Phonological Processes in Brahvi Child Language Acquisition

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Abstract

*This study renders an Optimality Theoretic (Prince & Smolensky, 2004) analysis of words produced by a child Manahil (M) who was acquiring Brahvi as her L1 in the age of 12 to 25 months. The study focuses on acquisition of consonants of Brahvi. This study also examines the phonological processes operative in Brahvi child language acquisition. The data were collected through a diary study. The subject of this study, Manahil, had a pure monolingual setting as both her parents are native speakers of Southern (Jhalawani) Brahvi. The findings suggest that in the early stages of L1 acquisition M avoids the most marked structures and sounds and applies different phonological tactics like deletion, substitution, fortition, etc. to overcome her production difficulties. The study also indicates the order of acquisition of L1 consonants in Brahvi children. M's order of acquisition is from unmarked to marked segments and structure. She acquired coronal sounds before labial and dorsal segments. Thus, the ranking *DORSAL >> *LABIAL >> *CORONAL in the grammar of the child is confirmed. In her early productions she deleted fricatives, affricates, rhotics and velar stops at initial stage of learning. The CVC structure is marked for M. She, therefore, changes CVC syllables into CV by deleting the coda consonant. Weak or unstressed syllables are also deleted in her lexicon. She also reduces consonant clusters deleting more sonorous light syllables and retaining less sonorous heavy syllables (e.g. /mo.'bæl/ → ['bæl]). Substitution is another major phonological process operative in her productions. Velar stops, fricatives and affricates are substituted with coronal stops which confirms that coronal stops are acquired before any other consonant. The substitution of fricatives and affricates with coronal stops is applied to avoid feature [+continuant] at the initial stage of learning. At later stage, rhotics /r/ and /ɽ/ are substituted with lateral [l] which confirms that the anterior consonants are acquired before the posterior ones in Brahvi child language acquisition. The overall findings show that Markedness constraints outrank Faithfulness constraints in her grammar when a child is acquiring Brahvi as L1. This is in line with universal pattern of first language acquisition.*

Keywords: *Brahvi, L1 acquisition, Optimality Theory*

1. Introduction

After coming into the world, the most important assignment for a newborn is acquisition of his/her mother tongue because it helps the baby to express his/her feelings and fulfill the basic needs of life. It also plays a vital role in cognitive development of a child. In the past, it was considered that the process of L1 acquisition is straightforward and simple; children acquire their L1 with ease facing no difficulties; but later studies on first language acquisition demonstrated that children acquire language by undergoing many difficulties and encountering complexities of human language. Children go through different acquisition stages like crying, babbling, etc. before mastering their L1.

Children are not born talking; they start L1 acquisition right after their birth (Clark, 2009). They are not born with language but they are born with innate, God-gifted qualities which make it possible for them to perceive and acquire human language (Vouloumanos & Werker, 2007). Perception is very much important for language acquisition because perception leads to production of a language (Brown, 1998). The importance of percetion can be seen that after coming into the world a baby first only listens to human speech at least for 1 year and then s/he starts producing words. Thus, children seem to be born with a perceptual system that is especially designed for listening to speech. Two days old babies show a preference for the language of their parents over others' (O'Grady, 2005; DesCasper & Fifer, 1980). Some researchers claim that children acquire their L1 in three years but others say that children get mastery over their language step by step in 5 years time period (Lust, 2006). Children produce first complete word of their L1 at the age of 10 to 15 months (Radford et. al, 2006). O'Grady (2005, p. 7) considers first word of a baby as one of the greatest milestones in his/her life. Most of the time this milestone happens when children are 12 months old (ibid). However, according to Hayes (2004), the true birth of phonology of a child's life starts when s/he is 8 months old.

The latest research on L1 acquisition states that first language acquisition starts before birth (Kisilevsky et. al, 2009). Fetuses give positive response to their parents' voice and newborns and fetuses can discriminate their mother's voice from another woman's voice ((DeCasper & Fifer, 1980; Kisilevsky et al., 2003). Children acquire language in an order- from unmarked (easy) sounds to marked (difficult) ones.

1.1. The current study

The main purpose of this study is to record and analyze the phonological processes operative in the first language acquisition of Brahvi. This aim will be achieved through a thorough study of words produced by a child Manahil (M) aged 13 to 25 months, who was acquiring Brahvi as her L1 at the time of observation.

1.2. Research Questions

The current study aims to address the following research questions:

1. What triggers phonological processes in L1 Brahvi child language acquisition?
2. What is order of acquisition of L1 consonants in Brahvi children?
3. What phonological processes are applied by Brahvi children in L1 acquisition?

1.3. Brahvi

Brahvi[1] is a language mainly spoken in southern and central regions of Balochistan particularly Kalat and Quetta, and some parts of Sindh like Nawabshah and Karachi (Andronov, 1980; Bray, 1907). Besides Pakistan, Brahvi is also spoken in Iran and in Neemrooz province of Afghanistan. Brahvi has three dialects, Sarawani (Northern), Jhalawani (Southern) and Noushki.. It has taken many words from its neighboring languages in the form of loanwords. Balochi and Persian are the main lenders to Brahvi. Thus, the modern form incorporated elements from Persian, Sindhi, Balochi and a number of other languages. Sarawani dialect is spoken mainly in Mastung, Quetta, Bolan, Sibbi, Naseerabad and Jaffarrabad districts. This dialect is prone to Urdu and English

[1]The word "Brahvi" is used for both the language itself and its speakers.

influences. It very slightly differs from the other Brahvi dialects in vocabulary, syntax, pronunciation and semantics. Jhalawan dialect is spoken in the areas of central Balochistan, like Khuzdar, Karkh, Moola, Baghbana, Zeedi, Wadh, Zehri and Naal, Lasbela etc. Jhalawan dialect is influenced by Sindhi. The speech of Zehris contains a large number of Sindhi words (Bray, 1907, p. 7). Balochi has exerted influence on Noushki dialect.

