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THE ACQUISITION ORDER OF CONSONANTS: A PROBLEMATIC VIEWPOINT

Introduction

Researchers to date have differed in the extent to which they emphasize individual variation in phonological acquisition. Universal theories such as R. Jakobson's (1968) and D. Stampe (1979) minimize the role of the individuality in phonological acquisition and emphasize the universal and innate order of acquisition. Much of the recent research, however, emphasizes the individual variation. Many researchers (e.g. Ferguson, Farwell 1975 : 435; Macken 1980 : 150) keep R. Jakobson's universal theory only as probabilistic. It is increasingly clear that children play an active role in acquiring their phonological system. According to C. Stoel-Gammon and J. A. Cooper (1984) several preference and avoidance cases are examples of the active role of child as a learner of language. Children seem to actively choose to produce certain words and avoid certain words and the child's selectivity was phonologically based (Ferguson, Farwell 1975).

Identifying the first occurrences of different linguistic elements in child language has, in spite of the problems associated with it, proved a fascinating research subject at least in the few Finnish studies made on children's early phonological development (Itkonen 1977; Iivonen 1986; Toivainen 1990; Savinainen-Makkonen 1996). The subject remains a compelling one because the structure of the first words of Finnish-speaking children is still not thoroughly understood. Although individual case studies have been conducted, as noted above, this field has simply not been studied comprehensively. The subject is, furthermore, of interest for the reason that, for example, R. Jakobson's (1968) theory about the order in which phonemes are acquired has not been fully supported by the few case studies (Itkonen 1977 : 15; Iivonen 1986 : 41; Toivainen 1990 : 64; Savinainen-Makkonen 1996 : 136) made concerning the Finnish language.

Sini's (Savinainen-Makkonen 1996) very first words in chronological sequence are in Table 1. Child age is given in years, months, and weeks. Child forms are given in square brackets e.g. [ki] using IPA, adult form is given in italics.

Sini's first consonants were in chronological order /k/, /t/, and /p/. The order is simply the reverse of R. Jakobson's (1968) predictions. The appearance of /k/ as a first phoneme is the most exceptional (Jakobson 1968 : 47; Cruttenden 1978 : 373; Ingram 1989 : 18). Later it became evident that in addition to the first phoneme, /k/ was also the most often used phoneme during the first words period. Sini acquired /k/ as her first consonant, as distinct from A. Iivonen's (1986 : 41) and J. Toivainen's (1990 : 64) sons, who acquired /t/ first. Also T. Itkonen's (1977 : 15) son differs from

this group with /m/ as his first consonant. None of these Finnish studies agree with R. Jakobson's (1968) prediction, in which the order is /p/, /t/ /k/.

Table 1

Sini's very first words (I = imitation)

Age (yrs;mths:weeks)	Child form	Adult phoneme	Adult form	Meaning
0;10:1	[?ka], [a'ka]	/k/	<i>kukka</i>	'flower'
0;10:2	[ki:k:a:] [et:æ]	/t/	<i>kiikkaa</i> <i>vettä</i>	'swing' 'water'
1;0:3	[pi], [əp:i], I [tat:i]	/p/	<i>nappi</i>	'button'
1;1:2	[ki]		<i>kissa</i>	'cat'

In studying first occurrences, it is also interesting to consider the input to the process. Do the structures heard by a Finnish child differ significantly from other languages to the extent that this would also be reflected as a difference in the order in which phonemes are acquired? Unfortunately, no Finnish studies are available which might have followed the possible convergence of adult and child phonemic distributions by comparing transcriptions from parent and child. Some idea can, however, be gained from the analysis of a child's target words. For example, in the case of the two boys in A. Iivonen's study (1986 : 42—43) and the boy in J. Toivainen's study (1990 : 62), the first word to be uttered by each of them was *äiti* 'mother'. This was also noted as the first word in S. Kunnari's (1997 : 38) study of 10 children, in which their most commonly used first words were listed on the basis of parental diary entries: *äiti* 'mother', *anna* 'give', *ei* 'no', *hauva* 'doggy', *kakka* 'pooh', *kiikkaa* 'swing', *maito* 'milk', *mummu* 'granny' and *tut-ti* 'dummy'. A. Iivonen (1986) went on to consider the word *äiti* in more detail. In the case study by T. Savinainen-Makkonen (1996), the first words to appear were *kukka* 'flower', *kiikkaa* 'swing' and *vettä* 'water'. The following are also words likely to be closely connected with a child's daily activities: *vaippa* 'nappy', *loppu* 'all gone', *poppa* 'hot', *nukkuu* 'sleep' and *leipää* 'bread'. At least at first glance, none of the consonants of these target words seems to be more prevalent than any other; words with each of the plosives /p/, /t/ and /k/ are found amongst these most common words.

