Hyper ASSIMILATION IN THE SPEECH OF Iraqi AUTISTIC CHILDREN: A GENERATIVE STUDY1

Asst. Prof. Mohammed Ahmed Abdul Sattar As-Sammer (Ph.D.)

Sarah Falih Hasan Duboony

Department of English -College of Arts -University of Basra

Abstrac: This paper explores the phonological disorder of assimilation elicited in the speech samples of eight Iraqi pre-school children diagnosed with autistic disorders. The main purpose of the work is to tackle the field of autism in Iraq by virtue of the shortage of studies in this concern, particularly in the area of phonology. The paper also aims to capture assimilation distortions (Hyper Assimilation) that are noted in the speech samples of the participants using two models of generative analysis. The first is Clark and Yallop (1995) generative phonological rules model, in which an attempt is made to compute the phonological rules to the assimilated speech of the autistic. The second is the constraint-screening model (within the framework of optimality theory) to form specific constraint restrictions to allow certain unified phonological representations. Through the analysis procedures that

are implemented in the present paper, it is found that assimilation aspect of the language of the autistic is highly impaired by unnecessary assimilated phonetic outcomes.

(Key Words)

(Hyper, autism, distortions, candidate, constraint, optimal)

(1)This paper is based on an MA thesis written by the second researcher and supervised by the first researcher.

LIST OF IRAQI ARABIC PHONEMIC INVENTORY

The following list of IA phonemic symbols are presented to facilitate reading the samples of transcription that are used in this study. The list is adapted from Ghalib (1984) with modification.

1. The Consonants:

Symbol	Description
/b/	A Voiced Bilabial Plosive.
/t/	A Voiceless Denti-alveolar Plosive.
/t̪/	A Voiceless Denti-alveolar Emphatic Plosive.
/d/	A Voiced Denti-alveolar Plosive.
/d̪/	A Voiced Denti-alveolar Emphatic Plosive.
/k/	A Voiceless Velar Plosive.
/g/	A Voiced Velar Plosive.
/q/	A Voiceless Uvular Plosive.
/ʔ/	A Glottal Stop.
/f/	A Voiceless Labio-dental Fricative.
/θ/	A Voiceless Interdental Fricative.
/ð/	A Voiced Interdental Fricative.
/ð̪/	A Voiced Interdental Emphatic Fricative.
/s/	A Voiceless Denti-alveolar Fricative.

/sˠ/ A Voiceless Denti-alveolar Emphatic Fricative.

/z/ A Voiced Denti-alveolar Fricative.

/ʃ/ A Voiceless Palato-alveolar Ficative.

/ʒ/ A Voiced Palato-alveolar Fricative.

/ɠ/ A Voiced Uvular Fricative.

/ħ/ A Voiceless Pharyngeal Fricative.

/ɛ/ A Voiced Pharyngeal Fricative.

/h/ A Glottal Fricative.

/tʃ A Voiceless Palato-alveolar Affricate.

/dʒ/ A Voiced Palato-alveolar Affricate.

/m/ A Voiced Bilabial Nasal.

/n/ A Voiced Denti-alveolar Nasal.

/r/ A Voiced Alveolar Flap.

/l/ A Voiced Alveolar Lateral.

/w/ A Voiced Labio-Velar Approximant.

/y/ A Voiced Palatal Approximant.

2. The Vowels:

Symbol	Description
/i/	A Short half-close Front with Lip-spreading Vowel.
/i:/	A Long Close Front with Lip-spreading Vowel.
/ee/	A Long Half-close to Half-open Front with Lip-spreading Vowel.
/ɑ/	A Short Half-open Central Neutral Vowel.
/ɑ:/	A Long Open-central Neutral Vowel.
/ɔ:/	A Long Half-close to Half-open Back Rounded Vowel.
/u/	A Short Half-close Back Rounded Vowel.
/u:/	A Long Close Back Rounded Vowel.

1. Introduction: This paper is intended to explore the developmental phonological disorder of assimilation routed in the speech of eight Iraqi preschool children with autism aged between (7-10) years, who are all monolingual of Basra Iraqi Arabic (BIA) which is the dialect of Iraqi Arabic (IA) that is spoken in Basra, the southern city of Iraq (Al-Khalesi,2007: xvi). Due to the great diversity of the sub-dialects that represent BIA, the participants who represent the population of this study speak the variety of the city center of Basra and the nearby districts. All the participants are monolingual speakers of BIA and are phonolo- gically impaired in different degrees. They all receive daycare in Al-Basra Autism Center for the aim of developing their linguistic and social skills. The center introduces re-habitation for children (aged between 3-14 years) with Autistic Syndrome Disorders (ASD) and other syndromes like Down's syndrome, cerebral palsy, and linguistic delay. The center aims to improve the children's linguistic, social and visual skills by offering continuous linguistic and behavioural sessions. It is also worth noting that Al-Basra Autism Center encompasses 10 classes for 150 children with different mental cases, four of which are specified for 80 children who are diagnosed with ASD . For privacy and confidentiality, representative symbols are used, throughout the paper, in reference to each participant, and below is a list of the symbols of the participants sorted by age at the period of recording with the number of recording sessions for each one of them:

Table 1. Names and Ages of the Participants and Number of Recording Sessions.

The name of the participant		The age by years	Number of recording Sessions
1	AS 1	10	3
2	AS 2	8	6
3	AS 3	8	6
4	AS 4	7	3
5	AS 5	9	6
6	AS 6	10	6
7	AS 7	9	6
8	AS 8	7	3

It is also important to note that all the participants in this work are males, and this gender asymmetry is because ASD is considered a male deficit especially that all related studies found that the male/ female ratio is 4:1 around the world. For example, The University of Cambridge and the Statens Serum Institute in Copenhagen, (Denmark) relate this phenomenon to the influence of genes and hormones. That is, males have elevated levels of Testosterone , Progesterone, and Cortisol in the womb which affect the fetal brain development (Glenn,2014).

By transcribing the speech patterns of the participants' corpus, it is asserted that there are some developmental phonological features in their utterances that can easily be observed. One of these features is the inappropriate assimilation (Hyper Assimilation). Assimilation is going to be treated via two models; the first is the generative phonological rules model proposed by Clark,Yallop and Fletcher (1995), and the second is the constraint-based Optimality Theory (OT) model. The study aims to offer answers to the following research questions: (i)to what extent is assimilation considered pervasive in the speech of the participants? (ii) what are the prominent assimilated distorted forms elicited in the participants' performance?, (iii) what is the range of the applicability of the generative phonological rules on these forms?, (iv) how can this phonological process be treated within an OT perspective?, and (v) what are the prominent competing constraints that control the generation of the optimal phonetic outputs?

2.Autism Spectrum Disorder (ASD) : There is no definite answer for what autism exactly is, but there are many researches which depended on the shared symptoms of the autistic people. The term is not something new, it is derived from the Greek word "Autos" which means "self", and "ism" which means "state" (George and Sulekha, 2013: 1525). It is generally determined by a severe mental disorder associated by isolation and deficits in thought and language (Kellogg and Pisacreta, 2004:495). An early description for autism can be traced to the work of Haslam in 1809 "Observation of Madness and Melancholy" in which he described a

7-year male child with delayed language, impaired socialization and preoccupations . He also described how the autistic boy improved his language only with short sentences at the age of 13, and interesting speaking with the third person pronoun rather than using the first person singular (Matson, 2014:3). Autism then was used in its modern sense with the work of Leo Kanner , a doctor from Johns Hopkins University, in 1943 when he described a group of 11 children who shared the same symptoms as being autistic. One year later, Hans Asperger published his doctoral thesis which relies upon his observations of some children with pragmatic difficulties and eye-contact problems. Children with Asperger`s Syndrome are also unique in their degree of intelligence and preoccupation in areas like mathematics, physics and chemistry (Mesibov, 2002 : 9) .

In the 1970s, the improvement with behavioural therapy was revealed with a genetic link (Silva, 2015:1). The role of this kind of therapy and the use of highly controlled learning have been considered primary treatments for autism during the 1980s and 1990s . Other treatments were added as needed for many forms of autism and related conditions (Doyle, 2014). Nowadays, autism is referred to as Autism Spectrum Disorder (ASD) to describe a group of diagnosis including autistic disorders (AD), Asperger`s Syndrome (AS), atypical disorders (ATD), Pervasive Developmental Disorders (PDD) and Elective Mutism (EM) (Gerdts and Bernier, 2010:1 In spite of the advanced understanding of autism all over the world, no one knows what causes autism until

the moment . Although, certain theories are trying to identify the causes of autism. Some of those theories relate the case genetically, while others suggest that it is caused by intrauterine and neonatal stress or trauma (George and Sulekha, 2013:1525).). This is so because most of the autistic children were born with caesarean surgery (Mesibov, et al, 2002: 17). From the genetic point of view, candidate genes that are associated with ASD and other neuro-developmental disorders (NND) are notified on chromosomes 7q, 15q, and 16q. In this concern, Croft (2015:120) states that:

"…autism appears to be a family of diseases with common phenol-types

linked to a series of genetic anomalies, each of which is responsible for no

more than 2-3% of cases. The total fraction of ASD attributed to genetic

inheritance is about 30-40%.".

Furthermore, a report published in 2006, classified evidences that associate ASD with chemical toxicity (Feldscher, 2014). Regarding the relation between ASD and toxic chemicals, Croft (2015:120) also asserts that:

" Exploration of the environmental causes of autism and other NNDs has

been catalyzed by growing recognition of the exquisite sensitivity of the developing human brain to toxic chemicals " .

It is difficult to diagnose people with Asperger Syndrom AS and Autistic disorders AD, though they might share the same difficulties (Mesibov, et al, 2002:26). Generally, autistic children show a unique bunch of symptoms including impairments in various nonverbal behaviours such as avoiding the eye contact, inappropriate body gestures, and preoccupation with certain narrow activities and interactions, such interactions are usually made with inanimate objects. They also lack the ability to understand and comprehend emotional expressions (Hollander,2003:21), and they have restricted interests and repetitive behaviours including stereotypic movements and insistence on routines in everyday activities (George and Sulekha, 2013:1525). Most autistic children, especially those who are pre-school are unable to control their hand muscles appropriately. They also have strange body movements, for example, if they could engage in writing they may move their jaws in a strange way unwillingly. This means that children with ASD do not usually get the energy they need to use their muscles appropriately (Gordon, 2008).

The ability of the autistic children varies from one child to another depending on their degree of intelligence and social development. Some children may have difficulty to understand and comprehend what people say, while others suffer from the disability to develop their linguistic skills. Verbal and non- verbal communications are affected in ASD, and language development takes place slowly, because of the sensory problems that autistic children suffer from (Gordon, 2008) . Most children with autism

usually have problems in their articulation. Their limited speech production relates to their

weakness of articulatory muscles. They are unable to control their lips and tongue movements in the right way and they also have difficulties in their breath control (ibid). They may also show certain symptoms concerning the use of vowel-like vocalization and the limited repertoire of consonants as well as the inconsistency in the production of words in isolation and within string of words and the production of single and multi-syllabic words (Gretz,2000).