2. Literature Review

First language acquisition has become one of the fast growing areas of linguistics since Chomsky (1968) gave the idea of Universal Grammar (UG). According to him, human beings are pre-programmed and endowed with innate qualities for language acquisition. Children by birth are wired for language acquisition; they only need input. Since then researchers have been trying to test his hypothesis. For the same purpose, various studies have been done on children in order to find out the language acquisition process involved in L1. The whole previous research on L1 acquisition suggests that there are various phonological processes operative in child phonology. Consonant harmony, deletion, insertion, substitution, etc. are commonly found phonological processes in child language. This paper attempts to study the phonological processes operative in productions of Brahvi as L1.

2.1. Order of acquisition

The order of acquisition of L1 phonemes has been debatable since Jakobson (1939) for the first time proposed universal order of acquisition of L1 sounds, because later research confirmed that the order of acquisition assumed by Jakobson was very strict in its nature and had several shortcomings. For example, Jakobson considers that segment /s/ is acquired first in L1 acquisition before any other fricatives but Ahmal (Smith, 1973) acquired fricative /v/ before /s/. Thus, Amahl's order of acquisition is not the same as predicted by Jakobson. According to Jakobson lateral [l] is acquired fairly late. But previous studies show that French children have no difficulties in the production of laterals at the age of 12-15 months (e.g. Vihman & Boysson-Bardies, 1994). Although, there are some flaws in Jakobson's order of acquisition but some of his assumptions have been proved correct. He hypothesizes that coronal sounds are acquired before dorsal ones. We have ample data which show the substitution of dorsal sounds with coronals (e.g. Stoel-Gammon, 1996; Bleile, 1991; Inkelas & Rose, 2007, etc.). He further claims that single consonants are acquired before consonant clusters. This claim is quite natural and later studies have confirmed it as well (e.g. Gnanadesikan 2004, Smith 1973, etc.).

Let us realize that human children are not like machines which act according to the instructions and programs designed for this purpose. Each human child is unique and therefore, many researchers suggest that every child develops her own grammar (Vihman & Croft, 2007). Therefore, world literature on L1 acquisition shows first words produced by children are not the same? Although, there are generalizations about child language acquisition regardless of individual differences but we also find similarities in first language acquisition

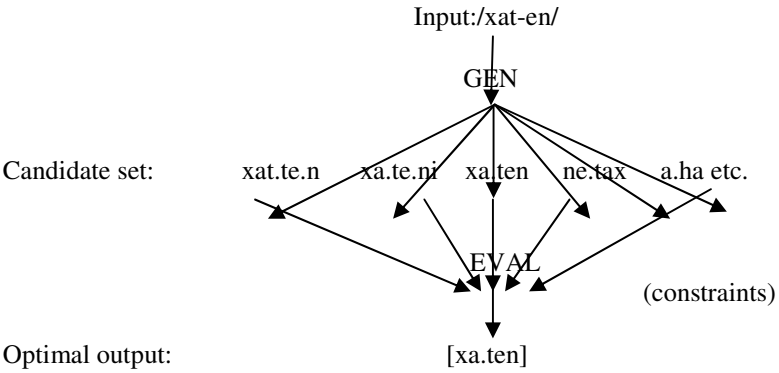
2.2. Optimality Theory

Optimality Theory (OT) is a linguistic framework which was first introduced in the field of linguistic in 1993 by Prince and Smolensky. Since then linguists started debates on OT and in 2004 OT received its theoretical status in the field of linguistics. OT is the most modern theory in linguistics which has largely supplanted rule-based frameworks (Chomsky & Halle, 1968) within

phonology because OT best models human competence and fill the gaps which the previous models left. OT has been applied primarily to phonology and generally to other aspects of language. Gnanadesikan (2004) considers OT to be the heart of phonology. OT studies input and output relations in linguistics and language acquisition (Tesar & Smolensky, 2004). It successfully describes child phonology (Gnanadesikan, 2004). Since its introduction, researchers of L1 acquisition prefer to apply OT model as a framework in their research as it has supplanted previous models applied on child language acquisition. OT not only represents what a child during L1 acquisition has produced but it also answers why a child has not produced a particular segment/structure. It also provides the reason beyond a child's failure in production. In a nutshell, OT is the most effective theory in linguistics widely used and preferred for first language acquisition.

OT has three main functions; GENrator, EVAluator and CONstraints. GEN generets unlimited numbers of linguistic objects (candiades) and each candidate has equal chance to be selected as optimal but EVAL selects a candidate in the light of CONstraints which best satify the constraints. EVAL selects the candidate which is most harmonic or optimal. The process of EVAL continues till the point when only one candidate is left. This is a systemic process reflected in (1) reproduced from (Archangeli, 1997, p. 14)

(1)



In OT constraints are universal. Universal grammar (UG) includes a constraint component CON that contains the entire repertoire of constraints (McCarthy, 2008, p. 15). All constraints are present in the grammars of all languages (ibid). In other words, each language has access to all constraints but their ranking is language specific. The ranking of the constraints determines grammar of that language. The constraints which are lower-ranked in one language may be higher-ranked in other language. Constraints are re-ranked within a language as well. Ranking of constraints may be different for children and adults. For example, *COMPLEX-CC is lower-ranked for English adult speakers but it is higher-ranked for English children acquiring their L1 (Johnson & Reimers, 2010).

OT constrains are of two types namely Markedness constraints and Faithfulness constraints. Markedness constraints demand well-formedness of outputs. Faithfulness constraints demand that output should be identical to the input, there should be similarity in input and output forms. Both

Markedness and Faithfulness constraints are normally in conflict. Satisfaction of one type of constraints results violation of the other type. Simply, it means no form can satisfy two opposing constraints simultaneously.

According to OT, L1 acquisition is result of re-ranking or demotion of universal constraints. A child re-ranks his or her constraint ranking with the development of language. Children keep on re-ranking their grammar till they master their mother tongue. In the initial stage of acquisition, a child only listens to human speech but cannot produce any sound which means she violates FAITH-IO, which demands that output should be identical to the input, which is lower ranked in her grammar in the initial stage of acquisition as the following ranking shows.

