Phonological Processes in Acquisition of Saraiki as L1

Nasir Abbas Syed

Abstract

This study renders an OT based analysis of productions of a 2;06 year old child SZ acquiring Saraiki as L1. Substitution, deletion and insertion are major processes operative in the grammar of SZ. Substitution occurs in consonants in thatrhotics are substituted with laterals and [s z] with [ʃʒ]), although [ʒ] does not exist in Saraiki.Metathesis is another phonological process occurring in the speech of the child.An example of the emergence of the unmarked (McCarthy & Prince, 1994) is that she inserts a vowel in CVC words changing them into CV.CV. A labial harmony in vowels and consonants exists in SZ's production regardless of direction, domain or place of articulation of the target. Deletion occurs to simplify a complex branching onset. Obstruent+sonorant clusters in onsets are simplified by deletion of the sonorant. Unstressed short vowels delete in certain contexts. Syllable deletion occurs in tri-syllabic words. Normally, the unstressed syllable deletes. However, in a disyllabic word, if the syllable which is target of deletion starts with an obstruent and that which is to be retained has a sonorant in the onset, the obstruent is retained but the sonorant deletes and if both syllables have obstruents in the onset, the unstressed one deletes. These examples show that in SZ's grammar the sonority sequence generalization is crude which is blind to sonority difference between plosives and fricatives. These data are analyzed in OT perspective (Prince & Smolensky, 2004). The phonological processes occurring in stages are analyzed using Harmonic Serialism.

Keywords: L1 acquisition, Optimality Theory, Saraiki, Phonological processes

This paper presents and analyzes data obtained from a child who is acquiring Saraiki as mother language. Different processes occur in her grammar at initial stage of learning. The paper is divided into six sections. The first section gives a brief introduction of first language acquisition. The data are presented and analyzed in section 2. Data illustrating different phonological processes like substitution, deletion, vowel and consonant harmony and de-palatalization are analyzed in different subsections. Section 3 summarises and concludes the findings of this paper.

1. First Language Acquisition

A child is born with innate bias to listening humanspeech (Vouloumanos & Werker, 2007). Since the day first,when a child starts listening to human voices carefully, the process of acquisition starts. L1 is acquired in approximately five years, although it is at the age of 6 to 10 months that babies demonstrate their comprehension of L1 (Bortfeld et. al, 2005). Pre-linguistic cries and noises are stimulus-controlled and are produced as a reaction to a natural desire (Fromkin, Blair, & Collins, 2001, p. 319). It is at the age of 10-15 months that a child produces first word of L1(Radford et. al, 2006, p. 106). Scholars claim that at the age of five months, babies start understanding words (Hayes, 2004). However, Hayes declares 8th month of life as a time of the birth of true phonology.

Jakobson (1968) was first to formally point out a universal order of acquisition of L1 sounds. It is agreed that perception of a child always precedes production. According to Mani (2011), acoustic information, frequency of listening, distribution and timing of exposure may influence the

direction and sequence of acquisition of L1 sounds. Best (1994, 1995) and her colleagues (Best, McRoberts, & Goodell, 2001; Best & Tyler, 2007; Hallé & Best, 2003, etc.) maintain that babies have direct access to articulatory gestures of L1 sounds. However, Kuhl and her colleagues (P. Iverson & Kuhl, 1995; P. Iverson et al., 2003; Kuhl, 2007; Kuhl et al., 2008) give importance to distribution of sounds as well as acoustics in L1 acquisition. The idea that language acquisition is influenced by age of exposure dates back to Penfield and Roberts (1959) and Lenneberg (1967). Later on, Scovel (1988) and Patkowski (1990) substantiated this idea with their empirical research. (Also see research by Flege and colleagues (Flege, 1992, 1993, 1995; Flege & Fletcher, 1992; Flege, Takagi, & Mann, 1996; Flege, Yeni-Komshian, & Liu, 1999) for a counter-argument). Empirical research shows that all these factors have strong influence on L1 acquisition (Tesar & Smolensky, 2004). Boersma (1998) thinks that L1 constraints originate from articulatory and perceptual factors but some others think that language acquisition is actually a process of re-ranking or demotion of constraints (Prince & Tesar, 2004). The classical version of OT is adopted in this paper with some modifications. For example, following the standard optimality theory of McCarthy (2008, p. 27), the FILL and PARSE constraints are replaced by DEP and MAX. Feature geometry is also exploited in the analysis because, in the opinion of some scholars, acquisition of a language is actually acquisition of features of that language (Brown, 1998; Rice & Avery, 1993). The data presented in this paper are a collection of words of a child SZ aged 28 months at the time of data collection. She was in the stage of language acquisition which may be called telegraphic stage. She was able to produce truncated sentences, sometimes without function words. The author and the subject remained together for some months. During all this time, the author kept a notebook and instantly noted the words produced by her. The data is analyzed using Optimality Theory because OT is the most suitable tool to study input-output relations by providing a very effective 'line of attack' for such situations (Kager, Pater & Zonneveld, 2004, p.17). Hayes (2004, p.165-6) also considers OT suitable for such studies because it also resolves conspiracies.[2]

2. Presentation and analysis of data

The data are presented in the following sub-sections. Different phonological processes were observed in the speech of SZ. Palatalization is a dominant process in Saraiki. Saraiki language also has implosive sounds Syed (2013b) but the child had already acquired implosives when the author started observing her speech. In the following sections, different phonological processes are discussed which exist in the vocabulary of SZ.

2.1. Substitution

Substitution in child phonology is a world-wide attested phenomenon. Children normally substitute the marked consonants with the relatively unmarked ones. The same is also apparent in this study. The most common trend in the current case is substitution of [f] to [s] or [t̪ʰ], [r] and [ɽ] to [l], [s] to [ʃ], [x] to [k] or [kʰ]. There are also examples of substitution of more complex phonemes to simplex ones. An important type of substitution in the grammar of SZ is that at initial stage, she substituted [s] with [cʰ]. After sometime, she started substituting it with [ʃ]. The sounds [c] and [cʰ] are stops in Saraiki. Thus, the substitution of [s] with [c] and/or [cʰ] confirms the ranking *Fricative>>*Stop. Addition of aspiration to [c] sound in substitution of [s] indicates that SZ perceives frication in [s]. Since she has not yet reached the level where she can produce the fricative [s], SZ compensates the loss of frication by adding aspiration to [c] because acoustically,

[2]Kissebirth (1970) was first to point out conspiracies in language.

aspiration and frication have similar cues. A similar practice is also noted in the second language phonology of adult Pakistani learners of English. The Pakistani L2 learners of English substitute English dental fricative [θ]with dental stop and add aspiration to voiceless stop substituting English [θ]with [t̪ʰ] (Mahboob & Ahmar, 2004; Rahman, 1990, 1991; Syed, 2013a). This is because the feature [spread glottis] is common between aspiration and frication. The substitution is illustrated in the following words of SZ.

(1)	S. No.	a. Input	b. Stage-1	c. Stage-2	d. meanings
	i.	/pase/	[pacʰe]	[paʃe]	'side'
	ii.	/t̪us.sã/	[t̪ucʰ.cʰã]	[t̪uʃ.ʃã]	'you' Pl.
	iii.	/gilas/	[gacʰ]	[gaʃ]	'glass'

These examples indicate the direction of acquisition. This not only confirms the ranking *Fricative>> *Stop but also reveals that the child acquires laminal coronels before the apical ones. The following tableau shows the ranking which maps out [cʰ] as an output for [s]. The substitution of [s] to [ʃ] is discussed later. The retention of frication in the form of aspiration is captured in a constraint CORRESPONDENCE^{FRICATION}. Correspondence means acoustic correspondence here because phonetically, frication and aspiration have similar acoustic correlates (Backley, 2011; Harris & Lindsey, 1995). The relevant constraints which trigger this substitution are defined below.

DEP-IO: Output segments must have input correspondents (Kager, 2010, p. 68).

CORRESPONDENCE^{FRICATION}: Frication in the input has acoustic correspondent in the output (Wester, Gilers & Lowie, 2007).

IDENT-IO [F]: 'Correspondent segments have identical values for feature [F]' (Kager, 2010, p. 250).

The constraint IDENTITY-IO [continuant] resists against changing the feature [continuant] and CORRESPONDENCE [Frication] is an extension of the idea of Wester, Gilbers, and Lowie (2007) that input features have acoustic correspondents in the output.

Table 2.1: **Substitution of [s] to [cʰ]**

/s/	*FRIC	CORRESPOND Fric	*STOP	IDENT-IO [Continuant]	DEP Aspiration
a.[s]	*!				
b.[c]		*!	*	*	
☞c.[cʰ]			*	*	*

In table 2.1, the candidate [a] is defeated for violating the highly ranked constraint *FRICATIVE and b also loses because it does not correspond to the input in terms of frication. The input has frication which the candidate b lacks. Thus, the candidate c is a winner which satisfies both highly ranked constraints violating only the low ranked faithfulness constraints of IDENT and DEP family and a markedness constraint *STOP. We need to differentiate between IDENT-[continuant] and CORRESPONDENCE $_{[Frication]}$. The former demands that the feature [continuant] of an input

is preserved in the output and the latter demands an acoustic correspondent of the input fricative noise in the output.

In the examples which show substitution of /s/ to [ʃ] in (1), the constraints CORRESPONDENCE $_{[Frication]}$, IDENT-IO $_{[continuant]}$ and DEP-IO $_{[Aspiration]}$are satisfied. These data show that on word-initial, medial and final position, /s/ substitutes with [ʃ]. This substitution is regardless of number of syllables in the word. The substitution of /s/ with /ʃ/ is very common in Saraiki speaking children. The consonant [s] is [-distributed] or apical and [ʃ] is [+distributed]. The substitution of /s/ with /ʃ/ indicates that SZ acquires laminal fricatives before apical ones. In other words *Laminal is ranked lower than *Apical in the grammar of SZ.[3] The constraint IDENT-IO [distributed] is also lower ranked. These constraints may be an elaboration of a general constraint defined below.

*[F]: A specific input feature does not surface as an output.

This constraint is a version of the markedness constraints devised by Kager (2010, p.127) which may be split into *C[-distributed], *C[+distributed] or *Apical and *Laminal, respectively.[4] The following example establishes the ranking.