Problems in determining the order in which phonemes are acquired

Determining the order in which phonemes are acquired is difficult first and foremost from the viewpoint of word definition. This is because during the first words stage there will also be periods of babbling, as this stage partially overlaps with the preceding babbling stage. If the sequences in which consonants are acquired are to be capable of comparison and if first occurrences of different linguistic elements are even to be identified, the criteria used in comparative studies for defining what constitutes a word must be the same. Amongst the criteria commonly given (Ingram 1989; Vihman, McCune 1994) are the phonetic similarity of children's utterances compared to those of adults, and the stability of use. At the babbling stage, a child's utterances are already reminiscent of adult language; the segments of the child's utterances sound like adult phonemes. According to C. Stoel-Gammon (1992 : 441), it is at the stage when reduplicative babbling starts to emerge that parents report that the child has spoken his or her first words.

Besides the concept of the word, the concept of the phoneme also gives rise to problems in child language. The principle behind the concept of the phoneme is that a minimal pair can be found which proves that the sounds are in opposition in an identical phonetic environment, e.g. *suu* — *kuu* ('mouth' — 'moon'). The requirement for a

minimal pair, however, is very difficult to satisfy in the context of child language. At the early stage of learning to talk, a child's active vocabulary is small, and the minimal pairs necessary for structural argumentation are simply not found from the child's first words (Kiparsky, Menn 1977 : 49). In Finnish word structures, which feature a lot of constructions longer than one syllable, the task of searching for minimal pairs may be even more difficult. On the other hand, minimal pairs can be readily found amongst some children's first words, e.g. *pappa* — *mamma* — *kakka* ('grandpa' — 'grandma' — 'pooh').

Having mentioned the problem of applying the phoneme concept to child language, it may be instructive to see how this has been approached in the literature. In particular, what terms have been used to describe the speech of children learning to talk? *Protoword*, for instance, is the term used by P. Menyuk, L. Menn and R. Silber (1986 : 211) to describe a child's early utterances that are either the child's own invention or early, word-like utterances formed on the adult model. M. M. Vihman (1996 : 130), however, accepts as protowords only those that are the child's own inventions; for words based on adult utterances she uses the term *context bound*, borrowed from, E. Bates, L. Benigni, I. Bretherton, L. Camaioni, V. Volterra (1979). Referring to the pre-linguistic stage, A. Iivonen (1994 : 41), for example, talks of "unripe" words and prototype syllables. But what term would apply, for instance, to the *k*-like and *t*-like *k* and *t* segments which sound alike at both the babbling and the first words stages? A. Iivonen (1995 : 4) uses *protovowel* and *protoconsonant* for the segments of the pre-lexical stage but has also referred (1994 : 41, 46) to the terms *vocant* and *closant*, proposed by J. A. M. Martin (1981). The terms *consonant* and *vowel* have also been used quite freely (e.g. Linell, Jennische 1980 : 17) without making a distinction between the segments of a protoword and those of a word; on the other hand, these terms have also been qualified in some cases. For instance, A. Iivonen (1995 : 11) uses the term *lexical consonant* when discussing the segments of the first word used by boy E in the study. When classifying the segments for boy J, A. Iivonen (1995 : 12) states that: "Phonetically, he had the following consonants: [t]-words beginning at age 0;10 (e.g. *että*) ...". In referring (1995 : 11) to word patterns that sound like the structures of adult language, A. Iivonen may have sought to emphasise the adult viewpoint of the study.

Should there, however, be a desire to get away from the phoneme concept and its definitions, consideration would need to be given to the criteria that can be used to judge whether a 'phoneme' has been acquired in the child's language or not. At what stage does a small articulated segment become a phoneme? The examples used below are taken from the early [t]-words uttered by Sini in a study by the present author (Savinainen-Makkonen, in press), as shown in Table 2.