(2)

*GLIDES >> *LIQUIDS >> *FRICATIVES >> *STOPS >> FAITH-IO

The above ranking illustrates that in the beginning, a child satisfies Markedness constraints at any costs by violating a Faithfulness constraint i.e. FAITH-IO. After acquiring stops the child re-ranks his/her grammar in which *STOPS goes to lower rank as shown below regarding manner of articulation of consonants.

(3)

*GLIDES >> *LIQUIDS >> *FRICATIVES >> *STOPS

The above ranking shows the order of acquisition of consonants. According to which children first acquire stops, then fricatives, and so on. The following algorithm shows that how a child re-ranks his/her grammar at different stages of language acquisition.

(4)

1. *GLIDES >> *LIQUIDS >> *FRICATIVES >> *STOPS >>**FAITH -IO**
2. *GLIDES >> *LIQUIDS >> *FRICATIVES >>**FAITH -IO**>> *STOPS
3. *GLIDES >> *LIQUIDS >>**FAITH -IO**>> *FRICATIVES >> *STOPS
4. *GLIDES >>**FAITH -IO**>> *LIQUIDS >> *FRICATIVES >> *STOPS
5. **FAITH -IO**>> *GLIDES >> *LIQUIDS >> *FRICATIVES >> *STOPS

The above algorithm shows that children keep on violating Markedness constraints in order to place Faithfulness constraint FAITH-IO at a higher position. They violate *STOPS and satisfy FAITH-IO which indicates that a child after acquiring stops has re-ranked her grammar and thus, acquisition is actually a process of re-ranking of constraints (Prince & Tesar, 2004). A child moves from step 1 to 5 and on each step she violates Markedness constraints because in the early stage of acquisition Markedness constraints dominate Faithfulness constraints (Gnanadesikan, 2004). In line with the above hierarchy, there is also a universal hierarchy of constraints which indicates the path of acquisition of place nodes in the feature geometry of a child (Brown, 1998; Rice & Avery, 1993). The following ranking is a general hierarchy observed in most of the studies on child language acquisition.

(5)

*DORSAL >> *LABIAL >> *CORONAL

The above hierarchy indicates the path of acquisition of place nodes. According to this hierarchy a child will first activate coronal node to produce coronal segments, then labial and at the end dorsal node is activated.

3. Research Methodology

The current study analyzes productions of the subject of this study Manahil (M) aged 13 to 25 months, who was acquiring Brahvi, a Dravidian language, as her L1. The subject had a pure monolingual setting as both her parents speak Brahvi. M was acquiring the Southern (Jhalawāni) Brahvi. The first author is father of the subject. Both the first author and the subject lived together in the same house during the study period. The researcher listened and talked to the subject almost 4 to 5 hours daily during this period. The researcher always had a diary with him in which he noted the words uttered by the subject. During M's language acquisition various dynamic phonological processes like substitution, deletion, fortition etc. occurred which are discussed in the following section. The whole data will be analyzed in the perspective of optimality Theory.

4. Data analysis and Presentation

This section is for data analysis and presentation. The data are analyzed and presented in detail through Classical Optimality Theory (Prince & Smolensky 1993/2004) but following Standard Optimality Theory (McCarthy, 2008) the Faithfulness constraints PARSE and FILL are replaced with MAX and DEP in the data analysis. Different phonological processes like fortition, deletion, substitution, etc. are analyzed and presented in different tableaux in this chapter. Slash brackets will be used for input data and straight lines for output forms. A list of consonants of Brahvi is given in the appendix which is reproduced from Elfenbein (1997, p. 800). The phonological processes which are operative in the productions of the subject of this study are discussed at large in the following sections.

4.1 Fortition

Fortition is a common phonological process found in child phonology cross-linguistically. Fortition is a consonantal change from a weak sound to a strong one. A sound becomes strong when there is occlusion in the oral tract because blockage of the air-stream needs more effort to make a contact between active and passive articulators. Conversely, a wider aperture of oral tract facilitates production of more sonorous segments. Therefore, fortition is sometimes defined on the basis of sonority that is substitution of a more sonorous segment with a less sonorous one. The following examples show the process of fortition occurring in the production of M.

(6)

	Input	Output	Meaning
(i)	/pæ.sɘ/	[pæ.t̪ɘ]	'money'
(ii)	/nʌs.so/	[ʌt̪.t̪o]	'a name'
(iii)	/sæl/	[t̪æl]	'cell'
(iv)	/sɘl/	[t̪ɘl]	'to stop'
(v)	/fi.za/	[bi.d̪a]	'a name'
(vi)	/a.zam/	[a.d̪am]	'a name'
(vii)	/zi:.a/	[d̪i:.a]	'up'
(viii)	/xɘl/	[t̪ɘl]	'stone'
(ix)	/a:.xɘ/	[a:.t̪ɘ]	'No'
(x)	/pʊʧ/	[pʊt̪]	'cloth'
(xi)	/ʧet̪/	[t̪et̪]	'roof'
(xii)	/ʃa.t̪ɘ/	[t̪a.t̪ɘ]	'pour/wear'

The above examples illustrate that, at this stage of language acquisition, the child cannot produce fricatives and affricates at any position. The above tokens show that the child cannot produce fricative /s/ therefore, she replaces it with [t̪]. The examples show that /z/ is replaced with [d̪] and all other segments / ʃ, ʧ, x/ are substituted with [t̪]. The above examples also show that all sonorant or less sonorant segments are replaced with the least sonorant or [-sonorant] ones, but not vice versa. It also indicates that the child has not acquired feature [+continuant] which makes a difference between stops and fricatives. The child changes feature [+continuant] with [-continuant] which results in fortition. The above data also indicates the direction of acquisition of consonants in Brahvi. Manahil replaces fricatives with coronal stops[2] because fricatives as compared to stops are more marked cross-linguistically. Fricatives at this stage for her are difficult to produce. Therefore; she applies substitution strategy. The above examples also confirm the ranking *FRICATIVE >> *STOP. It is widely reported that children acquire stops before fricatives. Johnson & Reimers (2010) and Smith (1973) provide data refer to children who in the early stage of L1 acquisition substitute fricatives with stops. As M's data show, she also replaces both coronal and velar fricatives with coronal stops which is enough to claim that coronal stops are acquired before dorsal ones. M follows the universal order of acquisition that is, *DORSAL >> *LABIAL >> *CORONAL. In other words, coronal stops, in L1 acquisition, are the first sounds to be acquired then labials and dorsals are the last ones in acquisition. The following tableau shows OT representation of the above examples. The relevant constraints are also defined below.

