ISSUES IN THE ACQUISITION OF PHONOLOGY BY AN ENGLISH-ROMANIAN BILINGUAL CHILD

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Abstract: This paper is a case study of the early stages in the acquisition of phonology by a bilingual English-Romanian child. The phenomena analyzed are consonant harmony, the treatment of voiceless stops, the emergence of fricatives, the phonetic realization of liquids, and the resolution of various types of onset clusters. Also discussed are some implications of the findings.

Keywords: consonant harmony, voiceless stops, fricatives, liquids, onset clusters

1. Introduction

The present paper is a case study of selected phenomena in the acquisition of phonology by a child bilingual in English and Romanian.

The data are from subject S., a child exposed to English, spoken by the parents, and to Romanian, spoken by other family members and peers. The period under investigation was from age 1;0 to age 1;9. The methods used in data collection consisted of participant observation and a diary study.

The paper is structured as follows. Section 2 is concerned with consonant harmony. Section 3 looks at the treatment of the voiceless stops. Section 4 focuses on fricatives. Section 5 analyzes the phonetic realization of the lateral and rhotic liquids in target words. Section 6 deals with the treatment of several types of onset clusters. Section 7 discusses some of the implications of the findings.

2. Consonant harmony

As put by Macken (2013: 138), children's early phonology is characterized among others "by the set of constraints that determine the ways in which consonants can be combined in words". A well-known manifestation of such constraints is consonant harmony, "a constraint which stipulates that if two consonants appear in a word, they must be the same or highly similar" (Macken 2013: 138).

Consonant harmony is generally regarded (e.g. Vihman 1978, Ingram 1986, Shaw 1991, Goad 1997, Hansson 2011, Rose 2011, Menn 2013) as an instance of assimilation at a distance or long-distance assimilation[1], in which consonants "agree" in manner or place of articulation features or in both, across intervening segments[2]. In other words,

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[1] Consonant harmony is considered by some an instance of partial reduplication. Clark (2009: 120) writes that children "may also use partial reduplication" by "keeping the consonant the same (consonant harmony)".

[2] The intervening segments are usually vowels, regardless of their quality, but they may also be consonants which do not belong to the particular class targeted by consonant harmony (see e.g. Shaw 1991, Rose 2011).

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consonant harmony is a case of feature assimilation whereby consonants which are not string adjacent assimilate to one another. Consonant harmony may be either partial, i.e. either place or manner of articulation, or complete, i.e. involving both place and manner of articulation features. Consonant harmony in child phonology[3] is widespread, regardless of the target language, and is identified by some (e.g. Smith 1973) as a universal. The specifics of consonant harmony, however, may be dependent on the target language, since the "choice of distinctive features assimilated in consonant harmony in child language appears to vary across languages" (Lust 2006: 171).

As noted by many researchers (e.g. Drachman 1978, Vihman 1978, Velleman and Vihman 2007, Lust 2006, Johnson and Reimers 2010, Menn 2013), the occurrence of consonant harmony in early phonology is one of the striking differences between adult and child language. Velleman and Vihman (2007: 33), for instance, state that "certain aspects of early phonology, such as consonant harmony […] are inconsistent with patterns in the world's languages". Firstly, "in adult languages, the usual type of assimilation is contact assimilation" (Menn 2013: 180), in which a consonant becomes more similar to a string adjacent one, i.e. one or several features of a consonant spread to an adjacent one. Secondly, while consonant harmony is attested in adult phonologies[4], it is relatively rare and tends to be restricted to certain classes of consonants (Lust 2006: 169, Velleman and Vihman 2007: 33, Menn 2013: 180). Thirdly, while consonant harmony involving manner of articulation occurs in some adult languages, primary place of articulation harmony "is often pointed out as the prototypical instance of a child-specific phonological process" since "not a single case of it has turned up in cross-linguistic surveys of consonant harmony" (Pater and Werle 2003: 385-386). Fourthly, assimilation at a distance in adult languages is rather illustrated by vowel harmony.

Finally, from the point of view of phonological theory, the occurrence of consonant harmony in child language has been adduced as evidence for the planar segregation of consonants and vowels[5]. According to Vihman et al. (2013: 267), "the child's system may be less integrated with consonantal and vowel effects occurring independently due to planar segregation". On their view, "planar segregation in child phonology allows vowels to be transparent to consonant harmony" and thus accounts for its "increased frequency […] in early phonologies" (Vihman 2013: 267).

Both manner and place of articulation features are subject to consonant harmony in the output of subject S[6]. The forms produced by S. are mostly illustrative of partial consonant harmony. Only a few cases exhibit complete consonant harmony.

As far as manner of articulation is concerned, the only type attested is the occurrence of nasal harmony. Consider the Romanian forms below produced by S. at age 1;3:

[3] Sometimes referred to as developmental consonant harmony (see e.g. Pater 2002).
[4] For an overview see Shaw (1991) and Rose (2011).
[5] A discussion of the merits of such analyses of consonant harmony is beyond the scope of the present paper. For an assessment and alternative accounts the reader is referred to Goad (1997), Hansson (2011), and Rose (2011).
[6] See also Avram (1999: 158-160), for an analysis couched in an optimality-theoretic framework.