Sini's early [t]-words (I = imitation)

Table 2

Age (yrs; mths: weeks)	Child form	Adult form	Meaning
0;10:2	[et:æ], I [et:æ]	<i>vettä</i>	'water'
1;0:3	[pi], [əp:i], I [tat:i]	<i>nappi</i>	'button'
1;2:0	[eio:yt:æ:]	<i>ei oo yhtää</i> (colloquial)	'there's nothing'
	[eiti]	<i>äiti</i>	'mother'
1;2:1	[æiti]	<i>äiti</i>	'mother'
	I [tøetyt]	<i>löyty</i> (colloquial)	'find' past
1;2:2	[tytto] [tyttøe]	<i>tyttö</i>	'girl'

The following proposition would seem to merit cautious consideration: that if a child is able to produce a consonant in the right place in a word and this is not simply a short-lived phenomenon but is repeated in an equivalent or almost equiv-

alent form on successive occasions, then this could be called a phoneme. It would then follow that [t], even in the absence of a minimal pair, could be classified as a phoneme in Sini's utterance [et:] *vettä* 'water', which was made at the age of 0;10 and then repeated regularly thereafter. But how should we deal with the fact that at the age of 1;0:3 Sini produced the utterances [pi] and [p:i] but occasionally also I [tat:i] *nappi* 'button', in which /p/ is replaced by [t]?

The continuity criterion outlined above is relatively easy to fulfil: all temporary expressions are left outside the analysis. It is not unusual, though, for a child's utterances to appear to regress to a weaker level (Ferguson, Farwell 1975), with the same adult language word being uttered in quite a different form; an equivalent or almost equivalent form will not necessarily reoccur. The complexity of a child's early utterances is often limited by the principle of a single consonant type (Menyuk, Menn, Silber 1986 : 208—209), whereby all other consonants in the word assimilate to the word's strongest consonant. Although these kinds of words are not useful for identifying first occurrences, they are important later on when studies are made of the consolidation of consonants into regular use.

Problems with the data

Successfully detecting the first words uttered by a child can prove difficult (Iivonen 1995 : 6, 13). The order of acquisition can be studied using sound or video recordings, especially if the recording is made at relatively frequent intervals. However, even frequent recordings will contain only the words that happened to be uttered at the time of each recording. The recording can, though, be structured beforehand to ensure that as many of the child's words as possible can be recorded. The most successful recording, however, might be achieved by studying one's own child, because new words will be noticed when they are fresh and efforts can be made to elicit them in a similar environment for recording purposes. The result will, of course, be influenced by a variety of factors including the child's alertness, the particular objects of interest and the guidance given. But even in the best cases, only a proportion of the child's utterances will be recorded. Only by keeping a 24-hour diary can everything the child says theoretically be recorded.

Whatever the method of data collection used, children will always speak about things which awaken an interest in them personally. Objects of interest to the child will be influenced not only by the child's personal preferences but also by the interactive style of the parents (and the words they use). It has been noted (Ferguson, Farwell 1975) that a child will choose from adult words the particular words he or she wishes to target. Moreover, the study data will include not only unintentional gaps but also so-called intentional gaps (Kiparsky, Menn 1977 : 51). This conceals one of the problems of comparisons between datasets: one child produces more suitable material than another in terms of phonetic definition, whatever the method of data collection. Below is a theoretical example of diary entries for two different children:

Child 1

1. [kuk:a] *kukka* 'flower'
2. [kak:a] *kakka* 'pooh'
3. [kek:a] *Pekka* (proper name)
4. [tut:i] *tutti* 'dummy'
5. [pupu] *pupu* 'bunny'
6. [pu:] *puu* 'tree'
7. [pup:i] *kuppi* 'cup'

Child 2

1. [kuk:i] *kuppi* 'cup'
2. [pap:i] *nappi* 'button'
3. [pop:a] *potta* 'pot'
4. [kuk:a] *kukka* 'flower'
5. [kak:a] *kakka* 'pooh'
6. [tu:] *suu* 'mouth'
7. [mapa] *napa* 'navel'
8. [æit:æ] *äiti* 'mother'

The utterances of Child 1 include consonants of adult language acquired in the order /k/, /t/ and /p/. With Child 2, however, the adult language consonants have been acquired in the order /k/ and /p/. At the next stage in the phoneme acquisition of Child 2 the /t/ of adult language appears in the child's utterances, but not in the right place: it appears as a substitute for /s/ in [tu:] *suu* 'mouth'. Similarly, /m/ appears in the place of /n/ as the result of assimilation in the word [mapa] *napa* 'navel'. In a motor sense, therefore, both /t/ and /m/ are produced, but in terms of the phonological system their position is still unsettled. The data collected from Child 2 does not include the kind of ordinary words such as *tutti* 'dummy', *nenä* 'nose' and *mummi* 'granny' in which it would be possible to produce the phonemes without the disturbance of other consonants. In the event that one child says the word [tut:i] *tutti* 'dummy' (as with Child 1) and the other child the word [pop:a] *potta* 'potty' (as with Child 2), the order of acquisition for /t/ is recorded differently, even though it may have been the same; due to the lack of data, this cannot be ascertained with any certainty. As the complexity of words produced at the first words stage is often limited by the principle of a single consonant type, whereby a word contains only one different consonant at a time (Iivonen 1994 : 47; Vihman 1996), data collection should include phonemes that can be produced in a 'disturbance-free' environment so that the order of acquisition can be defined and, in particular, that comparisons can be made between children. Such words would include *tutti* 'dummy', *kakka* 'pooh', *poppa* 'hot' and *suu* 'mouth'. This raises the question of how perfectly a phoneme must be mastered before it can be considered to have been acquired. Is it sufficient that the child manages to successfully produce the consonant in a given location in a word, for example at the start of a word, as in *suu* 'mouth'? With many children, the tendency towards word-final open syllables (Grunwell 1987 : 213; Savinainen, Kunnari 1998 : 79), as in e.g. [pa:p:a] *saappaat* 'boots', seems to limit the production of word-final consonants, not to mention cluster reduction, e.g. [sak:e] *sakset* 'scissors', which may remain with the child for several years (Grunwell 1987 : 217–221; Iivonen 1994 : 71, 74). It would appear that the more significant tendencies such as word-final open syllables and a single consonant type represent barriers to the production of individual consonants at the first words stage.

