Plosives	2;1	1;0	1;6	1;4	P	1;8	1;4	P	1;5	1;9	P	1;10
Nasals	2;1	1;2	1;6	1;4	N	1;8	1;9	N	1;5	1;9	N	1;10
Glides	2;7	1;2	1;7	1;7	F	1;8	2;0	F	1;6	1;10	L	1;10
Fricatives	2;8	1;4	1;10	1;8	L	1;10	2;1	G	1;11	1;10	G	1;11
Liquids	2;11	1;4	2;0	1;10	G	2;1	2;3	L	2;3	1;11	F	2;0

For the consonants in coda position a single order of appearance was found. The data presented here are from five children of Fikkert's (1994) study. The category Glides is not present in the table since there are no glides in this position in the adult language.

Table 9. Phonetic inventory in coda position

Class	Age				
	ch1	ch2	ch3	ch6	ch7
Fricatives	2;1	1;3	1;6	1;6	1;7
Plosives	2;2	1;3	1;7	1;7	1;7
Nasals	2;2	1;4	1;8	1;8	1;8
Liquids				2;0	2;0

### 5.6. Common mismatches

Common mismatches for sounds are sounds with default, unmarked features instead of marked features. For consonants, obstruents are unmarked in comparison to

sonorants. Within the obstruents, plosives are unmarked compared to fricatives, and [-voice] is the default value for [voice]. For sonorants, [+voice] is the default value, and nasals are unmarked compared to liquids and glides. In addition, it has been assumed that the default value for place is coronal (Beers, 1995; Fikkert, 1994; Levelt, 1989).

### 5.7. Syllable structure

There are three studies of the acquisition of syllable structure in Dutch (Fikkert, 1994; Levelt, Schiller & Levelt, 2000; Levelt & van de Vijver, 2004). There is a consistent course of development across children. The order of acquisition of the different syllable types is given in table 10. Whether children start out producing complex onsets before complex codas or vice versa might depend on their personal experience with either of the two syllable types.

Table 10. Order of acquisition of syllable structure

	ch1	ch2	ch3	ch4	ch5	ch6	ch7
CV	2;1	1;0	1;6	1;4	1;8	1;4	1;5
CVC	2;1	1;3	1;6	1;4	1;8	1;6	1;7
V(C)	2;1	1;4	1;6	1;4	1;8	1;6	1;7
CCV(C)	2;9	1;6	2;0		2;2	1;8	2;0
(C)VCC			2;4			2;2	1;10

### 5.8. Prosody

Four studies have discussed the acquisition of Dutch stress (Fikkert, 1994; Nouveau, 1994; Wijnen, Krikhaar & den Os, 1994; Lohuis-Weber & Zonneveld, 1996), of which Fikkert (1994) is the most extensive study. There appears to be a trochaic bias in the early stages of acquisition (around 1;6-2;0). Bisyllabic words with stress on the initial syllable – trochees – like *robot* /'rɒbɒt/ and *kayak* /'kajak/) remain bisyllabic and show no stress-errors. However, bisyllabic iambic words (words with stress on the second syllable, like the Dutch word for *balloon* /bɑ'lɒn/ and *guitar* /χi'tar/) are reduced to a single syllable. The stress pattern of bisyllabic wS target words is acquired between the ages of 2;0 and 2;5. The stress patterns of longer words are acquired between 3;0 and 3;5 (Fikkert, 1994; Nouveau, 1994).

### 5.9. Phonological awareness

Aarnoutse, van Leeuwe & Verhoeven (2000) report a longitudinal study of phonemic awareness skills of Dutch children from 4 to 7 years of age. Dutch children begin formal schooling at age 4 (Grade 1). Children at the end of Grade 1 performed relatively poorly on a monosyllabic phoneme segmentation task with only 29% correct. One year later, their performance had increased to 52%. A test that included both phoneme blending and word rhyming skills appeared to be much easier: at the end of Grade 2 (age 5-6) children scored 77% correct (Aarnoutse et al., 2000). Scheltinga (2002) showed that Dutch 10-year-old children with Specific Language Impairment

performed more poorly on a phoneme deletion task than typically developing age-matched children (respectively 17% versus 55% correct).

## **6. Speech assessment for Dutch children**

Dutch SLTs use published tests of articulation and phonology developed and produced in the Netherlands. Some of these tests are based on tests produced in the USA or UK. There has been no survey of the tests that Dutch speech-language pathologists use for assessing children's speech sounds. The tests listed here are mentioned in the Dutch literature:

- ◆ Taaltoets Alle Kinderen, Klankarticulatie (Verhoeven & Vermeer, 2001)
- ◆ Taaltoets Allochtone Kinderen, Klankarticulatie (Verhoeven et al., 1986)
- ◆ Utrechts Articulatie Onderzoek (Peddemors-Boon, van der Meulen & de Vries, 1974)
- ◆ Logo-Art (Baarda, de Boer-Jongsma & Haasjes-Jongsma, 2005)
- ◆ Conversational speech sampling
- ◆ Informal/home made single word tests

The following computerized analyses have been designed for analyzing Dutch speech:

- ◆ Fonologische Analyse van het Nederlands (FAN) documented in Beers (1995).

