

What Metathesis Reveals about L1 and L2 Acquisition

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1. Introduction

Comparing notes on the linguistic behaviour of our respective children, we became aware of a peculiar phenomenon of metathesis they both presented. One of the children was growing up in a monolingual Japanese environment, the other had been exposed to Spanish and Icelandic from birth, and to English from age 2:5, and was by age 3:00 predominantly English-speaking and passively trilingual. What was peculiar was not the fact that they both performed metathesis, which is not uncommon in small children, but rather that, in spite of the children's very different linguistic background, the type of metathesis they performed had some characteristics in common. For instance, the metathesis always involved segments – rather than syllables, as is usually seen in adult Japanese utterances.

The difference between the child's utterances and the adult metathesis patterns in Japanese seemed to suggest that adult speech was somehow influenced by the spelling system. The influence of spelling is something we had observed before in analysing transfer from L1 of adult foreign language students (L1 Japanese > L2 English and L1 English > L2 Spanish, cf. Miglio and Fukazawa 2006). While the metathesis data seemed to point to another wide-reaching influence of spelling even on elusive phenomena such as metathesis, the children's data pointed to universal mechanisms at work, despite of language-specific input. The phenomena deserved some attention because of the theoretical implications they entailed, at least they seemed to fit within the thesis set forth in Bley-Vroman's seminal paper on the Fundamental Difference Hypothesis (1989).

Thus, the paper analyses the data from one monolingual Japanese child, Japanese metathesis in adults (in passing also transfer into English as L2), as well as from a trilingual child with Spanish, Icelandic and English as L1 inputs. These data show how metathesis applies differently in L1 and L2, comparing child and adult utterances in Japanese, as well as the utterances of the two children with different L1s.

We conclude that the phenomena analysed reveal a fundamental difference between L1 and L2 acquisition (Bley-Vroman 1989), i.e. the importance of analogy as a transfer factor in adult L2. Metathesis also reveals the influence that spelling has on adult L2 learners. Using OT, spelling influence/ analogy is formally introduced in the L2 model, contributing to the understanding of L2 phonology.

The novelty of the proposal lies in showing the similarities of utterances produced by children exposed to extremely different L1 environments, which suggests that we are seeing UG at work, and in proposing that adults can acquire constraints later in life, or at least make use of cognitive strategies that mimic the principles of UG, as suggested in Bley-Vroman (1989).

1.1 Data

In the first data set, we would like to show how metathesis works in adult native Japanese speakers (data from Fukazawa p.c., cf. also Terao 2002).

(1) Japanese adult metathesis

*[tarabukasu] for [taburakasu] “deceive”

*[takumoteki] for [tamokuteki] “multipurpose”

*[otoko] for [okoto] “koto” (Japanese traditional musical instrument)

The first two examples clearly show that the unit for adults’ metathesis is the syllable, as it is the whole CV sequence that trades places: [ta.ra.**bu**.ka.su] > [ta.**bu**.ra.ka.su].

On the other hand, if one compares these well-known examples of metathesis to those found in the speech of one monolingual Japanese child, one finds that the picture is somewhat different:

(2) Japanese infant metathesis (Eugene, 2.5)

Correct utterance	Metathesis
tsumiki “wood building block”	tsukimi
nezumi “mouse”	nemuzi
nemaki “pajama”	menaki
sakippo “tip”	sapikko

Eugene’s examples show that he metathesises segments, not whole syllables, as would be expected if we took segments as the phonological units, the basic building blocks of human speech.