Discussion

Following from the above, it can be concluded that the study of a child's early word development from the point of view of phonemes inevitably demands an extensive and comprehensive dataset. There are no practical means, however, of achieving this at the early stages of the child's development, when his or her vocabulary is very restricted. The child's vocabulary will also contain the intentional and unintentional gaps already referred to. Since the necessary extensive database is normally not available, determination of the first occurrences of consonants will not be particularly reliable. The question could be asked, then, whether identification of the order in which phonemes are acquired or the study of the development of individual phonemes are even relevant at the very early stages of speech development. Is it even appropriate to search for such small segments from a child's speech when there is strong evidence that at the first words stage the child learns to produce words and not phonemes or phonemic oppositions (Waterson 1971; Farwell, Ferguson 1975; Menn 1978; Macken 1979; Stoel-Gammon, Cooper 1984)? A child has not yet learnt to segment his or her utterances (Vihman 1996 : 216) but instead processes words as holistic entities. Would it, indeed, be more productive to

look at other structures? Children's first words have been found typically to be mono- or disyllabic words (Vihman 1996) and to consist universally of CV syllables (Jakobson 1968). B. De Boisson-Bardies, M. M. Vihman, L. Roug-Hellichius, C. Durand, I. Landberg, A. Fumiko (1992) compared the phonological development of English, French, Japanese and Swedish-speaking children at the "0-stage" (babbling, no words) and at the 25-word stage (cumulative vocabulary of approx. 50 words), looking, amongst other things, at syllables. At the 0-stage, single syllables and word-final open syllables were typical in all language groups. By contrast, at the 25-word stage it was found that single syllables remained a strong feature only in English and that the utterances of the English-speaking children also featured more word-final consonants than in the other language groups. The explanation for this is found in the influence of adult language: the English language contains more monosyllabic words than the other languages studied here, and it also has a great many consonant-final words. Further studies would be necessary to include Finnish-speaking children in the comparison.

Finnish studies, however, have revealed that children produce words according to the principle of reduplication (Iivonen 1994 : 36, 39). Although in T. Savinainen-Makkonen's (1998) study syllables of the type CV(V) formed the largest syllable group (61%) produced by Sini, and there were noticeably more (77%) open syllables than are found in Finnish in general (52%), some 23% of Sini's syllables were nevertheless consonant-final (of the form VC, CVC or CVVC). These structures, however, never appear in word-final position, as open syllables are virtually a rule at the first words stage. Because VC appears solely as part of a larger construction, it might be more apt to talk not of the VC syllable but of the structure (C)VCCV, e.g. *poppa, tutti* and *kukka*. In this respect, it would be more appropriate for the choice of unit to be the word rather than the syllable. It might also be assumed that a Finnish child's early word development consists mostly of disyllabic words, as the proportion of monosyllabic words in Finnish is very small. It would be worth conducting further studies to investigate whether the reduplication principle (with syllables as the main unit) can also be generally applied to Finnish children's word formation, or whether, for example, long consonant structures (with words as the main unit) are more common amongst some children.