Three main cognitive theories are concerned with defining what autism is. The first theory is The Theory of Mind (TOM) which refers to the normal children`s ability to engage with mental states of others, e.g. to conceptualize their desires and behaviours (Hale and Tager-Flusberg, 2006). Baron-Cohen in 1995 refers to this theory as a cognitive theory that displays what is called "mind-reading" in individuals. He suggested that all children with ASD suffer from what he called "Mind-blindness". Unlike normal children who are mind-read, autistic children have problems with the theory of mind, i.e. they lack the intuition and imagination of other people`s thoughts and desires about the world in general (Feinstein ,2010:75). The second theory is known as Weak Central Coherence Theory (WCCT) which is concerned with the ability to integrate the available details of a certain piece of information to create a higher meaningful concept (Jarrold et.al., 2000:127). Frith (1989, cited in Terra, 2009) assumes that autistic children have a weak central coherence which makes them

look at things in a very classical and limited way. Their problem in extracting meanings from the surrounding details in contrast with their normal peers means that they consider all the available information as to be irrelevant to their message. As such, they tend to pick out local forms from what they see or hear, rather than global forms.

Executive Functioning theory (EF) is another cognitive term that is associated with neuropsychological processes that are responsible for the physical and cognitive skills. EF deficits are usually observed in autism and other neurodevelopment defects like attention deficit hyperactivity disorder (ADHD) (Corbett et. al., 2009). People with executive dysfunctions (EDFs) usually show problems in social and non-social domains (Hill,2006). Symptoms of carelessness, difficulties in sustaining attention, planning, organizing and concentrating on certain tasks and problems in fluency are obviously observed (Gerdts and Bernier,2010: 258).

3.The Most Common Developmental Phonological Processes in Children with Autism:

Developmental phonological processes are defined as the children`s inability to articulate sound segments accurately because of their ignorance of

the phonological rules of the speech sounds (Feit,2007:77). Donegan and Stampe (2009:2) referred to the phonological processes in their natural phonology hypothesis as a mental representation of the speech sounds that coincides with the

children`s phonetic features that are responsible of their speech production and perception. They determine that:

" Phonological processes operate on a real-time mental prosodic representation of the features of the intended utterance, and their output,

though it may differ considerably in content, is of the same kind: a real-

time prosodic mental representation of the features of the actual utterance. When we speak here of sounds, or kinds of sounds, like vowels

or consonants, we are speaking of their mental representations".

These developmental processes may be characterized by sound distortion, omission of sound segments, inappropriate assimilation, and incorrect segmental substitution (Nguyen,2002). It is suggested that such processes are observed in high-functioning children with ASD because of their chronologically linguistic delay. Autistic children are assumed to have what is called " chronological mismatch ", which is a term used for the first time by Grunwell (1981) to refer to the child`s ability to produce earlier processes before or alongside the later ones(Cummings,2008: 240). This means that their segmental inventories may include certain phonemes that are acquired typically in later stages such as fricatives and affricates while earlier phonemes like plosives are missed or produced with difficulty.

Non-developmental distortions are also available in the speech production of the autistic children. Cleland et al, (2010: 10-11) ,in this concern , propose that some children with autistic disorders may tend to palatalize, labialize, or nasalize phonemes.

4. Assimilation : Assimilation is a general characteristic of most of the languages of the world. It is defined by Frawley (2003: 320) as a phonological process in which two sound segments in the same neighbouring region become more alike . This similarity results from the articulatory influence of one of the two segments upon the other (Crystal, 2003: 38). Zafarani and Shokouhian (2009 :64) explain that this takes place because of the tongue failure to move quickly between the two places of articulation to produce the next sound as it is. In assimilation context, in order to be similar, the adjacent sounds undergo changes in their place of articulation (POA), manner of articulation (MOA), and voiced sounds may change their voicing to be voiceless and vice versa (Alkhuli, 2002: 152). Assimilation, according to Roach (2009:139), is the result of speech being connected. It takes three directions: progressive, when a sound segment affects the following one, regressive, when a sound affects the preceding one , and coalescent, in which the adjacent sounds affect each other to produce a different sound (Zafarani and Shokouhian , 2009: 65). It could be total or partial (Crystal,2003: 38). A sound is assimilated completely when it takes the exact features of the adjacent sound, or it may change only partially to be similar to the other sound (Alkhuli, 2002: 154).Voicing, nasalization,

palatalization, velarization, dentalization, lateralization ,…etc. are all types of assimilation (Nathan, 2008: 78-80).

5. Generative Phonological Rules : The term Generative phonology is associated directly with Chomsky and Halle`s Generative Grammar (Alduais,2013: 35). Crystal (2003: 199) discloses that generative grammar is maintained to measure the capacity of the grammar of a language to formulate the infinite number of grammatical sentences. According to him, generative grammar is: "a set of formal rules which project a finite set of sentences upon the potential finite set of sentences that constitute the language as a whole, and it does this in an explicit manner". It is supposed that each phoneme entails an underlying form, which is referred to as Systematic Phonemic Representation. These representations are converted into their phonetic or surface representations via specific rules known as Generative Rules (Bagha, 1991:1). The basic structure of a phonological rule is as follows:

A→B / C_D

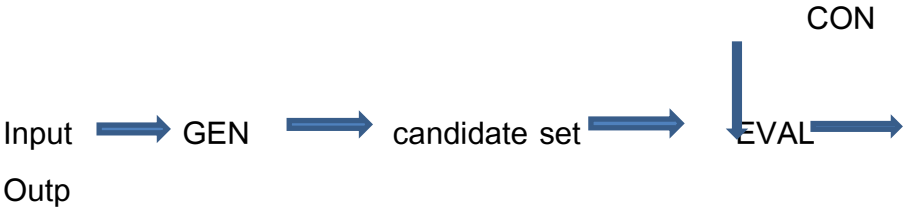
For this rule,(A) represents the segment in the underlying form which is going to change to (B) in the context between (C) and (D). The (/) indicates the environment where the change occurs while the symbol (_) denotes the exact context in which (A) is shifted into (B).

Basically, Phonological rules are used to describe the speech of individuals with unique combination of rule usage that is considered to be different from the normal speaker`s combination of rules (Gordon-Brannan and Weiss,2007 :246) . Those rules

can perform certain phonological cases, including phonemic substitution, elision and assimilation (Bagha, 1991:1). That is why they are preferred as a model of analysis for assimilation in the present study.

6. Optimality Theory : The theory is introduced by Prince and Smolensky (2004: 3) as a grammatical theory which relies on grammar conflicts according to ranking constraint in a strict dominant hierarchy. It is, in other words, introduced as a grammatical model that entails how grammars are constructed (McCarthy , 2007:1). It is developed for the sake of exploring an evidence of the way in which the representational well-formedness establishes the grammatical structure (Prince and Smolensky, 2004: 1). This aim is approached, for Crystal (2003:329), by specifying the competition between the conflicting universal constraints.

Yavas (2011:215) proposes that the output of a given input is created by a mechanism called Generator (GEN), and evaluated then by a process called Evaluation (EVAL). The elevated output is exposed to a set of candidates through the constraints in which the candidate that treats the fewest constraints is chosen as the optimal output.



For Prince and Smolensky (2004: 4-5), the standard phonological rules that are presented in Chomsky and Halle`s (1968) The Sound Pattern of English are structured in the following order:

A→B/ C__D

They assume that such a rule is loose and an informative, that is, the structural change from A to B in the rule above needs to be defined with its structural description . As such, it is supposed in OT that the input CAD is presented as CBD, when A is changed into B, but never realized as CAD, or ACD, for instance:

CAD→CBD

* CAD→CAD

* CAD→ACD

According to the approach of OT, the output CBD could be formulated when the following requirements are available:

-the markedness constraint which describes the configuration CAD as ungrammatical : *CAD

-the faithfulness constraint that describes how the output is identical to the input. Here the constraint that describes any change on the input as ungrammatical should be formulated in order to avoid deriving a configuration like DCA, for instance, as stated in the rule below:

*A→B/ C__

Two types of conflicting constraints are recognized in OT framework; markedness constraints and faithfulness constraints. This notion (markedness) indicates the idea that all linguistic structures have specified either of being "marked" or "unmarked".

While unmarked feature represents a basic in all grammars, the marked values are likely to be avoided and used for creating contrasts among grammars. Markedness in itself represents a key core of universality (Kager,1999:2).That is, according to Yava (2011: 215), the unmarked forms are universal and they do not need to be learned, while the marked ones are unique and have to be learned . Besides universality, markedness constraints in OT are violable. They enforce the well-formedness of the output (surface structure) irrespective of the formedness of the input (Zuraw,n.d.:2).

Faithfulness constraints, on the other hand, entail the well-formedness of the output (surface structure) in respect to the input. They strengthen similarity between input and output (ibid: 3). Faithfulness constraints are supposed to be conservative, for MacCarthy (2007:5), insisting on the output form to be identical to the input form. For this reason, MacCarthy continues, that these two major classes of constraints are in continuous competition for which they could endure any changes to the input, especially that markedness constraints favour some structures over others.

7. Analysis of Assimilation in the Corpus:

7.1 Treatment of Assimilation Via Generative Phonological Rules:

Formulating generative phonological rules to assimilation phonological processes requires (70) rules for analyzing (94) samples that are selected from the speech samples of the participants.

(1)t→b / ɪ __b

Rule one indicates that the voiceless denti-alveolar plosive obstruent /t/ assimilates fully to the voiced bilabial stop obstruent /b/ when preceded by it, e.g. / gɪlɪssɪbbɑydɑ/ for / gɪlɪssɪt bɑydɑ:ʔ/ "tell Miss Bayda`".

(2) t̪→b / ɪ __b

The voiceless denti- alveolar emphatic plosive obstruent / t̪/ changes completely to the voiced bilabial plosive obstruent /b/ that follows it, as in / tɪbbɑx ʔɑkɪl/ which serves as / tɪt̪bɑx ʔɑkɪl/ " she is cooking food".

(3) k → t/ t__u:

The voiceless velar plosive obstruent /k/ is assimilated progressively to the preceded voiceless denti-alveolar plosive obstruent /t/ before the long back vowel /u:/ as in / kɑttu:tw kɑtɑ:ti:t/ instead of / kɑtku:tw kɑtɑ:ki:t/ "a nestling and nestlings".

(4) q→s / s__u

A progressive assimilation is also elicited when the voiceless uvular plosive obstruent /q/ is affected by the preceding voiceless denti-alveolar fricative obstruent /s/ befor the short back vowel /u/, e.g. / kɑwssuzɑħ/ for / qɑws quzɑħ/ "a rainbow".

(5) f→ t/ ɪ__t

Rule 5 encompasses the influence of the voiceless denti-alveolar plosive obstruent /t/ on the voiceless labio-dental fricative obstruent /f/ after the short close-front vowel / ɪ/ as in / mɑtɑ:ti:ħ

nɪttɑħ bi:hɑ bɑ:b/ that is stated for / mɑfɑ:ti:ħ nɪftɑħ bi:hɑl bɑ:b/ " keys, we use them for opening the door".

(6) f→ t/ɑ __t

After the short open-central vowel /ɑ/, the voiceless labio-dental fricative obstruent /f/ also assimilates to the following voiceless denti-alveolar plosive obstruent /t/ in a word like /hɑ:dɑ dɑttɑw/ for /hɑ:ðɑ dɑftɑr/ "this is a copybook".

(7) f→s/ s__ ɑ

In this context, /f/ becomes identical to the preceding voiceless denti-alveolar fricative obstruent /s/ before the short open-central vowel / ɑ/ , e.g. /xɑndʒi:bɪssɪndʒɑ/ which functions as /xɑndʒi:bɪsfɑndʒɑ/ "let us fetch the sponge".

(8) ð→ b/ ɑ__b

This rule reads the assimilation of the voiced interdental fricative obstruent / ð/ into the voiced bilabial plosive obstruent /b/ regessivly, as in /qɑmi:ʃ whɑbbɑtɑyu:n/ for /qɑmi:s̩ whɑð bɑnṭɑru:n/ " a shirt, and these are trousers".

