

Comparative studies in the phonological L2 acquisition in bilingual pre-schools*

1. Introduction

In the age of globalization and increasing co-operation world wide and between European countries, it is getting more and more important, socially and economically, to be familiar with the languages of the partner countries. The most important language in this respect is the language which has generally developed into the world's vehicular language during the last century, English. In order to adapt to this new situation it is useful to complement traditional ways of teaching and education with new and more effective concepts. These concepts should provide a frame in which language learning may start earlier in life, and allow for a higher share of practical experience than is traditionally practiced. One possibility to account for these new necessities is the integration of the didactic concept of immersion (IM) which has been integrated by several German institutions over the last few years. Among these institutions are two bilingual pre-schools in northern Germany, i.e. Rostock with a French-German bilingual project, and Altenholz, a Kiel suburb, with an English-German one. The data analyzed in this paper stems from these two pre-schools.

The aim of this analysis is to compare the phonological acquisition of the children from these different projects. In order to do so, different tests have been conducted, transcribed and analyzed with regard to different sets of sounds which can be found in both L2s, English and French.

The results suggest that subjects use indeed different production strategies with regard to the three sound groups, however, the difference is not as clear-cut as theory will have it. A comparison of the English and the French data corpus shows that these strategies are used in both L2s independently. With regard to the age of learning, the same strategies used by older learners are already in place at age 3.

2. The Immersion Projects

Immersion is the concept or the methodology of introducing a second language with the language as vehicle to transport information, not as the subject of teaching itself. In other words, English as an immersion language is not a subject in its own right, but it is used as the teaching language in different kinds of subjects. Bilingual pre-schools aim at the early introduction of an L2. The early beginning of the acquisition of an L2 has proven very valuable especially in the field of phonology. As phonological research has shown, the older the learners when introduced to an L2, the more likely they are to develop a foreign accent (Lenneberg 1967, James 1994, Long 1990, Moyer 1999, Wode 2002.)

*This paper is a summary of a larger study (Kersten, K. 2002. *Äquivalenzklassifizierungen im Zweitspracherwerb in bilingualen Kindertagesstätten*. Kiel: English Department).

Different kinds of bilingual pre-schools have different aims and target groups (Wode 1995a, 1996b). The immersion projects in northern Germany all follow the concept of introducing an L2 (chiefly a universal language) to children of a monolingual majority. They aim at providing a playful and natural encounter with the L2, and guarantee, at the same time, that the development of the children's L1 remains up to their age level. An additional goal is the increase of the children's cultural and metalinguistic awareness (Blondin et al. 1998). Each group is led by two pre-school teachers, one of which is a native speaker of the children's L1, the other a native speaker of the L2. Both interact with the children in their native language, thus creating a natural linguistic environment and providing the same level of input in both languages. This approach comes close to the *one parent – one language* principle (Döpke 1992) as applied in families who raise their children bilingually.

Between 1995 and 1999, three immersion projects were established in northern Germany. All of them were supervised and evaluated by the linguistics division of the English Department of Kiel University, headed by Prof. Dr. Henning Wode. In 1995, the first project (the pilot project), a bilingual pre-school (BPS) was set up in an already existing German pre-school in Rostock. It included French as L2. In 1997 the same setup was established in Kiel-Altenholz with English as L2. In 1999, a bilingual class was set up for the first group of the latter project in a nearby elementary school. All three setups follow the concept of early partial IM. The L2 input in both BPSs amounts to about 50% of the daily linguistic input. Both institutions had a change in their staff, so that the children were exposed to different speakers. Coming from various parts in Great Britain and the United States, the accents of the English native speakers differed to a great extent. This was not true for the native speakers in the French project. The methodology of this study tries to take these differences into account.

The research team of Kiel University was responsible for the scientific supervision of these projects. All institutions were visited on a regular basis by student research assistants who observed and took part in the daily routines and conducted tests to evaluate the children's linguistic abilities and development. The ones this study relies on are different versions of a *cue card* test (adapted to the groups' linguistic input), in which picture cards are to be recognized or named by the children. This kind of test makes it possible to assess the subjects' comprehension as well as their production. The three production parts of the tests were transcribed phonetically and were analyzed in several smaller studies. This study aims at enlarging on these analyses and at comparing the results in order to get a broader picture of the phonetic development of pre-school children aged 3-6.

3. Theoretical background

It is generally assumed that speaking a foreign language is not easy; to pronounce it without a foreign accent, however, is considered extremely difficult. One aim of L2 phonology is to explain which

linguistic features are to be held accountable for these difficulties. With regard to the data at issue the following questions may be asked:

1. What are the reasons for the foreign accent in the pronunciation of an L2?
2. Are some elements acquired with more difficulty than others?
3. Comparing the acquisition of different languages as L2 – which differences and which similarities are discernible?
4. Which role does the age (AOL – *age of learning*) play, at which a learner is first introduced to an L2?

A "foreign accent" is most commonly known as a matter of speaking the new language with the pronunciation patterns of the L1 (James 1994). The reason for this can be found in two different structural components: the perception of new sounds and their production, which is their articulation. According to several theories (Werker & Tees 1984, Flege 1995 "Speech Learning Model", Kuhl 1992, Kuhl & Meltzoff 1995), the perception of speech sounds involves so-called mental categories for the distinct phonemes of a language. These categories are formed in infants at the age of 10-12 months. In the process of speech perception, the different allophonic productions are automatically classified as belonging to the mental category of the respective phoneme, a mechanism which takes place extremely quickly and subconsciously. It is due to their phonemic relevance within a language that the phoneme's boundaries have to differ distinctly from each other. New research prefers, however, to talk about a high degree of categoriality rather than of categories with distinct boundaries. Researchers point out that mental categories may function more like prototypes with flexible boundaries and so-called fuzzy edges (Wode 1992).

