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LONG VOWELS IN THE ACQUISITION OF FINNISH MORPHOLOGY*

Very early in their development, Finnish children use vowel lengthening in the unstressed second or third syllable for various morphological purposes. This is apparently one reason why their language exhibits several grammatical functions that are missing from the speech of, for example, English-speaking children of the same age. Slobin's operating principles give only a partial explanation for the unstressed long vowels, namely, by the principle "pay attention to the last syllable of an extracted speech unit" (Slobin, 1985, p. 1251). More useful here is his principle of "thinking for speaking" in the child's acquisition of the language (Slobin, 1991).

In our sample, children acquiring Finnish begin to use inflectional forms including terminal long vowels from the age of 1;3. Verb inflection begins with affirmative third person singular forms, and the median child (13th of the sample) used it at 1;8. The first cases of nouns with long vowels are partitive and illative, both used by the children at 1;11. Additionally, there are 1st person plural forms in spoken language having long vowels in terminal syllables. The various uses of unstressed long vowels are combined under one semantic concept called non-entirety, which is hence marked iconically.

Introduction

Randomly selected one-year-old Finnish children produced many correct instances in their language usage. Half of the 24 children studied already used at least five Finnish inflectional suffixes before the age of two (Toivainen,1980, p. 165, 1997). In fact, five of these children showed particularly advanced acquisition as evidenced in fragments of their speech from 20-23 months of age using more than ten separate suffixes; these five children are excluded from the present analysis, namely, Riikka from the age of 1;8 (having 23 categories out of 32), Katja 1;10 (23), Maila 1;11 (21), Marko 1;11 (12) and Ville 1;11 (11). (See J. Toivainen,1980, pp. 168-170.)

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The first suffixes include a considerable number of allomorphs, which in themselves, or in combination with word stems, have an unstressed long vowel, e.g. Arja 1;3: *nukk**u-u*** 'sleep-3SG'(= '(It) is sleeping.'), Katja 1;3: *pap**i-i*** 'BT: sleep-3SG' (= '(It) is sleeping.'), Harri 1;6: [*tatt**a-a***], Adult "satta-a", 'rain-3SG' (= 'It is raining.'); Katja 1;3: *ruok**a-a*** 'food-PART' (= 'some food'); Kirsti 1;4: *sukka jalk**a-a**n. men**e-e**.* 'sock foot-ILL. go-3SG' (= 'Sock on. There it goes.')

If we suppose that all the early phenomena mentioned above are relevant, we must find an explanation for the acquisition process. Seemingly adult parts of speech are not complete in every respect; however, they are not totally meaningless either. Let us consider the child's Language Making Capacity and neural models for cognitive science and high-level brain functions, as proposed by Teuvo Kohonen and others.

Since 1971, Dan Slobin has assumed the existence of operating principles, in fact, an innate program for the child. "The Language-Making Capacity", in its recent formulation (Slobin, 1985), consists of numerous statements concerning procedures or strategies, which are "necessary prerequisites for the perception, analysis, and use of language in ways that will lead to the mastery of any particular input language" (Slobin, 1985, p. 1159). Ann Peters (1985) developed a somewhat shorter set of operating principles for perception in contrast to those developed by Slobin, whose main interests concerned production. These principles are not derived from cognitive aspects; as Magdalena Smoczyńska (1986, p. 392) put it: "The child is above all a language user; pragmatic factors are much more relevant for him than cognitive ones." Through language the child is not organizing the world but, primarily, living in it. The systems emerge later.

To my mind, results of artificial neural network studies conducted by Teuvo Kohonen and his colleagues (Kohonen, 1987), we have already got an answer to the question of how an infant can acquire the phoneme system of the language. The result is elaborate but the solution must be so simple that a machine can do it as has been done successfully in the distribution of phones of a sample of Finnish speech into phonemes. Central consonants can be easily included taking into account the context and the surrounding phonological environment only. This automatic phonological analysis of the language input, performed by the child's brain as well as by a simple machine, is an important prerequisite for the rapid storing and analyzing of morphological material. Recent studies show that auditory discrimination of phonemes is possible in newborns, and speech sounds elicit electrical brain responses even in healthy premature infants born 30-35 weeks after conception, demonstrating that the human brain is able to discriminate phonemes at this early stage (Cheour-Luhtanen et al., 1995, 1996).