In fact, we collected metathesis data from a different child the same age as Eugene, who speaks a different language – he has been exposed to three different languages (Spanish, Icelandic, and English) and has at some point or other presented metathesis in all three of his languages:

(3) Trilingual child (Loftur, 2:5 – 3:5)

Correct utterance	Metathesis
Klink ‘coins’ <i>Ice</i> .	[kinkl]
Leðurbökur ‘bats’ <i>Ice</i> .	[leðYrbökIYr]
Kalt ‘cold’ <i>Ice</i> .	[klalt]
Fugl ‘bird’ <i>Ice</i> .	[flYg]
Calcetines ‘socks’ <i>Sp</i> .	[kaltelines]
Ask <i>Eng</i> .	[aks]
Gul blaðra ‘yellow balloon’ <i>Ice</i> .	[bYl glaðra]
Chocolate <i>Eng</i> .	[tloklet]

Loftur therefore also metathesises single segments: [‘leðYr,blökYr] > [‘leðYr,bökIYr], [kalse’tines] > [kalte’sines], regardless of the language or of its syllabic structure. Even if Loftur’s production cannot be immediately compared to Eugene’s, we think that the fact that a child, whose linguistic experience is completely different from a monolingual Japanese child, still makes comparable mistakes in pronunciation involving metathesis points to a universal tendency that metathesis has the phoneme as its basic unit of operation.

2. What is Metathesis?

Metathesis is the reversal of the expected linear order of segments, which may affect contiguous (ask > aks) or non-contiguous segments (leðurbökur > leðurböklur).

Traditionally, metathesis has been considered a sporadic, superficial effect relegated to performance error. Its relevance, as such, would only be historical or developmental in L1 acquisition. In recent work, however, Blevins and Garrett (1998) and Hume (2002) among others have been reversing the traditional trend and attributing a more fundamental role to metathesis as a phonological process connected to the misperception of sounds.

These authors maintain that metathesis occurs in fact because of ambiguity in the acoustic signal. At the basis of the phenomenon there is ambiguity in the signal – which can lead to the misinterpretation of cues, for instance of their length, as well as of the inception of the segment (Blevins and Garrett 1998, Hume 2002).

The frequency of the occurring patterns also seems to be important, attesting to the role of the knowledge of the speaker's own native language: both orders of the sequence, in fact, must be attested in the language for metathesis to occur, and speakers seem to be aware of what patterns appear more frequently and reproduce them in metathesis (Hume 2002).

The points of view of these researchers are dissimilar. If Blevins and Garrett (1998) reject the traditional functionalist view of metathesis as an optimising operation – an emergence of the unmarked (ease of pronunciation, improving syllable structure along the sonority dimension for instance), Hume (2002) certainly continues this tradition stating that phonetic and phonological factors (optimising pronunciation or perceptive cues), coupled with lexical frequency can explain why some patterns are more frequent than others.

Blevins and Garrett (1998), on the other hand, also make interesting and wide-reaching observations about language change in general: they for instance reject the hypothesis that the causes for language change can be defined on the synchronic level because of some phonetic optimization producing sound patterns that are somehow 'better' (easier to pronounce or perceive) than the earlier ones. Taking many examples of metathesis into account clearly shows that if some could be interpreted as easier to pronounce or perceive, others are just as difficult as the ones the base form started with, if not worse on a phonotactic level. In any case, these authors maintain that if some metathesis is optimising, this can be simply due to chance. (ibid.)

It is very tempting to interpret the metathesis patterns in our data in functionalist terms. Optimisation of patterns can be conceived of in terms of striving to reach for the least marked form along some dimension, and therefore as the emergence of universally unmarked patterns. This is especially attractive to explain child metathesis, whereas language-specific unmarkedness (even embodied by the force of analogy) could explain our examples of adult metathesis in Japanese.

It is difficult to see, though, what is being optimised in Eugene's examples in (2), for instance in the exchange of nasals in [nemaki] for [menaki] or in Loftur's [kaltesines] for [kalsetines] – although a statistical study could clarify which syllables are the most common, perhaps. It is, however, intriguing to notice along with Hume (2002) that all the examples of metathesis in this paper mirror patterns actually found in the languages to which the metathesised words belong. Lexical frequency may then indeed be a factor to consider, even in terms of influencing child production.

It is however clear from our examples that ambiguity in the string is at the basis of the switches, so that Eugene's switching nasals in Japanese (*nemaki* for *menaki*), or the *in situ* copies of the metathesised laterals in Loftur's speech ([tloklet] for *chocolate*) can be interpreted in that way.