Table 2.2: **Substitution of [s] with [ʃ]**

/s/	*Apical	*Laminal	IDENT-IO [distributed]
a. s	*!		
☞b. ʃ		*	*

Table 2.2 shows that [s] is defeated on account of violation of a higher ranked constraint and the laurels go to the candidate b which violates a lower ranked constraint.As pointed out earlier, this is counter-evidence to the idea that a child acquires unmarked sounds before the marked ones. See section 3 for a detailed discussion.

The following data illustrate the substitution of [r, ɽ] with [l].

(2)

S. No.	a. Input	b. output	c. meanings
i.	/raɽ/	[laɽ]	'night'
ii.	/gʱʌr/	[gʱʌl]	'home'
iii.	/kʌr.re/	[kʌl.le/	'do'
iv.	/kʰʌɽ/	[kʰʌl]	'stop'
v.	/ke.ɽʱa/	[ke.la]	'which one'
vi.	/kʰʌɽ.ɽo/	[kʰʌl.lo]	'wait'

In the above examples, /r/ changes to [l] on word-initial (i), medial (iii) and final (ii) position. The retroflex rhotic /ɽ/ does not occur word-initially in Saraiki. On word-medial (vi) and final position (iv), /ɽ/ also substitutes with [l]. The example in (v) shows that the breathy voiced /ɽʱ/ also

[3] Normally, apical phonemes are preferred to laminal because the former is less marked.

[4]According to Wyn Johnson (personal communication), apical sounds are more unmarked than laminal ones. In this way, the substitution of an apical with alaminal is an emergence of the *marked* which is against the general practice across the world.

substitutes with [l] although other examples show that SZ can produce breathy voiced lateral [lʱ]. 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/. Thus, at this stage the constraint *Rhotic is higher ranked than *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].[5] This involves a violation of faithfulness to the feature [distributed]. The feature [+lateral] is also added since /l/ is [+lateral]. There are similar 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 this substitution.

Table 2.3: **Substitution of rhotics with laterals**

/gʱʌr/	*Rhotic	*Laterals	IDENT-IO [anterior, lateral][6]
a. gʱʌr	*!		
☞b. gʱʌl		*	*

The candidate [a] violates a highly ranked constraint *Rhotic and is defeated. Therefore, the candidate b which violates lower ranked *Lateral and IDENT-IO [anterior, lateral] wins. As the example (v) in the above data shows, the child also deletes secondary articulation and /ɽʱ/ is produced as [l] although the consonant [lʱ] also exists in Saraiki. Other examples show that the child is able to produce breathy voiced sounds but the purpose in the substitution of /ɽʱ/ with [l] is to replace a more marked structure with a relatively less marked one. Thus, it is claimed that *Complex is also ranked higher than IDENT-IO.

In the vocabulary of the subject, /x/ was deleted initially. Thus, in the grammar of SZ, *Dorsal was ranked higher than MAX-IO$_{consonant.}$ The words like /xə̟t̟.t̟əm/ were produced as /ə̟t̟.t̟əm/. When she acquired the dorsal node and started producing dorsal sounds, first she produced stops only and substituted [x] with [k] substituting the word /xə̟t̟.t̟əm/ with [kə̟t̟.t̟əm]. Later, on, she replaced [x] with [kʰ] producing /xə̟t̟.t̟əm/ as [kʰə̟t̟.t̟əm]. This is a significant development. It indicates that the child realizes the existence of frication but cannot yet produce a dorsal fricative. She compensates the loss of frication in /x/ by adding aspiration to the dorsal stop because aspiration is acoustically similar to frication and is realized as similar perceptually. This is the same strategy which was adopted in substitution of [s] with [cʰ]. The path of acquisition for [x] is,

[ɸ] --> [k] --> [kʰ] --> [ʊ] --> [x]

Let us remember that this directionality is functional after the child acquires dorsal node in her feature geometry. First she acquires stops, then perceives a fricative but initially she cannot

[5] Some linguists (Clements & Hume, 1995; Halle, 1995) claim that the feature lateral is [± distributed]. If we accept this point of view, it means the child adds laminal gesture in her production of [l] for /r/ and /ɽ/.The substitution of [s] with [ʃ] also substantiates this idea.

[6] Due to its controversial nature, the change in the feature [distributed] is not captured in this tableau.

produce it. In the acquisition of fricatives, SZ again follows the same direction. First she acquires fricatives at coronal position and then at labial position. The substitution of [fu:n] with [ʃu:n] and /ka.ɣʌz/ with [ka.ʊʌz] are indicators of this directionality. As the above data shows, at a stage, SZ substitutes /x/ with the labial /ʊ/.[7] Let us keep in mind that the child has already acquired fricatives at the coronal place. Now the fricative/continuant sounds are added to the L1 phonemic inventory of the child but she is following the ranking *DORSAL>>*LABIAL>>*CORONAL in acquisition of fricatives.

Another example of substitution in the speech of SZ is that of [l] for [j] in the word /ju:sif/ which is produced as [lu:fif]. It is an example of lateralization. Both lateralization and de-lateralization are attested in child phonology (Kager, Pater, & Zonneveld, 2004, p. 10). Substitution of /l/ to [j] in the word 'yellow' /jelou/ produced as /lelou/ is also noted in the vocabulary of Ahmal Smith (Smith, 2010). Another example of substitution is production of the word /dog/ as [gogi:] by SZ. This is an example of the emergence of the unmarked with reference to syllable structure and also that of velar harmony. The CVC syllable of the original word 'dog' is difficult for the child so she produces it as CV.CV word by adding a vowel word-finally. The substitution of /d/ to [g] is an example of velar consonant harmony which is also attested in world languages like English (Ingram, 1974; Menn, 1971; Pater & Werle, 2003; Smith, 2010; Vihman, 1996), Greek (Kappa, 2001), Spanish (Macken & Ferguson, 1983), etc. The examples of velar harmony are discussed in detail in section 2.4.

2.2. Deletion

Deletion occurs in the grammar of SZ when she receives input of disyllabic words whereas her own lexicon yet consists of only monosyllabic words. At later stage when she acquires words of two syllables, she still deletes one syllable in some cases. This occurs when the input is not in accordance with the prosodic requirements of the grammar of SZ. If the input consists of a heavy syllable preceded by a light syllable (i.e. LH), the light syllable deletes. Thus, SZ uses deletion as a strategy to accommodate the input according to her grammar. The following examples show this.

[7]The substitution of voiced dorsal fricative with a labio-dental approximant is an apparently unexpected development. There are examples of weakening of stops into frictionless approximants in Western Andalusian dialect of Spanish (Backley, 2011, p.127). Stoel-Gammon (2011)has pointed out similar unexpected developments and reports that children acquire some words in the form which even does not exist in the adult language. She (Stoel-Gammon) calls these words proto words (p.3). SZ's production of alveo-palatal fricative [ʒ] sound which does not exist in Saraiki is an illustration of such a phenomenon. The direction of acquisition of /z/ is from [ɟ] to [ʒ] to [z]. Another example of such a phenomenon is quoted by Watson (1971) who records that at the age of 1;6 her son produced palatal nasal consonant in some words of English like 'finger', 'window' or 'another' whereas palatal nasal does not exist in English. But the whole thing may be seen from another angle. Following the comment in footnote 3, we can say that after having acquired stops, the child starts acquiring fricatives. But still she is not able to produce dorsal fricative. She substitutes it with the available labial consonant in her phonemic inventory which is not a fricative but an approximant. This shows that the child perceives fricatives on the basis of the feature [+continuant] not [+sonorant]. That is why she does not mind substituting a dorsal fricative with a labial approximant because in such a substitution she retains the feature [+continuant] although she loses the feature [-sonorant].

(3)	S. No.	a. Input	b. output	c. meanings
	i.	/bə.ca/	[ca]	'save'
	ii.	/pi.ʃab/	[ʃab]	'urinate'
	iii.	/sə.ku:l/	[ku:l]	'school'
	iv.	/ru.mal/	[mal]	'hand-kerchief
	v.	/mə.si:ʈ/	[ʃi:ʈ]	'mosque'
	vi.	/mə.ɟi:ɖ/	[ɟi:ɖ]	'a name'
	vii.	/mu.bæl/	[bæl]	'mobile'
	viii.	/bə.zar/	[ɟal][8]	'market'

In these examples, all words in column 'a' are disyllabic. The ultimate syllable is heavy and stressed while the penultimate syllable is light and unstressed. Saraiki is a quantity sensitive language. The data in column b shows that the light unstressed syllable deletes and the stressed heavy syllable is maintained. Ahmal also deletes unstressed syllables as well as those with sonorant onsets (Smith, 2010). There are many other examples of deletion of unstressed syllables or those with sonorant onsets in the L1 literature (Ingram, 1989; Pater & Paradis, 1996). Such examples are found in L1 acquisition of English (Demuth, 1996; Gerken, 1991, 1994; Pater & Barlow, 2003), German (Goad & Rose, 2004), French (Rose, 2000), Portuguese (Freitas, 1996), etc. (For a detailed discussion, please also see references quoted in Crowhurst and Olivares (2014, p. 57)). The examples iv-v in (4) show that SZ can produce disyllabic words. Therefore, it is not the requirement of monosyllabic word which forces deletion; rather some prosodic constraints determine whether a syllable is to be deleted or not.

(4)	S.No.	a. Input	b. output	c. meanings
	i.	/ə.zan/	[zan]	'prayer call'
	ii.	/ə.zab/	[zab]	'torture'
	iii.	/ə.ram/	[ram]	'rest'
	iv.	/i.la.hi:/	[la.hi:]	'Allah'
	v.	/i.ma.mʌʈ/	[ma.mʌʈ]	'religious leadership'

In the above data the examples i-iii are disyllabic but those in iv-v are tri-syllabic. The tri-syllabic words emerge as disyllabic words. This shows that it is not that the grammar of SZ does not accept disyllabic words at this age; rather it does not yet accept a weak (unstressed) syllable followed by a heavy syllable (i.e. LH). If the input is LH (as in i-iii), the output is H and if the input is LHH (as in iv-v), the output is HH[9]. A leftmost light syllable followed by a heavy syllable is either unparsed in the grammar of SZ and is therefore extrametrical or it is parsed as an iamb which is universally marked foot format (Johnson & Reimers, 2010; Kager, 2010). The extrametrical syllable or an iambic foot does not map out into the output in the grammar of SZ. Therefore, the light syllable is deleted. Goad and Rose (2004)claim that a child receives input from adults as fully prosodified. Thus, any part of the input which is not parsed does not surface in the output of child language. The following constraints in tableau 4 reflect this.