This principle of categorization allows for an extremely quick mental processing of information, since the different allophones, which are produced by each speaker in a different way, do not have to be analyzed individually. Without categorization, a speaker would not be able to communicate – listen, process, understand and produce speech – at the rapid rate which is characteristic for human beings. This principle of mental processing also becomes relevant in the acquisition of an L2, i.e. when all those L2 sounds which are similar to but not identical with the L1 are classified as member of the category of the respective L1 phoneme. This rapid and subconscious classification makes it very difficult for the listener to perceive the small differences between the two similar sounds. This principle, which Kuhl (1992) calls *magnet effect*, has been backed up by a large body of research, for example findings regarding the differences in the VOT (*voice onset time*) in the production of voiced plosives. The acquisition of new categories always takes place in a process, in the course of which the category boundaries become more and more distinct as compared to other (L1 and L2) categories (Flege 1995).

As pointed out, the *magnet effect* only applies to L2 sounds with a certain similarity to sounds contained in the L1 sound system. Such sounds are called *equivalent* to L1 sounds. Thus, it has become quite useful to subdivide an L2 sound system into sounds *identical* with, *equivalent* to and *unknown* to the L1 (*new sounds*) (Flege 1988, Wode 1978, 1980). Today, however, the boundaries between these three groups of sounds are, in analogy to the mental categories, no longer thought to be clear-cut (Wode 1981). The theory maintains that these different sets of sounds are acquired in different ways: sounds identical with the L1 system do not pose any problems; they are transferred from the L1 to the L2 (*positive transfer*, Ellis 1994; "transfer hypothesis" Leather & James 1996). Similar sounds are usually substituted by the L1 equivalent (*negative transfer*), whereas new sounds are acquired in a completely different way which may resemble their acquisition by native speakers (Wode 1981). This last hypothesis, however, still remains to be proven.

The perception and the production of speech sounds are inseparable. To comprehend this complex interplay, the learner has to recognize the underlying phonological system of the L2, and s/he has to develop the respective phonetic representations to control the articulation. This development takes place in a process which, at the beginning, does not usually show a great amount of phonetically target-like structures. While there are constraints like the *magnet effect* in the realm of speech perception, the acquisition of a new articulatory system obstructs the production of speech. Obstacles like unknown positions of the articulators in combination with suprasegmental and prosodic features of the new language form part of these difficulties. The production of language relies on complex processes, which are depicted in the following.

To articulate an L2 in an appropriate manner, learners have to adapt the movements of their articulators to the mental representation (James 1994). This process relies on the perception of spatial configurations within the mouth, which provide tactile and proprioceptive feedback. In other words, information about place and manner of articulation is correlated with information from auditive perception and mental representation. Taken together, these pieces of information provide a complete picture about the production of a speech sound.

There are different hypotheses about the temporal order of speech perception and speech production in the acquisition of an L2 (for an overview, see Leather & James 1996). While some studies hint at the fact that correct perception precedes correct production, other studies seem to point to the opposite. It is beyond doubt, however, that perception and production are closely interrelated.

4. Hypotheses

In accordance with these findings, the following working hypotheses are investigated in the data:

1. The youngest subjects (3;10-4;2) in the BPS groups will already show signs of interference with their L1, since the mental categories for L1 sounds have been established much earlier.
2. The children are in the process of acquiring mental categories for L2 sounds. This will be visible through the production of sounds which share several phonetic features with the respective L2 sound but are not yet target-like.
3. Target-like productions of L2 sounds will show that some subjects have already succeeded in establishing target-like L2 categories.
4. The three different sets of sounds of L2 sound systems (identical, equivalent, new in comparison with the L1) will be acquired in different ways: identical and equivalent sounds will be transferred from the L1, resulting in positive and negative transfer, respectively; new sounds will be acquired in a completely different way, most likely similar to their acquisition in L1.
5. These processes will take place independently from the language which is learnt as an L2.

5. Methodology

5.1 The tests

The data this study relies on were elicited via different forms of a cue-card lexicon test which was aligned with the input of the respective BPS groups. The test was conducted in three bilingual groups from the two IM projects, one French and German, and two English and German groups. The test setup was designed due to the criteria of objectivity, reliability, and validity (Alderson et al. 1995). In all three groups, a pilot test, a pre-test, and a post-test were conducted. The test consisted of two different tasks. The first task, in which the children had to recognize a specific object among others, examined comprehension. The second, in which the object had to be labeled, elicited word production. The production part was transcribed phonetically (according to the *International Phonetic Alphabet*, rev. to 1993) by members of the research group at the Linguistics division of the English Department (Kiel University) for several single studies (Westphal 1998, Berger 1999, Lauer 1999, Tonn 1999). These studies served as a basis for the present comparative analysis.

The researchers who carried out the transcriptions are native speakers of German who have a very good command of the respective second language. However, for a non-native speaker of the L2 it is difficult to recognize whether a production would be accepted as target-like by a native speaker. Therefore the use of this categorization is avoided when necessary. In order to categorize the child production tokens, a set of target phonemes was established. This operation turned out to be extremely difficult for the English project, since the input the children had received showed a high range of variation: the BPS had different teachers from different regions in Great Britain and the United States, so that the teachers' regional varieties differed to a great extent. Hence, a range of different reference phonemes had to be established for the English data, which take the regional

differences into account. The input in the French project has not been analyzed separately. Because of the fact that the regional variety of the French teacher did not differ noticeably from standard French, which serves as the basis for transcriptions in dictionaries, this variety was assigned as reference for the French data.

5.1 Contrastive Analysis

The general criterion of comparison for the two L2s involved in the data is the subdivision into sets of identical, equivalent, and new sounds, which has already been mentioned. In order to determine these sets, a contrastive analysis between German, French and English was carried out. The analysis is based on phonetic descriptions of the respective sound system as presented by several different researchers, and is displayed below.