## **7. Speech intervention for Dutch children**

Dutch SLTs are familiar with and use intervention techniques from English and German speaking countries. In addition, specific intervention programmes have been developed for use with Dutch children with speech impairments.

Intervention techniques that have been adapted for use with Dutch children are:

- ◆ Cycles approach (Hodson & Paden, 1991)
- ◆ Metaphon (Howel & Dean, 2000)
- ◆ PROMPT (Hayden, 2003; Raaijmakers & van der Meulen, 2004)
- ◆ Traditional articulation therapy (Günther & Kessels-de Beer, 2005; Van Riper & Erickson, 1996)

Speech intervention techniques that have been developed for use with Dutch children include:

- ◆ Behandeling van articulatiestoornissen (Stess, 2000). An intervention programme based on traditional articulation therapy.
- ◆ Dyspraxieprogramma (Eurlings-Van Deurse et al., 1993). A programme for intervention of developmental dyspraxia of speech. It contains auditory, visual and tactile techniques to elicit speech sounds.
- ◆ Fonologische procesanalyse met oefeningen (van Borsel, 2003). Intervention of abnormal use of phonological simplification and substitution processes with exercises.
- ◆ Logo-art (Baarda, de Boer-Jongsma & Haasjes-Jongsma, 2005). Logo-art contains specific exercises and pictures for each Dutch speech sound.
- ◆ Logopedieklapper (Paulussen-van Vugt, 1980). A booklet with several stimulus pictures in alphabetic order.
- ◆ Metaphonbox (Leijdekker-Brinkman, 1998). The Methaphonbox is an adjustment

and extension of the Metaphon Resource Pack by Howel & Dean (2000). It contains exercises and suggestions for intervention.

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## Appendix A. Resources about Dutch especially useful for SLTs

### 1. Books

- Gillis, S. & Schaerlaekens, A.M. (red.) (2000). *Kindertaalverwerving. Een handboek voor het Nederlands*. Groningen: Martinus Nijhoff.
- Goorhuis, S.M. & Schaerlaekens, A.M. (2000). *Handboek taalontwikkeling, taalpathologie en taaltherapie bij Nederlandssprekende kinderen*. Utrecht: De Tijdstroom
- Huybrechts, G. (1998). *Articulatie in de praktijk: consonanten*. Leuven: Acco.
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- Kooij, J. & Oostendorp, M. van (2003). *Fonologie: uitnodiging tot de klankleer van het Nederlands*. Amsterdam: Amsterdam University Press.

### 2. Journals

- ◆ *Logopedie en Foniatrie*  
A clinical journal published in Dutch by Essentials in Rotterdam.
- ◆ *Stem-, Spraak- en Taalpathologie*  
A research journal published by Nijmegen University Press in Nijmegen.

### 3. Professional association and degree courses

The professional association of SLTs (called *logopedist*) within the Netherlands is *De Nederlandse Vereniging voor Logopedie en Foniatrie* [www.nvlf.nl](http://www.nvlf.nl)

Colleges offering a bachelor in speech-language pathology

- ◆ Chr. Hogeschool Windesheim (Zwolle)
- ◆ Fontys Paramedische Hogeschool (Eindhoven)
- ◆ Hanzehogeschool Groningen (Groningen)
- ◆ Hogeschool Arnhem en Nijmegen (Nijmegen)
- ◆ Hogeschool Rotterdam (Rotterdam)
- ◆ Hogeschool van Utrecht (Utrecht)
- ◆ Hogeschool Zuyd (Heerlen)

Universities offering a master in speech-language pathology

- ◆ Radboud University (Nijmegen)
- ◆ University of Amsterdam (Amsterdam)
- ◆ University of Groningen (Groningen)
- ◆ Utrecht University (Utrecht)

### 4. Useful Dutch Websites

[www.logopediekrant.com](http://www.logopediekrant.com)

[logopedie.pagina.nl](http://logopedie.pagina.nl)

[www.ggdkennisnet.nl](http://www.ggdkennisnet.nl)



<http://www.ned.univie.ac.at/publicaties/taalgeschiedenis/en>  
[http://en.wikipedia.org/wiki/Dutch\\_language](http://en.wikipedia.org/wiki/Dutch_language)  
<http://todi.let.kun.nl>

## **Appendix B. Summary of studies of typical Dutch speech acquisition**

Authors	Year	Country	No. of children	Age of children	Information	Sample type	Data collection
Beers	1995	Netherlands	90	1;3-4;0	Acquisition of phonological contrasts and occurrence of phonological processes	Connected speech (CS)	Cross-section
Fikkert	1994	Netherlands	12	1;0-2;11	Acquisition of syllable structure and stress	CS	Longitudinal
Levelt	1994	Netherlands	12	1;0-2;11	Acquisition of place features and vowel height	Naturalistic speech samples (CS)	Longitudinal
Jongstra	2003	Canada/Netherlands	45	1;11-3;4	Acquisition of consonant clusters	Naturalistic speech (CS) and elicited speech	Longitudinal