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(1) /ʃ/ → [n]
a. [na**n**u] *naşu'* 'godfather'
b. [na**n**a] *naşa* 'godmother'

As can be seen, the [+nasal] trigger is always a [n] occurring in the target word and the undergoer is /ʃ/. In terms of directionality, nasal harmony is exclusively progressive.

Note that nasal harmony is extremely infrequent with S. It is attested only at age 1;3. Interestingly, it only occurs in Romanian words to the exclusion of English ones, although nasal harmony is attested in monolingual children acquiring English (see e.g. Johnson and Reimers 2010: 17 and 19). Nasal harmony appears to be rare in child Romanian (Buja 2013), in which, however, it may be both regressive and progressive (Buja 2013).

Consonant harmony involving place of articulation is much better represented in S.'s output. Three sub-types are found: labial harmony; coronal harmony; dorsal harmony[7].

Labial harmony targets both [CORONAL] and [DORSAL] consonants[8], as illustrated by the following English forms recorded at age 1;4:

(2) /r/ → [b]
[bɑ:**b**ʊ] *bath**r**oom*
(3) /k/ → [p]
a. [**p**ʌm] ***c**ome*
b. [bʌpɪ] *mon**k**ey*

In such instances the trigger is a [LABIAL] consonant, such as [b] or [m]. The undergoer is either a [CORONAL] consonant, such as /r/ or [DORSAL] consonant, such as /r/, found elsewhere in the target word. The direction of labial harmony is either regressive, as in (2) and (3a), or progressive, as in (3b). As is well known, labial harmony is also attested in monolingual children acquiring English (see e.g. Ingram 1986: 227, Gnanadesikan 1996, Goad 1997, Pater 2002, Pater and Werle 2003, Johnson and Reimers 2010: 18 and 32). Labial harmony is also amply documented in the early phonology of monolingual acquirers of Romanian (Avram 1962, Buja 2013, 2015).

Coronal harmony is attested in S.'s output, both in English and in Romanian forms, between age 1;3, as in the examples under (4) and (5), and age 1;7, as in (6):

(4) /k/ → [t]
a. [**t**æt] *cat*
b. [tɪ**t**ɪ] *chi**c**k**s***
(5) /g/ → [g]
a. [**d**ata] ***g**ata* 'ready'
b. [taɪ**t**ə] *ti**g**er*

[7] Also called velar assimilation (Ingram 1986: 227) or velar harmony (see e.g. Goad 1997, Pater 2002, Pater and Werle 2003).
[8] [LABIAL], [CORONAL] and [DORSAL] are considered to be unary features.

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(6) /g/ → [d]
[**t**^{h}**æd**ʊdu:] ***k****an****g****aroo*

In forms produced throughout this period, the trigger is always one of, either [t] or [d], including cases when these are reflexes of another [CORONAl] in the target word, e.g. of /ʧ/ in (4b) or of /r/ in (6). Coronal harmony targets [DORSAL] consonants exclusively. The undergoer is always one of the two [−nasal, DORSAL] consonants of English and Romanian, i.e. either /k/ or /g/. As for directionality, coronal harmony may be either regressive, as in (4a), (5a) and (6), or progressive, as in (4b) and (5b). The English forms found in S.'s output are similar to those attested in forms produced by monolingual acquirers of English. Coronal harmony is widely attested in the early phonology of such children (see e.g. Goad 1997, Pater 2002, Pater and Werle 2003, Johnson and Reimers 2010: 18), although many authors rather surprisingly fail to mention it (e.g. Ingram 1979 and 1986, Fikkert n.d.). Note also that according to Pater and Werle (2003: 24), in child English "regressive coronal harmony is only occurring with front vowels". This claim is disconfirmed by the form in (6), where coronal harmony occurs with the back vowel [ʊ].

Consider finally dorsal harmony. The English and Romanian forms below illustrate its occurrence at age 1;3:

(7) /t/ → [g]
[**g**ɪŋkɪŋ] *s****t****inking*
(8) /d/ → [g]
[**g**ɒŋgɪ] ***d****oggie*
(9) /n/ → [g]
[**g**iku] *bu****n****icu* 'grandfather'

Dorsal harmony is also found in English and Romanian forms produced at age 1;7:

(10) /b/ → [g]
a. [**g**ʊk] ***b****ook*
b. [**g**aɪk] ***b****ike*
(11) /d/ → [g]
[**g**uku] *Săn****d****ucu*
(12) /n/ → [g]
[**g**ika] *bu****n****ica* 'grandmother]

The last instances of dorsal harmony, in English forms, are recorded at age: 1;9:

(13) /p/ → [g]
a. [ʌ**g**əgəʊ] *u****p*** *you go*
b. [k^{h}ʊ**g**l] *co****p****y*
(14) /b/ → [g]
[k^{h}ʊgl**g**ʊk] *copy****b****ook*

As can be seen, the three [DORSAL] consonants [k], [g] or [ŋ], of either English or Romanian, can function as trigger. The undergoer is a [LABIAL] consonant, such as /p/ or

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/b/, or a [CORONAL] consonant, such as the stops /t/ and /d/ or the nasal /n/. Similarly to labial and coronal harmony, dorsal harmony may be either regressive or progressive. However, directionality is constrained by the nature of the undergoer. Thus, dorsal harmony is exclusively regressive when the undergoer is [CORONAL], but it may be either regressive or progressive, when the undergoer is [LABIAL]. On the whole, regressive dorsal harmony is by far prevalent, as shown by the examples in (7) through (12), (13a) and (14). Progressive dorsal harmony occurs very rarely, as in (13b).

According to Pater (2002: 364), consonant harmony involving place of articulation attested in the early phonology of monolingual children acquiring English can be accounted for in terms of a number of generalizations regarding the preferred trigger, undergoer and direction. These are reproduced below, adapted from Pater (2002: 364):

(15) Progressive consonant harmony: [DORSAL] or [LABIAL] trigger, [CORONAL] or [LABIAL] undergoer.
(16) Progressive consonant harmony: [DORSAL] or [LABIAL] trigger, [CORONAL] or [LABIAL] undergoer.
(17) Consonant harmony in child English:
  a. Undergoer: Non-[CORONAL] implies [CORONAL];
  b. Trigger: [LABIAL] implies [DORSAL];
  c. Direction: Progressive implies regressive.

Generally, these generalizations also hold for S.'s English forms exhibiting consonant harmony involving place of articulation. Interestingly, there is one exception. As shown by the examples under (3), in progressive consonant harmony a [LABIAL] trigger can also target a [DORSAL], in violation of the generalization in (16). In other words, S. appears to behave differently from monolingual acquirers of English. However, this different behaviour is not necessarily attributable to the fact that S is a bilingual child, given that instances of a [LABIAL] trigger targeting a [DORSAL] in progressive consonant harmony are also reported for monolingual children acquiring English. The only example of consonant harmony provided by Clark (2009: 120) is one such case:

(18) /k/ → [b]
[ba**b**i] *blan**k**et*

It follows that S. behaves just like other children who acquire English as monolinguals and that the generalization in (16), proposed by Pater (2002: 364), needs to be revised.

The findings on consonant harmony with monolingual children acquiring English have also been interpreted as indicative of a strength hierarchy of place of articulation. The first[9] to suggest such a hierarchy that governs consonant harmony involving place of articulation was Menn (1975: 295). Reproduced below is the original formulation:

(19) C_1 assimilates to C_2 if C_1 is weaker than C_2 on the strength hierarchy.

[9] Johnson and Reimers (2010: 34) erroneously attribute it to Rose (2000).

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For monolingual acquirers of English the strength hierarchy (Rose 2000, Johnson and Reimers 2010: 34) is:

(20) dorsal > labial > coronal[10]

The hierarchy is interpreted a.o. in the sense that both [DORSAL] and [LABIAL] consonants function as triggers which target [CORONAL] consonants as undergoers, and assimilation by a [DORSAL] is more frequent[11]. In S.'s output consonant harmony involving place of articulation conforms to the strength hierarchy in (20). Therefore, in this respect too, S behaves like monolingual children acquiring English.

As put by Vihman et al. (2013: 267), [CORONAL] consonants can be assumed to be underlyingly underspecified "if a child demonstrates regressive and progressive harmony affecting target coronals […] whenever a labial or dorsal […] consonant occurs anywhere in the word". Such cases have been analyzed as evidence of the universally special status of [CORONAL] consonants, i.e. of their underspecification (see in particular Spencer 1986, Stemberger and Stoel-Gammon 1991). As shown above, [CORONAL] consonants also function as triggers of consonant harmony in the English and Romanian forms produced by S. It follows, then, that for S [CORONAL] consonants are underlyingly specified for their primary place of articulation. The same conclusion is reached by Goad (1996 and 1997) with respect to monolingual acquirers of English[12]. In other words, S. behaves like monolingual children acquiring English.

Finally, note that forms evincing consonant harmony amount to only a fraction of S.'s output between age 1 and age 1;9. This also accords well with Menn's (2013: 180) observation that "sometimes a child may produce some non-harmonic sequences and yet apparently require harmony in other words".

3. Voiceless stops

As is well known, the English voiceless stops /p/, /t/ and /k/ have aspirated allophones [p^h], [t^h] and [k^h] respectively. Since S. was acquiring both English and Romanian, it is interesting to look at the phonetic realization of /p/, /t/ and /k/ in the output, given that the two languages differ in their allophony.