3. Bley-Vroman's Fundamental Difference Hypothesis

Bley-Vroman's Fundamental Difference Hypothesis (1989) maintains that the acquisition of the L1 is fundamentally different from L2 learning. His theory is based on various observations: the degree of success of L1 and L2 learners, the character and uniformity of resulting systems, the susceptibility to motivation, and the previous state of the organism, among other things.

According to Bley-Vroman's proposal, the knowledge of the L1 fulfills in learning a second language the same role of UG in the acquisition of the L1. The learning of foreign languages in adults occurs thanks to general "problem-solving principles" that play the role of the universal principles deployed by children in learning the L1.

3.1 Interpretation of our data

In the light of Bley-Vroman's proposal, we can interpret our data as follows. When the Japanese child says *[nemuzi] for [nezumi] "mouse", he is producing an onset metathesis. This may be caused

by misperception of the origin of the acoustic cues, as Blevins and Garrett (1998) suggest, but in moving a single phoneme we believe that it is UG at work.

On the other hand, when an adult Japanese speaker says *[tarabukasu] for [taburakasu] “deceive”, s/he is clearly metathesising the whole syllable – a phenomenon more akin to language games than to a phonological process.

We believe that this kind of metathesis is caused by spelling interference (Miglio and Fukazawa 2006). Spelling influences L2 pronunciation in adults as if it were a type of analogy operating on the grammar of the interlanguage. If a grammar is conceived of as a ranking of constraints in OT terms, the child attains the adult grammar by demoting markedness constraints and promoting faithfulness constraints based on the input s/he receives from the environment (Gnanadesikan 1995, Smolensky 1996).

We propose to formalize the concept of analogy as one of Blevins-Vroman’s “problem-solving devices” mimicking this kind of grammar-building constraint activity in adult L2 grammar learning.

What prompts the differences between children (L1 Japanese) and adults (L1 Japanese learning L2 English)? Japanese has sequences of CV, V as basic syllable structures (CVC exceptionally). Attempts to form CV syllables make adult L2 learners also produce: *bike* as [baiku], *strike* as [sutoraiku], *ask* as [asuku].

In spite of the fact that adult learners can understand the logical explanation of what can cause mistakes, Japanese adult learners find it difficult to accept that consonants may be pronounced individually – not as part of a CV sequence.

In these terms, let us explore how spelling can influence L2. Japanese has 3 spelling systems: Chinese characters, and two syllabic (Kana) systems. Kana letters represent a mora/ a syllable V or CV such as あ[a], く[ku], と[to] (taught in first grade). The Roman alphabet is introduced when children are around 10 years of age. Kana symbols, however, are often used in EFL books, and dictionaries. The use of Kana symbols, rather than – say – the IPA to represent pronunciation, becomes an obstacle for L2 learning, as it is difficult for Japanese students to learn [s], [t] as a single segment (rather than as part of a syllable as in Kana).

3.2 The Proposal in OT Terms

The force at work in adult L1 metathesis and L2 transfer here is a form of analogy. Analogy can be captured in OT via Output-Output Correspondence (Benua 1997), i.e. originally a phonological faithfulness relation between two separate words, competing in a parallel way with Input-Output faithfulness and Markedness constraints. In the present case, it embodies the relation between the syllabic Kana spelling and the (adult) pronunciation of a word with metathesis.

The constraints needed for the tableaux are as follows. A constraint against metathesis (McCarthy and Prince 1995), which monitors the sequence of segments from the input to the output and checks if any of them has switched place, if so then each reversal of sequence gets a violation. Informally:

(4) LINEARITY – “No Metathesis”

The input of a form is consistent with the precedence structure of the output and vice versa.

Faithfulness constraints of the Identity family, monitoring that all the input segments be realized in the output, and that all output segments be present originally in the input, are also needed.

Finally it is necessary to consider what forces the presence of metathesised segments. If it is true that, at least in child metathesis, one is dealing with the emergence of universally unmarked patterns, then the simple interaction between top-ranked markedness constraints and lower-ranked faithfulness constraints will result in a less marked metathesised form.