PARSE: Each syllable in a prosodic word is parsed in the output (McCarthy & Prince, 1993).

[8] [a] is a long vowel in Saraiki. It carries two morae.
[9] L stands for light (monomoraic) and H for heavy (bi-moraic) or super-heavy (tri-moraic) syllable.

Ft Bin: A foot carries minimum two morae.

*IAMB: Right-headed feet are not permitted.
MAX-IO: Maximum input emerges as output. (No deletion.)
PRESERVE-ANCHOR-R: Preserve right margin of a prosodic word in the output.
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).

Table 2.4: **Deletion of weak syllable**

/bə. 'ca/	PARSE	Ft-Bin	WSP[10]	PRESERVE-ANCHOR-R	*IAMB	MAX- σ
a. bə. ('ca)	*!					
b.(bə).('ca)		*!				
c.(bə).		*!	*!	*!		*
d. (bə.'ca)					*!	
e. ('bə. ca)			*!			
☞ f. (ca)						*

In this table, the candidate [a] loses because it violates a highly ranked constraint PARSE. The candidate [b] loses on account of a fatal violation of Ft Bin because the first syllable is not bi-moraic. The candidate [c] commits more violations of higher ranked constraints so it also cannot emerge a winner at all. The candidate [d] has iambic foot-form whereas the grammar of SZ does not accept iambic feet at this stage. Therefore, it also loses. The candidate [e] incurs violation of WSP which is also a higher ranked constraint in the grammar of SZ because her language is quantity sensitive and a heavy syllable attracts stress. Thus, the candidate [f] emerges as a winner. It violates only a low ranked constraint MAX-σ.

The highly ranked constraint *IAMB demonstrates that the grammar of SZ does not accept the marked iambic 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 SZ is to delete the unstressed light syllable to satisfy highly ranked constraints. An important point in this regard is that while deleting a syllable, SZ 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. Although the constraint MAX-σ is lower ranked but the constraint MAX 'σ is higher ranked as the following tableau also shows. This is quite natural to preserve a stressed syllable because stressed syllables are relatively more prominent acoustically (Spencer, 1996). Besides, children's words observe unmarked foot structure (Demuth, 1995). The same ranking will give a right candidate as output if the input is a left-headed /'ca.ca/ with two heavy syllables as illustrated below;

[10]The candidate e is also defeated on account of violation of MAX-'σ which prohibits deletion of a stressed syllable. The constraint is not included here due to space problem.

Table 2.5: **Preservation of heavy syllables**

/'ca.ca/	PARSE	IDENT-'σ	MAX-'σ	PRESERVE-ANCHOR- R	MAX- σ
a. (ca. 'ca)		*!			
b.(ca)			*!		*
c. ('ca)				*!	*
☞e.('ca.ca)					
f. ba (ca)	*!				

The above ranking provides us the right candidate as the most optimal output.[11] Importantly, although the words of LH structure exist in the adult grammar of Saraiki but the grammar of SZ is different from the grammar of her parents because she does not accept the marked LH structure.
Another important thing is that it is not always the whole left-most syllable which deletes and it is not the whole heavy syllable that is always intact. In the following examples, although, the light syllables delete but the onset of light and heavy syllables sometimes swap before the deletion of the light syllables takes place.

(5)	S. No.	a. Input	b. output	c. meanings
	i.	/xə.'rab/	[xab]	'dirty'
	ii.	/ɟə.'mi:l/	[ɟi:l]	'a name'
	iii.	/ku.'ran/	[kan]	'Quran'
	iv.	/ɖ̪ə.'ʋa/	[ɖ̪a]	'medicine'
	v.	/sə.li:m/	[ʃ̺i:m]	'Saleem'
	vi.	/ʈ̪u.'hi:ɖ̪/	[ʈ̪:ɖ̪]	'Monotheism'

In the above data, all examples consist of disyllabic words. The stress is on the ultimate heavy syllable. The onset of the unstressed syllable in all these examples is obstruent but that of the heavy stressed ultima is sonorant. The output shows that although the penultimate light syllable deletes but the onset of the light syllable which is an obstruent, substitutes with the onset of the ultimate syllable. Thus, the obstruent consonants are preserved but the sonorant onsets and light syllables delete. In this way, the onsets swap between syllables before the deletion of the light syllable takes place. This may be explained using the constraint ranking, *SONORANT^{ONSET}'σ>>*IAMB, WSP, MAX-'σ>>MAX-σ, *OBSTRUENT^{ONSET}'σ, LINEARITY-IO which assures that first the obstruent takes the place of the sonorant and then the unstressed syllable is deleted (Goad & Rose, 2004, p.110). The substitution and deletion are illustrated in the following tableau.

[11]According to Wyn Johnson (personal communication), normally right edge of a prosodic word is protected in a child language. Thus, the constraint ANCHOR-R which militates against the deletion of right-most syllable is ranked higher which ensures that the right output emerges at the surface grammar. However, the optimal winner may emerge as a winner if we also have one of the constraints WSP, MAX-'σ higher ranked.

Table 2.6: **Substitution and deletion**

/kuran/	*SON^{ONSET}'σ	*IAMB	MAX-'σ	WSP	MAX-σ	*OBS^{ONSET}'σ
a. ku'**ran**		*!				
b. ran	*!				*	
☞c. kan					*	*
d. **ku**ran				*!		*

The candidate [a] loses because it has right-headed iambic foot. The candidate b also loses because it has a sonorant onset of a stressed syllable whereas *SONORANT^{ONSET}'σ militates against sonorant onset of a stressed syllable. Therefore, the candidate [c] emerges as a winner which only violates a lower ranked constraint MAX-σ. The candidate [d] is also defeated on account of violation of WSP which is higher ranked. An interpretation of this is that the whole process occurs in stages. In that case, this may be better explained in the process of harmonic serialism (McCarthy, 2000, 2009, 2010).

Kager (2010, p.241) discusses some context-specific markedness constraints. These constraints resist against the occurrence of a specific sound in a specific context. He develops *[ŋ constraint which resists velar nasal word-initially. In the same line, Johnson and Reimers (2010, p. 63) give the following detailed ranking of child grammar for onset.

*ONSET/V>>*ONSET/APPROX>>*ONSET/NAS>>*ONSET/+VOICE FRIC >> *ONSET/-VOICE FRIC >> *ONSET/+VOICE STOP>>*ONSET/-VOICED STOP[12]

The hierarchy is also applicable for onset of a stressed syllable. We conflate the above hierarchy for onset of stressed syllables. *SONORANT-ONSET-'σ>>*OBSTRUENT-ONSET-'σ. Grijzenhout and Joppen-Hellwig (2002)claim that at early stage of language acquisition children avoid fricatives but favour stops and nasals at the left edge. The followers of sonority-based approach to consonant deletion in clusters(Chin, 1996; Gierut, 1999)also claim that children retain the least sonorant consonant on the onset.[13]This ranking prefers an obstruent in the onset position. Actually, this ranking is a summarized version of that of Johnson & Reimer quoted above. LINEARITY-IO[14] is also involved in these examples. It is a constraint which militates against metathesis. Kager (2010, p. 251) defines it in these words;

LINEARITY-IO: 'S_1 is consistent with the precedence structure of S_2, and vice versa'.
Now we illustrate the process of substitution and deletion in harmonic serialism.

Table 2.7: **(Step 1) Substitution of onsets**

/xə. 'rab/	*SON-ONSET-'σ	*OBS-ONSET-'σ	LINEARITY
a. xə. 'rab	*!		
☞ b. rə.'xab		*	*

[12] Prince and Smolensky (2004) use the constraints PEAKS and MARGINS instead of ONSET/X.
[13]Also see Steriade (1999), Spencer (1986), Goad and Rose (2004), etc. for a counter argument.
[14]Gnanadesikan (2004) suggest I-CONTIGUITY-IO instead of LINEARITY-IO and a set of μ/Y constraints instead of *ONSET/X hierarchy whereas Prince and Smolensky (2004) suggest a set of *MARGIN constraints which determine hierarchy of occurrence of segments on margins.

The candidate [a] loses as it violates *SON-ONSET-'σ. Thus, the candidate [b] which is a metathesized form of the input emerges as winner. Metathesis is a common process observed during first language acquisition. In this case, metathesis occurs to satisfy certain phonological constraints. *SON-ONSET-'σ>>*OBS ONSET-'σ is a ranking which ensures that a child acquires obstruents before sonorants. The grammar of SZ also has a ranking *SON-ONSET-'σ>> *OBS-ONSET-'σ. Therefore, although she has acquired osbtruents and sonorants, her priority for onset positionis obstruent because perceptual requirements demand a word-initial to be always prominent[15](Hume, 2001, p. 7)

Table 2.8: **(Step 2) Deletion of unstressed syllable of obstruent onset[16]**

/rə. 'xab/	PARSE-	Ft Bin	MAX- 'σ	*IAMB	MAX- σ
a. rə.('xab)	*!				
b.(rə).('xab)		*!			
c.(rə)[17]		*!	*!		*
d. (rə. 'xab)				*!	
☞ e. ('xab)					*

The third stage is that of convergence in which the input emerges as output very faithfully as reflected in the following table.

Table 2.9: **(Step 3) Convergence**

/'xab/	PARSE	Ft Bin	TROCHEE	MAX- σ	LIN
☞ ('xab)					

According to Gnanadesikan (2004), the emergence of an obstruent (instead of a sonorant) on onset position is an example of the emergence of the unmarked (McCarthy & Prince, 1994). Gnanadesikan analyses similar examples with a different angle. Her subject of study G adds a dummy syllable 'fi-' after deleting unstressed word-initial syllable of the original words e.g. 'container' becomes 'fi-tena' and 'Christina' becomes 'fi-dina' but 'koala' becomes 'fi.kola' not 'fi.ala' or 'fi-wala'. Gnanadesikan argues that actually, G retains the deleted syllable of the original word and when she needs it, the required 'k' emerges to fill empty onset position in the word 'fi-ala' changing it into 'fi-kala'. Similarly, it may be argued that in the underlying representation of SZ, the deleted obstruents are preserved which emerge as onset in the words which have sonorants on stressed syllables, thus substituting sonorants with obstruents.[18]An important point is that in the grammar of SZ, fricatives and stops are considered at equal level of sonority. Thus, the word /xə.'rab/ becomes [xab] but /pi.ʃab/ does not become *[pab]; rather it remains [ʃab]. However, [ɦ]

[15]A word is maximally recognized by its left edge (Beckman, 1998).Perhaps this is one of the reasons that trochee is a most common unmarked foot pattern. According to Johnson and Reimers (2010, p. 21), a child prefers obstruent onsets to maintain maximum dispersion of sonority contrast between onset and peak.