The examples that follow illustrate the phonetic realization of English target words containing aspirated stops. One such form is recorded at age 1;1:

(21) /t/ → [t]
[**t**i:] ***t****ea*

[10] In earlier formulations, e.g. Ingram (1986: 228), "the hierarchy, from strongest position to weakest, is velar, labial, dental".
[11] Cf. the formulation in Ingram (1986: 228): "dentals will assimilate to both labials and velars, with the latter being a stronger tendency".
[12] Goad (1997: 114) categorically states that "an analysis involving Coronal underspecification […] is untenable".

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A second one is produced at age 1;2:

(22) /k/ → [k]
[**k**i:] ***k****ey*

The forms produced at age 1;3 include the following:

(23) /k/ → [t]
[**t**ɑ:] ***c****ar*

All three voiceless stops occur in several forms recorded at age 1;4

(24) /p/ → [p]
[**p**ɑ:] ***p****ark*
(25) /t/ → [t]
a. [**t**i:nə] ***t****ea-spoon*
b. [**t**ʊɪ] ***t****oy*
(26) /k/ → [k]
[**k**i:] ***k****ey*

At the same age, the forms produced by S also include instances of substitution of another voiceless stop for the voiceless stop in the English target word:

(27) /k/ → [t]
[**t**æt] ***c****at*
(28) /k/ → [p]
[**p**ʌm] ***c****ome*

As can be seen, in all the forms above the English target voiceless stop is phonetically realized without aspiration. The same holds for cases of substitution of voiceless stops for other consonants in English target words, as in the form below, produced at age 1;3:

(29) /s/ → [t]
[**t**i:] *sea*

Finally, in forms in which the target /s/ + stop onset cluster is resolved via deletion of /s/[13] the voiceless stop now in word-initial position is also phonetically realized without aspiration. Consider the following form recorded at age 1;4:

(30) /t/ → [t]
[**t**eɪdɛə] ***st****ay there*

[13] See section 6.

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The picture changes with the onset of age 1;5. English target words start exhibiting aspirated stops:

(31) /p/ → [p^{h}]
a. [**p^{h}**ɛbʊ] ***p**ebble*
b. [**p^{h}**ɛnʊ] ***p**encil*
(32) /t/ → [t^{h}]
a. [**t^{h}**ɛnɪ] ***t**ennis*
b. [**t^{h}**eɪbʊ] ***t**able*
(33) /k/ → [k^{h}]
a. [**k^{h}**ɪnɪ] ***k**itchen*
b. [**k^{h}**æmʊ] ***c**amel*
c. [**k^{h}**ʌm] ***c**om*e
d. [**k^{h}**ɑ:] ***c**ar*

Aspiration of voiceless stops also occurs when these are substituted for other consonants in the English target words. Consider the following forms in (34) and (35), produced by S. at age 1;5 and 1;7 respectively:.

(34) /ʧ/ → [t^{h}]
a. [**t^{h}**ɪtɪ] ***ch**icks*
b. [**t^{h}**ɪn] ***ch**in*
(35) /s/ → [t^{h}]
[**t^{h}**i:w] ***s**eal*

Further confirmation of the fact that starting with age 1;5 S. produces target-like aspirated stops is provided by the treatment of English words with /s/ + stop onset clusters which are resolved via deletion of /s/. The first such form is recorded at age 1;5:

(36) /t/ → [t^{h}]
[**t^{h}**ɒp] ***st**op*

Further forms are produced at age 1;7, illustrative of the phonetic realization of all three voiceless stops:

(37) /p/ → [p^{h}]
[**p^{h}**u:n] ***sp**oon*
(38) /t/ → [t^{h}]
[**t^{h}**əʊn] ***st**one*
(39) /k/ → [k^{h}]
[**k^{h}**aɪ] ***sk**y*

Consider next the case of Romanian target words containing voiceless stops. As in adult Romanian, the voiceless stops /p/, /t/ and /k/ are phonetically realized without

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aspiration throughout the period under investigation. The following are forms produced by S. at age 1;0, in (40), and 1;5, in (41)-(43):

(40) /p/ → [p]
[**p**a**p**a] ***p**a**p**a* ‘food’
(41) /p/ → [p]
a. [**p**ə**p**əm] ***p**ă**p**ăm* ‘[we] eat’
b. [**p**ute] ***p**ute* ‘[it] stinks’
(42) /t/ → [t]
[pu**t**e] *pu**t**e* ‘[it] stinks’
(43) /k/ → [k]
a. [**k**a**k**a] ***c**a**c**a*
b. [**k**aw] ***c**al* ‘horse’

As can be seen, voiceless stops in Romanian target words continue to be phonetically realized without aspiration even after age 1;5. The same applies to Romanian target words with /s/ + stop onset clusters resolved via deletion of /s/, as in the forms below, recorded at age 1;5:

(44) /t/ → [t]
a. [**t**ai] ***st**ai* ‘stay’
b. [**t**op] ***st**op* ‘stop’