Kirchner (1998:xiv) proposes a constraint LAZY that embodies the principles of minimum effort, and in order to simplify the interaction between markedness and faithfulness in child grammar, we will use LAZY as a top ranked, portmanteau constraint:

(5) Child grammar - onset metathesis
(minimum sound unit = phoneme)

/nezumi/	LAZY	LINEARITY	ID-IO
1. nezumi	*!		
2. nemuzi		*	M*z*
3. nemizu		**!	m*i*z*u*

One needs to assume that there is some markedness advantage to the form *nemuzi*, for instance the fact that there is an uninterrupted sequence of nasal consonants as onsets in the first two syllables, instead of a sequence of [+nas][-nas][+nas] as in the input. In that sense, LAZY would be visible with a top-ranked violation for the oral consonant interrupting the nasal sequence in the faithful candidate. Candidate 2 satisfies LAZY and has only one violation of LINEARITY, which makes it the winner over 3 where the syllabic metathesis causes two violations (counting the number of switches between segments).

In the case of an adult metathesis, as can be seen in tableau 6, we see that the hierarchy of LAZY >> LINEARITY has not changed, but that the analogy with the spelling system in adult grammar is so strong as to be embodied by a constraint inserted only in the adult grammar via relativised faithfulness, i.e. OO-SP_{KANA}.

This constraint, which may turn out to be simply a strategy mimicking the activity of grammatical principles, as Bley-Vroman suggested (1989), demands that consonants be moved as syllables, not as single segments, and therefore dooms the previously victorious candidate 2. Candidate 3, which is least faithful to the input results in the winner as a result.

(6) Adult grammar - spelling influence on metathesis
(minimum sound unit = phoneme, but unit for metathesis = syllable)

/nezumi/	OO-SP KANA	LAZY	LINEARITY	ID-IO
1. nezumi		*!		
2. nemuzi	*!*		*	m*z*
3. nemizu			**	m*i*z*u*

The obvious question at this point is however that metathesis in adult grammar is only an haphazard phenomenon, far from being obligatory: most of the times it does not happen, on rare occasions it does.

A plausible suggestion is that the ranking LAZY >> LINEARITY of tableau 6 is not fixed, but rather ‘floating’, optional, sometimes LAZY is ranked above LINEARITY, and then metathesis happens; at other times, LINEARITY is ranked above LAZY and the faithful input emerges, as in tableau 7 (where the squiggly line indicates the optional ranking causing variation).

(7) Adult grammar no metathesis

/nezumi/	OO-SP KANA	LINEARITY	LAZY	ID-IO
1. ☞ nezumi			*	
2. nemuzi	*!*	*		m*z*
3. nemizu		*!*		m*i*z*u*

4. Relativized Faithfulness Constraints

Constraints in OT terms are of course supposed to be innate and universal, as they are part of UG. As such, they have to be accessed by infants acquiring their native language. Clearly, it is dubious to posit a universal constraint such as OO-SP involving spelling, after all, only about a third of the approximately 5800 languages that exist today have a writing system at all (DeMauro 2003:15). In any case, babies acquire the constraint ranking in their mother tongue before being able to write, therefore interference from spelling in early L1 acquisition is not a viable option.

One can envisage, however, that such constraints can be acquired later, through relativisation of faithfulness in UG, as proposed by Fukazawa and Kitahara (2001), Fukazawa, Kitahara, and Ota (to appear) and adopted also in Miglio and Fukazawa (2006).

In the original paper, Fukazawa and Kitahara suggested that the most restricted proposal is to posit that a mechanism for relativisation and some of the relativised constraint sets are present in UG, but not every single relativised constraint. Many of the relativised sets of constraints are in fact language-specific.