[16] Because of space problems, the irrelevant constraints are not included in this tableau.

[17]Candidate c also violates WSP.

[18]If we accept this view point, we have to review the analysis of harmonic serialism. According to Johson (pc) harmonic serialism is never applied to L1 acquisition. The issue is open for further research.

does not enjoy this status because, / ʈu.'hi:ɖ/ becomes ['ʈi:ɖ] not *[hi:ɖ]. Thus, [ɦ] is not considered among the class of fricatives by the child. Thus [ɦ] is treated as a semi-vowel.

2.3. Vowel Harmony

The following examples show vowel harmony in the grammar of SZ.

(6)

S. No.	Input	Output	Meanings
i.	/ləhor/	[lohoɾ]	'Lahore'
ii.	/si: .ru:/	[ʃu: .lu:]	'a name'
iii.	/mə. ko. ɽa/	[mo. ko.la][19]	'ant'
iv.	/mo.mʌl/	[mo.mo]	'soft'
v.	/mi: . rã/	[bi: .li:]	'a name'

The examples (i-iv) show that the back vowels [o] and [u:] spread feature [LAB] but [a] is not spreading as the word in (v) above shows. The example in (ii) is important because the nucleus of ultimate syllable is [u:] and that of penultimate syllable is [i:]. Both are high vowels but [i:] changes to [u:]. It means it is not the feature [+high] which is spreading, rather it is the feature [LAB] or its dependent vocalic feature [round] which is spreading.[20]

The word in (v) shows that if there is no labial vowel in the input, the nucleus of the stressed syllable spreads. These examples confirm that labial harmony is ranked higher than the harmony of the vowel of the stressed syllable. An important point to note is that harmony does not have a fixed direction. It is regressive in (i) and (iii) but progressive in (ii) and (iv) above. The direction is determined by the trigger in a disyllabic word. However, the case of trisyllabic words is different. In the example (iii), the direction of spreading of the feature [LAB] is leftwards although there is another vowel in the nucleus of the syllable next to the trigger of the harmony.

The spreading of feature [LAB] in the word 'momʌl' in the example (iv) may be interpreted in two ways. First, the word final [l] deletes and the vowels get the feature [LAB]. Another interpretation is that first the process of [l] vocalization occurs and then the feature [LAB] spreads which changes the vowel in the ultimate syllable into [o]. L-vocalization is a process commonly found in the world-languages (Johnson & Reimers, 2010) including English (Cruttenden, 2001; Johnson & Britain, 2007), French (Gess, 1998), Serbo-Croatian (Kenstowicz, 1994), Catalan, Slovenian (Backley, 2011, p.179) and Dutch (G. K. Iverson & Salmons, 2008), etc. An interesting thing in this regard is that there are no examples of l-vocalization in adult Saraiki speech. Johnson and Reimers (2010, p. 50) claim that only the children learning a language which has dark variant of /l/ show l-vocalization during L1 acquisition. But those children whose language does not have dark variant of /l/ do not show l-vocalization. Johnson and Reimers substantiate their claim with empirical evidence from other languages which do not have dark lateral. But the current case provides a counter-evidence to this claim. However, with only a single example we cannot

[19]At some stage of L1 acquisition, it was produced as [ko.la].Syllable deletion isalready discussed.

[20] Clements and Hume (1995) use the vocalic feature [round] dependent on LAB place. However, we are using the main place feature [LAB] for these examples conflating the features of C-place and V-place to maintain symmetry in the discussion since in the following paragraphs, we shall also discuss consonant harmony in which the feature [LAB] spreads in the word. For both types, the same constraint is used.

establish such a generalization. Thus, it is recommended for future researchers to further work on this issue.[21] We explain the phenomenon of the labial harmony using the following constraints;
V-HARM-LAB: The vocalic feature [LABIAL] spreads in the domain of a word.

V-HARM-'σ: The nuclei of all syllables in a foot be harmonious to the nucleus of the stressed syllable of that word.

The following ranking reflects of the grammar of SZ.
V-HARM-[LAB] >>V-HARM-'σ>>IDENT-IO (V)

This ranking is established in the following tableau.

Table 2.10: **Vowel Harmony**

/lə.'hor/	V-HARM-[LAB]	V-HARM-'σ	IDENT-IO (V)
a. lə.hor	*!	*	
b. lə.hər	*!	*	*
☞c. lo.hoɽ			*

The substitution of [r] to [ɽ] is not considered in this tableau because it is already discussed. This table only accounts for vowel harmony. The most faithful output, 'lə.hor' is not acceptable as it violates the highest ranked constraint V-HARM [LAB]. However, the stress lies on the ultimate syllable in this word and the nucleus of the ultimate syllable is also a labial vowel. From this example the ranking between the constraint V-HARM [LAB] and V-HARM-'σ cannot be established. However, the following table determines a ranking between these two constraints. It shows that only in case of absence of a labial vowel, the nucleus of a stressed syllable spreads its features. In the word /si:-lu:/, the stress lies on penultimate syllable but the feature of [u:] spreads.

Table 2.11: **Spreading of vocalic feature [round]**

/ʃi: .lu:/	V-HARM [LAB]	V-HARM-'σ	IDENT-IO (V)
a. 'ʃi: .lu:	*!	*	
b. 'ʃi: .li:	*!		*
☞c. 'ʃu: .lu:		*	*

The vowel [u:] is [+back, +high, +round] and the vowel [i:] is [-back, +high, -round]. The vowel [i:] is front and [u:] is back. It means the harmonious feature which is spreading is [LAB] or [+round]. These examples demonstrate that the feature which primarily spreads is [round] or [LAB]. In case there is no rounded or labial vowel, the vowel of the stressed syllable spreads to create vowel harmony. The reason for the vowel harmony in the grammar of SZ is quite understandable. Labial vowels and those in stressed syllables are more prominent and acoustically more perceptible than non-labial or unstressed vowels. Thus, a prominent feature spreads to develop vowel harmony. The substitution of /mi:.rã/ to [bi:.li:] confirms the role of V-HARM-'σ.

[21]There is a little phonetic velarisation in word-final /l/ in Saraiki but not to the extent that it is called a dark lateral like English word-final lateral (Varma, 1936).

In the words which lack a labial vowel, features of nucleus of the stressed syllable spread in a prosodic word. This is explained in the following tableau.

Table 2.12: **Spreading of vocalic features of nucleus of the stressed syllables**

/mi: . rã/	V-HARM [LAB]	V-HARM-'σ	IDENT-IO (V)
a.'mi:.rã		*!	
b. ' ba:.la:		*!	*
☞c. ' bi:.li:			*

The candidate [a] loses for violation of V-HARM-'σ which demands spreading of vocalic features of nucleus of the stressed syllable. The candidate [b] is very important because it confirms the status of V-HARM-'σ in the ranking. Although vowel harmony is achieved by [b] but since it violates the constraint V-HARM-'σ, it cannot emerge as a winner. The candidate c is selected as the final output because it satisfies V-HARM-'σ. The constraint V-HARM [LAB] is vacuously satisfied by all candidates because there is no labial vowel in the input. The substitution of [r] to [l] and denasalization in the above example are not explained here because it is already discussed.

2.4. Consonant Harmony

Consonant harmony is a common phenomenon in child phonology (Vihman, 1978). Demuth (2011, p. 577) ascribes it to difficulties in co-articulatory gestures. The following data provide examples of consonant harmony in the grammar of SZ.

(7)

S. No.	Input	Output	Meanings
i.	/ʒə. **f**ʌr/	[ʊə. fʌl]	'name'
ii.	/ju: .s**if**/	[lu: .fif]/[ʊu: .fif]	'Josef'
iii.	/ʈʰə**p.p**ʌɽ/	[pʰəp.pʌl]	'slap'
iv.	/kʌ**p**.ɽe/	[pʌp.le]	'garments'
v.	/ ɦa.**f**iʒ/	[ɦa.fif]	'crammer'
vi.	/ki.ɖa.**b**ã/	[ba.bã]	'books'
vii.	/nʌ**ɟ**.ma/	[ɟʌɟ.ma]	'a name'

We can summarise the consonant harmony process of the above data below.

(8)

S. No.	Direction	Domain	Trigger	Target
i.	regressive	word	f	z
ii.	regressive	syllable	f	s, j
iii.	regressive	word	p	ʈʰ
iv.	regressive	word	p	k
v.	progressive	syllable	f	z
vi.	regressive	word	b	ʈ
vii.	regressive	word	ɟ	n

The example (v) is illustration of progressive labial harmony which indicates that if there is no consonant in the left of the labial consonant, then the feature [LAB] spreads progressively.[22] The feature which is harmonious is spreading in only disyllabic words. The word in (vi) is a tri-syllabic word but the first syllable is deleted before the process of harmony starts. In other words, the input in this case is a disyllabic word at this stage. This example can also be explained using harmonic serialism (McCarthy, 2009). Another important thing in these data is that, except for the last word, in all examples, the triggers are labial consonants and, with the exception of one case (iv), the targets are coronals. It is important that the only exception in the data set of vowel harmony is that of /mi:rã:/ into [bi:li:]. This is an example of spreading of coronal in vowels. If this is a part of grammar of SZ (not an exception), then we may also develop another generalization that if there is no labial trigger then coronal harmony activates.

The change of /*n*ʌ**ɟ**.ma/ into [ɟʌɟ.ma] (like /mi:rã:/ --> [bi:li:]) is the only example of its type; so for a moment it is neglected as an exception. In the word /*n*ʌ**ɟ**.ma/, there is a labial /m/ but it is not an obstruent. This infers that only obstruents are triggers in the labial harmony. One of the targets is [k] and the remaining ones are coronals. Thus, we can generalize that labial consonants are trigger and coronals are target of labial harmony.[23] The triggers determine the direction of spreading.[24]. In the world literature, velars are found to be the most frequent triggers (Johnson &Reimers, 2010). However, examples of labial harmony also exist (Fikkert, 1994; Kappa, 2001; Menn, 1971; Smith, 2010).