To conclude, aspiration of the English voiceless stops /p/, /t/ and /k/ is acquired very early. In this respect, S. behaves just like monolingual acquirers of English (see Vihman 1996: 250-260). Also, the acquisition of aspiration precedes the acquisition of complex onsets with /s/ + stop onset clusters, again as with monolingual children acquiring English[14]. The voiceless stops /p/, /t/ and /k/ are phonetically realized with aspiration, i.e. [p^h], [t^h] and [k^h] respectively, only in English target words. The aspirated voiceless stops exclusively occur in the phonological environments where they would appear in adult English. Since aspirated voiceless stops do not occur in Romanian target words, it follows that voiceless stops are treated differently, in accordance with the phonology of the two target languages, i.e. English and Romanian respectively.

4. Fricatives

No fricatives are produced by S. between age 1;0 and 1;3. In addition to being most frequently deleted, the /s/ occasionally undergoes stopping in onset position, as in the form below, recorded at age 1;3:
(45) /s/ → [t]
[**t**i:] ***s**ea*

[14] This is a developmental path so typical of monolingual acquirers of English that it is mentioned even in introductory textbooks of linguistics (Fromkin and Rodman 1993: 435).

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Age 1;4 witnesses the occurrence of the first fricative, either substituted for other fricatives, as in (46), or as the phonetic realization of /h/ in the target words, as in (47):

(46) /s/ → [h]
[**h**ʌn] ***s**un*
(47) /h/ → [h]
[**h**ai] ***h**ai* ‘come on’
[**h**aidi] ***h**aide* ‘let’s’

Note that [h] is only found in onset position.

The period from age: 1;5 to 1;8 is characterized by considerable variation and inconsistency in the treatment of fricatives. The forms below, produced at age 1;5, are illustrative of the various strategies[15] employed by S. In onset position, fricatives in the target words continue to be frequently deleted:

(48) /s/ → ø
[p^{h}ɛnʊ] *pen**c**il*
(49) /z/ → ø
[ɪbwa:] ***z**ebra*

Alternatively, onset fricatives undergo stopping:

(50) /ð/ → [d]
[**d**ɛə] ***th**ere*
(51) /s/ → [t]
[u**t**a] *uşa* ‘door’

Deletion appears to be the only option in the case of word-final fricatives:

(52) /θ/ → ø
[maʊ] *mou**th***
(53) /s/ → ø
[t^{h}ɛnɪ] *tenni**s***

The only fricative produced continues to be [h]. It serves as a substitute for several other fricatives in onset position in English or Romanian target words:

(54) /f/ → [h]
[**h**u:nʊ] ***ph**one*

(55) /s/ → [h]
[**h**ʌn] ***s**un*

[15] The examples do not include the substitution of [n] for a fricative, already discussed in section 2.

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(56) /ʃ/ → [h]
a. [**h**ina] *maşina* ‘car’
b. [**h**u:] ***sh****oe*
c. [**h**ɔ:] ***sh****irt*
d. [**h**eɪm] ***sh****ame*

Not surprisingly, [h] is also the reflex of /h/ in both English and Romanian target words:

(57) /h/ → [h]
a. [**h**ai] ***h****ai* ‘come on’
b. [**h**ai] *Mi****h****ai*
c. [**h**ɛnʊ] ***h****en*

The first fricative other than [h] only emerges at age 1;7:

(58) /f/ → [f]
[**f**jæt] ***f****lat*

To sum up, from age 1;3 to age 1;7, fricatives are generally deleted or undergo stopping, both strategies being reported for monolingual children acquiring English (Ingram 1986: 225, Ingram 1989: 371, Johnson and Reimers 2010: 13-14) or Romanian (Buja 2013). Interestingly, for almost three months the only fricative produced by S. in both English and Romanian is [h]. This runs counter to the predictions, originally made by Jakobson (1941), that if the child has only one fricative it is /s/ (with a variable articulation between [s] and [ʃ]) and that other fricatives will be changed to [s]. S.’s first production of [s] occurs at age 1;9:

(59) /s/ → [s]
[jɛ**s**ən] *lesson*

A possible explanation for the early emergence of [h], including as a substitute for other fricatives, is that it only has a passive articulator (the larynx/glottis), but no active articulator. Phonetically, [h] is therefore articulatorily less complex, i.e. less marked, than the other fricatives of both English and Romanian, which all involve an active articulator as well. From this perspective, then, [h] can be analyzed as the “default” fricative.

5. Liquids

Neither the lateral liquid /l/ nor the rhotic liquid /r/ are attested in the English and Romanian forms produced by S. in the period investigated.