5.2.1 The German sound system

Tab. 1: German Vowels

		palatal		central		velar	
		ur.	r.	ur.		ur.	r.
close	(tense)	i	y				u
	(lax)	ɪ	ʏ				ʊ
mid-close	(tense)	e	ø				o
mid-open	(tense)	ɛ:					
	(lax)	ɛ	œ	ə			ɔ
open	(tense)			a:			
	(lax)			a		(a)	
diphthongs		eɪ	aɪ	aʊ	ɔɪ	ʊɪ	V ^b (V ^a) (V ^ε)

according to Kohler (1995), Wode (1981), Arnold & Hansen (1979)

'ur.' unrounded

'r.' rounded

() vowels which do not have the status of a phoneme in all German dialects

Tab. 2: German Consonants

		bilabial	labio-dental	alveolar	post-alveolar	palatal	velar	uvular	glottal
Plosive	vl.	p		t			k		
	v.	b		d			g		
Fricative	vl.		f	s	ʃ	ç	x		h
	v.		v	z	ʒ				
Vibrant	v.			(r)				R	
Affricate	vl.	pf		ts	tʃ				
	v.				(dʒ)				
Nasal	v.	m		n			ŋ		
Approximant	v.			l		j			

according to Ladefoged (1993), Wode (1981)

'vl.' voiceless

'v.' voiced

() consonants which are not present in all German dialects or are borrowed from other languages

5.2.2 The English sound system

Tab. 3: English Vowels

		palatal		central		velar	
		ur.	r.	ur.	r.	ur.	r.
close	(tense)	i					u
	(lax)	ɪ					ʊ
mid-close	(tense)				ɜ		
mid-open	(tense)						ɔ
	(lax)	æ	ɛ		ʌ	ə	
open	(lax)			(a)		ɑ	ɒ
Diphthonge		eɪ (e)	aɪ	aʊ	ɔɪ	əʊ ~ ɔʊ (o)	

according to Ladefoged (1993), Crystal (1987), Wode (1981)
 (abbreviations see Tab. 1)

- () sounds which are not present in all British or American dialects
- ~ the first variant is used in British, the second in American English

Tab. 4: English Consonants

		bilabial	labio-dental	dental	alveolar	post-alveolar	palatal	velar	glottal
Plosive	vl.	p			t			k	
	v.	b			d			g	
Fricative	vl.		f	θ	s	ʃ			h
	v.		v	ð	z	ʒ			
Vibrant	v.				(r)				
Affricate	vl.					tʃ			
	v.					dʒ			
Nasal	v.	m			n			ŋ	
Approximant	v.	w			l	ɹ	j		

according to Ladefoged (1993), Wode (1981)
 (abbreviation see Tab. 2)

5.2.3 The French sound system

Tab. 5: French Vowels

		palatal		zentral		velar		
		ur.	r.	ur.	r.	ur.	r.	
close		i	y				u	
mid-close		e	ø				o	
mid-open		ɛ	ẽ	œ	œ̃	ə	õ	
							ɔ	
open							ɑ	ã

according to Hammarström (1998), Rothe (1972), Wise (1957)
 (abbreviations see Tab. 1)

The definition of French vowel phonemes is getting increasingly difficult with the language change as observed today (Martinez 1945, Rothe 1972, Robert 1993). The opposition between /a/ and /a/, /ɛ̃/ and /œ̃/, and /e/ and /ɛ/ is more and more neutralized in spoken language.

Tab. 6: French Consonants

		bilabial	labio-dental	dental	alveolar	post-alveolar	palatal	velar	uvular	glottal ¹
Plosive	vl.	p		t				k		
	v.	b		d				g		
Fricative	vl.		f		s	ʃ		(x)	ʁ	(h)
	v.		v		z	ʒ				
Vibrant	v.				(r)				R	
Affricate	vl.				(ts)	(tʃ)				
	v.					(dʒ)				
Nasal	v.	m		n			ɲ	(ŋ)		
Approximant	v.	w ɥ		l			j			

according to Ladefoged (1993), Rothe (1972), Wise (1957)
 (abbreviations see Tab. 2)

5.2.4 Comparison of the three sound systems

Tab. 7: Comparison of the Three Vowel Systems

		palatal		central		velar	
		ur.	r.	ur.	r.	ur.	r.
close	(tense)	i i	y y			u u	u
	(lax)	ɪ ɪ	ʏ			ʊ ʊ	ʊ
mid-close	(tense)	e e	ø ø		ɜ	o o	o
mid-open	(tense)	ɛɛ				ɔ	ɔ
	(lax)	ɛ ɛ ɛ	œ œ	ə ə	ə	ɔ ɔ	ɔ̃
open	(tense)	æ		ʌ		ɑ ɑ̃	ɑ̃
	(lax)	a		a:		ɑ ɑ̃	ɑ̃
				(a)	a	(ɑ) ɑ ɑ̃	ɑ̃
diphthongs	German	eɪ	aɪ	aʊ	ɔɪ	ʊɪ	V ^b (V ^o) (V ^ɛ)
	English	eɪ (e)	aɪ	aʊ	ɔɪ	əʊ ~ oʊ (o)	

according to Kohler (1995), Wode (1981), Arnold & Hansen (1979), Crystal (1987), Ladefoged (1993), Wise (1957), Rothe (1972), Hammarström (1998)

black: German vowels

blue: English vowels

red: French vowels

(abbreviations see Tab. 1)

As expected, the English and the French sound systems differ from the German one in various respects. Both of them contain, among the consonants, sounds which are identical with German consonants, and consonants and vowels which are equivalent to German sounds. French plosives e.g. differ from English and German in their so-called *voice onset time* (VOT) and the degree of aspiration (Vihman 1996, Wode 1997). Another difference between German and the two other

¹ See Rothe (1972:66) for a discussion about the glottal fricative /h/ in French. Since this sound is generally not included in the French vowel system, it is henceforth neglected in the contrastive analysis.