DEP-IO: Output segments must have input correspondents (Kager, 2010, p. 68).
IDENT(ITY)-IO [F]: 'Correspondent segments have identical values for feature [F]' (Kager, 2010, p. 250).

*FRICATIVE: Fricatives should not be produced.
*STOP: Stops should not be produced.

[2]Coronal stops /t̪ d̪/ were the first sounds acquired by Manahil at the age of 12 months.

Tableau 1: **Fortition**

/s/	*FRIC	IDENT [Cont]	*STOP	IDENT [anterior]	IDENT [place]
a. /s/	*!				
☞ b. [t̪]		*	*	*	
/z/					
a.[z]	*!				
☞b.[d̪]		*	*	*	
/ʃ, ʧ/					
a. [ʃ, ʧ]	*!				
☞b.[t̪]		*	*	*	
/x/					
a. [x]	*!				
☞b.[t̪]		*	*		*

In the above tableau, candidates in (a) lose because they violate higher ranked Markedness constraint *FRIC. On other hand, the candidates in (b) incur many violations of lower ranked constraints *STOP, IDENT[anterior] and IDENT[place]. Despite many violations of Markedness constraints and Faithfulness constraints, the candidates in (b) are declared as winners because OT constraints are in strict domination hierarchy (Prince & Smolensky, 2004, p.3) and a single dominating constraint has absolute superiority over many lower ranked constraints; thus a single violation of a higher ranked constraint is avoided at the cost of many violations of lower ranked constraints. All candidates in (a) incur a violation of higher ranked constraint *FRIC and on the other hand, candidates in (b) violate many lower ranked constraints.

4.2. Deletion

Children either produce the adult form or apply another strategy to overcome the difficulties in acquisition. Deletion is a common phonological process which is used by children to simplify inputs. They have two options, either be faithful to the input by producing the same input accurately or simplify it into an acceptable form. It has been observed that children acquiring their first language normally apply deletion as a strategy to solve their production problems. It can be at segmental level or syllable level. Segmental deletion is frequently used by children because, in some cases, they cannot acquire all features of the target sounds altogether. In the earlier stages of acquisition some sounds are marked (difficult) for children to produce. Thus, they delete the difficult sounds. In the current study we see that M cannot produce marked segments in her early stage of acquisition therefore, she deletes fricatives (/s z x/), rhotic (/r/) and velar stop (/k/). The process of deletion is discussed as under.

4.2.1 Deletion of fricatives

Fricatives are marked in the early stage of L1 acquisition. The following data show that M's grammar does not allow fricatives to be produced at early stage of L1 acquisition. Thus, she applies deletion to make her production easier. The following examples illustrate deletion of fricatives in M's productions.

(7)

	Input	Output	Meaning
(i)	/zo:.ba/	[o:.ba]	'come fast'
(ii)	/sa.bə/	[a.bə]	'a name'
(iii)	/sa:.fei/	[a.bei]	'it's clean'
(iv)	/t̪os/	[t̪o]	'toast'
(v)	/ʤu:s/	[ʤu:]	'juice'
(vi)	/xə.ʃa.ne/	[ə.ʃa.ne]	'sleeping'
(vii)	/xə.n̪ʌm/	[ə.n̪ʌm]	'finished'

The above examples show that the child cannot produce fricatives at this stage. She deletes fricatives[3] in her productions word-initially (i,ii,iii, vii & viii) and word-finally (iv, v). The above tokens also indicate that the child has acquired labial nasals and affricate /ʤ/ before fricatives and dorsal stops. The example (v) shows that the child deletes /s/ but produces [ʤ]. M's order of acquisition is from stop to affricate and her grammar ranks *FRICATIVE above MAX-IO [consonant]. The relevant constraints are defined below.

MAX-IO: Input segments must have output correspondents (Kager, 2010, p.67).
ONSET: Syllables must have onsets (Kager, 2010, p. 92)

Tableau 2: **Deletion of fricatives**

/zo:.ba/	*FRIC	ONSET	MAX-C [z]
a. zo:.bə	*!		
☞b.o:.bə		*	*

The candidate (a) loses because it violates the highly ranked constraint *FRICATIVE. The candidate (b) is declared winner because it satisfies the highly ranked constraint and only incurs violations of lower ranked constraints ONSET and MAX-C [z]. The above tokens confirm that in the initial stage of acquisition, markedness constraints dominate faithfulness constraints. Fricatives at initial stage of L1 acquisition are marked for children. Amahl (Smith, 1973) also faces difficulties in production of fricatives. Therefore, he uses deletion as a strategy to resolve this difficulty.

4.2.2. Deletion of rhotics

Deletion in M's productions at this stage is not only restricted to fricatives but she also deletes rhotic [r] in her utterances. The following data show [r] deletion.

(8)

	Input	Output	Meaning
(i)	/d̪i:r/	[d̪i:]	'water
(ii)	/rof/	[o:f]	'broom
(iii)	/ra.ju:/	[a.ʤu:]	'a name'
(iv)	/bar.bəʤ/	[ba.bəʤ]	'12 o' clock'
(v)	/pər.wi:n/	[ə.bi:n]	'a name'

[3] Manahil first substituted fricatives with coronal stops but later she deleted fricatives.