In vowel and consonant harmony, we see a kind of symmetry. The feature model of Clements and Hume (1995) equally captures the behaviour of vowels and consonants in spreading because both types of spreading are symmetric. In the following, lines we explain the process of consonant harmony.

SPREAD$_{[LAB]}$/PrWd: The feature labial spreads to other consonants in a prosodic word.
SPREAD$_{[LAB]}$/L-PrWd: The [LAB] spreads regressively to consonants in the domain of a prosodic word.

*SPREAD $_{[LAB]}$ /L-R Pr Wd: Do not spread feature [LAB] bi-directionally.

The constraint *SPREAD $_{[LAB]}$ /L-Pr Wd is a constraint of 'Do not do unless' type (Prince & Smonlensky, 2004) which ensures that bi-directional labial spreading is strictly prohibited. The priority is given to regressive spreading. If a suitable context for regressive spreading is available, then there is no progressive spreading as the change of the word /*ɻ*^{h}ə**p.p**ʌɽ/ into [p^{h}ə**p.p**ʌɽ] but *[*p*^{h}ə**p.p**ʌp][25] shows.

---

[22]We assume that the consonant /ɦ/ in /ɦa.fiz/ is a semi-vowel. Thus it is not a target of labial harmony because only consonants are targets. See motivation for this in the following paragraphs.
[23]A simple example of dorsal being a target of labial harmony is considered an exception. According to Johnson and Reimers (2010), it is very rare for labials to target dorsals in spreading.
[24] In the literature, regressive spreading is more frequent than progressive spreading.
[25] One possible reason is that the spreading targets only only obstruentsnot sonorants. However, a limited number of such examples cannot support such a big generalization. Therefore, it may be treated only a hypothesis. Also, we have seen substitution of /*n*ʌ**ɟ**.ma/ with /**ɟ**ʌ**ɟ**.ma/ shows that sonorant is a target. However, it can be claimed that SZ treats [n] as a stop,so she does not strictly follow the principle that only

Table 2.13: **Labial harmony in consonants**

/ ɦa.fiz/	SPREAD$_{[LAB]}$σ	IDENT-IO$_{[F]}$
a. ɦa.fiz	*!	
☞ b. ɦa.fif		*
c. fa.fiz		**!

The most faithful candidate [a] is rejected on account of violation of SPREAD$_{[LAB]}$σ. Thus, the candidate [b] emerges as a winner. The candidate c incurs two violations of the lower ranked faithfulness constraint and is defeated. The constraint SPREAD$_{[LAB]}$σis vacuously satisfied by candidate [b] although the feature labial does not spread to the word-initial /ɦ/, because the constraint demands labial spreading to consonants only while /ɦ/ behaves as a semi-vowel in Saraiki, as pointed out before. Therefore, furtherspreading of [LAB] does not accrue any benefit; rather it incurs more violations of the faithfulness constraint.

The reason that [ɦa.fiz] does not become [fa.fiz] is that first, /ɦ/ is a placeless phoneme whereas LAB HARM is a constraint which demands labial place for phonemes. Secondly, there is ample evidence that /ɦ/ behaves as semi-vowel in Saraiki. For example, /ɦ/ behaves as a transparent segment in nasalization, vowel shortening and coalescence in Saraiki whereas other consonants including all fricatives are opaque to these processes (Kula & Syed, 2014; Syed, 2009). The transparency of /h/ world-wide is already attested in the literature (Clements & Hume, 1995; Lavoie, 2001). Since /ɦ/ is a semi-vowel in Saraiki, it may not be a target of labial spreading. Consequently, if /ɦ/ does not get labialization in labial harmony, the relevant constraint is not violated. Rather, it is vacuously satisfied. The following example confirms the ranking SPREAD$_{[LAB]}$/L -Pr Wd>> *SPREAD $_{[LAB]}$/ Pr Wd >>SPREAD$_{[LAB]}$/R-Pr Wd.

Table 2.14: **Regressive labial spreading**

/ʈʰə**p.p**ʌɽ/	SPREAD $_{[LAB]}$/ L-Pr Wd	*SPREAD $_{[LAB]}$/ Pr Wd	IDENT-IO$_{[F]}$
a. ʈʰəp.pʌɽ	*!		
☞ b. pʰəp.pʌl		*	*
c. ʈʰəp.pʌp	*!	*	*
d. pʰəp.pʌp		*	**!

The candidate [a] is defeated on account of violation of the constraint which demands leftward labial spreading to consonants. The candidate [c] also fails to map out as an optimal candidate because it does not fulfil the demand of leftward spreading; although it spreads feature [LAB] but the direction of spreading is not leftward. The candidate d is defeated because it has bidirectional spreading which is strictly prohibited. The candidate [b] emerges a winner which only incurs violations of lower ranked constraints. The substitution of /*j*u:.*si***f**/to [ʊu: .fi**f**] indicates that the

sonorant consonants can be target of spreading. If this view is accepted, we need a constraint which activates labial harmony process only if an obstruent is available as a target in the domain of the prosodic word.

spreading of the feature [LAB] may reach to any number of consonants on the left of the trigger if a suitable environment is available.

2.5. Palatalization

Palatalization is one of the main features of Saraiki phonology (Shackle, 1976). Past forms of passive verbs are obtained by adding palatalization to the imperative forms of verbs. The following examples illustrate this.

(9)

S. No.	Imperative	Past (Passive, objective)		
i.	/mar/	'beat'	/mar^{j}a/	'beaten'
ii.	/pʌʈ/	'uproot'	/pəʈ.ʈ^{j}a/	'uprooted'
iii.	/sʌʈ/	'burn'	/səʈ.ʈ^{j}a/	'burnt'

SZ does not produce the words in column 3 with palatalization. She rather produces these words without palatalization. So, in her lexicon, the above words are /mala/, /pəʈ.ʈa/ and /səl.la/. She deletes the secondary articulation in these words. In other words, her grammar does not allow palatalization of a consonant. In the optimality theoretic language, the constraint *COMPLEX-C^{j} is still un-dominated.[26] The following tableau illustrates this.

Table 2.15: **Loss of platalization**

/mar^{j}a/	*COMPLEX-C^{j}	IDENT-IO$_{palatalization}$
a. mar^{j}a	*!	
☞ b. mala		*

The table confirms the ranking *COMPLEX-C^{j}>>IDENT-IO$_{palatalization}$. The candidate [a] loses because it violates the highly ranked constraint *COMPLEX-C^{j}. The candidate b which violates only the lower ranked faithfulness constraint IDENT-IO $_{[palatalization]}$ is a winner. The substitution of [r] to [l] is already discussed.

2.6. Metathesis

According to Demuth (2011) metathesis is a common process in child phonology. Leonard and McGregor (1991) present interesting cases of metathesis in L1 acquisition. In our case, we noticed examples of metathesis some of which are listed below.

(10)

S. No.	Input	Output	Meanings
i.	/pep.si:/	[pes.pi:]	'Pepsi'
ii.	/sur.xi/	[ʃuk.li:]	'rouge'
iii.	/ɟʌʊ.ʈe/	[ɟʌl.ʊe]	vermicelli
iv.	/ɖʌʈ.ke/	[ɖʌk.le]	'shouts'
v.	/mir.cã/	[mic.lã]	'chillies'

[26]McMahon (2000, p. 107)andZubritskaya (1997)use the constraint PAL for palatalization in Russian but we prefer to use *COMPLEX-C^{j} because the problemhere is due to complexity of the palatalized consonant.

In all these examples, the words which undergo changes are of CVC.CV type. The onset of the ultimate syllable and the coda of the penultimate syllable exchange their positions. In all cases, the coda of the penultimate syllable is a sonorant whereas the onset of the ultimate syllable is either an obstruent or a consonant more sonorous than the preceding consonant. The sonorant moves from coda of the penultimate syllable to the onset of the ultimate syllable.[27] At the initial stage of first language acquisition, *CODA is ranked at an inviolable position. Later on, when children start acquiring codas, they first acquires stops, then fricatives and finally liquids. A careful analysis of the above data shows that SZ also prefers to take a less sonorous consonant on coda position of the penultimate syllable. Thus, in the grammar of the subject the following directionality of acquisition of consonants is strictly observed for coda position of the penultimate syllable.

Stop → Fricative → Liquid → Rhotic → Glide

This means a more consonantal phoneme is more suitable for this position. In the above data, a relatively more sonorant phoneme moves from coda position of the penultimate syllable to the onset of the ultimate syllable and the less sonorant or more complex (an obstruent in most of the cases) phoneme moves from the onset of the ultimate syllable to the coda position of the penultimate syllable. The grammar of SZ has following ranking regarding selection of sounds for coda position of the stressed word-initial syllables.

$*GLIDE_{CODA/}[L\sigma>>$ $*RHOTIC_{CODA/}[L\sigma>>$ $*LATERAL_{CODA/}[L\sigma>>$ $FRICATIVE_{CODA/}[L\sigma>>$ $*STOP_{CODA/}[L\sigma$

The lower ranked constraint which is violated to satisfy these constraints is LINEARITY which militates against metathesis. An important issue in this regard is that an obstruent consonant is also preferred for onset position because onset is a stronger position than coda. In other words, the above ranking is also relevant for the onset position. But in the above examples, the less sonorous consonant moves from onset of the ultimate syllables to the coda of the penultimate syllables. We need to recall that in all the above examples, the stress falls on the penultimate syllables. These data demonstrate that requirement of the coda of a stressed syllable has priority over the of onset of an unstressed syllable. It shows the sequence of acquisition. First a child acquires CV syllable with C preferably a less sonorous or more complex obstruent consonant. When the child reaches the next stage where she acquires codas, the syllable structure in the grammar of the child becomes CVC. At this stage, onset has priority over coda which means a more prominent or less sonorous (i.e. an obstruent) consonant is selected for onset and a relatively less complex or prominent segment (i.e. a sonorant) for coda position. At this stage, we hypothesize that if the input is /tal or lat/ the output will be only [tal] with a complex/prominent consonant on the onset. This output will map out at the cost of violation of LINEARITY if the input is /lat/. The next stage of acquisition is bisyllabic words. When the child reaches at a stage where she produces words of CVC.CV structure, she has to face a conflict about which position is stronger. In CVC.CV types of words, there are two onset positions and one coda position. The above data show that the child selects more prominent or complex consonant for the coda of the penultimate syllable than for the onset of the ultimate syllable at the cost of violation of LINEARITY. There may be two possible

[27]The substitution of rhotic [ɽ] and [r] with [l] and [s] with [ʃ] is already discussed in the previous sections. The substitution and metathesis may also be explained in steps as a gradual process inHarmonic Serialism.

reasons for this; first, the penultimate syllable is stressed. The stressed syllable is always prominent; and another reason is that left-most syllable is always more prominent in a prosodic word. In the above examples, the leftmost syllable is also stressed. Thus, coda of the stressed penultimate syllable should be more prominent than the onset of an unstressed ultimate syllable in the grammar of SZ. This is reflected in the constraint ranking.