The treatment of the lateral liquid /l/ is different, according to whether it occurs in the onset or in the coda of the target words. In a first attempt, at age 1;5, /l/ in onset position is phonetically realized as the glide [w]:

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(60) /l/ → [w]
[jɛ**w**ʊ] *ye**ll**ow*

From age 1;6 onwards, /l/ in onset position consistently undergoes gliding to [j]. Consider the following examples, recorded at age 1;7, in (61), and respectively age 1;9, in (62):

(61) /l/ → [j]
a. [**j**ɛgəʊ] ***L**ego*
b. [**j**aɪnʊ] ***l**ion*
(62) /l/ → [j]
a. [**j**ɛsən] ***l**esson*
b. [**j**ʌvjʊ] ***l**ove you*
c. [**j**apte] ***l**apte* ‘milk’

S. resorts to two strategies in the phonetic realization of /l/ in the coda of English target words: /l/ gliding and /l/ vocalization[16]. The first strategy resides in the substitution of the glide [w] for “dark” [ɬ]. Gliding of /l/ to [w] is illustrated by the forms below, produced at age 1;7, in (63), and respectively age 1;9, in (64):

(63) /l/ → [w]
a. [wi:**w**] *whee**l***
b. [bɔ:**w**] *ba**ll***
c. [mɪ**w**k] *mi**l**k*
(64) /l/ → [w]
[fɔ:**w**daʊn] *fa**ll** down*

In /l/ vocalization the vowel [ʊ] is consistently substituted for syllabic [ɬ] in English target words, as in the forms below, produced at age 1;7:

(65) /l/ → [ʊ]
a. [æp**ʊ**] *appl**e***
b. [t^{h}eɪb**ʊ**] *tabl**e***
c. [bɒt**ʊ**] *bottl**e***
d. [k^{h}æm**ʊ**] *camel*

Though far less frequently, /l/ vocalization occurs in Romanian forms as well. As can be seen from a form produced by S. at age 1;9, the phonetic realization of word-final /l/ is the vowel [u]:
(66) /l/ → [u]
[ka**u**] *cal* ‘horse’

[16] Both are frequently lumped together under the name /l/ vocalization, as in e.g. Johnson and Reimers (2010).

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There is only one exception in the corpus, the form in (60), where [w] occurs in onset position – instead of the expected [j]. Otherwise, /l/ in onset position, i.e. "clear" [l], is consistently [j], in both English and Romanian. In the literature, /l/ gliding to [j] is reported to occur with monolingual acquirers of both English (see e.g. Smith 1973, Stampe 1979, Ingram 1986: 225, Ingram 1989: 372, Vihman 1996: 250-260) and Romanian (Buja 2013). Moreover, it is also found in bilingual children acquiring German and English, in both languages (Ingram 1989: 378).

Similarly, /l/ in coda position is phonetically realized as [w] in both languages. Gliding of /l/ to [w] is attested with monolingual acquirers of English (see e.g. Smith 1973, Gnanadesikan 1996). As is well known (Johnson and Britain 2003), /l/ vocalization to [ʊ] in coda position is widely found in English in reflexes of syllabic /l/, which is phonetically "dark" [ɬ]. Also, syllabic /l/ vocalization to [ʊ] is widely attested with monolingual children acquiring English (see e.g. Menn 1971, Smith 1973, Ingram 1986: 226, Ingram 1989: 372, and Pater 1997). Furthermore, it also occurs with bilingual children acquiring German and English (Ingram 1989: 378).

Romanian forms such as the one in (66) show that /l/ vocalization in coda position also occurs in languages in which the allophones of this phoneme do not include "dark"[ɬ]. This is further confirmed by data from monolingual acquirers of Romanian[17]. The occurrence in child Romanian of /l/ vocalization to [w] therefore disconfirms Johnson and Reimers's (2010: 50) claim that "interestingly, children acquiring languages with no such /l/ allophony do not vocalize".

As for the rhotic liquid /r/[18], it is generally realized phonetically as [j]. Consider the following forms recorded at age 1;7:

(67) /r/ → [j]
- a. [**j**i:dɪt] ***r****ead it*
- b. [**j**ɛd] ***r****ed*
- c. [**j**adu] ***r****adio* 'radio'
- d. [kwi**j**əw] *squirrel*

The only other phonetic realization of word-initial /r/ is [w]:

(68) /r/ → [w]
[**w**u:f] ***r****oof*

The prevalent phonetic realization by S. of /r/ is [j], in both English and Romanian. In child English, however, it is generally [w] which is substituted for /r/ (Ingram 1989: 355, 371 and 374, Johnson and Reimers 2010: 63-65). Also, in the profile for phonological development for the stages II to IV, from age 1; 6 to age 3; 0, Grunwell (1982) only mentions "GLIDING /r/ → [w]". In this respect, then, S. behaves differently from

[17] For instance, [kete**u**] *căţe**l*** 'doggie' (own corpus).
[18] The variety of English spoken by S.'s parents is non-rhotic.

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monolingual children acquiring English[19]. As for S.'s Romanian output, /r/ gliding to [j] is consistent with its frequent occurrence in child Romanian (Buja 2013).