(9) ð→ ħ / ɑ:__ ħ

The voiced inter-dental fricative obstruent / ð / assimilates to the following voiceless pharyngeal fricative obstruent / ħ/, e.g. / mɑri:d̩ stɑħħɑssɑ:n/ which replaces /mɑri:d̩ stɑ:ð ħɑssɑ:n/ "Mr. Hassan is ill".

(10) s→t/ u__t

A regressive assimilation occurs when the voiceless denti-alveolar fricative obstruent /s/ becomes identical to the voiceless

denti-alveolar plosive obstruent /t/, as in /mɑyi:d muttɑʃfɑ/ that is is computed for /mɑri:d mustɑʃfɑ/ "he is ill, a hospital".

(11) ħ →m/ ɑ__m

Rule 11 points out that the voiceless pharyngeal fricative obstruent / ħ/ assimilates fully to the voiced bilabial nasal sonorant /m/ after the short open-central vowel / ɑ/, as in /nɔ:nɑ ʔɑmmɑl/ that stands for /lɔ:nɑ ʔɑħmɑr/ " it is red".

(12) ɛ→b/ ɪ __b

The voiced pharyngeal fricative obstruent / ɛ/ is assimilated to the following voiced bilabial plosive obstruent /b/ after the short close-front vowel / ɪ/ as in / mɑ:nɪbḅɪl ʃɑ:lɪʔ/ for / mɑ:nɪɛbur ʃɑ:rɪɛ/ " we never cross the street".

(13)) ɛ→d/ ɑ:__d

Here, the voiced pharyngeal fricative obstruent / ɛ/ is corresponded to the voiced denti-alveolar plosive obstruent /d/ after the long central vowel / ɑ:/, e.g./ bɑ:ddɑm hɑ:y/ as an alternative to / bɑ:ɛ dɑm hɑ:y/ "look out, this is blood".

(14) ɛ→ g/ g__ɪ

This rule discloses that the voiced pharyngeal fricative obstruent / ɛ/ is affected progressively by the adjacent voiced velar plosive obstruent /g/, e.g. /ʔɪggɪd bi:hɑ/ which denotes /ʔɪgɛɪd bi:hɑ/ " I sit in it".

(15)) ɛ→ dʒ/ ɑ__ dʒ

After the short open-central vowel / ɑ/, the voiced pharyngeal fricative obstruent / ɛ/ assimilates totally to the following voiced palato-alveolar affricate / dʒ/, e.g. /fɑrrɪtʃ ʔɑsnɑ:n mɑdʒdʒɔ:n/

which exemplifies /ʔafɑrrɪtʃ ʔɑsnɑ:ni mɑɛdʒɔ:n/ "I brush my teeth, teeth, a tooth paste".

(16) ɛ→ s/ s̩__ ɑ

/ɛ/ also assimilates fully to the preceding voiceless denti-alveolar emphatic plosive obstruent / s̩/ before the short open-central vowel / ɑ/ as in /ʔɑssɑd bi:hɑ/ which is computed for /ʔɑs̩ɛɑd bi:hɑ/ "I use it to get up".

(17) ɛ→ s/ s__ ɑ:

In this context, a progressive assimilation is formulated from the voiced pharyngeal fricative obstruent /ɛ/ to the voiceless denti-alveolar fricative obstruent /s/ as in /sɑyyɑ:wɑt ʔɪssɑ:f/ for / sɑyyɑ:rɑt ʔɪsɛɑ:f/ "an ambulance".

(18) h→b/b-- ɑ

The glottal fricative /h/ assimilates fully to the preceded voiced bilabial plosive obstruent /b/ before the short open-central vowel / ɑ/ as in /ħɪbbɑ sɑ:wɑ/ in place of /ʔɑħɪbhɑ sɑ:rɑ/ "I like Sarah".

(19) h→n/i:__n

A regressive assimilation is routed where the glottal fricative /h/ assimilates fully to the following voiced denti-alveolar nasal sonorant/n/, e.g./ xɑlli:nnɑ/ which refers to / xɑlli: hnɑ/ " put it here".

(20) n→b/ ɑ__b

The voiced denti-alveolar nasal sonorant /n/ assimilates to the voiced bilabial plosive obstruent /b/ after the short open-

central vowel / ɑ/ as in / lɪɛbɑbbɑnɑ:t/ which implies / ylɪɛbɑn bɑnɑ:t/ "girls are playing".

(21) n→t/ ɑ__t

Rule 21 reads the assimilation of the voiced denti-alveolar nasal sonorant /n/ to the voiceless denti-alveolar plosive obstruent /t/ which entails regressive assimilation after the short open-central vowel / ɑ / as in / mɪttɑ:ħ mɑkkɑttɔ:/ in lieu of / mɪftɑ:ħ mɑl kɑntɔ:r/ "a closet key".

(22) n→k/ ɑ__k

The voiced denti-alveolar nasal sonorant /n/ assimilates fully to the voiceless velar plosive obstruent /k/after the short open-central vowel / ɑ / as in / ṭi:nɪ bɑkkɑ/ for /nṭi:nɪ bɑnkɑ/ "give me a fan".

(23) n→g/ ɪ__g

This assimilation points out the influence of the voiced denti-alveolar nasal sonorant /n/ by the following voiced velar plosive obstruent /g/ after the short close-front vowel / ɪ/, e.g. /xtɑggɑt ʔɪddɪxɑ:n/ instead of /xtɪngɑt bɪddɪxɑ:n/ "she got suffocated by the smoke".

(24) n→q/ ee__q

In this rule, the voiced denti-alveolar nasal sonorant /n/ assimilates to the voiceless uvular plosive obstruent /q/ after the long half-close to half-open front vowel /ee/ as in / weeqqɪṭɑɛ/ for / weenɪl qɪṭɑɛ/ "where are the peaces?". This type of assimilation comes as a result of the elision of the short close-front vowel /ɪ/ and the voiced alveolar lateral sonorant /l/.

(25) n→f/ u__f

This sequence is about assimilating the voiced denti-alveolar nasal sonorant /n/ to the voiceless labio-dental fricative obstruent /f/ after the short close-back vowel /u/ as in / xɑlli: tuffɑx/ that is computed for / xɑlli: tunfɑx/ "get it blown".

(26) n→ʃ/ ee__ʃ

Again after the long half-close to half-open front vowel /ee/, the voiced denti-alveolar nasal sonorant /n/ assimilates to the following voiceless palato alveolar fricative obstruent / ʃ/ as in / nɑdʒdʒɑ:r mɪʃʃɑ:r/ in place of / nɑdʒdʒɑ:r mɪnʃɑ:r/ "a carpenter, a saw".

(27) n→r/r__ ɑ:

A progressive assimilation is observed due to the influence of the voiced denti-alveolar nasal sonorant /n/ by the preceded voiced alveolar flap sonorant /r/ before the long open-central vowel / ɑ:/, e.g. / fɪffɪʔɑxdɑr qɪrrɑ:bi:t̪/ in exchange to / fɪlfɪl ʔɑxdɑr, qɪrnɑ:bi:t̪/ "green pepper, cauliflower".

(28) r→b/ u__b

Here, the voiced alveolar flap sonorant /r/ is labialized with the following voiced bilabial plosive obstruent /b/ after the short close-back vowel /u/, e.g. /ħɑ:ʔ ħɑyi:b ʃubbɑħɑyi:b/ instead of /ħɑ:ð ħɑli:b yʃrub ħɑli:b/ "this is milk, he is drinking milk".

(29) r→b/ ɑ__b

The voiced alveolar flap sonorant /r/ assimilates to the voiced bilabial plosive obstruent /b/ after the short open-central vowel /ɑ/

as in / fusu:yʔɑbbɑʔɑ/ which refers to / fusˌu:l fusˌu:l ʔɑrbɑɛɑ/ "four seasons".

(30) r→b/ i:__b

It is also noted that the voiced alveolar flap sonorant /r/ assimilates fully to the following voiced bilabial plosive obstruent /b/ after the long close-front vowel /i:/ as in /ɛɑsi:bbuttuqɑ:lɑ/ for /ɛɑsi:r burtuqɑ:l/ "orange juice".

(31)r→d/ ɑ__d

Rule (31) implies the regressive assimilation of the voiced alveolar flap sonorant /r/ to the voiced denti-alveolar plosive obstruent /d/ as in / ħɑmwɑ wɑddɪyyɑ hɑ:d/ instead of / ħɑmrɑ wɑrdɪyyɑ hɑ:y/ "red, this is pink".

(32) r→ tˌ/ ɪ __ tˌ

This rule entails the of the voiced alveolar flap sonorant /r/ into the following voiceless denti-alveolar plosive obstruent /t/ ,that substitutes the voiceless denti-alveolar emphatic plosive obstruent for the sake of economy of effort, e.g. / sɑyyɑwɑtʃɪttɑ/ for / sɑyyɑ:rɑt ʃɪrtˌɑ/ "a police car".

(33) r→t/ u__t

After the short close-back vowel /u/, the voiced alveolar flap sonorant /r/ assimilates to the adjacent voiceless denti-alveolar plosive obstruent /t/ as in /kɪllɑ wɑddɪ buttuqɑ:lɪ/ that displaces /kɪllɑ wɑrdɪ burtuqɑ:lɪ/ "all of them are pinky and orange".

(34) r→k /ɪ__k

Rule (34) implies that /r/ assimilates to the following voiveless velar plosive obstruent /k/ after the short close-front

vowel / ɪ/ in a word like /ʔɪkkɪd mutɑy/ as an alternative to /tɪrkɪd bɪlmutˌɑr/ "she is running in the rain".

(35) r→q/ɑ__q

The /r/ is intracted to the following voiceless uvular plosive obstruent /q/ after the short open-central vowel / ɑ/, e.g. /wɑqqɑ qɑlɑm/ for /wɑrqɑ wqɑlɑm/ " paper and pen".

(36) r→f/ ɑ__f

In this context, the voiced alveolar flap sonorant /r/ assimilates to the voiceless labio-dental fricative obstruent /f/ after the short open-central vowel /ɑ/ as in /dʒi:bɑktɪb ħɑffɪttɑ:ʔ/ that serves as /dʒi:bɑktɪb ħɑrfɪttɑ:ʔ/ "let me write T letter".

(37) r→s/ ɔ:__s

A regressive assimilation is also entailed via the change shift of the voiced alveolar flap sonorant /r/ at the word-final position and after the long half-close to the half-open back vowel / ɔ:/ into the following voiceless denti-alveolar fricative obstruent /s/, e.g. / mɑ:tɔ:ssɪkɪ/ that refers to / mɑ:tˌɔ:r sɪkɪl/ "motor cycle".

(38) r→s/ ɑ__s

Another environment in which the voiced alveolar flap sonorant /r/ assimilates to the following voiceless denti-alveolar fricative obstruent /s/ is after the short open-central vowel /ɑ/ as in /ʔɑssɪm bi:hɑ qɑyɑm wɑyqɑ/ in replacement of /ʔɑrsɪm bi:hɑ qɑlɑmw wɑrqɑ/ "I draw by it, a pen and a paper".

(39)r→ʃ /ʃ__ɑ

Rule (39) reads that the voiced alveolar flap sonorant /r/ assimilates progressively to the preceding voiceless palato-alveolar fricative obstruent / ʃ/
before the following / ɑ/, e.g. / zɑhhu:r tɪʃʃɑb mɑ:y/ for / zɑhhu:r tɪʃrɑb mɑ:y/ "Zahu:r (a proper name) is drinking water".