Tab. 8: Comparison of the Three Consonant Systems

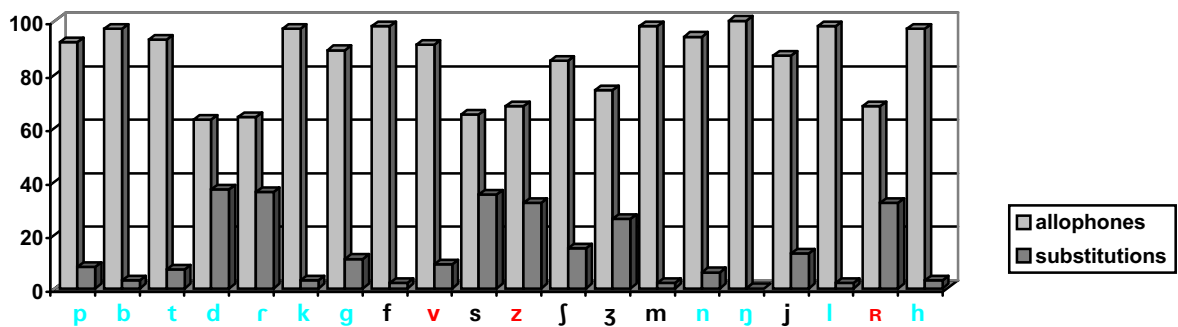
		bilabial	labio-dental	dental	alveolar	post-alveolar	palatal	velar	uvular	glottal
Plosive	vl.	p p p		t	t t			k k k		
	v.	b b b		d	d d			g g g		
Fricative	vl.		f f f	θ	s s s	ʃ ʃ ʃ	ç	x (x)		h h
	v.		v v v	ð	z z z	ʒ ʒ ʒ				
Vibrant	v.				(r) (r) (r)				R R	
Affricate	vl.	pf (pf)			ts (ts)	tʃ (tʃ) (tʃ)				
	v.					(dʒ) dʒ (dʒ)				
Nasal	v.	m m m		n	n n		ɲ	ŋ ŋ (ŋ)		
Approximant	v.	w w ɥ		l	l l	ɹ	j j j			

according to Ladefoged (1993), Wode (1981), Wise (1957), Rothe (1972)
 black: German consonants
 blue: English consonants
 red: French consonants
 (abbreviations see Tab. 2)

languages concerning plosives and fricatives is the phonotactic rule of *final devoicing*, which neutralizes the voiced - voiceless opposition in final position. Among the new French sounds are the nasal vowels and the approximants /w/ and /ɥ/. The back rounded vowel /ɔ/, the diphthong /əʊ/ (or its American variant /ou/), the two fricatives /ð/ and /θ/, and the approximants /w/ and /ɹ/ represent the new sounds from the English sound system.

6. The Data

6.1 Identical sounds



Allophones of the Target Sound and Substitutions – Identical Sounds (%)

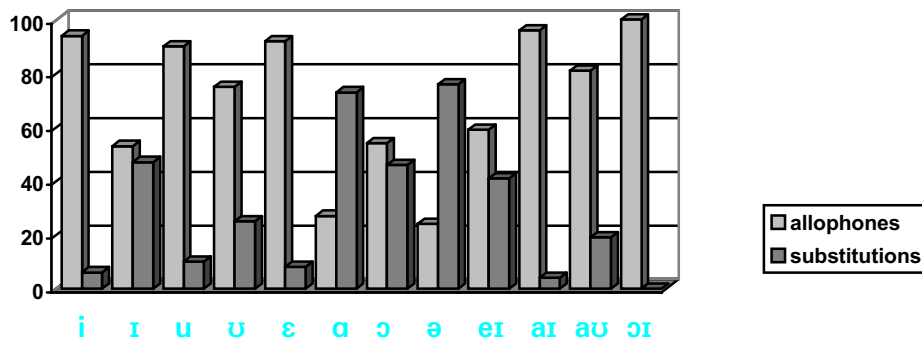
%	p	b	t	d	r	k	g	f	v	s	z	ʃ	ʒ	m	n	ŋ	j	l	R	h
Alloph.	92	97	93	63	64	97	89	98	91	65	68	85	74	98	94	100	87	98	68	97
Subst.	8	3	7	37	36	3	11	2	9	35	32	15	26	2	6	0	13	2	32	3
Total (absol.)	282	213	419	160	14	214	72	251	44	510	25	174	95	121	658	37	96	144	65	123

blue: English sounds
 black: summation of German, English, and French sounds
 red: French sounds

Fig. 1: Identical Sounds

As the vowel systems of the three languages differ from each other in many respects, sounds identical with the German system are only found within the consonants. In both English and French, there are several consonants which share the same place and manner of articulation with German consonants. Although the overall amount of substitutions is relatively small in this set of sounds, there is still a small percentage of non-target-like structures. The highest range of substitutions is found with the alveolar and post-alveolar fricatives, an effect which may be explained by the lisp of many of the subjects. The comparatively higher substitution rate of French /r/ (with its allophones [ʀ] and [ʁ]) is due to phonotactic constraints of /r/ in word-final position, which is unknown to German syllable formation.