The above examples show that M is not faithful to liquid /r/[4]. This is her initial stage of acquisition in which /r/ regardless of place of occurrence is marked for her to produce. The segment /r/ has feature [-anterior]. It is noticeable that M can produce nasal /n/ which like /r/ and /ɽ/ is coronal and is [–distributed]. The segments /r, ɽ/ also are [-anterior, –distributed]. The feature retroflex makes the difference between /r, ɽ/. Segment /ɽ/ has feature retroflex but segment /r/ lacks it. The data in (8) indicate universal pattern of L1 acquisition that is that labial, nasal, and affricates are acquired before rhotics. It is noticeable that M deletes /r/ word-initially, word-medially and word-finally. Her grammar does not allow rhotics which means in her grammar *RHOTICS, *RETROFLEX are higher ranked than MAX-C[r]. The relevant constraints are defined below.

*RHOTICS [r]: Rhotics must not be produced.

Tableau 4: **Deletion of rhotic [r]**

/d̪i:.r/	*RHOTICS	MAX-C[r]
a. d̪i:.r	*!	
☞b. d̪i:		*

The candidate (a) is defeated on account of violation of a highly ranked constraint *RHOTICS. On the other hand, the candidate (b) violates only the lower ranked constraint MAX-C[r]. Therefore, the candidate (b) emerges as a winner.

On the onset of L1 acquisition, children acquire laterals before rhotics because rhotics are marked and less frequent in the world languages. This is also in accordance with the universal markedness pattern because according to Maddieson (1984), /r/ exists in a relatively smaller number of languages than /l/. This shows that the child is following the universal pattern of acquisition in which laterals are acquired before rhotics. In the initial stage children either substitute rhotics with laterals or delete them because they cannot produce them. We saw above in (8) M substituted rhotics with laterals. It should be kept in mind that M deleted rhotics only until she had acquired feature lateral /l/. After she acquired /l/, she started replacing rhotics with laterals.

4.2.3 Deletion of velars

In the initial stage of L1 acquisition, children acquire coronal stops before the velar ones because the former as compared to the latter are more marked and are acquired late in L1 acquisition. The following examples show deletion of velar stops in the production of M.

(9)

	Input	**Output**	**Meaning**
(i)	/kun/	[un]	‘eat’
(ii)	/kæ.lə/	[æ.lə]	‘banana’
(iii)	/kʌ.baɽ/	[ʌ.baɽ]	‘cupboard’
(iv)	/kʌp.pa/	[ʌp.pa]	‘don’t do it’
(v)	/ka.pi:/	[a.pi:]	‘note-book’

[4]The /r/ segment is very marked for children in L1 acquisition. Manahil could not produce /r/ until the age of 25 months. She either deleted or substituted it with [l].

The above examples indicate that at this stage of acquisition M's grammar does not allow her to produce velar stops but she has acquired coronal and labial stops. This confirms the ranking *DORSAL >>* LABIAL >>*CORONAL in her early grammar. The example (i) shows that the child deletes dorsal /k/ but retains nasal /n/. The former is dependent on [DORSAL] node and the later requires [CORONAL] one. M does not delete coronal /n/ because the child has activated the required coronal node in feature geometry. The constraint *DORSAL is higher ranked in the child's grammar. The child's outputs are presented in a tableau below. The relevant constraint is also defined under.

*STOP [dorsal]: Dorsal stops must not be produced.

Tableau 5: **Deletion of dorsal stop**

/ kʌ.baʈ/	*STOP [dorsal]	MAX-C[k]	ONSET
a. kʌ.baʈ	*!		
☞ b. ʌ.baʈ		*	*

The candidate (a) is defeated due to the violation of the highly ranked constraint *STOP [dorsal]. This demands that dorsal[5] stops must not be produced. Therefore, candidate (b) is declared winner as it only violates lower ranked constraints MAX-C[k] and ONSET. The candidate (b) satisfies the highly ranked constraint *STOP [dorsal]. The tableau confirms the ranking *STOP[dorsal] >> MAX-C[k], ONSET. The child's grammar allows deletion but prohibits dorsal stops which are highly ranked at this stage of acquisition.

In the process of deletion, it was observed that in the early stage of L1 acquisition M could not produce fricatives, affricates, rhotics and dorsal stops in all positions because these all consonants were marked for her. Thus, she used deletion as a strategy to make her production easier.

4.2.4 Syllable deletion

Children also delete part of a syllable of a polysyllabic word and sometimes they delete a complete syllable. In syllable deletion, children take into account the suprasegmental constraints. Normally they delete unstressed syllable of a polysyllabic word.

(10)

	Input	**Output**	**Meaning**
(i)	/xʌ.**raː.b/**	[baːb]	'bad'
(ii)	/sʌ.**bɘr/**	[bɘl]	'wait'
(iii)	/kʌ.**biːr/**	[biː]	'a name'
(iv)	/rʌ.**ʃiː.ɖa/**	[ʈiː.ɖa]	'a name''
(v)	/mo.**bæl/**	[bail]	'mobile'
(vi)	/ko.**noː.**ne/	[noː.ne]	'will eat you'

The tokens in (10) illustrate that all unstressed syllables are deleted by M. Because syllables bearing primary or secondary stress are more noticeable than their unstressed counterparts. They tend to be more salient to children in the early stages of L1 acquisition (O'Grady & Cho, 2011). As a result, stressed syllables are more likely to be retained in children's pronunciation than are

[5]Manahil could not acquire dorsal sounds until the age of 25 months.

unstressed[6] syllables. Brahvi is a quantity sensitive language; heavy syllables attract stress in Brahvi. We see that when the child receives disyllabic or tri-syllabic words she changes them into monosyllabic or disyllabic words. She retains the heavy syllables and consequently, the light syllables are deleted. In other words, if the input consists of one heavy and one light syllable, the light syllable is deleted. The following tableau shows the process of syllable deletion. The relevant constraints are defined below.