REFERENCES

- Bates, E., Benigni, L., Bretherton, I., Camaioni, L., Volterra, V. 1979, *The Emergence of Symbols: Cognition and Communication in Infancy*, New York.
- de Boisson-Bardies, B., Vihman, M. M., Roug-Hellichius, L., Durand, C., Landberg, I., Fumiko, A. 1992, *Material Evidence of Infant Selection from the Target Language. — Phonological Development: Models, Research, Implications*, Timonium.
- Cruttenden, A. 1978, *Assimilation in Child Language and Elsewhere. — Journal of Child Language* 5, 373—378.
- Ferguson, C. A., Farwell, C. B. 1975, *Words and Sounds in Early Language Acquisition. — Language* 51, 419—439.
- Grunwell, P. 1987, *Clinical Phonology*. Second Edition, London—New York—Tokyo—Melbourne—Madras.
- Iivonen, A. 1986, *Lapsen fonologisen kehityksen tutkimusmetodiikka. — Logopedis-foniatriinen tutkimus Suomessa*, Helsinki (Suomen logopedis-foniatriisen yhdistyksen julkaisuja 19), 17—58.
- 1994, *Paradigmaattisia ja syntagmaattisia näkökohtia lapsen fonologis-foneettisessa kehityksessä. — Lapsen normaali ja poikkeava kielen kehitys*. Toinen painos, Helsinki, 34—77.

- 1995, Lapsen fonologis-foneettinen kehitys 3. Lapsi leksikon kynnyksellä. — Suomen logopedis-foniatrinen aikakauslehti 1, Helsinki 1—15.
- Ingram, D. 1989, *First Language Acquisition. Method, Description and Explanation*, Cambridge—New York—New Rochelle—Melbourne—Sydney.
- Itkonen, T. 1977, *Lapsen kielen oppiminen*, Helsinki (Opuscula Instituti Linguae Fennicae. Universitas Helsingiensis 58).
- Jakobson, R. 1968, *Child Language, Aphasia and Phonological Universals*, The Hague—Paris.
- Kiparsky, P., Menck, L. 1977, *On the Acquisition of Phonology*. — *Language Learning and Thought*, New York.
- Kunnari, S. 1997, *Fonologisen kehityksen varhaisvaiheet*. Suomen logopedis-foniatrinen aikakauslehti 1—2, Helsinki, 33—38.
- Linell, P., Jennische, M. 1980, *Barns uttalsutveckling*, Lund (Liber Läromedel).
- Macken, M. 1978, *Permitted Complexity in Phonological Development. One Child's Acquisition of Spanish Consonants*. — *Lingua* 44, 219—253.
- 1979, *Developmental Reorganization of Phonology. A Hierarchy of Basic Units of Acquisition*. — *Lingua* 44, 219—253
- 1980, *Aspects of the Acquisition of Stop Systems. A Cross-Linguistic Perspective*. — *Child Phonology 1. Production*, New York.
- Martin, J. A. M. 1981, *Voice, Speech, and Language in Child. Development and Disorders*. — *Disorders of Human Communication*, Vol. 4, New York.
- Menck, L. 1978, *Phonological Units in Beginning Speech*. — *Syllables and Segments*, Amsterdam.
- Menyuk, P., Menck, L., Silber, R. 1986, *Early Strategies for the Perception and Production of Words and Sounds*. — *Language Acquisition. Studies in First Language Development. Second Edition*, Cambridge.
- Savinainen-Makkonen, T. 1996, *Lapsenkielen fonologia systemaattisen kehityksen kaudella*. Lisensiaatintyö, Helsinki (Manuscript).
- *Ensisanojen kauden fonologiaa*, Oulu (Oulun yliopisto. Suomen ja Saamen kielen ja logopedian laitoksen julkaisuja) (in press).
- Savinainen-Makkonen, T., Kunnari, S. 1998, *Lapsenkielen fonologian arviointi*. — *Kielihäiriöisen lapsen tutkiminen — testamistako?*, Helsinki (Suomen logopedis-foniatrisen yhdistys ry:n julkaisuja 30), 71—85.
- Smith, N. V. 1973, *The Acquisition of Phonology. A case study*, Cambridge.
- Stampe, D. 1979, *A Dissertation on Natural Phonology*, New York.
- Stoel-Gammon, C. 1992, *Prelinguistic Vocal Development. Measurement and Predictions*. — *Phonological Development. Models, research, implications*, Timonium.
- Stoel-Gammon, C., Cooper, J. A. 1984, *Patterns of Early Lexical and Phonological Development*. — *Journal of Child Language* 11, 247—271.
- Toivainen, J. 1990, *Acquisition of Finnish as a First Language: General and Particular Themes*, Turku (Turun suomalaisen ja yleisen kielitieteen laitoksen julkaisuja 35).
- Vihman, M. M. 1996, *Phonological Development*, Cambridge (Mass.).
- Vihman, M. M., McCune, L. 1994, *When is a Word a Word?* — *Journal of Child Language* 21, 517—542.
- Waterson, N. 1971, *Child Phonology. A Prosodic View*. — *Journal of Linguistics* 7, 179—211.