6.2 Equivalent sounds

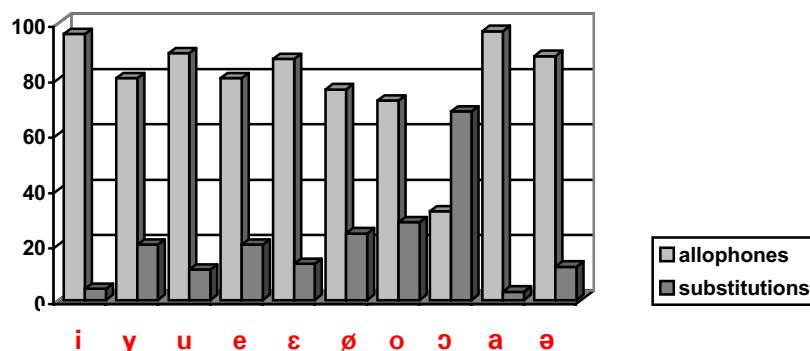


Allophones of the Target Sound and Substitutions – Equivalent Sounds (%): Vowels (English)

%	i	ɪ	u	ʊ	ε	α*	ɔ*	ə	eɪ	aɪ	aʊ	ɔɪ
Alloph.	94	53	90	75	92	27	54	24	59	96	81	100
Subst.	6	47	10	25	8	73	46	76	41	4	19	0
Total (absol.)	194	312	279	68	184	117	170	220	76	163	87	26

blue: English sounds (both English data-sets)
 * including target-like productions according to different input-dialects

Fig. 2: Equivalent Sounds: Vowels (English)

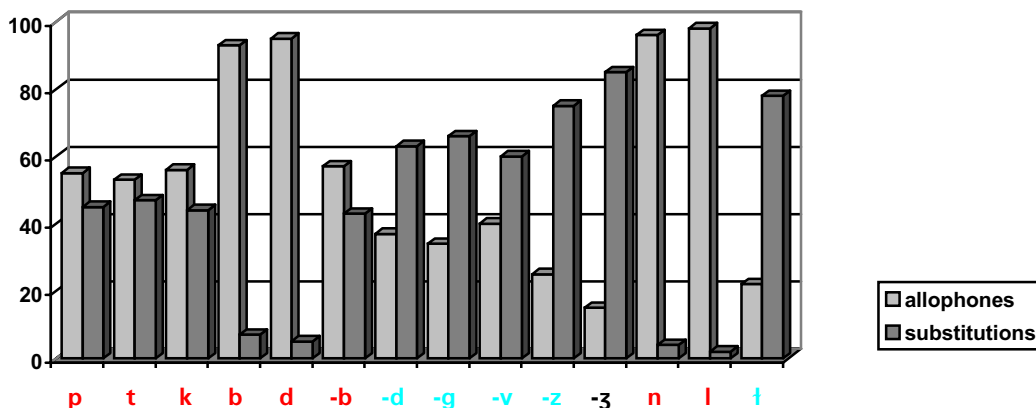


Allophones of the Target Sound and Substitutions – Equivalent Sounds (%): Vowels (French)

%	i	y	u	e	ɛ	ø	o	ɔ	a	ə
Alloph.	96	80	89	80	87	76	72	32	97	88
Subst.	4	20	11	20	13	24	28	68	3	12
Total (absol.)	55	25	27	51	89	21	50	63	225	16

red: French sounds

Fig. 3: Equivalent Sounds: Vowels (French)



Allophones of the Target Sound and Substitutions – Equivalent Sounds (%): Consonants

%	p	t	k	b	d	-b	-d	-g	-v	-z	-ʒ	n	l	ʃ
Alloph.	55	53	56	93	95	57	37	34	40	25	15	96	98	22
Subst.	45	47	44	7	5	43	63	66	60	75	85	4	2	78
Total (absol.)	93	104	54	45	20	7	60	53	115	110	48	54	263	157

blue: English sounds

black: summation of German, English, and French sounds

red: French sounds

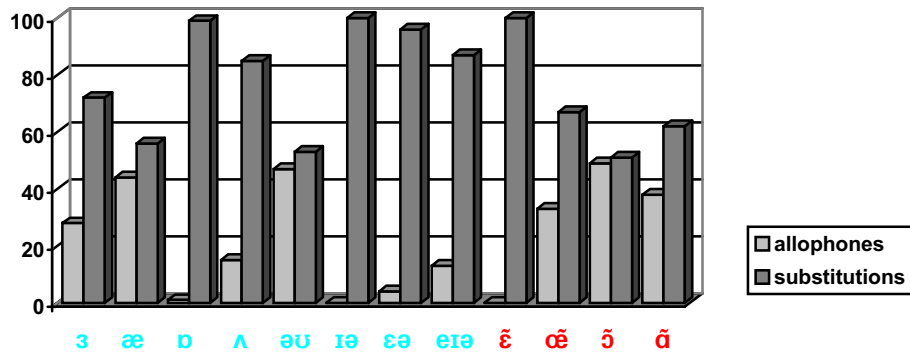
-C final position

Fig. 4: Equivalent Sounds: Consonants

There are equivalent sounds among both the vowels and the consonants in both L2s. It is striking that the vowels which seem to pose the greatest difficulties stem from the half-open/open back place of articulation. It is possible that this is due to the fact that the differences between the phonemes in this area are very small, an effect which may lead to difficulties with the perception and the categorization of the L2 sounds. Difficulties with English /ə/ are probably due to the English reduction of vowels in unstressed position, which is unknown to the German language. The most striking range of substitutions with regard to the consonants are the word-final voiced plosives and fricatives. This phenomenon is not surprising, as German incorporates the phonotactic syllable rule of *final devoicing* which prevents the application of the feature *voicing* to final consonants. Another difficult sound seemed to be the velarised "dark" [ɨ]. In both cases however, there were target-like productions in the data as well. The overall amount of substitutions is higher than that of the identical sounds. Moreover, at this point it has to be underlined that the category *Allophones* in the graphs includes both L1 and L2 allophones (i.e. the acoustic difference between a French and a German [i] for instance is not being differentiated). This is due to the fact that the phonetic transcriptions were created by L1

speakers of German. To reliably tell the difference between the equivalent L1 and L2 allophones, an acoustic analysis, or at least a native speaker judgment, would have been necessary. Unfortunately, this was out of the scope of the present study. As far as the transcribers' judgment is concerned, however, the L2 sounds were, with great regularity, replaced by the L1 equivalents, incidences of clear L2 equivalents being the exception in the data.