Artificial neural networks can take into account contexts of any sort. They work in a self-organizing fashion. Even a machine can have an associative memory. Since artificial neural networks reach a considerable level in activities which demand self-organization and associative memory, one can seek answers to questions concerning the child's processing of first language data. Associative memory is useful in categorizing varieties of bound morphemes taking into account phonetic and semantic facts in varying contexts.

Anders Lansner (1991) modified an artificial neural network model to achieve a capability of learning from unlabeled and noisy examples. He pointed out that it is possible to design a recurrent artificial neural network that employs a distributed representation and is capable of extracting prototypes even from problematic examples.

Table 1. Frequencies and examples of categories with unstressed long vowels used by Finnish children aged under 2 years. V = the preceding vowel.

Inflection:		3-4 categories		5 categories	
Children:		11 at 1;3-1.11		11 at 1;7-1.11	
Instances:	132		44		88
Noun inflection				St. ‘vet-tä’ ‘koira-a’	
		*tääl peip**ä-ä***		*vett**ä-ä** koij**a-a***	
PARTITIVE		here bread-PART		water-PART dog-PART:NEG	
70%:-a, -ä	14		2		12
ILLATIVE		*sukka jalk**a-a**n*		*ännü-ün* “sänky-yn”	
80%:-Vn	13	sock foot-ILL	4	bed-ILL ‘to bed’	9
Infinite verb				*istu-m**a-a**n syl**i-i**n*	
				sit-INF-ILL lap-ILL	
ILLATIVE				*ukk**u-u**n* Dial. “nukku-un”	
100% -Vn	7			sleep-ILL ‘to sleep’	7
Finite verb		*nukk**u-u***		*aj**a-a*** (even: haj**a-a**)	
PRESENT TENSE		sleep-PRES.3SG		drive-PRES.3SG	
3RD PERSON		*ott**a-a***		*aje-**le-e*** ‘he is driving’	
AFFIRM		take-PRES.3SG		drive-CONT-PRES.3SG	
100% -V	72		22		50
		*kato-t**aa***			
1PL AFFIRM		look-at-PASS:1PL			
100% -TAAN	5	‘let us look at it’	4		1
Others		St. ‘haloo’		St. ‘ammuu’	
PHRASES		*all**oo***		*amm**uu***	
		‘hallo!’		BABY TALK ‘cow’	
CLITICS		*ei men-nyk-k**ää***			
		not go-PAST-CL:NEG			
		‘(sock) did not go’			
NOMINATIVE		St. ‘kaniini’		St. ‘poliisiauto’	
IMITATION		*kan**ii**na*		*pol**ii**si* ‘police car’	
		‘cony’		police	
	21		12		9

Unstressed long vowels and their acquisition

Let us look at word-final long vowels which are always unstressed in Finnish. Concerning the youngest children, there are the following findings (see Table 1).

(1) In standard Finnish, the Oulu dialect is in these respects in accordance with the standard language: the partitive case endings *a*, *ä* added to words with terminal *a*, *ä* produce long vowels, e.g. *tääl +peip**ä-ä*** ‘here bread-PART’ (= ‘There’s some bread here.’); *e-o-k koij**a-a** tä* ‘ei ole koira-a tä(ssä)’ ‘NEG.V be: NEG dog-PART: NEG here’ (= ‘Here is not a dog.’); *vett**ä-ä*** ‘vet-tä’ ‘water(: PART)-PART’ (= ‘There is some /that is water’). The

Table 2. Long vowel including a third person present suffix and emerging short vowel forms in the speech of Finnish one-year-olds. Morphemic transcription [phonetic in brackets]. Age of the child and two letters out of the name (underlined here), + = female: Anu+, Arja+, Harri, Ilpo, Katja+, Kimmo, Kirsti+, Kyösti, Mika, Niina+, Saila+, Sanna+, Teppo, Ulla+, Ville.