(40) r→ʒ / ɑ __ʒ

It is also elicited that the voiced alveolar flap sonorant /r/ is influenced by the following voiced palato-alveolar fricative obstruent /ʒ/ that is performed instead of the voiced palato-alveolar affricate obstruent /dʒ/ as in /ʔɑɛɛɑb mɑʒʒu:ħɑ/ that replaces /ʔɑlɛɑb mɑrdʒu:ħɑ/ "I`m swinging by the swing".

(41)r→ħ/ ɑ:__ ħ

This rule reveals the regressive assimilation of /r/ to the voiceless pharyngeal fricative obstruent / ħ/ after the long open-central vowel /ɑ:/ in a context like /bɑ:ħħɑ xɪsˌsˌɑtnɪ ðɪbbɑ:nɑ/ instead of / lbɑ:rħɑ gɪrsˌɑtnɪ ðɪbbɑ:nɑ/ "a fly bit me yesterday".

(42)r→m/ɪ__m

Labial assimilation is noted in rule (42) where the voiced alveolar flap sonorant /r/ becomes identical to the following voiced nasal bilabial sonorant /m/, e.g. / ɛɑʃɪmmɑtɑ:ti:ħ/ in replacement with / ɛɑʃɪr mɑfɑ:ti:ħ/ "ten keys".

(43)r→n/ ɑ __n

The voiced alveolar flap sonorant /r/ becomes identical to the following voiced denti-alveolar nasal sonorant /n/ after the short open-central vowel / ɑ/, e.g. /ʔɑnnɑb lɪħsˌɑ:n/ that alternates /ʔɑrnɑb lɪħsˌɑ:n/ "a rabbit, the horse".

(44) l→b /ɪ__b

Labial assimilation of the voiced alveolar lateral sonorant /l/ to the following voiced bilabial plosive obstruent /b/ is observed after the short close-central vowel /ɪ/,e.g. /ʔɪsbɑħ ʔɪbbuħɑylɑ/ which depicts as / yɪsbɑħ bɪlbuħɑyrɑ/ "he is swimming in the lake".

(45)l→d/ ɪ__d

The voiced alveolar lateral sonorant /l/ becomes correspondent to the following voiceless denti-alveolar plosive obstruent /d/ after the short close-front vowel /ɪ/, e.g. /yɑ:kɪddɪʒɑ:ʒ/ that functions as /yɑ:kɪl dɪdʒɑ:dʒ/ "he is eating chicken".

(46)l→ t/ ɪ__t

The /l/ is dentalised into the following voiceless denti-alveolar plosive obstruent /t/ also after the short close-front vowel /ɪ/, e.g. / yɪɛbu:nɪttɔ:bɑ/ in lieu to / ylɪɛbu:n bɪl ṭɔ:bɑ/ "they are playing with the football".

(47) l→k/ ɑ :__k

Velar assimilation takes place when the voiced alveolar lateral sonorant /l/ matches the coming voiceless velar plosive obstruent /k/ after the short close-front vowel /ɪ/, e.g. / mɪttɑ:ħ mɑkkɑttɔ:/ that is stated for / mɪftɑ:ħ mɑlkɑntɔ:r/ "a closet key".

(48) l→ k/ ɪ__k

Here, the voiced alveolar lateral sonorant /l/ assimilates regressively to the voiceless velar plosive obstruent /k/ after the long open-central vowel / ɑ:/, e.g./ gɑ:d ʔɑqya ʔɑkkɪtɑ:b/ for /gɑ:ɛɪd tɪqra bɪlkɪtɑ:b/ "she is reading the book".

(49) l→g/ ɪ__g

Another context of velar assimilation is elicited by the change shift of the voiced alveolar lateral sonorant /l/ to the adjacent voiced velar plosive obstruent /g/after the short close-front vowel /ɪ/, e.g. / mɔ:ṭɑ bɪggɑ:ɛ bɑ:rɪd/ instead of / mɔ:ṭɑ bɪlgɑ:ɛ bɑ:rɪd/ " a cold ice-cream is on the ground".

(50)l→q /ɪ__q

This rule discloses that the voiced alveolar lateral sonorant /l/ assimilates to the following voiceless uvular plosive obstruent /q/ after the short close-front vowel /ɪ/, e.g. /ʔɪsɑ:fɪ ʔɑqqɑmɑy/ that acts as /ysɑ:fɪr lɪlqɑmɑr/ "he travels to the moon".

(51) l→ʔ/ ɪ__ʔ

In this context, the voiced alveolar lateral sonorant /l/ assimilates to the voiced glottal stop /ʔ/ after the short close-front vowel /ɪ/ as in /mɑ:ʔɑħɪbɪʔʔubwɑ/ that refers to / mɑ:ʔɑħɪbbɪl ʔubrɑ/ "I don`t like the injection".

(52) l→f/ ɪ__f

It is also observed that /l/ assimilates to the following voiceless labio- dental fricative obstruent /f/ after the short close-front vowel / ɪ/ as in / fɪffɪ ħɑ:y/ for / fɪlfɪl ħɑ:r/ "chili popper".

(53) l→x/ɪ__x

Rule 53 denotes the regressive assimilation of the voiced alveolar lateral sonorant /l/ to the voiceless uvular fricative obstruent /x/ after the short close-front vowel / ɪ/ as in / yɑ:kɪxxubɪz ħɑli:b/ which stands for/ yɑ:kɪl xubɪz ħɑli:b/ "he is eating bread and milk".

(54) l→ ɠ/ ɪ__ ɠ

It is also noticed in this rule that /l/ assimilates to the following voiced uvular fricative obstruent / ɠ/ when preceded by the short close-front vowel / ɪ/, e.g. /xɑlu:f bɪɠɠɑ:bɑ/ which incorporates / xɑru:f bɪlɠɑ:bɑ/ "a sheep is in the forest".

(55) l→ ħ/ ɪ __ ħ

The /l/ is also affected by the following voiceless pharyngeal fricative / ħ/ after the short close-front / ɪ/, e.g. / fɪtɑw ʔɑħħɑdi:qɑ/ in the place of / fɪtɪr bɪlħɑdi:qɑ/ " a mushroom is in the garden".

(56) l→ ɛ/ ɑ__ ɛ

In this rule, the voiced alveolar lateral sonorant /l/ is assimilated regressively to the following voiced pharyngeal fricative obstruent / ɛ/ after the short open-central vowel /ɑ/, e.g. /ʔɑɛɛɑb mɑʒʒu:ħɑ/ for /ʔɑlɛɑb mɑrdʒu:ħɑ/ " I`m swinging".

(57) l→ dʒ/ ɪ__ dʒ

Here it is found that the voiced alveolar lateral sonorant /l/ is corresponded to the following voiced palato-alveolar affricate / dʒ/ when preceded by / ɪ/, as in /ʔɑnnɑb yɑkɪdʒdʒɪzɑr/ that substitutes /ʔɑrnɑb yɑkɪl dʒɪzɑr/ "the rabbit is eating carrot".

(58) l→m/ ɪ__m

The voiced alveolar lateral sonorant /l/ is labialized into the voiced labial nasal sonorant /m/ after the short open-central vowel / ɪ/, e.g. /ʔunɑyyɑ ʔɪmmutɑy/ in exchange for / bnɑyyɑ bɪlmutɑr/ " a girl is in the water".

(59)l→n/ ɪ__n

Regressive nasal assimilation is noted where the voiced alveolar lateral sonorant /l/, after the short open-central vowel / ɪ/, becomes identical to the following voiced denti-alveolar nasal sonorant /n/, e.g. / hɑ:y wɑʃɑ:ʔɪnnɑqɪ/ that functions as / hɑ:y wɑsɑ:ʔɪl nɑqɪl/ "these are transportations".

(60) l→w/ ɪ__w

Finally, the voiced alveolar lateral sonorant /l/ assimilates to the voiced labio-velar approximant sonorant /w/ after the short open-central vowel / ɪ/, as in / ħɪwwɑ:t bɑzzu:nɑ:t/ for / ħɪlwɑ:t bɑzzu:nɑ:t/ "cats are sweet".

(61) y→b/ ɑ:__b

This rule is about the regressive assimilation of the voiced palatal approximant sonorant /y/, after the long open-central vowel / ɑ:/, where it is labialized side by side with the following voiced bilabial plosive obstruent /b/, as in / mɑ:bbɪggɑ:ɛ/ in lieu of / mɑ:y bɪlgɑ:ɛ/ "water is on the ground".

(62) y→t / ɑ:__t

It is also elicited that the voiced palatal approximant sonorant /y/ assimilates , after the long open-central vowel / ɑ:/, to the voiceless denti-alveolar plosive obstruent /t/, as in /hɑ:ttuffɑ:ħɑ/ instead of /hɑ:y tuffɑ:ħɑ/ " this is an apple".

(63) y→f/ ɑ:__f

The voiced palatal approximant sonorant /y/ homologizes the following voiceless labio-alveolar fricative obstruent /f/, after the long open-central vowel / ɑ:/, e.g. / hɑ:ffɑyyɑ:ʃɑ/ rather than / hɑ:y fɑrrɑ:ʃɑ/ "this is a butterfly".

(64) y→s / ɑ:__s

In this environment, the voiced palatal approximant sonorant /y/ assimilates to the adjacent voiceless denti-alveolar fricative obstruent /s/after the long open-central vowel / ɑ:/, e.g. / hɑssɑyyɑ:wɑ/ for / hɑ:y sɑyyɑ:rɑ/ "this is a car".

(65) y→ʃ / ɑ:__ ʃ

Again, after the long open-central vowel / ɑ:/, the voiced palatal approximant sonorant /y/ assimilates regressively to the voiceless palato-alveolar fricative obstruent / ʃ/ as in / hɑ:ʃʃɑ:y wʔɑʃkɑwi:tɑ/ in exchange for / hɑ:y tʃɑ:y wbɑskɑwi:tɑ/ "these are tea and biscuit".

(66) y→ dʒ/ ɑ:__ dʒ

A change shift from the voiced palatal approximant sonorant /y/ to the adjacent voiced palato-alveolar affricate obstruent / dʒ/ is noted after the long open-central vowel / ɑ:/ , e.g. / hɑ:dʒdʒɑyyɑ:dɑ/ instead of /hɑ:y dʒɑrrɑ:dɑ/ " this is a locust".

(67) y→m/ ɑ:__m

Labial assimilation takes place where the voiced palatal approximant sonorant /y/ is changed equally to the following voiced bilabial nasal sonorant /m/ after the long open-central vowel / ɑ:/,e.g./ hɑ:mmrɑ:yɑ/ which signifies / hɑ:y mrɑ:yɑ/ "this is a mirror".

(68)y→r/ ɑ:__r

Here, it is perceived that /y/ assimilates to the following voiced alveolar flap sonorant /r/, after the long open-central vowel / ɑ:/

as well, as in / hɑ:rrɑħlɑ xɑdrɑ/ instead of / hɑ:y rɑħlɑ xɑdˌrɑ/ "this "this is a green desk".

(69) y→w / ɑ:__w

As revealed in this rule, the voiced palatal approximant sonorant /y/ assimilates regressively, after the long open-central vowel /ɑ:/ , to the following voiced labio-velar approximant sonorant /w/, e.g. /hɑ:wwɑsˌxɑbbɑkkɑ/ for / hɑ:y wɑsˌxɑlbɑnkɑ/ "this fan is dirty".

(70) y→w/ ɑ__w

The final rule denotes that the voiced palatal approximant sonorant /y/ assimilates regressively to the voiced labio-velar approximant sonorant /w/ after the short open central vowel /ɑ/, e.g. /zɪrɪg ħɑwwɑ:nɑ:t/ that is stated for / ħɑywɑ:nɑ:t zɪrɪg / "blue animals".