We repeat here the criteria for relativisation of faithfulness constraint first proposed in Fukazawa and Kitahara (2001). The OO-SP constraint is in our view a language-specific one. There is a mechanism for relativisation of the faithfulness set in the language in question (in this case Japanese), and the OO-SP is relativised through the set based on the language-specific information as follows:

(8) Criteria for relativization

- a) There are two kinds of relativised faithfulness constraint sets. One is originally in UG, and the other is acquired in the course of language acquisition through the mechanism of relativisation.
- b) The mechanism for relativising the faithfulness set is in UG.
- c) When the category of the relativised set is grounded in phonetic reasons, it is considered to be originally in UG. (e.g. positional faithfulness for the onset)
- d) When only some part of the category of the set is relativised, then it is considered to be originally in UG. (e.g. positional faithfulness for the onset, but not for the coda)
- e) When the set is relativised based on language specific information, then it is considered to be relativised via the mechanism in the course of language acquisition. (e.g. Japanese vocabulary strata).

Here, as in our 2006 paper, we would like to stress that the novelty of our proposal from a theoretical point of view is that constraints can be incorporated in the adult grammar, later than the early L1 acquisition of phonology as a baby. The OO identity constraint based on the analogy with the spelling in the L1 is one of these adult constraints.

The exact nature of such constraints is open to discussion – we believe that adult constraints may embody those problem-solving strategies that mimic the workings of UG, as suggested in Bley-Vroman (1989). These strategies, for instance, enable adults to learn a foreign language proficiently, but their presence in the adult grammar makes L2 learning a – if not fundamentally at least considerably – different endeavour from the acquisition of L1.

5. Conclusions

The data in this paper, gathered from the literature as well as two restricted longitudinal studies of children's utterances, show that metathesis phenomena differ between child and adult grammars.

Surprisingly the two children in the longitudinal studies, a monolingual Japanese child and a child exposed to three different languages in his early stages of development (passively trilingual at age 3:6), behaved in remarkably similar manners regarding metathesis. The children, regardless of their L1, always metathesised segments, not whole syllables.

Literate adults, on the other hand, are affected by analogy with a representational system such as spelling; the Japanese adult metathesis data point to analogy with the moraic Kana alphabet. Rather than moving single phonemes, as expected universally, the adult Japanese speakers move entire syllables.

These facts have a series of novel theoretical implications: firstly that children resort and have access to UG even in more or less sporadic manifestations such as metathesis, hence perhaps metathesis is not a superficial performance error as traditionally maintained. Our data seem to point to a phenomenon connected to the emergence of unmarked structures.

Moreover, this shows that adults, who behave differently with respect to metathesis, do not have direct access to UG. Their strategies are influenced by constraints that can only be acquired later in life (not at the stage of L1 acquisition), such as analogies with spelling.

One of the novelties of our proposal is suggesting that constraints can be incorporated into the adult L1 grammar, or deployed in learning L2. The exact nature of such constraints is debatable, perhaps despite the lack of direct access to UG, these are the cognitive strategies that in adults – as Bley-Vroman (1989) suggests - mimic the way UG works. In OT terms, these are, for instance, constraints of the OO type.

The interaction of constraints with optional ranking allows OT to model variation, which is necessary here, since in adult grammars, metathesis is not a regular phenomenon, but rather a sporadic one. What causes the changes in the ranking is best left for future research.

The behaviour of adults and the two children of the study clearly show that the Fundamental Difference Hypothesis still holds, and that L1 acquisition is markedly different from L2 learning.

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Proceedings of the 9th Generative Approaches to Second Language Acquisition Conference (GASLA 2007)

edited by Roumyana Slabakova, Jason Rothman, Paula Kempchinsky, and Elena Gavrusseva

Cascadilla Proceedings Project Somerville, MA 2008

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Fukazawa, Haruka and Viola Miglio. 2008. What Metathesis Reveals about L1 and L2 Acquisition. In *Proceedings of the 9th Generative Approaches to Second Language Acquisition Conference (GASLA 2007)*, ed. Roumyana Slabakova et al., 30-36. Somerville, MA: Cascadilla Proceedings Project.

or:

Fukazawa, Haruka and Viola Miglio. 2008. What Metathesis Reveals about L1 and L2 Acquisition. In *Proceedings of the 9th Generative Approaches to Second Language Acquisition Conference (GASLA 2007)*, ed. Roumyana Slabakova et al., 30-36. Somerville, MA: Cascadilla Proceedings Project. www.lingref.com, document #1623.