6.3 New sounds



Allophones of the Target Sound and Substitutions – New Sounds (%): Vowels

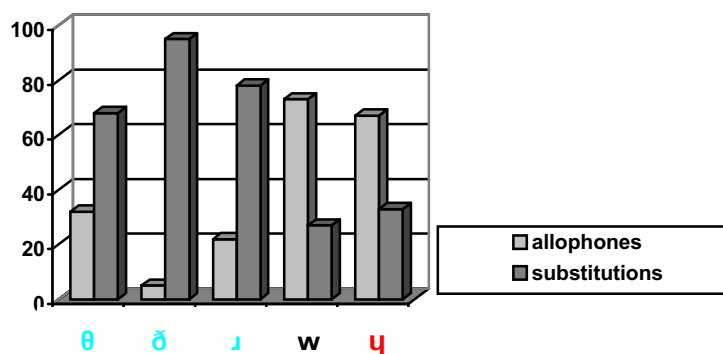
%	ʒ	æ	ɒ	ʌ	əʊ*	ɪə	ɛə	eɪə	ɛ̃	œ̃	ɔ̃	ɑ̃
Alloph.	28	44	1	15	47	0	4	13	0	33	49	38
Subst.	72	56	99	85	53	100	96	87	100	67	51	62
Total (absol.)	18	226	89	198	76	24	28	8	10	3	109	80

blue: English sounds

red: French sounds

* including target-like productions according to different input-dialects

Fig. 5: New vowels



Allophones of the Target Sound and Substitutions – New Sounds (%): Consonants

%	θ	ð	ɹ	w	ɥ
Alloph.	32	5	22	73	67
Subst.	68	95	78	27	33
Total (absol.)	184	19	336	218	6

blue: English sounds

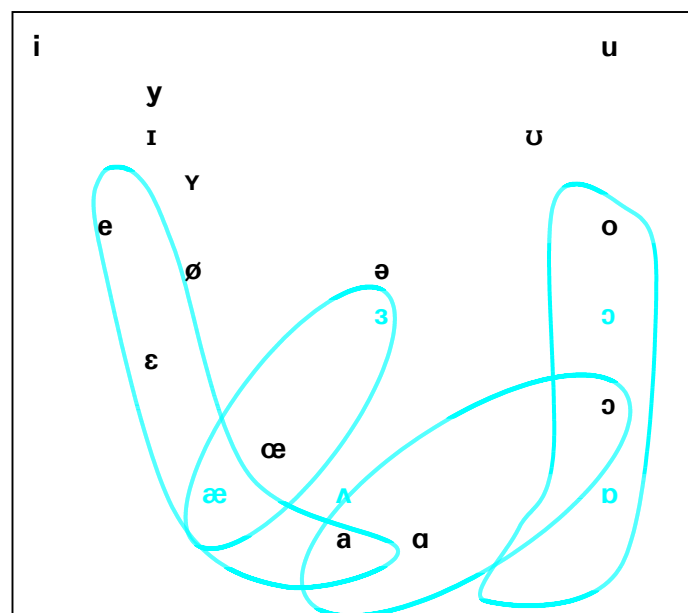
black: summation of German, English, and French sounds

red: French sounds

Fig. 6: New consonants

In contrast to the two other sets of sounds, the substitutions predominate over target-like realizations within the group of new sounds. The vowels which posed the greatest difficulties were the new diphthongs in English and the nasal vowels in French. The English back rounded vowel /ɔ/ was more difficult than the two front vowels /ɛ/ and /æ/. Here, as well as with some nasal vowels, quite a few allophones of the target phonemes could be detected. The consonant which shows the least amount of substitutions is the approximant /w/. This may be due to the fact that it can exist in some German speakers' idiolect as an allophone of /v/, as in German *Quatsch*. Moreover, together with /ɥ/, it is very close to the articulation of German vowels (the vowels /o/ and /y/ simply have to be pronounced with more closure and lip rounding). This is why they were the only consonants to be substituted by vowels in the French data.

It has to be pointed out, however, that the acquisition of new sounds followed at least partly the same pattern of transfer as the equivalent sounds. The mechanism according to which this was observed is depicted below.



(Pseudo-)positions of articulation which served as substitution for new sounds. (The model does not correspond to formant positions.)

(according to Kohler 1990, 1995, Ladefoged 1993, Delattre 1981, Scherer & Wollmann 1972)

- ▼ German vowel
- ▼ new English vowel
- articulatory position used for substitution