Ft Bin: A foot carries minimum two morae.
TROCHEE: Feet are left-headed (trochaic)
Weight-to- Stress Principle (WSP): Heavy syllables attract stress.

The constraint MAX-σ and MAX-'σ are extensions of MAX-IO which militate against deletion (McCarthy, 2008).

Tableau 6: **Deletion of weak syllable**

/mo.'bæl/	TROCHEE	Ft-Bin	WSP	MAX-'σ	MAX-σ
a. mo.'bæl	*!				
b.'mo.bæl			*!		
c.mo		*!		*!	*
☞d.'bæl					*

In the above tableau, the candidate (a) loses because it violates the most highly ranked constraint TROCHEE. The candidate (b) loses on account of a fatal violation of WSP which is also a higher ranked constraint in the grammar of M because her language is quantity sensitive. The candidate (c) could not emerge as winner on account of fatal violation of Ft-Bin because the first syllable is not bi-moraic and also because of MAX-'σ. The (d) candidate emerges as optimal which only incurs a single violation of lower ranked constraint MAX-σ.

The highly ranked constraint TROCHEE demonstrates that the grammar of M only accepts the unmarked trochaic foot in a prosodic word at this stage of language acquisition. World-wide, trochees are acquired before iambs (Jusczyk, Houston, & Newsome, 1999). The repair strategy adopted by M is to delete the unstressed light syllable to satisfy highly ranked constraints. An important point in this regard is that while deleting a syllable, M has to select one of the two syllables in the input. In this regard, she is more faithful to the stressed syllable which also determines the place of WSP and MAX-'σ in this ranking. This is quite natural to preserve the stressed syllable because a stressed syllable is relatively more prominent acoustically (Spencer, 1996). Besides, children's words observe unmarked foot structure (Demuth, 1995).

4.2.5 Consonant cluster reduction

Consonant clusters are more marked for children in the early stage of L1 acquisition. Other things being equal, a single consonant is acquired before consonant clusters (Jakobson, 1963). There are many studies on L1 acquisition which show that children reduce consonant clusters in their early utterances (e.g. Gnanadesikan, 2004; Smith, 1973). It has been reported that in cluster reduction some children follow the sonority pattern while others violate it. The following examples illustrate the consonant cluster reduction in M's productions.

[6]Weak or unstressed syllables are not perceived by children at a particular stage of acquisition. Manahil always deleted unstressed syllable of the word /mo.'bæl/ and produced it as ['bail]

(11)

	Input	**Output**	**Meaning**
(i)	/mʊʃk/	[mʊt̪]	‘mouse’
(ii)	/pʌst̪/	[pʌt̪]	‘pocket’
(iii)	/d̪ost̪/	[d̪ot̪]	‘friend’
(iv)	/hust̪/	[ut̪]	‘heart’
(v)	/amb/	[am]	‘mango’
(vi)	/bomb/	[bom]	‘bomb’
(vii)	/kʊmb/	[t̪ʊm]	‘pool’

All above examples show that the child cannot produce a cluster of two consonants because they are marked for her at this stage. This is the stage where the child has acquired all the sounds mentioned in the words listed in (11). Thus, it confirms that *COMPLEX-CC is the trigger for this deletion at this stage of acquisition. She deletes /s/ when it is followed by /t̪/. It seems that for her both the consonants /s t̪/ have equal sonority so she deletes one consonant. The examples (v, vi, viii) show that the child prefers to retain labial nasal /m/ over labial stop / b/. The following tableau exhibits the process of consonant cluster reduction. The relevant constraint is defined below.

*COMPLEX-CC: Complex structures are not allowed.

NO-CODA: syllables are open (Kager, 2010, p.94).

Tableau 7: **Reduction of consonant cluster**

/pʌst̪/	*COMPLEX-[st̪]	*CODA[fric]	*CODA[stop]	MAX-C[s]
a. pʌst̪	*!			
b. pʌs		*!		
☞c.pʌt̪			*	*

The candidate (a) which is most faithful is rejected on account of violation of the higher ranked markedness constraint COMPLEX-[st̪]. And the candidate (b) also fails to emerge as winner because it incurs a violation of *CODA[fricative] which is also higher ranked in M’s grammar. Thus, the candidate (c) emerges as winner satisfying the higher ranked constraints. It only violates lower ranked constraints.

At this stage, the child has already acquired both /s, t̪/ segments. When she receives both consonants in the cluster, she deletes one of the consonants. In these cases she deletes /s/ and retains /t̪/. It seems she does not follow the Sonority Sequence Principle (SSP), the SSP is well-known generalization found cross-linguistically for syllable formation. SSP states that sonority of the segments in a syllable rise throughout the onset to the necleus, and a slow fall occurs throughout the nucleus to the coda (Clements, 1990). But the child seems to follow the SSP only in examples (v, vi, vii) . She deletes labial stop /b/ but retains nasal /m/ which results a slow fall from necleus to the coda. The former is [+sonorant] and the latter is [-sonorant].

4.3 Lateralization

When rhotics are replaced by laterals it is called lateralization. Lateralization is widely reported in the first language acquisition literature. In the initial stage of L1 acquisition, children are often reported to substitute /r, ɽ/ with [l]. The following productions of M also illustrate the substitution of /r, ɽ/ with [l].