6. Onset clusters

Following a well-entrenched tradition (see e.g. Johnon and Reimers 2010), a distinction is operated between the so-called "canonical clusters" and "non-canonical clusters". In canonical clusters the sonority profile of a syllable slopes outwards from the nucleus. Such clusters obey the so-called "Sonority Sequencing Generalization"[20], i.e. in the onset sonority increases towards the nucleus, whereas in the coda sonority decreases away from the nucleus. Canonical onset clusters consist of an obstruent and an approximant. In both English and Romanian, the obstruent may be either a stop or a fricative, while the approximant may be either a liquid or a glide.

In the earliest stages, the forms produced by S. exhibit no obstruent + approximant onset clusters. These illicit clusters are resolved via deletion of the approximant. Consider the following form, produced at age 1;3, corresponding to an English target word containing a stop + liquid onset cluster:

(69) /tr/ → [t]
[**t**æm] ***tr**am*

Starting with age 1;4, the lateral liquid in stop + liquid onset clusters is no longer deleted, but it is phonetically realized as the glide [w]:

(70) /kl/ → [kw]
[**kw**akwa] ***Cl**audia*

This treatment is attested throughout the period under analysis. Consider the forms below, recorded at ages 1;5 and 1;7, under (71)-(72) and (73)-(74) respectively:

(71) /bl/ → [bw]
[**bw**u:] ***bl**ue*
(72) /kl/ → [kw]
/**kw**i:n] ***cl**ean*
(73) /kl/ → [kw]
[**kw**əʊt] ***cl**ose*
(74) /gl/ → [gw]
[**gw**ɑ:tɪ] ***gl**asses*

[19] However, [w] for /r/ is frequently found in the phonetic realizations of both target words with stop + /r/ or fricative + /r/ onset clusters, as shown in section 6.
[20] Alternative terms include "Sonority Sequencing Principle".

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An alternative strategy, sporadically attested only at age 1;7, is the substitution of the glide [j] for the lateral liquid. In all these cases, the preceding stop has the feature [LABIAL]:

(75) /pl/ → [pj]
a. [**pj**eɪt] ***pl****ate*
b. [**pj**eɪp^{h}ɛn] ***pl****ay pen*

As for the rhotic liquid in stop + liquid onset clusters, it is consistently realized phonetically as the glide [w]. Relevant examples include the following, illustrative of ages 1;5, in (76)-(77), and respectively 1;7, in (78)-(80):

(76) /br/ → [w]
[**bw**ɔ:] ***br****ead*
(77) /gr/ → [w]
[**gw**i:n] ***gr****een*
(78) /br/ → [bw]
[i**bw**a] *ze****br****a*
(79) /tr/ → [tw]
[**tw**eɪn] ***tr****ain*
(80) /kr/ → [kw]
[**kw**emə] ***cr****emă* ‘cream’

Reflexes of target words containing fricative + liquid onset clusters are far less represented in S.’s output. The lateral liquid /l/ is phonetically realized as the glide [j], as in the following form, recorded at age 1;7:

(81) /fl/ → [fj]
[**fj**æt] ***fl****at*

The rhotic liquid also undergoes gliding. As shown by the form below, produced at age 1;7, the glide [w] is consistently substituted for /r/:

(82) /θr/ → [θw]
[**fw**i:] ***thr****ee*

Stop + glide and fricative + glide onset clusters as reflexes of stop or fricative + liquid onset clusters are attested quite early, at age 1;4. The first such clusters occur considerably earlier than in Grunwell’s (1982) profile of phonological development, according to which clusters of the type obstruent + approximant are first attested in stage V, i.e. at age 3;0–3;6. The early occurrence, by age 1;9, of stop + glide onset clusters in which the glide is substituted for the liquid in the target word is also reported for monolingual acquirers of English (Ingram 1986: 232) and of Romanian (Buja 2013) as well as for bilingual children acquiring English and German (Johnson and Reimers 2010: 180).

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Consider next non-canonical onset clusters, i.e. which violate the requirements of the Sonority Sequencing Generalization[21]. These include /s/ + stop onset clusters. As is well known the status of these sequences is a matter of debate in the phonological literature. On the assumption that these sequences are clusters of the non-canonical type, they pose a number of problems, such as their syllabification which is not always straightforward[22]. In light of data including from the acquisition of phonology, the /s/ in such sequencs has been analyzed as an "appendix"[23], attached either to the syllable node (see e.g. Gierut 1999, Barlow 2001) or to the higher node of the prosodic word (Goad and Rose 2004). It has also been suggested (Avram 2010) that the syllabification of /s/ + consonant onset clusters in English is undecidable[24]. In the present paper the sequences at issue are considered to be non-canonical onset clusters, as in much, if not most, of the literature on the acquisition of phonology.