Fig 11: Substitutions of New Vowels: English

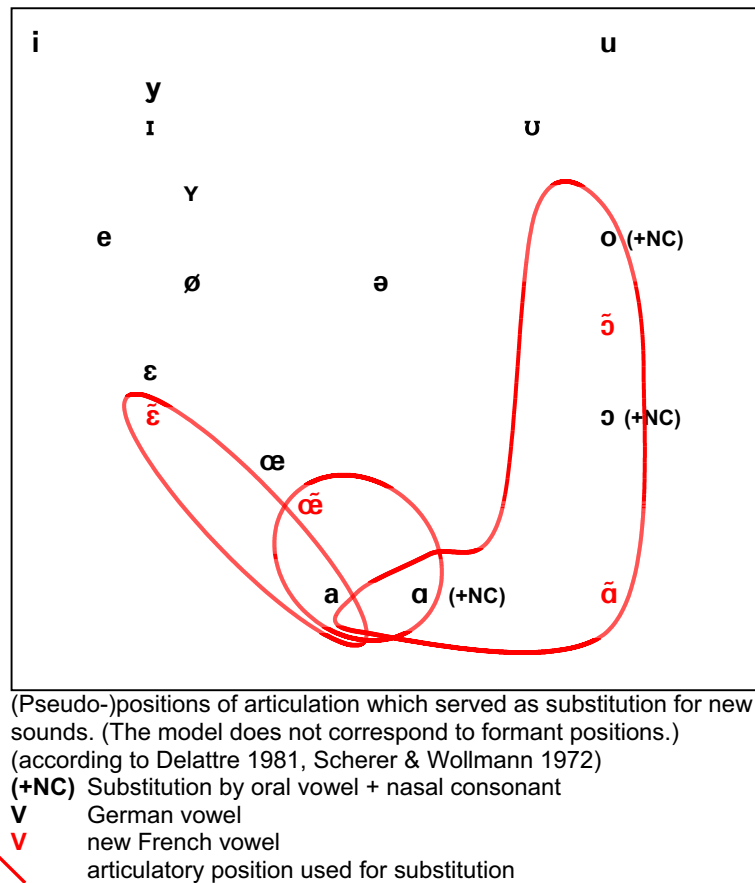


Fig. 12: Substitutions of New Vowels: French

It is striking that the subjects predominantly used sounds for substitution which stem from a similar articulatory area as, or which share at least one articulatory feature with, the target phonemes. The vowels which were chosen for substitution show that the subjects usually recognized features like degree of openness, lip rounding, nasal quality, and the place of articulation, because the substitutions they chose generally share these features with the target sounds. The French nasal vowels for example were partly substituted by their oral counterpart, and a nasal consonant was added to express the nasal quality, since the subjects were unable to articulate a vowel with the required degree of nasal quality. The same is true for the consonants. Whether the hypothesis that these sounds are acquired similarly to acquisition patterns in L1 acquisition is true remains to be proven, but these findings point to a different strategy.

6.4 Summary

In summary it can be stated that the identical sounds represent the set of sounds which gets substituted the least. The number of substitutions is increased with the equivalent sounds, and is highest with the new sounds. As expected, identical sounds are characterized by positive transfer and, presumably, equivalent sounds by negative transfer. However, especially in the case of equivalent sounds, other mechanism, like e.g. phonotactic constraints or lexical transfer, seem to play

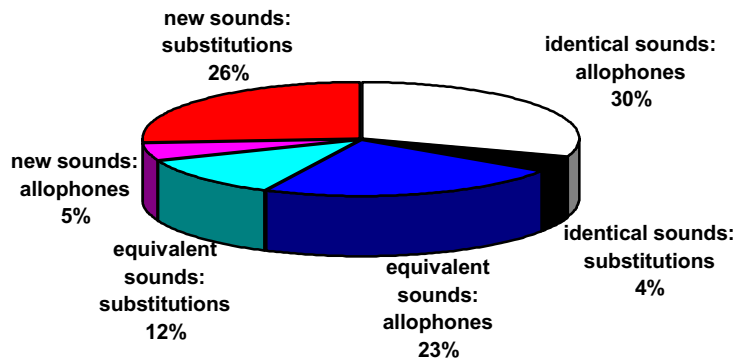


Fig 7: Relation of Tokens within the Three Sound Sets (Total 9067 tokens = 100%)

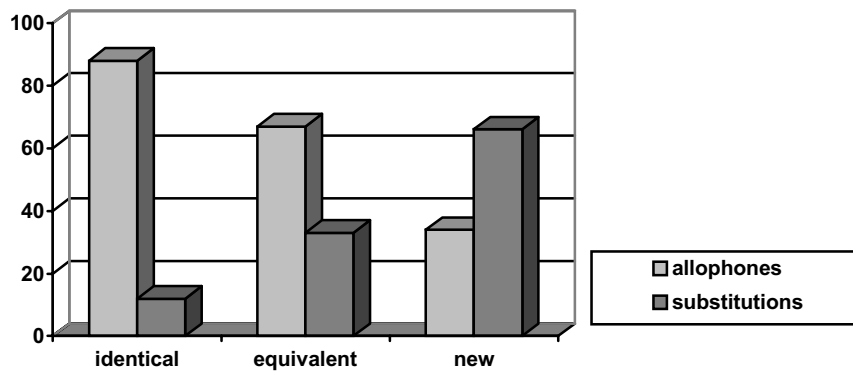


Fig. 8: Allophones and Substitutions within the Three Sound Sets (%)

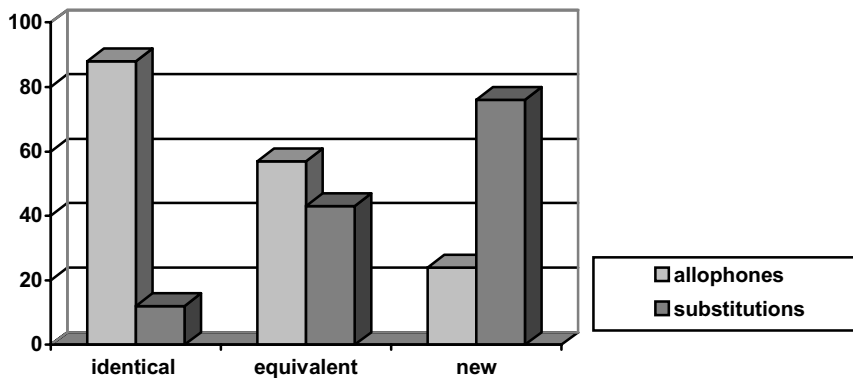


Fig. 9: Allophones and Substitutions: L2 English (%)