(12)

	Input	**Output**	**Meaning**
(i)	/i:ɽ/	[i:l]	'sister'
(ii)	/sʌ.bər/	[bəl]	'wait'
(iii)	/mər.jʌm/	[məl.ʌm]	'a name'
(iv)	/bə.ro/	[bə.lo]	'will come'
(v)	/reil.lə/	[lei.lə]	'to train'
(vi)	/pa.pəɽ/	[pa.pəl]	'snacks'
(vii)	/ʧa.po:ɽ/	[pa.pal]	'slap'
(viii)	/rab.beɽ/	[ab.bal]	'rubber'

In the above examples, /r/ changes into [l][7] on word-initial (vii), word-medial (iv) and word-final (I &ii) positions. The rhotic /ɽ/ does not occur in word-initial position in Brahvi (Elfenbein, 1997). The above examples show that M substitutes /ɽ/ with [l] word-finally. This indicates that she is following the universal order of acquisition in which laterals are acquired before rhotics. This is also according to the universal markedness pattern because according to (Maddieson, 1984), /r/ exists in a relatively smaller number of languages than /l/ which means /r/ is more marked than /l/; hence /l/ is acquired earlier. At this stage of acquisition, M's grammar ranks *RHOTICS above *LATERAL. To achieve this ranking the child substitutes /r/ with [l] which also involves a change in the feature [anterior]. Both /r/ and /ɽ/ are [-anterior] which change into [+anterior] when /r/ and /ɽ/ change into [l]. This involves a violation of faithfulness to the feature [anterior]. The feature [+lateral] is also added in this substitution since /r/ is [-lateral] and /l/ is [+lateral]. There are examples of lateralization in child phonology in English (Smith, 2010). It is also established in the literature that liquids are substituted with rhotics by children because rhotics are acquired very late in L1 acquisition (Brown & Mathews, 1993, 1997).The following tableau illustrates substitution of rhotics /r, ɽ/with lateral [l].

Tableau 8: **Lateralization**

/bər/	*RHOTICS	*RETROFLEX	*LATERAL	IDENT-IO [anterior]
a. bər	*!			
b. bəl			*	*
/i:ɽ/				
a. i:ɽ	*!	*!		
☞b .i:l			*	*

[7]Manahil acquired clear /l/ when she was 17 months old and she acquired Brahvi dark lateral /ɬ/ at the age of 25 months

The candidate (a) is defeated because of violation of higher ranked constraint *RHOTIC[8] therefore, candidate (b) is declared as a winner which violates constraints *LATERAL and IDENT-IO [anterior] which are lower ranked in the child's grammar. These examples also indicate that the child has acquired coronal node. The [+anterior] and [+distributed] are articulator- bound features which are only linked with coronals where they make a difference between anterior and posterior coronals and apical from laminal coronals (Clements & Hume, 1985, p. 252). This not only confirms that coronal sounds are acquired before dorsals but in addition to it, it also indicates that anterior/apical segments are acquired before posterior/laminal ones. Apical segments are more unmarked sounds than laminal ones. M's order of acquisition[9] is according to the universal order of acquisition that is anterior segments are required before posterior. Thus, at this stage of L1 acquisition M's grammar is *+ANTERIOR >> *-ANTERIOR.

4.4Assimilation

Assimilation is also one of the processes commonly found in child phonology. Children often change the feature [+voice] into [-voice] or vice versa as a result of assimilation. The following examples illustrate the process of voice assimilation.

(13)

	Input	**Output**	**Meaning**
(i)	/xeid̪/	[d̪eid̪]	'perspiration'
(ii)	/fi.za/	[bi.d̪a]	'a name'
(iii)	/ki.bi:n/	[d̪i.bi:n]	'cabin'
(iv)	/sə.ba/	[d̪ə.ba]	'a name'
(v)	/ʧa.bi:/	[d̪a.bi:]	'key'

All the examples in (13) show that M's productions lose the specification [-voice] in the input and gain the specification [+voice] in the output. In these words, the voiced segments spread regressively their [+voice] feature to the voiceless sounds. O'Grady & Cho (2011) and Johnson & Reimers (2010) provide such data in which voice assimilation process were operative in the languages of the children under their study. M's assimilation process is presented through OT language in the following tableau.

Tableau 9: **Assimilation**

/xeid̪/	*DOR	SPREAD [voice]	IDENT- [place, continuant]
a. xeid̪	*!	*!	
☞b. d̪eid̪			**

The candidate (a) could not emerge as winner due to the violation of the higher ranked constraint SPREAD [voice] which demands spreading of the feature [+voice]. It also satisfies the other highly ranked constraint *DOR. The candidate (b) satisfies the higher ranked constraints violating only the lower ranked constraints IDENT-[place, continuant]. Thus, the candidate (b) is declared optimal.

[8]Clements and Hume and many others do not include 'retroflex' in the list of features but some phoneticians like Ladefoged want to differentiate between /r/ and /ɽ/ using this feature.

[9]Manahil acquired [+anterior] sounds before [-anterior] ones. She replaced [r, ɽ] with [l].

4.5 Velar fronting

It is widely reported that children replace dorsal sounds with front consonants because in their feature geometry, at that stage, of acquisition velar place is marked for children. The following data show process of velar fronting.

(14)

	Input	**Output**	**Meaning**
(i)	/kər/	[t̪əl]	'deaf'
(ii)	/kər.us/	[t̪əl.us]	'you are deaf'
(iii)	/d̪a.kə/	[d̪a.t̪ə]	'from here'
(iv)	/ko.t̪i:/	[t̪o.t̪i:]	'room'
(v)	/o:ka/	[o:t̪a]	'from here'
(vi)	/go:.go:/	[d̪o:.d̪o:]	'dove'
(vii)	/go.li:/	[d̪o.li:]	'tablet'
(viii)	/pʌg.ga/	[pʌ.d̪a]	'tomorrow'
(ix)	/d̪ʌg.gi:/	d̪ʌd̪.d̪i:]	'cow'
(x)	/xeid̪/	[d̪eid̪]	'perspiration'
(xi)	/xʌl/	[t̪ʌl]	'stone'/ 'hit'
(xii)	/a:.xə/	[a:t̪ə]	'No'

What is going on in (20) is that all velar sounds are replaced by coronal stops. The dorsals lose their place (and in some cases, manner) of articulation. In other words, they lose feature [DOR] and receive [COR] feature. The Process of velar fronting happens in all three positions i.e. word-initially, word-medially and word-finally. The child retains feature [voice] of the input forms as well. In the examples, we see place and manner change and mostly the outputs are faithful in terms of voicing. She replaces the voiceless velars /k, x/ with voiceless coronal stops [t̪] and voiced velar /g/ with voiced coronal [d̪]. All the output forms are identical to the input forms in voicing. The substitution of dorsal stops and fricatives with coronals confirms that the child has not acquired features [DOR, Continuant]. At this stage of acquisition, M violates faithfulness constraints in order to satisfy markedness constraints. The process of velar fronting is presented in the following tableau.