7.2 Treatment of Assimilation Within the Optimality Theoretical Framework

This section reconsiders assimilation in the speech samples of the participants within the framework of OT in terms of some violable ranking constraints. The following tableaux exemplify OT analysis for representative samples in the corpus:

Tableau (1):The Progressive Assimilation of The Bilabial Plosive Obstruent /b/ into the Following Voiceless Denti-alveolar Fricative /s/ in The Optimal Output / bɪssɪ dʒɪbɪn/ from The Underlying / bɪbsɪ wdʒɪbɪn/ "pepsi and cheese".

/b/	*b	*Plosive	IDENT-manner
(a)b	*!	*	
☞ (b)s			*

*b>>*Plosive>>IDENT-manner

The first tableau in this section indicates the violation of the second candidate to the lowest-ranked faithfulness constraint IDENT-manner, where /b/ is affected by the following /s/. It is then the winning candidate. As the first candidate determines the high-ranked markedness constraint, it has not been considered.

Tableau (2):The Progressive Assimilation of The Voiceless Denti-alveolar Plosive Obstruent /t/ into the Following Voiceless Velar Plosive Obstruent /k/ in The Optimal Output / hɑ:d kɑkku:tɑ/ from The Underlying / hɑ:ð kɑtku:t/ "this is a nestling".

/t/	*t	*Plosive	IDENT-place
(a)t	*!	*	
☞ (b)k			*

*t>>*Plosive>>IDENT-place

It is observed here that Candidate (a) has not been accounted because it corresponds the highest-ranked markedness constraint where violation is fatal. The winning candidate is (b) since it violates the lowest-ranked faithfulness constraint IDENT-place where the optimal output is featured by [+Velar].

Tableau (3):The Regressive Assimilation of The Voiced Denti-alveolar Plosive Obstruent /d/ into the Preceding Voiced Denti-

alveolar Nasal Sonorant /n/ in The Optimal Output /ʔɪnnɪtʃ bɑkkɑ/ from The Underlying / ɛɪndɪtʃ bɑnkɑ/ "do you have a fan?".

/d/	*d	*Plosive	IDENT-manner
(a)d	*!	*	
☞ (b)n			*

*d>>*Plosive>>IDENT-manner

This tableau discloses that violation of candidate (a) is not possible because it implies the highest-ranked markedness constraints, so it is excluded from any consideration. As a result, the winning candidate is (b) due to its lowest-ranked faithfulness constraint violation where the optimal output is defined by the manner feature [+Nasal].

Tableau (4):The Progressive Assimilation of The Voiceless Labio-dental Fricative Obstruent /f/ into the Following Voiceless Denti-alveolar Plosive Obstuent /t/ in The Optimal Output / hɑ:dɑ dɑttɑw/ from The Underlying / hɑ:ðɑ dɑftɑr/ "This is a copybook".

/f/	*f	*Fricative	IDENT-manner
(a)f	*!	*	
☞ (b)t			*

*f>>*Fricative>>IDENT-manner

Candidate (a) is left because it attaches the highest-ranked markedness

constraints. Candidate (b) flouts the lowest-ranked faithfulness constraint IDENT-manner in which the optimal output is featured with [+Plosive].

Tableau (5):The Progressive Assimilation of The Voiced Inter-dental Fricative Obstruent / ð / into the Following Voiceless Pharyngeal Fricative Obstuent /ħ/ in The Optimal Output /wɪstɑ:ħħɑssɑ:n/ fromThe Underlying / wɪstɑ:ð ħɑssɑ:n/ "and Mr. Hassan".

/ ð/	* ð	*Fricative	IDENT-place
(a) ð	*!	*	
☞ (b) ħ		*!	*

* ð>>*Fricative>>IDENT-place

IDENT-place is the lowest-ranked faithfulness constraint that is violated by the second candidate which is considered the winning one according to the place feature [+pharyngeal] which identifies the optimal output. The first candidate is ruled out since it maintains the highest-ranked constraint where violation is not possible.

Tableau (6):The Progressive Assimilation of The Voiced Pharyngeal Fricative Obstruent / ɛ / into the Following Voiced Bilabial Plosive Obstuent /b/ in The Optimal Output / bɑ:bbɑṭnɑ tɔ:dʒɛɑ / from The Underlying / bɑ:ɛ bɑṭnɑ tɔ:dʒɛɑ / "see, he is suffering from his stomach".

/ ɛ/	* ɛ	*Fricative	IDENT-manner

(a) ɛ	*!	*	
☞(b)b			*

* ɛ>>*Fricative>>IDENT-manner

The faithfulness constraint that is associated to the labial assimilation in this tableau is IDENT-manner. It represents the lowest-ranked constraint to which candidate (b) violates. This candidate is thus considered the winning candidate where the optimal output is identified by the manner feature [+Plosive]. Candidate (a) is excluded because it reads the highest-ranked constraint.

Tableau (7):The Progressive Assimilation of The Voiced Denti-alveolar Nasal Sonorant / n / into the Following Voiceless Denti-alveolar emphatic Plosive Obstuent / t̪/ in The Optimal Output / hɑ:dʒdʒɪt̪t̪ɑ / from The Underlying / hɑ:y dʒɪnt̪ɑ / "This is a bag".

/n/	*n	*Nasal	IDENT-manner
(a)n	*!	*	
☞ (b) t̪			*

*n>>*Nasal>>IDENT-manner

According to this tableau, the first candidate is not regarded because it implements the highly-ranked markedness constraints. Candidate (b) on the other hand flouts the lowest-ranked

faithfulness constraint where assimilation occurs. It is thus considered the winning candidate.

Tableau (8):The Progressive Assimilation of The Alveolar Lateral Sonorant / l / into the Following Voiced Bilabial Nasal Sonorant / m/ in The Optimal Output / ʔɑkɪmmɔ:s / from The Underlying / ʔɑ:kɪɬ mɔ:z/ "I`m eating banana".

/l/	*l	*Lateral	IDENT-manner
(a)l	*!	*	
☞ (b)m			*

*l>>*Lateral.>IDENT-manner

Candidate (a) is eliminated because it represents the standard item which deflects the highest-ranked markedness constraint . Violation here is fatal then. The winning candidate is the second one since it violates the lowest-ranked faithfulness constraint IDENT-manner where the representative feature of the assimilated optimal output is [+Nasal].

Tableau (9):The Progressive Assimilation of The Alveolar flap Sonorant / r / into the Following Voiced Bilabial Plosive Obstruent / b/ in The Optimal Output / ʃubbɑ:yɑ hɑ:y / from The Underlying / tʃurbɑ:yɑ hɑ:y/ "this is a bed".

/r/	*r	*Flap	IDENT-manner
(a)r	*!	*	
☞ (b)b			*

*r>>*Flap>>IDENT-manner

The winning candidate in this tableau is (b) because it violates the

lowest-ranked faithfulness constraint IDENT-manner where assimilation takes place. As such, candidate (a) is taken off as it promotes the highest-ranked markedness constraints where there is no violation.

Tableau (10):The Progressive Assimilation of The Voiced Palatal Approximent Sonorant / y / into the Following Voiceless Labio-dental Obstruent / f/ in The Optimal Output / hɑ:ffɑrɑ:wlɑ / from The Underlying / hɑ:y fɑrɑ:wlɑ / "this is a strawberry".

/y/	*y	*Approximant	IDENT-manner
(a)y	*!	*	
☞ (b)f			*

*y>>*Approximant>> IDENT-manner

Due to the lowest-ranked faithfulness constraint (IDENT-manner) violation of candidate (b), it is regarded the winning candidate in this tableau. The first candidate is neglected because it exemplifies the highest –ranked markedness constraints.

8. Discussion : In the speech samples of the participants, it is observed that assimilation distortions, among other distortions, occurred 470 times, with a rating of 18.38% , as illustrated in the following table:

Table 2. The Frequency and Percentage of Each Phonological Process.

The process Category	Frequency	Percentage
Phonemic Substitution	1540	60.22%
Elision	547	21.39%
Assimilation	470	18.38%
Total	2557	100%

24

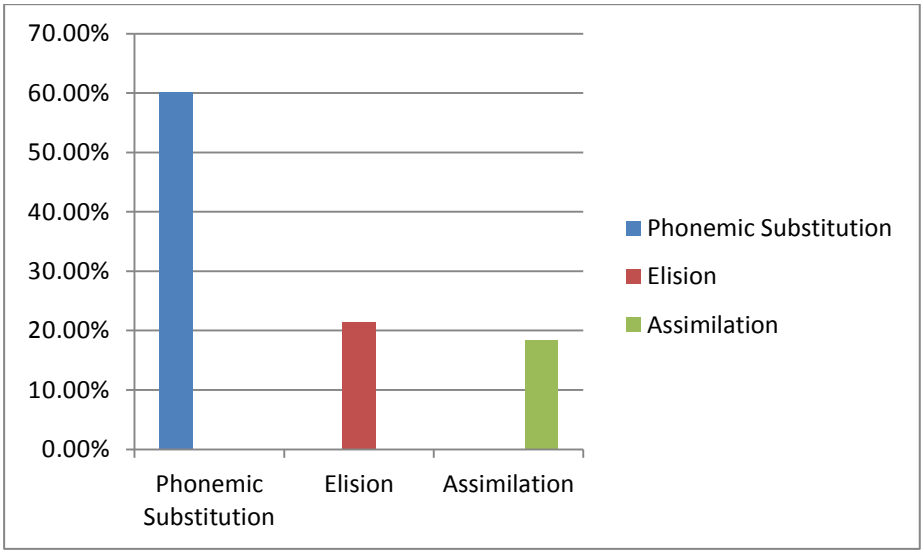


Figure 1. Bar Graph for the Frequency of the Subjects' Phonological Developmental Processes

According to the generative model, a table of 94 selected samples of assimilation disorders have been designed to show the formation of 70 generative phonological rules. Assimilation of /t, ṭ, k, q, f, ð, s, h / that are elicited in the corpus are mostly confined to

plosives, fricatives and affricates, either before or after the short close-front vowel /ɪ/ or the short open-central vowel /ɑ/. A single labial assimilation to a sonorant is noted when the voiceless pharyngeal fricative obstruent / ħ/ is changed into the voiced bilabial nasal sonorant /m/. It is also found that / ɛ/ is adhered to regressive and progressive assimilations to /b, d, g, dʒ, s, s/ when when associated either with an open-central or close-front vowels. The denti-alveolar nasal /n/ is observed as a consonant of any position that could assimilate regressively to any following plosive or fricative when associated with any of the following vowels: / ɪ, ɑ, ɑ, u, ee,/. The only progressive assimilation that is elicited for /n/ is to the alveolar flap /r/ when followed by the long open-central vowel / ɑ:/.

The voiced alveolar flap /r/, on the other hand, shows a regressive assimilation to a variety of obstruents when coming in juxtaposition to any of the vowels that are listed in IA phonemic inventory system. It is only in one
case that /r/ assimilates progressively, between the voiceless palato-alveolar fricative / ʃ/ and the short open-central vowel / ɑ/.

All kinds of regressive assimilation are noted with the alveolar lateral /l/ when preceded by / ɪ, ɑ, ɑ:/, while the alveolar flap /r/ always assimilates to the following segment when preceded by the long open-central vowel / ɑ:/. Assimilation, according to OT perspective, on the other hand, has been suspended to place and manner changes. That is, a competition is made between the

markedness constraints and IDENT–manner and IDENT–place faithfulness constraints, where the faithfulness constraints always dominate while resolved by the different constraint rankings.