PROMINENT^{ONSET}[Lσ >> PROMINENT^{CODA}[Lσ >>LINEARITY
This ranking is established in the following tableau.

Table 2.16: **Metathesis**

/ mir.cã /	PROMINENT-$^{CODA[L\sigma}$	LINEARITY
a. mir.cã	*!	
☞b. mic.lã		*
/ɖʌɽ.ke/		
a.ɖʌɽ.ke	*!	
☞b. ɖʌk.le		*
/sur.xi/		
a. ʃul.ki:	*!	
☞b. ʃuk.li:[28]		*
/ɟʌʊ. ɽe/		
a. ɟʌʊ. le	*!	
☞b. ɟʌl.ʊe[29]		*

In the above table, the most faithful candidates lose because they have codas of the left syllables which are less prominent/more sonorous than the onset of the right syllable which is a violation of PROMINENT$^{CODA[L\sigma}$. The winners have more prominent codas on the left syllables which are mapped out as optimal at the cost of violation of the low ranked faithfulness constraint i.e. LINEARITY-IO.[30]

In the above examples /pepsi/ becomes [pespi] although, [p] is more complex than [s] but in this example a fricative moves from the onset of the right syllable to the coda of the left syllable because fricatives are acoustically more prominent than stops on coda. Stops are suitable for onset because they are followed by a vowel which provides environment for burst but on the other hand, for a coda position a fricative is more suitable because fricatives provide a release to the final consonants making them prominent. Therefore in this example, the principle of prominent margins of stressed or left syllables is respected. We have yet to determine if it is stressed or left syllable which is more prominent. The following data confirm that it is the leftmost (not necessarily

[28]The substitution of the fricatives /x/ and /s/ with [k] and [ʃ] respectively are not addressedhereas it has already been discussed in the previous sections. These are serial changes in which first the fricative /x/ and /s/ exchange their positions with [k] and [ʃ] respectively and later on the metathesis occurs. The third stage will be that of convergence. Because of space problem, the first and the third step is bypassed.
[29]See footnote 3 regarding the substitution of /ɽ/ with [l].
[30]However, we need to highlight that this sequence disregards syllable contact law (Clements, 1990) which poses a challenge to this analysis.

stressed) syllable which is more prominent. In all these cases, the adjacent hetrosyllabic consonants swap positions.

(11)	S. No.	Input	Output	Meanings
	i.	/ru.'mal/	[mu.'lal]	'handkerchief'
	ii.	/'kic.cʌn/	['cik. kʌn]	'kitchen'
	iii.	/kə.'ʈo.ri:/	[ʈə.'ko.ri:]	'bowel'
	iv.	/xu.'ɖa/	[ɖu.'k^{h}a]	'God'

In these examples consonants which undergo metathesis are not adjacent. Both consonants are in the onsets. In these cases the priority is given again to the left margins. An important point to note is that in the examples (i, iv) the stress falls on the ultimate syllable because in these words, ultimate syllables are heavy But regardless of stress, the less sonorous consonant moves to the onset of the left-most syllable. It means stress does not have any role here. The motivation for metathesis is to place a less sonorous consonant on left-most margins. These examples confirm that the constraint PROMINENT-ONSET$_{[L\sigma}$ is ranked higher than PROMINENT-ONSET[$_{\sigma}$. The following table establishes this.

Table 2.17: **Metathesis**

/xu.'ɖa/	PROMINENT$^{ONSET[L\sigma}$	PROMINENT$^{ONSET[\sigma}$	LINEARITY
a. xu.'ɖa	*!		
☞b. ɖu.'k^{h}a		*	*

In the above table, the faithful candidate loses because it violates PROMINENT-$^{ONSET}_{[L\sigma}$. The winner only violates the lower ranked constraints. The substitution of [r] to [l] and [x] to [k^{h}] is not accounted for in these tableaux because these phenomena have already been explained in the previous sections.

An interesting example of metathesis found in the lexicon of SZ is the word /jəl.la/ changing into [ləi.ja]. In this example, the input first changes into [ləj.ja]. Like, most of the languages of the world, Saraiki does not accept [j] syllable-finally. This is not acceptable in the grammar of SZ because universally it is most marked for a glide to occupy a coda position. Therefore, [j] changes into [i] in the second step and after convergence, final output is [ləi.ja]. This shows the role of markedness is operative in the L1 grammar of SZ. Another example of such a metathesis is the word /xʌl.bu:.ze:/ 'melon' changing into [xə.lu:b.ze:]. In this example, the structure of the input is CVC.CV:.CV: This means all three syllables have equal weight, each having two morae. The output has the structure CV.CV:C.CV: Saraiki is a quantity sensitive language. Normally the heavier syllable in a prosodic word attracts stress in Saraiki. Therefore, SZ restructures the word in such a way that the stressed syllable (which is penultimate syllable in this case) becomes heavier than the one on its left. Saraiki does not accept a heavy syllable on the left of a stressed syllable in a prosodic word. This example shows how tactfully a child manages to satisfy grammatical constraints during L1 acquisition.

3. Findings and Conclusion

In substitution SZ prefers a less sonorant consonant on margins particularly on onset of the word-initial syllables. In the grammar of SZ obstruents are treated as being a single class in sonority. On

a detailed sonority scale (Selkirk, 1984), plosives are less sonorous than fricatives. But, a crude scale of sonority does not realize difference between plosives and fricatives and treats both as equal in sonority(Clements, 1990). In deletion of light syllable in diasyllabic words, SZ retains a less sonorous consonant. Thus, /xə.rab/, /ɟə.mil/ and /ku.ran/ become [xab], [ɟil] and [kan] respectively, but /pɪ.ʃab/ does not emerge as *[pab]. It remains [ʃab]. Such examples indicate that fricatives and plosives are treated as being equal on the sonority scale in grammar of the child.

The direction of acquisition is roughly from plosives to fricatives to approximants. When SZ has not acquired a fricative, she substitutes fricative with a plosive. The direction of acquisition is based on place and manner of articulation. SZ also acquires place nodes in a sequence, starting from coronal to labial and finally dorsal. When she has acquired only coronal consonants, she substitutes labial with coronal consonants. Some examples clearly indicate that universal grammar is operative as SZ strictly follows the direction of acquisition according to markedness scale. For example, the direction of acquisition of /z/ is from [ɟ] to [ʒ] to [z]. She substitutes /z/ with [ʒ] though [ʒ] does not exist in Saraiki. This shows that children acquire L1 following universal grammar neglecting the input that they receive from their parents. In the same vein, sometimes children neglect existing consonants of their L1 and opt for the most unmarked option. For example, SZ substitutes [r] with [l]. At this stage, SZ has learnt to produce Saraiki consonants /l/ and /l^{h}/ but not [r]. She substitutes [r^{h}] with [l] not with [l^{h}] although she knows how to produce [l^{h}]. This substitution is an indication of preference of the easiest (unmarked) option.

The emergence of the unmarked is not only evident in substitution in these data. It is also evident in the examples of deletion. If SZ receives a word of LH type, at a stage when her grammar does not accept iambic feet, she deletes the light syllable. In such a deletion, she gets rid of the marked iambic feet though LH syllables are part of adult Saraiki language. This is another example of the emergence of the unmarked in child language.

SZ's preference for obstruent consonants to sonorant consonants on margins triggers metathesis. Thus, in deletion process, first metathesis occurs as a result of which a sonorant consonant which is on the onset of heavy syllable swaps its position with an obstruent which is onset of a light syllable e.g. /xə.rab/ becomes [xab] not [rab]. Normally, onset position is considered more unmarked than coda position (Archibald, 1998). A child acquires onset before coda. she prefers to satisfy the requirements of onset before satisfying those of coda (Spencer, 1996). If there is one consonant which may be a possible candidate for either onset of first syllable or coda of second syllable, the priority is given to onset. This is called maximal onset principle (Clements, 1990). Obstruents are preferred for margins. However, in case of a conflict between onset and coda, priority is given to onset. Thus, fictitious inputs /lat/ and /tal/ are expected to emerge as [tal] not *[lat] in a child grammar. In the current data, we came across another kind of conflict which is between coda of ultimate syllable and onset of penultimate syllable of a disyllabic word. The words like /ɖ̪ʌɽ.ke:/ have sonorant consonants on coda of the penultimate syllables but obstruents on onset of the ultimate syllables. These words emerge as [ɖ̪ʌk.le:]. Metathesis in such words indicates that coda of a penultimate syllable has high priority over that of onset of ultimate syllable. This confirms that the constraints related to left syllables are more important than those of right syllables in disyllabic words.

Change of words like /ru.'mal/ into [mu.'lal] show that requirements of stressed syllables have priority over those of unstressed syllables. In deletion, normally child languages retain stressed syllable and delete unstressed ones. Thus, MAX-'σ is ranked higher than MAX-σ in general. But in our data it is apparent that the requirements of onset of left-most syllable have priority over those of onset of a stressed ultimate syllable. Both onsets require a low sonority consonant. But SZ places less sonorous consonant on onset of penultimate syllable although the ultimate syllable is also stressed. In case of change of /kə.'ʈo.ri:/ into [ʈə.'ko.ri:], although penultimate syllable is also stressed but coronal moves from penultimate to ultimate syllable. It means the leftmost (word-initial) margin has high priority over other syllables. It also shows that there are two types of hierarchies in the grammar of SZ. One is classification of sounds based on sonority. She prefers less sonorous sounds on margins of leftmost syllable. Another scale is based on place of articulation which is coronal → labial → dorsal.