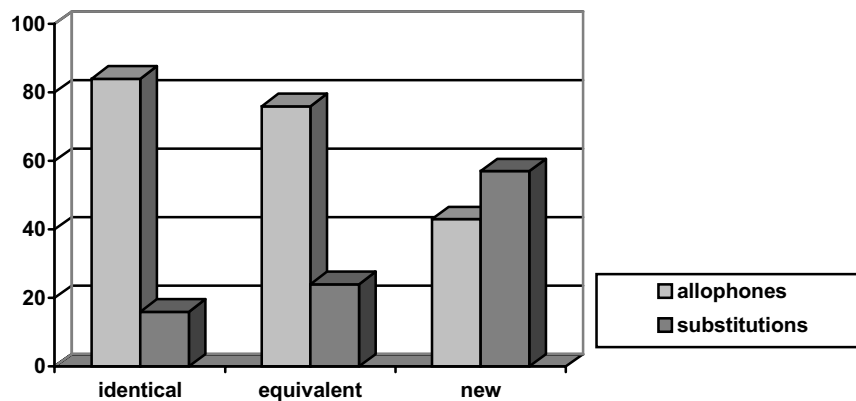


Fig. 10: Allophones and Substitutions: L2 French (%)

an equally important role. It is striking that even the identical sounds show a certain amount of substitutions and that these, contrary to the prediction, show a similar transfer pattern as the other two sets. Finally, target-like productions are found within all three categories as well.

7. Conclusion

With reference to the working hypotheses mentioned above, the analysis leads to the following conclusions:

1. Independent of their age, all subjects show a high range of interferences. This substantiates the claim that acquisitional strategies as known from older learners are fully in place at age 3;0. It has to be taken into consideration, however, that this study focused exclusively on the comparison of the groups as a whole. Thus, an extensional analysis of the data with regard to intra-individual characteristics of the subjects would be beneficial in the future.
2. With regard to mental categories, the data suggests that children depart primarily from their own sound system to approach the L2 sounds. This becomes evident in the interferences from the L1 and is especially noticeable in the sets of identical and equivalent sounds. The reason for this can be found in the area of perception (*magnet effect*) or of production (articulatory difficulties). But since these data only provide evidence for production, there are no final statements to be made. Target-like or almost target-like productions are more revealing with regard to mental categories. They suggest that the subjects have already formed mental categories for L2 sounds and try to articulate them appropriately. However, the number of subjects who produced certain sounds exclusively target-like in the data is very small. A few instances can be found, however, but the number of tokens is too limited to indicate with certainty the establishment of a new target-like L2 category. The fact that target-like structures do not occur exclusively within the tokens of single

subjects but are intermingled with a range of different substitutions indicate that these categories are not yet clearly established. They rather reveal that the child is in a process of developing categorial boundaries. The data suggests that these preliminary boundaries overlap with (sometimes several) L1 categories as well as with other preliminary L2 categories. It is certain, however, that the subjects' approach to the new categories takes place in a process since no child produced new L2 sounds target-like straightaway.

3. The children behaved predominantly as predicted with regard to their dealing with the different sets of sounds: indeed, the identical sounds showed positive transfer, and negative transfer is assumed for equivalent sounds, but there was also a certain amount of exceptions to this rule: transfer of sounds from the L1 did not turn out to be the only factor of L2 production; other factors were e.g. the transfer of lexical elements and phonotactic characteristics. A striking example is the evidence of *final devoicing* in the L2 production. An unexpected result within the set of new sounds was that the mechanism of transfer was used as well, in that they were generally substituted by sounds which shared certain articulatory features with them. In this respect, the hypothesis of the similarity with L1 acquisition could not be confirmed.
4. The data leads to the conclusion that the (somewhat rigid) classification of L2 sounds in three different sets with regard to their similarity to the L1 cannot be fully maintained. Although the data shows tendencies of the hypothesized mechanisms in L2 production (positive / negative transfer), the differences (especially with regard to transfer among the new sounds) is not as clear-cut as theory will have it. Empirically, it seems more adequate to postulate a perceptual continuum of similarity ranging from the poles "identical" to "new". This would suggest that, the more similar a sound is perceived, the more rigorously it is likely to be transferred from the L1. If, however, processes underlie certain phonological constraints in the L1, they prevail over the perceptual equivalence classification.
5. The acquisitional strategies depicted above are observable without paying regard to the L2 involved: the same mechanisms in production with regard to the three sets are observed in the L2 English as well as in the L2 French data. Many sounds even show similar amounts of substitutions in both languages, even though the sounds which served for substitution are not always identical. For this reason, it can be claimed that the mechanisms involved in the acquisitional process are independent of the fact whether English or French is learned as an L2. Although this study does not allow for conclusions regarding other languages, it is probable that these strategies are universal and can be applied to the acquisition of an L2 in general.

In conclusion, this study was able confirm the overall findings that the acquisition of an L2 follows certain universal patterns independent of the language which is learned. It has shown, moreover, that

the transfer patterns known from older learners are already fully in place with the youngest subjects of the test (age 3;10-4;2). But a lot of questions remain to be asked. It would, for example, be very interesting for future studies to investigate the inter- and intra-individual variation of the different subjects and to enlarge the analysis towards questions regarding older age and gender. It would also be interesting to compare immersion setups like these with other setups of early foreign language teaching. Additionally, a closer look at the input and acoustic analyses of the data would be beneficial to as an extension of this study.

Finally, the tests have shown that the beginning of introduction to foreign language cannot take place early enough in a child's life, since even the three year olds show signs of interference. To give the children more possibilities to encounter languages in a playful manner at a time when the child is still motivated, curious and able to play with the language without the interference of other factors mounting with age, early foreign language setups like the one described in this study should be applied more often. The data has shown that immersion is a useful means to pursue these goals.

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