Table 3. Frequency and Percentage of Faithfulness Constraints for Assimilation.

The Constraint	Frequency	Percentage
IDENT–manner	8	80%
IDENT–place	2	20%
Total	10	100%

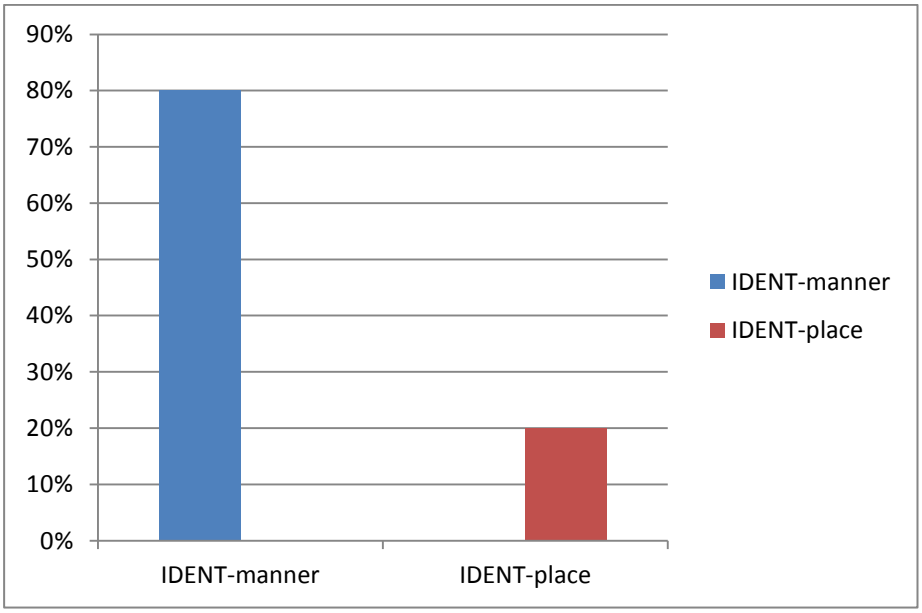


Figure 2. Bar Graph for the Percentage of the Faithfulness Constraints of Assimilation

Regressive and progressive assimilations are again distinctly captured via the utility of the optimality competing constraints analysis that is conducted.

9. Conclusions : Taking into account the generative analysis that is made to examine assimilation disorders in the speech samples of the participants, the following prominent findings emerge:

1- There is a distinct hyper assimilation (excessive unnecessary assimilations)
in the performance of the autistic subjects. It registers the frequency of 470
with the rating of 18.38% positing at the third level of the pronunciation
distortion profiling.

2- The phonological rules and the candidate screening scheme deployed to
capture the hyper assimilations prove high practicality to deal with this sort
of pronunciation disorder.

3- Contextual analysis to the related data has revealed that the autistic
assimilation takes place both regressively and progressively with a dominant rating to the regressive one.

4- Assimilations that are routed in the corpus are mostly confined to plosives,
fricatives and affricates in a variety of contexts.

5- The denti-alveolar nasal sonorant /n/ mostly assimilates regressively to the following plosives and fricatives. It is assimilated progressively in one context only, when it is preceded by the flap sonorant /r/.

6- The voiced alveolar flap sonorant /r/ shows a regressive assimilation to a

variety of obstruents (plosives and fricatives), and in few cases with the nasal sonorants /m/ and /n/. It registers one case of progressive assimilation when it follows the palate-alveolar fricative obstruent /ʃ/.

7- The alveolar lateral sonorant /l/ assimilates regressively mainly when

followed by plosives, fricatives, affricates, nasals, and rarely before the bilabial approximant sonorant /w/.

8- OT analysis unveils that the dominant faithfulness constraints that lie behind the surfacing of the assimilated optimal outputs are IDENT- manner and IDENT-place with a significant frequency to the former (80% vs. 20%).

10. Recommendations : In view of the findings of the current study, the following are some of the suggested recommendations:

1- The phonological rules that are formulated in this study could fit the speech

sample of the autistic under study due to the limitation of the respective population. It is preferred here to make a further generative research attempt for a further number of Iraqi autistic samples to create a set of rules that could be of a universal nature.

2- To enhance the behavioural and linguistic skills of the autistic, specialized drilling is quite necessary to be offered. This can be attained via designing well-constructed instruction programmes.

3- It is also beneficial to design a suitable speech therapy for the elicited phonological developmental processes including hyper assimilation. Due to the experience of the researchers in real life communication with the autistic, they are addicted to any kind of visual aids, that is why " minimal pairs" could be a good and effective technique for designing a specialized course of therapy.

11- Suggestions for Further Studies : The outcomes of this study are the product of utilizing two generative models, phonological rules and candidate screening scheme in the framework of OT. The corpus can be approached via other phonological models such as metrical phonology and harmonic phonology to support these findings. An acoustic study might be of immense value to identify the acoustic parameters that underlie the distortions of the autistic performance. Wave form charts, spectrograms that provide a visual representation of the acoustic features of the autistic speech could be helpful to attain this goal. Due to the rarity of the phonological studies that investigate the efficacy of gender variable in the autistic phonological disorders, a gender-based research work merits a serious thinking and much consideration.

References

Alduais, A. M. (2013). "Qur'anic Phonology and Generative Phonology: Formulating Generative Phonological Rules to Non-Syllabic Nuuns Rules". International Journal of Linguistics. Vol.5, No.1, pp. 33-61.

Al-Khalesi, Y. M. (2007). Modern Iraqi Arabic with MP3 Files: A Textbook. Washington D.C.: Georgetown University Press.

Alkhuli, A. M. (2002). English Phonetics and Phonology. Amman: Dar Al-Falah.

Bagha, K. N. (1991). "Generative Phonology". Islamic Azad University - Astara Branch.: Available at: http://jurnal.org. Retreived on: 11/9/2016.

Chomsky, N. and Halle, M. (1968). The Sound Pattern of English. New York: Harper and

Row, Publishers.

Clark, J. and Yallop, C. (1995). An Introduction to Phonetics and Phonology. (3rd. ed.).

Oxford: Blackwell Publishing.

Cleland, J. et al (2010). Phonetic And Phonological Errors in Children with High Functioning Autism and Asperger Syndrome. Edinburgh: Queen Margaret University.

Corbett, B. A., et al. (2009). "Examining Executive Functioning in Children with Autism Spectrum Disorder, Attention Deficit Hyperactivity Disorder and Typical Development". Available at: http://www.ncbi.nlm.nih.gov. Retrieved on:13/2/2016.

Croft, C. (2015). Enviromental Hazards and Neurodevelopment: Where Ecology and Well- Being connect. New Jersey: Apple Academic Press.

Crystal, D. (2003). A Dictionary of Linguistics and Phonetics. London: Blackwell Publishing Inc.

Cummings, L. (2008). Clinical Linguistics. Edinburgh: Edinburgh University Press.

Donegan, P., and Stamp, D. (2009). "Hypothesis of Natural Phonology". Pozna Studies in Contemporary Linguistics: School of English, Adam Mickiewicz University.

Doyle, K. (2014). "Children on the Autistic Spectrum Flourish Through Gardening Programmes". Available at: http://newsdocvoices.com. Retreived on: 29/1/2016.

Feldscher, K. (2014). "Toxic Chemicals Linked to Brain Disorders in Children". Available at: http://news.harvard.edu. Retrieved on: 30/1/2016.

Feinstein, A. (2010). A History of Autism: Conversations with the Pioneers. London: John Wiley and Sons, Ltd.

Feit, D. (2007). The Parent`s Guide to Speech and Language Problems. NewYork: McGraw-Hill Companies.

Frawley, W. (2003). The International Encyclopedia of Linguistics. London: Oxford University Press.

George, L., & Sulekha, S. (2013). "Awareness about Autism among Parents". International Journal of Science and Research (IJSR). Available at: www.ijsr.net. Retreived on: 15/12/2015.

Gerdts, J., and Bernie, R. (2010). Autism Spectrum Disorder. Santa Barbara: Library of Congress.

Ghalib, B. M. (1984). An Experimental Study of Consonant Gemination in Iraqi Colloquial Arabic. Unpublished Ph.D. The University of Leeds.

Glenn, J. (2014). "Children with Autism Have Elevated Levels of Steroid Hormones in The Womb". available at: https://www.cam.ac.uk. Retrieved on: 11/4/2016.

Gorden-Brannan, M. E. and Weiss, C. E. (2007). Clinical Management of Articulatory and Phonologic Disorders (3rd ed). Baltimore: Lippincott Williams and Wilkins.

Gordon, S. (2008). "Muscle Weakness Found in Some Autistic Children". Available at: http://consumer.healthday.com. Retreived on: 30/1/2016.

Gretz, S. (2000). "Speech Production and Children with Autism". Available at: http://www.apraxia-kids.org. Retreived on: 3/2/2016.

Hale, C. M., and Tager-Flusberg, H. (2006). "The Influence of Language on Theory of Mind: A Training Study". Available at: http://www.ncbi.nlm.nih.gov. Retreived on: 5/3/2016.

Hill, E. L. (2006). "Evaluating the Theory of Executive Dysfunction in Autism". Goldsmiths Research Online.

Hollander, E. (2003). Autism Spectrum Disorder. NewYork: Marcel Dekker Inc.

Jarrold, C. et al. (2000). "Linking Theory of Mind And Central Coherence Bias in Autism And General Population". The American Psychological Association.

Kager, R. (1999). Optimality Theory. Cambridge: Cambridge University Press.

Kellogg, R. T., and Pisacreta, R. (2004). Graduate Record Examination: Psychology Test. New Jersey: Research and Education Association Inc.

Matson, J. L. (2014). Autism and Child Psychopathology Series. NewYork: Springer International Publishing Switzerland.

McCarthy, J. (2007). "What is Optimality Theory?". University of Massachusetts - Amherst: Linguistics Department Faculty Publication Series.

Mesibov, G. (2002). Autism Spectrum Disorders Library. NewYork: Kluwer Academic Publishers.

Mesibov, G. et al. (2002). Understanding Aspergers Syndrom and High-Functioning Autism. NewYork: Kluwer Academic Publishers.

Nathan, G. S. (2008). Phonology: A Cognitive Grammar Introduction. Amsterdam: John Benjamins B.V.

Nguyen, M. A. (2002). "Autism and Language Disorders" . Available at: https://www.hawaii.edu. Retrieved on: 1/5/2016.

Prince, A. and Smolensky, P. (2004). Optimality Theory. Oxford: Blackwell Publishing Ltd.

Roach, P. (2009). English Phonetics and Phonology. (4th ed). Cambridge: Cambridge University Press.

Silva, R. (2015). "What Is Autism?". Available at : https://yourahi.org. Retrieved on: 29/1/2016.

Terra, C. (2009). Asperger Syndrome and Central Coherence Theory . Available at: http://www.aspiestrategy.com. Retreived on: 12/3/2016.

Yava, M. (2011). Applied English Phonology .(2nd ed). Oxford: A John Wiley and Sons Ltd. Publishing.

Zafarani, Z. and Shokouhian, M. (2009). An Introductory Course in English Phonology: Theory to Practice. (2nd ed). Tahran: Rahnama Press.

Zuraw, K. (n.d.). Optimality Theory in Linguistics. University of Southern California: Department of Linguistics.

APPENDIX (1) : TABLES OF THE SELECTED SAMPLES

Table 4. Samples for Generative Phonological Rules Analysis.