Markedness has always been a point of discussion among linguists. An unmarked phoneme is considered to be more frequent and easy to produce. Ease of articulation may vary depending on context of a phoneme. For example, in general, [a] vowel is easier and more frequent than [i] and [u]. In other words, [a] is more unmarked and preferred than [i] and [u]. But we see in section 2.3 that [a] and [i] change into [u]. Harmony is triggered for ease of articulation. It is easier to produce phonemes of the same place of articulation in a string of sounds than producing phonemes of different places of articulation. The data in this paper also indicate that children prefer relative contextual ease of articulation to general universal markedness and perceptually prominent structures. But Markedness has different layers. Based on place of articulation, manner of articulation or position of a phoneme in a syllable, different scales of markedness have been developed.

In the current data, SZ substitutes [s z] with [ʃʒ] although the latter are more marked than the former. This is something which is apparently unexpected. Normally children acquire unmarked sounds before the marked ones. SZ also acquired stops before fricatives. Acquiring stops actually means having activated specific place nodes. Saraiki does not have [+anterior, -distributed] stops like English [d]. It has either laminal stops on anterior position (e.g. dental [t̪ d̪]) or apical stops on posterior position (e.g. retroflex [ʈ ɖ]). After acquiring plosives, SZ starts acquiring alveolar fricatives [s z]. Thus she has already activated dental and alveo-palatal places of articulation for stops but still alveolar place of articulation is inactive. Perhaps this is the reason that SZ substitutes [s z] with [ʃʒ] though the latter are more marked than the former. We can rightly expect that alveolar fricatives are acquired before alveo-palatal fricatives because alveolar [s z] are more unmarked than [ʃʒ]. But the substitution of [s z] with [ʃʒ] in the current case strongly establishes that the moment a child acquires parts of L1 grammar, the acquired part of grammar starts interfering in the later acquisition. The issue has been raised by Major in ontogeny phylogeny model (Major, 2001) as these words of Major imply.

"If L1n=the complete NL system of the adult speaker and $L1_x$ represents the sum total of an L1 learner's system at a particular stage, then the portion of L1 that has not been acquired is $L1_{n-x}$.....However, suppose the L1 learner is not acquiring a marked phenomenon at stage $L1_{n-x}$. *The L1 learner first relies on what has already been acquired, namely the nearest equivalent in L1x. This is analogous to an L2 learner relying on L1.....*" (ibid, p. 112).

In other words, as an already acquired L1 resists acquisition of new L2 sounds, similarly, an already acquired part of L1 also resists the acquisition of the remaining L1 grammar. This also establishes that an already acquired language is more influential than universal markedness. Finally, we point out that the examples quoted above are not exhaustive. Many generalizations are based on a very small number of examples. Therefore these findings are hypotheses rather than generalizations. However, the data raise very interesting questions which are open for further research.

References

Archibald, J. (1998). *Second language phonology*. Amsterdam/Philadelphia: John Benjamins Publishing Company.

Backley, P. (2011). *An introduction to element theory*. Edinburgh: Edinburgh University Press.

Beckman, J. (1998). *Positional Faithfulness.* PhD, UMass.

Best, C. T. (1994). The emergence of native-language phonological influences in infants: A perceptual assimilation model. In C. Goodman & H. Nasbaum (Eds.), *The development of speech perception: The transition from speech sounds to spoken words* (pp. 167-224). Cambridge MA: MIT Press.

Best, C. T. (1995). A direct realist view of cross-language speech perception. In W. Strange (Ed.), *Speech perception and linguistic experience: Issues in cross-language research* (pp. 171-204). Timonium MD: York Press.

Best, C. T., McRoberts, G. W., & Goodell, E. (2001). Discrimination of non-native consonant contrasts varying in perceptual assimilation to the listener's native phonological system. *The Journal of the Acoustical Society of America, 109*(2), 775-794.

Best, C. T., & Tyler, M. D. (2007). Nonnative and second-language speech perception: Commonalities and complementarities. In O.-S. Bohn & M. J. Munro (Eds.), *Language experience in second language speech learning: In honor of James Emile Flege.* (pp. 13-34). Amsterdam: J. Benjamins.

Boersma, P. (1998). *Functional Phonology: Firmalizing the Interaction between Articulatory and Perceptual Drivers*. Amsterdam: Holland Academic Graphics.

Bortfeld, H., Morgan, J., Golinkoff, R., & Rathbun, K. (2005). Mommy and me: Familiar names help launch babies in speech stream segmentation. *Pschological science, 16*, 298-304.

Brown, C. A. (1998). The role of the L1 grammar in the L2 acquisition of segmental structure. *Second Language Research, 14*(2), 136-193.

Brown, C. A., & Mathews, J. (1993). The acquistion of segmental structure. *McGill Working Papers in Linguistics, 9*, 46-76.

Brown, C. A., & Mathews, J. (1997). The role of feature geometry in the development of phonemic contrasts. In S. J. Hannahs & M. Young-Scholten (Eds.), *Focus on phonological acquisition*. Philadelphia: John Benjamins.

Chin, S. B. (1996). The role of sonority hierarchy in delayed phonological systems. In T. W. Powell (Ed.), *Phonologies of Speech and Language: Contributions of Clinical Phonetics and Linguistics* (pp. 109-117). New Orleans: International Clinical Linguistics and Phonetics Association.

Clements, G. N. (1990). The role of the sonority cycle in core syllabification. In J. Kingston & M. E. Beckham (Eds.), *Between grammars and the physics of speech: Papers in Laboratory Phonology* (Vol. 1, pp. 283-333). Cambridge: CUP.

Clements, G. N., & Hume, E. V. (1995). The internal organization of speech sounds. In J. Goldsmith (Ed.), *A handbook of phonological theory* (pp. 245-306). Oxford: Blackwell.

Crowhurst, M. J., & Olivares, A. T. (2014). Beyond the Iambic-Trochaic Law: the joint influence of duration and intensity on the perception of rhythmic speech. *Phonology, 31*(1), 51-94.

Cruttenden, A. (2001). *Gimson's pronunciation of English*. London: Arnold

Demuth, K. (1995). Markedness and the development of prosodic structure. In J. Beckman (Ed.), *Proceedings of the North East Linguistic Society 25* (pp. 13-26). Amherst: Graduate Student Linguistic Association.

Demuth, K. (1996). Alignment, stress and parsing in earling phonological words. In B. H. Bernhardt & D. Ingram (Eds.), *Proceedings of the UBC International Conference on Phonological Acquisition* (pp. 113-125). Somerville, Mass: Cascadilla.

Demuth, K. (2011). The Acquisition of Phonology. In J. Goldsmith, J. Riggle & A. C. L. Yu (Eds.), *The Handbook of Phonological Theory* (Vol. second, pp. 571-595). Oxford: Wiley-Blackwell.

Fikkert, P. (1994). *On the acquisition of prosodic structure*: Holland Institute of Generative Linguistics.

Flege, J. E. (1992). The intelligibility of English vowels spoken by British and Dutch talkers. In R. D. Kent (Ed.), *Intelligibility in speech disorders thoery measurement and management* (pp. 157-232). Amsterdam: John Benjamins.

Flege, J. E. (1993). Production and perception of a novel, second-language phonetic contrast. *Journal of the Acoustical Society of America, 93*(3), 1589-1608.

Flege, J. E. (1995). Second language speech learning: Theory, findings, and problems. In W. Strange (Ed.), *Speech perception and linguistic experience: Issues in cross-language research* (pp. 233-277). New York: Timonium, MD.

Flege, J. E., & Fletcher, K. L. (1992). Talker and listener effects on degree of perceived foreign accent. *Journal of the Acoustical Society of America, 91*(1), 370-389.

Flege, J. E., Takagi, N., & Mann, V. (1996). Lexical Familiarity and English-language Experience Affect Japanese Adults' Perception of [ɹ] and [l]. *Journal of Acoustical Society of America, 99*(2), 1161-1173.

Flege, J. E., Yeni-Komshian, G. H., & Liu, S. (1999). Age constraints on second-language acquisition. *Journal of memory and language, 41*(1), 78-104.

Freitas, J. (1996). Onsets in early production. In B. Bernhardt, J. Gilbert & D. Ingram (Eds.), *Proceedings of the UBC International Conference on Phonological Acquisition* (pp. 76-85). Somervile: Cascadilla Press.

Fromkin, V., Blair, D., & Collins, P. (2001). *An Introduction to Language*. Southbank Victoria: Thomson.

Gerken, L. (1991). The metrical basis of children's subjectless sentences. *Journal of Memory and Language, 30*, 431-451.

Gerken, L. (1994). A metrical tempelate account of children's weak syllable omission from multisyllabic words. *Journal of Child Language, 21*, 565-584.

Gess, R. (1998). Compensatory lengthening and structure preservation revisited. *Phonology, 15*, 353-366.

Gierut, J. (1999). Syllable onsets: Clusters and adjuncts in acquisition. *Journal of Speech Language and Hearing Research, 42*, 708-726.

Gnanadesikan, A. (2004). Markedness and faithfulness constraints in child phonology. In R. Kager, J. Pater & W. Zonneveld (Eds.), *Constraints in Phonological Acquisition*. Cambridge: Cambridge University Press.

Goad, H., & Rose, Y. (2004). Input elaboration, head faithfulness, and evidence for presentation in the acquisition of left edge clusters in West Germanic. In R. Kager, J. Pater & W. Zonnevold (Eds.), *Constraints in phonological acquisition* (pp. 109-147). Cambridge: CUP.

Grijzenhout, J., & Joppen-Hellwig, S. (2002). Phonetic evidence for phonological structure in syllabification. In I. Lasser (Ed.), *The process of language acquisition* (pp. 319-339). Berlin: Peter Lang Verlag.

Halle, M. (1995). Phonological features. In W. Bright (Ed.), *International Encychlopedia of Linguistics* (Vol. 4, pp. 207-212). Oxford: Oxford University press.

Hallé, P. A., & Best, C. T. (2003). *Japanese listeners' perception of the French versus American English /r/-/l/ contrasts.* Paper presented at the 15th International Conference of Phonetic Sciences, Barcelona.

Harris, J., & Lindsey, G. (1995). The elements of phonological representation. In J. Durand & F. Katamba (Eds.), *Frontiers of phonology: Atoms, Structures, Derivations* (pp. 34-79). Harlow: Longman.

Hayes, B. (2004). Phonological acquisition in Optimality Theory: the early stages. In R. Kager, J. Pater & W. Zonneveld (Eds.), *Constraints in Phonological Acquisition*. Cambridge: Cambrige University Press.

Hume, E. (2001). Metathesis: Formal and Functional Considerations. In E. Hume, N. Smith & J. v. d. Weijer (Eds.), *Surface Syllable Structure and Segment Sequencing* (pp. 1-24). Leiden: HIL Occasional Papers.