Forms relevant to the treatment of /s/ + stop onset clusters first occur at age 1;4:

(83) /st / → [t]
[**t**ɛɪdɛə] ***st****ay there*

As can be seen, such illegitimate onset clusters are resolved via /s/ deletion. The same strategy is employed e.g. at age 1;5. Note that in the English forms produced by S. the retained voiceless stop is realized phonetically with aspiration[25]:

(84) /st / → [t]
a. [**t**^{h}ɒp] ***st****op*
b. [**t**ai] ***st****ai* 'stay'
c. [**t**op] ***st****op* 'stop'

Resolution of illicit /s/ + stop onset clusters is achieved via deletion of /s/ in still later stages, as shown by the forms below, produced at age 1;7:

(85) /sp/ → [p]
[**p**^{h}u:n] ***sp****oon*
(86) /st/ → [t]
[**t**^{h}əʊn] ***st****one*
(87) /sk/ → [k]
a. [**k**^{h}aɪ] ***sk****y*
b. [**kw**ɪjəw] ***squ****irrel*

In sum, between ages 1;0 and 1;9, S. consistently reduces /s/ + stop onset clusters via deletion of /s/. Deletion of /s/ in such clusters is attested in the early phonologies of

[21] This explains why such clusters are sometimes referred in the literature to as "anti-sonority clusters".
[22] For English see e.g. Avram (1997).
[23] For an overview, see Vaux and Wolfe (2009).
[24] Cf. Bertinetto (1999) for Italian.
[25] See section 3.

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monolingual acquirers of both English (see e.g. Ingram 1986: 230, Ingram 1989: 372, Johnson and Reimers 2010: 21 and 188) and of Romanian (Buja 2013, Buja and Brozbă 2014).

According to Johnson and Reimers (2010: 21), with respect to the treatment of all such clusters in the early stages of phonological acquisition "the question must be: What is retained? – rather than – What is deleted?". From this perspective, like the majority of acquirers (see e.g. Johnson and Reimers 2010: 188), S. initially treats English and Romanian canonical and non-canonical onset clusters in the same way: in both types of onset cluster it is the least sonorous consonant that is retained, while the consonant higher in sonority is deleted. This leads to a maximum sonority contrast between adjacent segments, i.e. a maximum dispersion of sonority (in the sense of Clements 1990). Also, as with other children, the first onset clusters to emerge are of the type obstruent + approximant, i.e. canonical clusters.

7. Conclusions

This paper is a contribution to the study of the acquisition of phonology by bilingual children, a topic rather infrequently covered by language acquisition studies.

The findings confirm some of the results of work on the phonology by monolingual acquirers of English or of Romanian. For instance, in both English and Romanian child language, consonant harmony is much more frequently of the regressive type. English monolingual children acquire the aspiration of the voiceless stops /p/, /t/ and /k/ before the acquisition of /s/-initial onset clusters.

The data analyzed show that coexistent phonological systems can emerge at an early stage. A case in point is the occurrence of aspiration only in English target words, but not in Romanian ones.

Caution needs to be exercised in identifying parallelisms between child language and language change (see in particular Drachman 1978). For instance, Johnson and Reimers (2010: 50) note that the occurrence of /l/ vocalization in syllable rhymes in child phonology has parallels in the historical phonology of some Romance (e.g. French, Spanish, Portuguese) and Slavic (e.g. Polish) languages. However, ontogeny does not always repeat phylogeny: children acquiring Romanian also exhibit /l/-vocalization in syllable rhymes even though this is not a characteristic of the historical phonology of the language.

The data illustrative of the occurrence of coronal harmony are relevant to the status of [CORONAL] consonants. Given that [CORONAL] consonants can be not only undergoers, but also triggers of consonant harmony, this considerably weakens the case for coronal underspecification, in confirmation of e.g. Goad (1996 and 1997) and contra Spencer (1986), Stemberger and Stoel-Gammon (1991).

It has also been shown that various generalizations suggested in the literature on the acquisition fail to hold. Consider first generalizations regarding particular child languages. One such example is the generalization proposed by Pater (2002) to the effect that in child English a [LABIAL] trigger can only target a [CORONAL] undergoer. Another example is Pater and Werle's (2003) claim that in child English regressive coronal

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harmony only occurs with front vowels. Consider next generalizations which seek to establish a relationship between particular phonetic realizations by children and the allophonic rules of the target language. The occurrence of /l/-vocalization in child Romanian, even though "dark [ɫ]" does not occur as an allophone in adult Romanian, demonstrates that it is not dependent on the allophony in the target language. Finally, some generalizations supposed to hold for all children, regardless of the language they are acquiring, are disconfirmed, e.g. Jakobson's (1941) claim that /s/ is the first fricative which is found in child phonology.

Not surprisingly, the data analyzed in this paper show that exceptions to general profiles of phonological development (Grunwell 1982) do occur. More generally, the findings confirm the observation (see a.o. Goad and Ingram 1987, Vihman 1996, Lust 2006, Johnson and Reimers 2010) that there is considerable individual variation in the acquisition of phonology, which is not amenable to generalizations.

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