	The Assimilated Segment	The Resulted Sugment	The Original Form	Meaning	The Adapted Form	The Context		
						The preceded Segment	The Following Segment	Consonant Major Class
1	/t/	/b/	/gɪlɪssɪt bɑydɑ:ʔ/	Tell Miss Bayda`	/gɪlɪssɪbbɑydɑ/	/ɪ/	/b/##	Sonorant–obstruent
2	/ t/	/b/	/tɪṭbɑx ʔɑkɪl/	She is cooking food	/tɪbbɑx ʔɑkɪl/	/ɪ/	/b/	Sonorant–obstruent
3	/k/	/t/	/kɑtku:tw kɑtɑ:ki:t/	A nestling and nestlings	/kɑttu:tw kɑtɑ:ti:t/	/t/	/u:/	Obstruent–Sonorant
4	/q/	/s/	/qɑws quzɑħ/	A rain bow	/kɑwssuzɑħ/	/s/	/u/##	Obstruent–Sonorant
5	/f/	/t/	/mɑfɑ:ti:ħ nɪftɑħ bi:hɑ bɑ:b/	Keys, we use them for opening the door	/mɑtɑ:ti:ħ nɪttɑħ bi:hɑ bɑ:b/	/ɪ/	/t/	Sonorant–obstruent
6	/f/	/t/	/hɑ:ðɑ dɑftɑr/	This is a copybook	/hɑ:dɑ dɑttɑw/	/ɑ/	/t/	Sonorant–obstruent
7	/f/	/s/	/xɑndʒi:bɪsfɑ ndʒɑ/	Let us fetch the sponge	/xɑndʒi:bɪssɪn dʒɑ/	/s/	/ɑ/	Obstruent–Sonorant
8	/ ð/	/b/	/qɑmi:s̩ whɑð bɑnṭɑru:n/	A shirt, and these are trousers	/qɑmi:ʃ whɑbbɑtɑyu:n/	/ɑ/	/b/##	Sonorant–obstruent
9	/ ð/	/ħ/	/mɑri:d̩ stɑ:ð ħɑssɑ:n/	Mr. Hassan is ill	/mɑri:d̩ stɑhhɑssɑ:n/	/ɑ:/	/ħ/##	Sonorant–obstruent
10	/s/	/t/	/mɑri:d̩ mustɑʃfɑ/	He is ill, a hospital.	/mɑyi:d muttɑʃfɑ/	/u/	/t/	Sonorant–obstruent
11	/ ħ/	/m/	/lɔ:nɑ ʔɑħmɑr/	It is red	/nɔ:nɑ ʔɑmmɑl/	/ɑ/	/m/	Sonorant–Sonorant
12	/ ɛ/	/b/	/mɑ:nɪɛbur ʃɑ:rɪɛ/	We never pass the street	/mɑ:nɪbbɪl ʃɑ:lɪʔ/	/ɪ/	/b/	Sonorant–obstruent
13	/ ɛ/	/d/	/bɑ:ɛ dɑm hɑ:y/	Look out, this is blood.	/bɑ:ddɑm hɑ:y/	/ɑ:/	/d/##	Sonorant–obstruent

32

14	/ ɛ/	/g/	/ʔɪgɛɪd bi:ha/	I sit in it	/ʔɪggɪd bi:ha/	/g/	/ɪ/	Obstruent-Sonorant
15	/ ɛ/	/dʒ/	/farrɪtʃ ʔasna:n maɛdʒɔ:n/	I brush my teeth, a tooth paste	/farrɪtʃ ʔasna:n madʒdʒɔ:n/	/a/	/dʒ/	Sonorant-obstruent
16	/ ɛ/	/s/	/ʔaṣɛad bi:ha/	I use it to get up	/ʔassad bi:ha/	/ṣ/	/a/	Obstruent-Sonorant
17	/ ɛ/	/s/	/sayya:rat ʔɪsɛa:f/	An ambulance	/sayya:wat ʔɪssa:f/	/s/	/a:/	Obstruent-Sonorant
18	/ ɛ/	/s/	/yɪṣɛad darra:dʒa/	He is getting into the motorcycle.	/yɪṣṣad dalla:dʒa/	/ṣ/	/a/	Obstruent-Sonorant
19	/h/	/b/	/ʔaħɪbha sa:ra/	I like Sarah	/ħɪbba sa:wa/	/b/	/a/	Obstruent-Sonorant
20	/h/	/n/	/xalli:hna/	Put it here	/xalli:nna/	/i:/	/n/##	Sonorant-Sonorant
21	/n/	/b/	/ylɪɛban bana:t/	The girls are playing	/lɪɛbabbana:t/	/a/	/b/##	Sonorant-obstruent
22	/n/	/t/	/mɪfta:ħ mal kantɔ:r/	A closet key.	/mɪtta:ħ makkattɔ:/	/a/	/t/	Sonorant-obstruent
23	/n/	/t/	/maftaħ kantɔ:r/	A closet key.	/mattaħ kattɔ:l/	/a/	/t/	Sonorant-obstruent
24	/n/	/k/	/nṭi:nɪ banka/	Give me a fan.	/ṭi:nɪ bakka/	/a/	/k/	Sonorant-obstruent
25	/n/	/g/	/xtɪngat bɪddɪxa:n/	she got suffocated by the smoke	/xtaggat ʔɪddɪxa:n/	/ɪ/	/g/	Sonorant-obstruent
26	/n/	/q/	/Ween qɪṭaɛ/	Where are the pieces.	/weeqqɪṭaɛ/	/ee/	/q/##	Sonorant-obstruent
27	/n/	/f/	/xalli: tunfax/	Get it blown.	/xalli: tuffax/	/u/	/f/	Sonorant-obstruent
28	/n/	/ʃ/	/ʃa:law ween ʃa:law/	They shifted into another house, wher di they shifted to?!	/ʃa:law weeʃʃa:law/	/ee/	/ʃ/##	Sonorant-obstruent
29	/n/	/ʃ/	/nadʒdʒa:r mɪnʃa:r/	A carpenter, a saw.	/nadʒdʒa:r mɪʃʃa:r/	/ɪ/	/ʃ/	Sonorant-obstruent
30	/n/	/r/	/fɪlfɪl ʔaxḍar qɪrna:bi:ṭ/	A green popper, cauliflower	/fɪffɪʔaxdar qɪrra:bi:ṭ/	/r/	/a:/	Sonorant-Obstruent

33

31	/r/	/b/	/ħa:ʔ ħali:b yʃurbal ħali:b/	This is milk, he is drinking milk	/ħa:ʔ ħayi:b ʃubbaħayi:b/	/u/	/b/	Sonorant–obstruent
32	/r/	/b/	/fusu:l ʔarbaɛa/	Four seasons	/fusu:yʔabbaʔa/	/a/	/b/	Sonorant–obstruent

33	/r/	/b/	/ɛɑsi:r burtuqɑ:lɑ/	An orange juice	/ɛɑsi:bbuttuqɑ :lɑ/	/i:/	## /b/	Sonorant–obstruent
34	/r/	/b/	/ʔɑðurbɑ bɪlmusɑddɑs/	I shoot him by the pistol.	/ʔɑðubbɑ bɪmmudɑddɑs /	/u/	/b/	Sonorant–obstruent
35	/r/	/d/	/ħɑmrɑ wɑrdyyɑ hɑ:y/	red, this is pink	/ħɑmwɑ wɑddyyɑ hɑ:d/	/ɑ/	/d/	Sonorant–obstruent
36	/r/	/t/	/sɑyyɑ:rɑt ʃɪrṭɑ/	A police car.	/sɑyyɑwɑtʃɪttɑ /	/ɪ/	/ t/	Sonorant–obstruent
37	/r/	/t/	/kɪllɑ wɑrdɪ burtuqɑ:lɪ/	They are pink, orange.	/kɪllɑ wɑddɪ buttuqɑ:lɪ/	/u/	/t/	Sonorant–obstruent
38	/r/	/t/	/qɑlɑm burtuqɑ:lɪ/	An orange pencil.	/qɑlɑm bɪttuqɑ:lɪ/	/u/	/t/	Sonorant–obstruent
39	/r/	/k/	/tɪrkɪḍ bɪlmutɑr/	She is running in the rain.	/ʔɪkkɪd mutɑy/	/ɪ/	/k/	Sonorant–obstruent
40	/r/	/k/	/yɪrkɑb bɑ:ysɪkɪl/	He is riding a bicycle.	/yɪkkɑbbɑ:ysɪk ɪl/	/ɪ/	/k/	Sonorant–obstruent
41	/r/	/q/	/wɑrqɑ qɑlɑm/	A paper and a pen.	/wɑqqɑ qɑlɑm/	/ɑ/	/q/	Sonorant–obstruent
42	/r/	/f/	/dʒi:bɑktɪb ħɑrfɪttɑ:ʔ/	Let me write the T letter.	/dʒi:bɑktɪb ħɑffɪttɑ:ʔ/	/ɑ/	## /f/	Sonorant–obstruent
43	/r/	/s/	/mɑ:tɔ:r sɪkɪl/	A motor cycle.	/mɑ:tɔ:ssɪkɪ/	/ ɔ:/	/s/	Sonorant–obstruent
44	/r/	/s/	/ʔɑrsɪm bi:hɑ qɑlɑm wɑyqɑ/	I draw by it, a pen and a paper	/ʔɑssɪm bi:hɑ qɑyɑm wɑyqɑ/	/ɑ/	/s/	Sonorant–obstruent
45	/r/	/ʃ/	zɑhhu:r tɪʃrɑb mɑ:y	Zahoor(a proper name) is drinking water.	zɑhhu:r tɪʃʃɑb mɑ:y	/ʃ/	/ɑ/	Obstruent –Sonorant
46	/r/	/ʒ/	ʔɑlɛɑb mɑrdʒu:hɑ	I`m swinging	ʔɑɛɛɑb mɑʒʒu:hɑ	/ɑ/	/ʒ/	Sonorant–obstruent
47	/r/	/ħ/	bɑ:rhɑ gɪrsɑtnɪ ðɪbbɑ:nɑ	a fly bite me yesterday	bɑ:ħhɑ xɪssɑtnɪ ðɪbbɑ:nɑ	/ɑ:/	/ħ/	Sonorant–obstruent