Present reference: ***continuative***

*aj**aa*** 1;7Km 1;9Ul [aijaa], 1;9Te [hajaa] ~ short vowel:[aijja] 'drives'
*ajel**ee*** 'is driving' 1;11Ar : correct past tense: ajeli 'was driving'
*av**aa*** 'opens' 1;8Vl [avvaa]
*halu**aa*** 'wants' 1;3Ni
*haukk**uu*** 'barks' 1;8Sn
*huut**aa*** 'shout' 1;8Vl
*ist**uu**(pi)* 'sits' 1;8Sn 1;8Vl 1;11Ar
*itk**ee*** 'cries' 1;8Sn 1;9Ni 1;9Ul
*kiikk**aa*** 'swings' 1;8Sl
*korj**aa*** 'repairs' 1;8Sn [kooraa]
*laitt**aa*** 'puts' 1;10Mi
*lask**ee*** with short vowel: [lakke] 'counts' : correct past tense: [akki] 'counted' 1;8Vl
*leikk**ii*** 'plays' 1;10Ha. With short vowel: [leikki] 'plays' 1;3Ka
*maal**aa*** 'paints' 1;5Vl [maam**aa**]
*mak**aa*** 'lies' 1;11Ar
*men**ee*** 'goes' 1;4Kr 1;8Sl 1;11Ar : correct past meni 'went' 1;11Ar
*nukk**uu*** 'sleeps' 1;3Ar 1;10Il, [ukkuu] 1;8Sn 1;8Ky
*näk**yy*** 'is seen' 1;8Ky
*paap**aa*** 'sleeps' 1;7Km 1;9Te
*paist**aa*** 'steaks' 1;9Te
*pap**ii*** 'sleeps' 1;3Ka
*pelk**ää*** 'is afraid' 1;10Ha
*pes**ee*** 'washes' 1;8Sn [petee]
*piirt**ää*** 'draws' 1;5Ky
*pyör**ii*** 'goes around' 1;8Vl 1;9Ni 1;10Mi 1;11Ar 1;9An [Bü,ää]
*sat**aa*** 'it is raining' 1;6Ha [tattaa]
*seis**oo*** 'stands' 1;9Ul [eitoo]
*toim**ii*** 'is functioning' 1;10Mi [toinii]
*tul**ee*** 'comes' 1;7Km 1;9Ni

telic

*pääs**ee*** 'can go on' [päätee] : correct past tense [pääti] 1;9Te

punctual

*lähte**e*** 'leaves' 1;7Km
*pist**ää*** 'sticks' : SHORT when the first syllable lengthened.[piistä] 1;8Vl. [pittää] 1;8Sn

Future reference: ***continuative***

*kats**oo*** 'looks' : correct SHORT with 1st person ending: katson 'I look' 1;8Kr

telic

*ant**aa*** 'gives' 1;10Il [antee]
*ott**aa*** 'takes' 1;3Ni
*pan**ee*** 'puts' : correct short in imperative: pane 'put (it)!' 1;7Km
*puto**aa*** 'falls' 1;3, 1;9Ni [puttoo] 1;8Ky Sn : correct past tense [putoti] standard *putosi* 'fell' 1;8Ky

punctual

*aukais**ee*** 'opens' 1;8Kr

instances are correct, except for one out of 14 instances, namely, Teppo's (1;9) reply to Father's question in the following fragment:

Father: *Mi-tä sinä nyt e**tsi**-t?* 'wh-PART you now look.for-2SG'
(= 'What are you looking for now?')
Teppo: ***tä**-tä kiija*. 'this-PART book'
(= '(I'm looking) for this book.')

Standard phrase *tä-tä kirj**a-a*** 'this-PART book-PART' includes case agreement: two partitive endings, the latter being lengthening of an unstressed vowel.

(2) Concerning illative case formation, there were 9 users and a total of 17 spontaneous instances (verbs included). Only two children used incorrect short vowel forms, Niina at 1;9: *pane kaappi-n* instead of "kaapp**i-i**n" 'wardrobe-ILL'; and Sanna at 1;8: [kotti], mother's "kott**i-i**n", standard "koti-in" 'home-ILL'. In these cases, there was no risk of confusion with the accusative or genitive because of the gemination before long vowel, cf. e.g., kaapi-n 'wardrobe-ACC/GEN'.