Tableau 10: **Velar fronting in stops**

/ga.na/	*DOR	IDENT-[place]	*COR
a. ga.nə	*!		
☞b. d̪a.nə		*	*

The candidate (a) is rejected on account of violation of the highest ranked constraint *DORSAL. Thus, the candidate (b) emerges winner which only incurs violations of lower ranked constraints IDENT-[place] and *CORONAL.

The above examples also confirm the pattern of acquisition that is *DOR >> *LAB >> *COR. It has never been seen in the studies of L1 acquisition that dorsal segments are acquired before coronal ones but the reverse is widely attested. In the literature on child phonology, we find lots of evidence of velar fronting (e.g. Stoel-Gammon 1996; Bleile 1991; Inkelas & Rose, 2007, etc.). The last three examples in (20) not only show place change but they also illustrate change in the

manner of articulation. In simple words, the output in child phonology does not retain feature [+continuant]. The following tableau shows the process of manner change.

Tableau 11: **Velar fronting in fricatives**

/xʌl/	*DOR	IDENT[place]	IDENT[continuant]	*COR
a. xʌl	*!			
☞b.t̪ʌl		*	*	*

The candidate (a) could not emerge as a winner because of violation of the highest ranked constraint *DORSAL. Thus, the candidate (b) emerges as optimal which only incurs violations of lower ranked constraints.

5. Summary of findings

The main objective of this attempt was to study the phonological processes operative in Manahil's acquisition of consonants of Brahvi as L1. The findings of this study suggest that the child applied different phonological tactics like deletion, substitution, fortition etc. in her grammar to make her production easier. Substitution was widely seen in her early utterances. She replaced marked consonants with unmarked ones. Her early productions showed that she followed universal pattern of acquisition in that she acquired coronal stops earlier than dorsal ones. Thus, dorsal stops and fricatives were replaced with coronal stops. M's order of acquisition is from unmarked to marked as coronals are more unmarked than dorsals.

The process of stopping was also found in her output forms. She replaced more sonorous segments with the least sonorous ones on onset position. She replaced fricatives and affricates with coronal stops. The feature [+continuant] is acquired late in her grammar. In the process of lateralization, she substituted rhotics /r, ɽ/ with lateral /l/. M also used deletion as a strategy in her grammar in order to make her speech easier by deleting a marked segment. Therefore, she preferred deletion over substitution in some contexts. Marked obstruent consonants such as /s z ʃ x r k/ were deleted in her early productions. Deletion was not limited to segments only, but weak or unstressed syllables were also deleted. She acquired coronal segments before any other sounds. M's order of acquisition is as under:

Stops (coronal) → affricates → nasal → lateral → fricatives → glides

M also followed the universal order of acquisition that is from unmarked to marked. The only difference between previous studies and this one is that M acquired fricatives late. This study is confined to only one child; therefore, it cannot satisfactorily describe the reason of late acquisition of fricatives. However, this study confirms that:

1. Dorsal segments are more marked than, and hence acquired after, coronal and labial segments.
2. Fricatives (coronal, dorsal) are acquired after coronal stops.
3. [-continuant] feature is acquired before [+continuant].
4. Segments [r ɽ] are acquired after [l] sound.
5. CV syllable structure is acquired before any other structure.
6. Markedness constraints outrank Faithfulness constraints.

The following rankings are also confirmed in this study.

1. *DORSAL >> *LABIAL >> *CORONAL
2. *FRICATIVE >> *STOP
3. *-ANTERIOR >> *+ANTERIOR
4. *RHOTICS, *RETROFLEX >> *LATERAL
5. *COMPLEX-CC >> MAX-IO[C]

The following tables demonstrate Manahil's chronological order of acquisition of consonants and syllables and her consonant phonemic inventory at the age of 25 months.

Table 1: **Manahil's chronological order of language acquisition of consonants**

Age of acquisition (months)	Segments acquired
12	t̪ d̪
12	p b
15	ʈ ɖ
15	n
15	ʤ
17	l
19	s
19	ʧ
19	ʃ
20	f
23	z
25	ɬ
25	w

Table 2: **Acquisition of syllables**

Age of acquisition (months)	Syllable structures acquired
12	CV.CV
15	V.CV
17	CVC
19	CV.CVC
21	CV.CV.CV

Table 3: **Manahil's Phonemic Inventory at the age of 25 months**

	Labial	Dental	Alveolar	Palatoalveolar	Retroflex	Velar
Stops	P b	t̪ d̪			ʈɖ	
Fricatives	f		s z	ʃ		
Affricates				ʧ ʤ		
Nasals	m		n			
Lateral			ɬ l			
Flaps						
Semivowel	w					

This paper, in a wider context, is limited by a number of factors. All consonants of Brahvi are studied except dorsals, rhotics and glottals in this paper because M did not produce dorsals, rhotics and glottals till this research ended. This leaves room for future researchers to study the acquisition of these segments in Brahvi. This paper only studies the consonants; vowels are not part of discussion. The study is confined to only one child and was conducted for a limited time i.e. 13 months only. More reliable generalizations about Brahvi language acquisition may be found in a study which focuses on a large sample of participants to get wider generalizations about Brahvi language acquisition.

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Appendix
Consonant Inventory of Brahvi (Elfenbein, 1997)

	Labial	Dental	Alveolar	Palato-alveolar	Retroflex	Velar	Glottal
Stops	p b	t̪ d̪			ʈ ɖ	k g	ʔ
Affricates				ʧ ʤ			
Fricatives	f		s z	ʃ ʒ		x ɣ	h
Nasals	m		n		ɳ	ŋ	
Laterals			ɬ l				
Flaps			r		ɽ		
Semivowels	w		j				