Ingram, D. (1974). Phonological rules in young children. *Journal of Child Language, 1*, 49-64.

Ingram, D. (1989). *Child language acquisition: Method, description, and explanation*. Cambridge: CUP.

Iverson, G. K., & Salmons, J. C. (2008). Germanic Aspiration: Phonetic enhancement and language contact. *Sprachwissenschaft, 33*(3), 257-278.

Iverson, P., & Kuhl, P. K. (1995). Mapping the perceptual magnet effect for speech using signal detection theory and multidimensional scaling. *Journal of the Acoustical Society of America, 97*(1), 553-562.

Iverson, P., Kuhl, P. K., Akahane-Yamada, R., Diesch, E., Tohkura, Y., Kettermann, A., & Siebert, C. (2003). A perceptual interference account of acquisition difficulties for non-native phonemes. *Cognition, 87*(1), B47-B57.

Jakobson, R. (1968). *Child Language Aphasia and Phonological Universals*. The Hague: Mouton.

Johnson, W., & Britain, D. (2007). L-vocalization as a natural phenomenon: Explorations in sociophonology. *Language Sciences, 29*(2-3), 294-315.

Johnson, W., & Reimers, P. (2010). *Patterns in Child Language Phonology*. Edinburgh: Edinburgh University Press.

Jusczyk, P., Houston, D., & Newsome, M. (1999). The beginnings of word segmentation. *Cognitive Psychology, 39*, 159-207.

Kager, R. (2010). *Optimality Theory* (10th ed.): Cambridge University Press.

Kager, R., Pater, J., & Zonneveld, W. (2004). Introduction. In R. Kager, J. Pater & W. Zonneveld (Eds.), *Constraints in phonological acquisition*. Cambridge: Cambridge University Press.

Kappa, I. (2001). Alignment and consonant harmony: evidence from Greek. In A. Do, L. Domingue & A. Johnson (Eds.), *Proceedings of 25th Annual Boston University Conference on Language Development* (pp. 401-412): Somerville:Cascadilla Press.

Kenstowicz, M. (1994). *Phonology in generative grammar*. Cambridge: Balckwell.

Kissebirth, C. (1970). On the functional unity of phonological rules. *L1, 1*, 291-306.

Kuhl, P. K. (2007). Is speech learning 'gated'by the social brain? *Developmental Science, 10*(1), 110-120.

Kuhl, P. K., Conboy, B. T., Coffey-Corina, S., Padden, D., Rivera-Gaxiola, M., & Nelson, T. (2008). Phonetic learning as a pathway to language: new data and native language magnet theory expanded (NLM-e). *Philosophical Transactions of the Royal Society of Biological Sciences, 363*, 979-1000.

Kula, N. C., & Syed, N. A. (2014). *Grapes are sour.* Paper presented at the Manchester Phonology Meeting 22, University of Manchester.

Lavoie, L. M. (2001). *Consonant strength: Phonetic Patterns and Phonological Manifestations*. New York: Garland Publishing Inc.

Lenneberg, E. (1967). *Biological foundations of language*. New York: Wiley.

Leonard, L., & McGregor, K. (1991). Unsusual phonological patterns and their underlying representations: a case study. *Journal of Child Language, 18*, 261-272.

Macken, M., & Ferguson, C. (1983). Cognitive aspects of phonological development: A phonetic and phonological study of word-initial stops. In K. Nelson (Ed.), *Children's language* (pp. 255-282). Hillsdale NJ: Lawrence Erlbaum.

Maddieson, I. (1984). *Patterns of sounds*: Cambridge University Press.

Mahboob, A., & Ahmar, N. H. (2004). Pakistani English: Phonology. In E. W. Schneider (Ed.), *A Handbook of Varieties of English: A Multimedia Reference Tool* (pp. 1003-1015). Berlin: Mouton de Gruyter.

Major, R. C. (2001). *Foreign accent: The ontogeny and phylogeny of second language phonology*. Mahwah NJ: Lawrence Erlbaum Associates.

Mani, N. (2011). Phonological Acquisition. In N. C. Kula, B. Botma & K. Nasukawa (Eds.), *The continuum companion to phonology* (pp. 278-297). London/New York: Continuum International publishing group.

McCarthy, J. (2000). *Harmonic serialism and parallelism.* Paper presented at the North East Linguistics Society 30.

McCarthy, J. (2008). *Doing Optimality Theory Applying Theory to Data*. Oxford: Blackwell Publishing.

McCarthy, J. (2009). Harmony in harmonic serialism. Retrieved from http://scholarworks.umass.edu/cgi/viewcontent.cgi?article=1040&context=linguist_faculty_pubs&sei-redir=1&referer=http%3A%2F%2Fscholar.google.co.uk%2Fscholar%3Fhl%3Den%26q%3DHarmony%2Bin%2Bharmonic%2Bserialism%26btnG%3D%26as_sdt%3D1%252C5%26as_sdtp%3D#search=%22Harmony%20harmonic%20serialism%22

McCarthy, J. (2010). An introduction to Harmonic Serialism. *Language and Linguistics Compass, 4*(10), 1001-1018.

McCarthy, J., & Prince, A. (1993). Generalized Alignment. *Yearbook of Morphology 1993*, 79-154.

McCarthy, J., & Prince, A. (1994). The emergence of the unmarked: Optimality in prosodic morphology. *Proceedings of the North East Linguistic Society, 24*, 333-379.

McMahon, A. (2000). *Change, Chance and Optimality*. Oxford: Oxford University Press.
Menn, L. (1971). Phonotactic rules in beginning speech. *Lingua, 26*, 225-251.
Pater, J., & Barlow, J. (2003). Constraint conflict in cluster reduction. *Journal of Child Language, 30*, 487-526.
Pater, J., & Paradis, M. (1996). Truncation without templates in child phonology. In A. Stringfellow, D. Cahana-Amitay, E. Hughes & A. Zukowski (Eds.), *Proceedings of the 20th Annual Boston University Conference on Language Development* (pp. 540-551). Somerville: Cascadilla Press.
Pater, J., & Werle, A. (2003). Direction of assimilation in child consonant harmony. *Canadian Journal of Linguistics, 48*(3/4), 385-408.
Patkowski, M. S. (1990). Age and Accent in a Second Language: A Reply to James Emil Flege. *Applied Linguistics, 11*(1), 73-89. doi: 10.1093/applin/11.1.73
Penfield, W., & Roberts, L. (1959). *Speech and Brain Mechanisms*. Princeton: Princeton University Press.
Prince, A., & Smolensky, P. (2004). *Optimality Theory: Constraint Interaction in Generative Grammar*. Malden, MA & Oxford: Blackwell.
Prince, A., & Tesar, B. (2004). Learning phonotactic distributions. In R. Kager, J. Pater & W. Zonneveld (Eds.), *Constraints in phonological acquisition*. Cambridge: Cambridge University Press.
Radford, A., Atkinson, M., Britain, D., Clashen, H., & Spencer, A. (2006). *Linguistics An Introduction*. Cambridge: Cambridge University Press.
Rahman, T. (1990). *Pakistani English: The linguistic description of a non-native variety of English*. Islamabad: National Institute of Pakistan Studies, Quaid-i-Azam University.
Rahman, T. (1991). Pakistani English: some phonological and phonetic features. *World Englishes, 10*(1), 83-95.
Rice, K., & Avery, P. (1993). Segmental complexity and the structure of inventories. *Toronto Working Papers in Linguistics, 12*(2), 131-153.
Rose, Y. (2000). *Headedness and prosodic licensing in L1 phonological acquisition.* PhD Dissertation, McGill University.
Scovel, T. (1988). *A time to speak: A psycholinguistic inquiry into the critical period for human speech*. Cambridge: Newbury House
Selkirk, E. (1984). On the major class features and syllable theory. In M. A. R. Oehrle (Ed.), *Language Sound Structure* (pp. 107-136). Cambridge, Mass: MIT Press.
Shackle, C. (1976). *The Siraiki language of central Pakistan: A reference grammar*. London: University of London School of Oriental and African Studies.
Smith, N. V. (2010). *The acquisition of phonology: A case study*. Cambridge: Cambridge Univ Press.
Spencer, A. (1986). Towards a theory of phonological development. *Lingua, 68*, 3-38.
Spencer, A. (1996). *Phonology : theory and description* Oxford: Blackwell.
Steriade, D. (1999). Phonetics and Phonology: The case of laryngeal neutralization. *UCLA Working Papers in Phonology, 3*, 225-246.
Stoel-Gammon, C. (2011). Relationship between lexical and phonological development in young children. *Journal of Child Language, 38*, 1-34.
Syed, N. A. (2009). *Nasalization in Saraiki.* MA Dissertation, University of Essex, Colchester.
Syed, N. A. (2013a). Acquisition of dental fricatives by adult Pakistani learners. *Newcastle Working Papers in Linguistics 19, 2*, 64-73.

Syed, N. A. (2013b). Voice onset time for plosives in Saraiki: Implications for the acquisition of English aspiration contrast. *EFL Annual Research Journal 2012 Shah Abdul Latif University Khairpur, 14*, 1-15.

Tesar, B., & Smolensky, P. (2004). Learnability in Optimality Theory. In J. McCarthy (Ed.), *Optimality Theory in Phonology A Reader* (pp. 118-140). Oxford: Blackwell Publishing.

Varma, S. (1936). The Phonetics of Lahnda. *Journal of Royal Asiatic Society of Bengal 2*, 47-118.

Vihman, M. M. (1978). Consonant harmony: its scope and function in child language. In J. H. Greenberg (Ed.), *Universals of human language* (pp. 281-334). Stanford, CA: Stanford University Press.

Vihman, M. M. (1996). *Phonological development: The origins of language in the child*. Oxford: Blackwell.

Vouloumanos, A., & Werker, J. F. (2007). Tuned to the signal: The previliged status of speech for young infants. *Developmental Science, 7*, 270-276.

Watson, N. (1971). Child phonology: a prosodic view. *Journal of Linguistics, 7*, 197-211.

Wester, F., Gilbers, D., & Lowie, W. (2007). Substitution of dental fricatives in English by Dutch L2 speakers. *Language Sciences, 29*(2-3), 477-491.

Zubritskaya, K. (1997). Mechnism of sound change in Optimality Theory. *Language Variation and Change, 9*, 121-148.