(3) Verb forms are even more correct in this respect. As already mentioned, infinite verb illatives had all the 7 Finnish long vowels in the terminal syllable. For 60 basic forms of verbs there are only two exceptions with a terminal short vowel. See Table 2.

(4) So-called passive forms, which are used in spoken Finnish in the function of the 1st person plural, are rather complicated compared with other personal forms. Before 2 years of age four instances appeared at 1;4-1;6 and only one later, at 1;8. Long vowels were mainly correct. In the case of one child at 1;4, there were passive hortative forms from the verb *katsoa* 'look at', always with a long vowel: *katotaa*, *atotaa*; even without the wordfinal n, which in fact is quite mildly pronounced in the local dialect of Oulu. What is interesting is that the child uses another verb without a long vowel although it is included in the adult form. I refer to the verb *kääntää* 'turn' which in the adult and general standard form is *käännetään*. The girl in this case utters the form in a shortened version: *kääntä.* This may be due to the fact that in everyday speech adults articulate this form very quickly: not the fully articulated form *käännetään*, but: *käännetä...kääntä.* This is exactly the same as the child Kirsti had apparently once noticed, and the short form, used as an imperative form quite correctly in the spoken language, was in accordance with the simple imperative of the 2nd person singular: *käännä!*

From this example one can see the difference between the indicative and the imperative. The former may terminate in a long vowel, while the latter usually has a short vowel ending. This material included only one verb in which the imperative form also has a long vowel ending, namely, maalaa (3rd person indicative) 'paints',(2nd person imperative) 'paint!' As mentioned above, this Janus-faced explanation is also present in passive forms.

The first inflectional morphemes in Finnish

The first inflectional morphemes were found from the Oulu sample of Finnish children at the age of one year three months (Toivainen, 1980, p. 27). However, the negation word is also a verb having inflection in person forms, e.g. ei 'not: 3SG' : e-n 'not-1SG', which appeared in the speech of one child, Niina, at 1;1 (op. cit., p. 257). The forms may be regarded as factual and relevant, because they are used in a correct manner in both pho-

netic and pragmatic respects, e.g. standing in the middle of the floor looking at the microphone she says one stressed word: en 'I do not (speak)', because she was afraid of the strange machine and the student interviewer. However, she also used the verb 'to be' in both negative and affirmative form: see fragments (1) and (2).

(1) Mother: *kukka, Niina, kukka*. 'flower, Niina, flower'
(= Niina, (it is) a flower.)
Niina: [ei vo:]. Adult "ei oo" 'NEG.V be: NEG'
(= (It) is not.)

(2) Niina: *poppa*. 'BT: light' (= 'lamp.')
Mother: *poppa siellä niin*. 'light there so'
(Yes, there is a lamp.)
Niina: *on. poppa*. 'is. light' (= The light is on.)

Other early observations are made from Turkish: 1;3 (Aksu-Koç & Slobin, 1985, p. 857), and Russian: 1;10 (Gvozdev, 1961; Bogoyavlenskiy, 1957/1973). Before two years of age the Finnish child may spontaneously use 8 inflectional case forms, and 2 plural markers for nouns. The corresponding morphemes (prepositions) are lacking, e.g., in Scandinavian materials (cf. Plunkett & Strömqvist, 1992). In English, however, there are some instances of prepositions recorded from a child under the age of 2 (Tomasello, 1987).

Verbs can also be inflected in present and past tenses in Danish at 1;11 (Plunkett & Strömqvist, 1992), but Finnish materials are even 6 months earlier. The temporal form with an auxiliary (perfect) already emerge in Finnish at 1;8, which is very early as compared to many other languages. Also, four personal forms and one infinitive are used before 2 years of age, and some others soon after 24 months.

Now the problem is how such a small child can acquire these separate forms and their meanings. The child's usage seems to be correct enough for those familiar with the child. Even the researcher accepts the explanations of the mother.

The morphemic status of terminal long vowels

There are two central suffixes which can consist of pure vowel lengthening: partitive case suffix and the 3rd person present suffix. As concerns the former, in Standard Finnish and some dialects (e.g. that of Oulu) the partitive suffix is thus only in the case of stems ending in *a*, *ä*. There are local dialects, e.g. that of the Helsinki region, in which assimilation has resulted in all partitive endings *a*, *ä* lengthening any unstressed terminal vowel of the stem, e.g. ove-e instead of *ove-a* 'door-PART', just as in 3rd person verbs in general, see the following point. (One reason for the assimilation in the adult language may be precisely child language acquisition, if my iconicity theory concerning long elements [J. Toivainen, 1997: 178; this article] can be accepted.) As concerns the latter central suffix, the 3rd person present suffix for all vowel stems leads to lengthening, e.g. *tule-e* ´come-3SG'.

Both are the first in the acquisition schedule of the Oulu sample: the former in noun inflection and the latter in the use of verbs (together with the 2nd person imperative forms). Note, however, that it is not obvious that, at that time, there are any real inflectional para-

digms. This is the problem of the first instance; the second emerging form makes it much easier to speak about inflection.

Generally, the nominative form of nouns is evidenced earlier than the partitive in Finnish children's speech. These two forms differ from each other only with respect to vowel lengthening (or other partitive ending), since the nominative has no singular suffix at all.

The 3rd person ending is quite exceptional, because the suffix has so many allomorphs, namely all vowels, e.g. ***-a***: *ottaa* 'takes, will take', ***-e***: *menee* 'goes', ***-i***: *papii* dialectal caretaker's word, BT 'sleeps, is sleeping', ***-o***: *puttoo* dialectal form 'falls, will fall', ***-u***: *nukkuu* 'sleep(s), is/are sleeping', ***-ü***: *näkyy* 'is/are seen', ***-ä***: *piirtää* 'draws, is drawing' (see Table 2). We cannot speak about any abstract morpheme with so many allomorphs. It is even more difficult to think that the child develops so many separate primitive morphemes so early in his/her development. In fact, it is rather hard to believe that the Finnish child, in the phase of three or four apparent adult-like suffixes, may have all of them clear before the age of 1;8.

The inflectional categories concerned, having suffixes with unstressed long vowels in the terminal syllables, are then the partitive and illative cases, the 3rd person present and the 1st person plural in the materials of one-year-olds although five of the most advanced children were taken in a separate group (having more than 10 inflectional categories in one sample, as mentioned above).

The correct realization of these long vowel instances can be explained by semantic factors. I shall combine all these instances under one semantic dimension, which is **non-entirety in all respects**. Obviously, this is the function of the partitive in Finnish in the child's language as well as in general (J. Toivainen, 1980, 1986, cf. Slobin, 1985, p. 1188). (Concerning the standard Finnish partitive case, see also Denison, 1957, Karlsson, 1983 and Vainikka, 1993.) To associate basic active verb forms with that concept, let us point to an aspect of the process depicted. Lacking separate future tense forms, the Finnish present tense can serve as future tense as well. Therefore the long vowel form of a verb is just like the partitive of a noun: the process does not form an entirety. As the partitive has as its opposite a nominative with generally a terminal short vowel, the 3rd person verb forms have corresponding imperative forms and past tense forms with a short vowel at the end of the word.

The majority of verbs (90 %) fit this formulation (Table 2). If the verb is telic or punctual in nature, it often refers to a future event, e.g. to the plans of the child herself/himself. Exceptional verb forms, those with a short vowel where a long vowel would be expected based on the adult form, could appear in those cases where semantics include some imperative, telic or punctual details. Here are a few instances:

1) The standard word *pist**ää*** 'prick' is found at 1;8 in two samples, in Sanna's and Ville's [pittää], but Ville has surprisingly changed the phonetic shape by lengthening the first syllable only, and the consonant combination st is not assimilated: [p**ii**stä] 'prick: 3SG'; apparently this comes directly from his grandmother's speech, who uttered it with an emphatic lengthening: [piistä], but this was originally an imperative form, just as in the standard language *pistä!* 'prick: IMP' = (in this case:) 'put off!'. Ville had even a third variant of this verb in the 3rd person form, which he used when frightened because he touched the tape-recorder of the interviewer: *pittä* – short vowel, but in a punctual verb – 'puts (one finger on the machine)'. (In a very affective state the child may regress in her/his language to a very babyish phase; e.g., a very advanced Finnish girl at 1;11, see Toivainen, 1961, pp. 305-310).

2) Standard Finnish ajaa ‘drives’, dialectal “ajjaa”, Ulla also with a short terminal vowel: aijja ‘drive: 3SG’; note consonant lengthening (ijj) however. Present tense long vowel forms are naturally in opposition to past tense forms of the same (continuative) verb always with a final short vowel (i): (Arja 1;11: aje-le-e ‘drive-CONT-3SG’ :) aje-l-i ‘drive-CONT-PAST’, or (mene-e ‘go-3SG’ :) men-i ‘go-PAST’ (Arja 1;11); adult “pääsee : pääsi”, nearly as such in Teppo 1;9: pääte-e ‘get-3SG.PRES’: päät-i or pääs-i ‘get-PAST’ and adult “mennee : meni” as menne-e ‘go-3SG.PRES’ : menn-i or men-i ‘go-PAST’.

3) The most frequent verb form in Finnish child language is on ‘is; has’ from the verb olla ‘be; have’, which is three-dimensional: (A)a copula, (B)an existential or (C) an auxiliary verb. We do not have sufficient observations on the phonetic variation of this verb (on, ono) in child language, but as such there is no overt marking of continuativeness in the verb, e.g. in the existential use. (This aspect can be marked in transitive and existential sentences by a partitive suffix in the second noun (object) of the clause.)

Iconicity of length

At the beginning, the long vowel is not a morpheme nor a mere symbol of non-entirety. It is a reality, it represents length itself or its image, indeed an icon of length. The vowel itself, like the concept, endures over time, without termination, ongoing. Vice versa: the short vowel is an icon of shortness, of what is gone, ended, a stop, or, on the contrary, fullness.

The iconicity of length is seen in vowels. But what about consonants in a language where there is no vowel length correlation like in Finnish? In gemination cases we saw some instances where vowel length was lacking in Finnish, but it was not systematic.

In Estonian, which is closely related to Finnish, unstressed long vowels have been replaced by a lengthened preceding consonant, e.g.

Est. *tuba* – Finn. *tupa* ‘house’,
Est. *tupa*, read: [tu**p: a**] – Finn. *tu**paa*** ‘house: PARTITIVE’,
Est. *tuppa*, read: [tu**p: : a**] – Finn. *tu**paa**n* ‘house: ILLATIVE’.

This was pointed out by Professor Paul Alvre (Tartu) in the 2nd seminar on research into acquisition of Finnic languages at the University of Turku in 1993 (K. Toivainen, 1994).

Discussion

Beyond cognitive preference in the acquisition of a first language, more important may be the surrounding language usage as well as mere chance. The mother emphasizes by intonation some words in her speech, and those are the primary candidates for acquisition. However, what about suffixes, in all cases of unstressed parts of words, in a language in which there are tens of alternatives of suffixes and suffix combinations to begin with? In every case, in every situation, in every scene, you may select among many suffixes that are relevant, even important, and informative in the given context. Naturally, these alternatives are offered originally by an adult. The child, semi- automatically, or by chance, may pick up words that also include some bound morphemes for use in certain contexts.

These bound morphemes are not grammatically systematic nor strict at the start. They may consist of contaminations unknown in the adult language. For example, the iconicity of long and short phonemes, developed with self-organization and associative memory in full accordance with the set of operating principles of the Language Making Capacity (Slobin, 1985) or Thinking for Speaking (Slobin, 1991), serve as a starting point for extracting word forms. So the normal one-year-old child can make distinctions which the adult categorizes as a distinction between partial and whole, or ongoing and perfective, indicative and imperative, non-past and past, if and when the language gives that kind of input to the child's neural network for starting and classifying.

Abbreviations for glosses

1	First Person	INF	Infinitive
2	Second Person	NEG	Negative
3	Third Person	PART	Partitive
ACC	Accusative	PASS	Passive
AFFIRM	Affirmative	PAST	Past
BT	Baby Talk	PL	Plural
CL	Clitic	PRES	Present
CONT	Continuative	SG	Singular
GEN	Genitive	St	Standard Finnish
ILL	Illative	V	Verb
IMP	Imperative		

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