48	/r/	/m/	ɛaʃɪr mafa:ti:ħ	Ten keys.	ɛaʃɪmmata:ti:ħ	/ɪ/	/m/#	Sonorant - obstruent
49	/r/	/n/	ʔarnab lɪħṣa:n	A rabbit, a horse.	ʔannab lɪħṣa:n	/a/	/n/	Sonorant - obstruent
50	/r/	/n/	ʔarnab ya:kɪl ɛarnu:ṣ	A rabbit is eating corn.	ʔarnab ya:kɪl ɛannu:ṣ	/a/	/n/	Sonorant - obstruent
51	/l/	B	yɪsbaħ bɪlbuħayra	He is swimming in the lake.	ʔɪsbaħ ʔɪbbuħayla	/ɪ/	/b/##	Sonorant - obstruent
52	/l/	B	xa:ʃu:ga ʔa:kɪl bi:ha	A spoon, I use it for eating.	ʔa:ʃu:ga ʔa:kɪbbi:ha	/ɪ/	/b/##	Sonorant - obstruent
53	/l/	B	ba:ysɪkɪl ʔalɛab ba:ysɪkɪl ʔɪlbeet	A bicycle, I play bicycle at home.	ba:ysɪkɪ ʔɪlʔabba:ysɪ kɪ ʔɪbbeet	/ɪ/	/b/##	Sonorant - obstruent
54	/l/	B	ʃu:fɪlbazu:n a ħɪlwa	Look at the cate, it is sweet.	ʃu:fɪbbazu:na ħaywa	/ɪ/	/b/##	Sonorant - obstruent
55	/l/	B	ba:ba yɪlbas hdu:ma	My father is wearing his clothes.	ba:ba yɪbbas du:ma	/ɪ/	/b/	Sonorant - obstruent
56	/l/	D	ya:kɪl dɪdʒa:dʒ	He is eating chicken.	ya:kɪddɪʒa:ʒ	/ɪ/	/d/##	Sonorant - obstruent
57	/l/	T	ylɪɛbu:n bɪl ṭɔ:ba	They are playing football.	yɪɛbu:nɪttɔ:ba	/ɪ/	/t/##	Sonorant - obstruent
58	/l/	/k/	mɪfta:ħ malkantɔ:r	A closet key.	mɪtta:ħ makkattɔ:	/a:/	/k/##	Sonorant - obstruent
59	/l/	/k/	ga:ɛɪd tɪqra bɪlkɪta:b	She is reading the book.	ga:d ʔaqya ʔakkɪta:b	/ɪ/	/k/##	Sonorant - obstruent
60	/l/	G	mɔ:ṭa bɪlga:ɛ ba:rɪd	A cold ice-cream is on the ground.	mɔ:ṭa bɪgga:ɛ ba:rɪd	/ɪ/	/g/##	Sonorant - obstruent
61	/l/	Q	ysa:fɪr lɪlqamar	He travels to the moon.	ʔɪsa:fɪ ʔaqqamay	/ɪ/	/q/##	Sonorant - obstruent
62	/l/	Q	ṭalqa ʔasawwi:lak musaddas	A bullet, would I make a pistol for you? (by modelling clay).	ṭaqqa sawwi:lak mudaddas	/ɪ/	/q/##	Sonorant - obstruent
63	/l/	ʔ	ma:ʔaħɪbɪl ʔubra	I don`t like the injection.	ma:ʔaħɪbɪʔʔ ubwa	/ɪ/	/ʔ/##	Sonorant - obstruent

64	/l/	ʔ	maɛdʒɔ:nɪl ʔasna:n	Toothpaste .	maʒɔ:nɪʔʔa ʃna:n	/ɪ/	/ʔ/##	Sonorant- obstruent
65	/l/	ʔ	ʔaqla:mɪl ʔalwa:n	Colour pencils	ʔaqya:mɪʔʔ aywa:n	/ɪ/	/ʔ/##	Sonorant- obstruent

66	/l/	F	ṣaːruːx kawkabɪl faḍaːʔ	A spaceship, a planet.	saːwuːx kawkabɪffa daː	/ɪ/	/f/##	Sonorant-obstruent
67	/l/	F	fɪlfɪl ħaːr	A chilli popper.	fɪffɪ ħaːy	/ɪ/	/f/	Sonorant-obstruent
68	/l/	F	ṣuːratɪl fawaːkɪh	A fruit photo.	suːyatɪffaw aːkɪ	/ɪ/	/f/##	Sonorant-obstruent
69	/l/	X	yaːkɪl xubɪz ħaliːb	He is eating bread and milk.	yaːkɪxxubɪz ħaliːb	/ɪ/	/x/##	Sonorant-obstruent
70	/l/	ġ	xaruːf bɪlġaːba	A sheep is in the forest.	xaluːf bɪġġaːba	/ɪ/	/ ġ/	Sonorant-obstruent
71	/l/	ħ	ɛalʔaʃdʒaːr bɪlħadiːqa	On the trees, in the garden.	ʔaʔaʒaw ʔaħħadiːqa	/ɪ/	/ ħ/	Sonorant-obstruent
72	/l/	ħ	fɪtɪr bɪlħadiːqa	A mushroom is in the garden.	fɪtaw ʔaħħadiːqa	/ɪ/	/ ħ/	Sonorant-obstruent
73	/l/	ɛ	ʔalɛab mardʒuːħa	I`m swinging.	ʔaɛɛab maʒʒuːħa	/a/	/ ɛ/	Sonorant-obstruent
74	/l/	dʒ	/ʔarnab yakɪl dʒɪzar/	A rabbit is eating carrot.	/ʔannab yakɪdʒdʒɪzar/	/ɪ/	/dʒ/	Sonorant-obstruent
75	/l/	M	bnayya bɪlmuṭar	A girl is in the rain.	ʔunayya ʔɪmmutay	/ɪ/	/m/	Sonorant-Sonorant
76	/l/	M	ʔalɛab bɪlmardʒuːħa	I`m swinging by the swing.	ʔayɛab bɪmmayʒuːħa	/ɪ/	/m/	Sonorant-Sonorant
77	/l/	/m/	ṣubɪlmaːy glaːs	Pour the water in the glass.	ʃubɪṃmaːy ʔaqyaːs	/ɪ/	/m/	Sonorant-Sonorant
78	/l/	/n/	haːy wasaːʔɪl naqɪl	These are transportation.	haːy waʃaːʔɪnnaqɪ	/ɪ/	/n/	Sonorant-Sonorant
79	/l/	/w/	haːy sallat ʔalwaːn	This is a colours basket.	hassallat nawwaːn	/a/	/w/	Sonorant-Sonorant
80	/l/	/w/	ħɪlwaːt bazzuːnat	Cats are sweet.	ħɪwwaːt bazzuːnat	/ɪ/	/w/	Sonorant-Sonorant
81	/y/	/b/	maːy bɪlgaːɛ	Water is on the ground.	maːbbɪggaːɛ	/ aː/	/b/	Sonorant-Obstruent

82	/y/	/t/	hɑ:y tɪlɛɑb tˌɑllɪɛ hɑ:y	This girl is playing, she get this out.	hɑttɪlɛɑb tˌɑllɪɛ hɑ:y	/ɑ:/	/t/	Sonorant– Obstruent
83	/y/	/t/	hɑ:y tuffɑ:hɑ	This is an apple.	hɑ:ttuffɑ:hɑ	/ɑ:/	/t/	Sonorant – Obstruent
84	/y/	/f/	hɑ:y fɑrrɑ:ʃɑ	This is a butterfly.	hɑ:ffɑyyɑ:ʃɑ	/ɑ:/	/f/	Sonorant – Obstruent
85	/y/	/ s/	hɑ:y sˌɑbbu:rɑ	This is a whiteboard.	hɑssɑbbu:yɑ	/ɑ:/	/ sˌ/	Sonorant – Obstruent
86	/y/	/s/	hɑ:y sɑyyɑ:rɑ	This is a car	hɑssɑyyɑ:wɑ	/ɑ:/	/s/	Sonorant – Obstruent
87	/y/	/s/	hɑ:y sɪbħɑ	These are prayer beads.	hɑssɪbħɑ	/ɑ:/	/s/	Sonorant – Obstruent
88	/y/	/ʃ/	hɑ:y ʃɑ:y wbɑskɑwi:tɑ	These are tea and biscuit.	hɑ:ʃʃɑ:y wʔɑʃkɑwi:tɑ	/ɑ:/	/ʃ/	Sonorant – Obstruent
89	/y/	/dʒ/	hɑ:y dʒɑrrɑ:dɑ	This is a locust.	hɑ:dʒdʒɑyyɑ:dɑ	/ɑ:/	/dʒ/	Sonorant – Obstruent
90	/y/	/m/	hɑ:y mˌɑgˊsɑlɑ	This is a sink.	hɑmˌmˌɑgˊsɑlɑ	/ɑ:/	/m/	Sonorant – Sonorant
91	/y/	/m/	hɑ:y mrɑ:yɑ	This is a mirror.	hɑ:mmrɑ:yɑ	/ɑ:/	/m/	Sonorant – Sonorant
92	/y/	/r/	hɑ:y rɑħlɑ xɑdˌrɑ	This is a grean desk	hɑ:rrɑħlɑ xɑdrɑ	/ɑ:/	/r/	Sonorant –

								Sonorant
93	/y/	/w/	hɑ:y wɑsˤɑlbɑnkɑ	This fan is dirty.	hɑ:wwɑsˤɑb bɑkkɑ	/ɑ:/	/w/	Sonorant – Sonorant
94	/y/	/w/	zɪrɪg ħɑywɑ:nɑ:t	Blue animals.	zɪrɪg ħɑwwɑ:nɑ:t	/ɑ/	/w/	Sonorant – Sonorant

37

Table 5. Samples for OT Analysis.

	The Assimilated Segment	The Resulted Segment	The Original Form	Meaning in English	The Adapted Foorm	The Context		
						The Preceding Segment	The Following Segment	Consonant Major Class
1	/ b /	/ s /	/ bɪbsɪ wdʒɪbɪn	pepsi and cheese	bɪssɪ dʒɪbɪn	/ ɪ /	/ s /	Sonorant-Obstruent
2	/ t /	/ k /	hɑ:ð kɑtku:t	this is a nestling	hɑ:d kɑkku:tɑ	/ ɑ /	/ k /	Sonorant-Obstruent
3	/ d /	/ n /	ɛɪndɪtʃ bɑnkɑ	do you have a fan	ʔɪnnɪtʃ bɑkkɑ	/ n /	/ ɪ /	Sonorant-Sonorant
4	/ f /	/ t /	hɑ:ðɑ dɑftɑr	This is a copybook	hɑ:dɑ dɑttɑw	/ ɑ /	/ t /	Sonorant-Obstruent
5	/ ð /	/ ħ /	wɪstɑ:ð ħɑssɑ:n	and Mr. Hassan	wɪstɑ:ħħɑssɑ:n	/ ɑ : /	/ ħ /	Sonorant-Obstruent
6	/ ɛ /	/ b /	bɑ:ɛ bɑtˤnɑ tɔ:dʒɛɑ	see, he is suffering from his stomach	bɑ:bbɑtˤnɑ tɔ:dʒɛɑ	/ ɑ : /	/ b /	Sonorant-Obstruent
7	/ l /	/ m /	ʔɑ:kɪł mɔ:	I'm eating banana	ʔɑkɪmmɔ:s	/ ɪ /	/ m /	Sonorant-Sonorant
8	/ r /	/ b /	tʃurbɑ:yɑ hɑ:y	this is a bed	ʃubbɑ:yɑ hɑ:y	/ u /	/ b /	Sonorant-Obstruent
9	/ y /	/ f /	/ hɑ:y fɑrɑ:wlɑ	this is a strawberry	hɑ:ffɑrɑ:wlɑ	/ ɑ : /	/ f /	Sonorant-Obstruent
10	/ y /	/ d ʒ /	hɑ:y dʒɪntˤɑ	This is a bag	hɑ:dʒdʒɪttˤɑ	/ ɑ : /	/ d ʒ /	Sonorant-Obstruent

المُستَخلَص

يُعنى هذا البحث بتَقَصي الإعتلالات المَعنية بحالات الإدغام المتحذلق لدى ثمانٍ من الأطفال المُشَخصة إصابتُهم باضطراباتِ طيف التوحُدِ للفئةِ ما دونِ سِنِ المَدرسة في العراق. تهدفُ الدراسة اولاً الى الخوضِ في مجال التوحُّدِ في العراق والذي تعدُ الدراساتُ بشأنهِ قليلة ، إضافةً الى رصدِ اعتلالات الإدغام المُلاحظ وجودها في النماذج اللغوية للعينات المُشاركة في الدراسة من خلال نموذجين تحليليين. يعود النموذج الأول الى القواعد الفونولوجية التوليدية لكلارك، يلوب (١٩٩٥) والذي كانت المحاولةُ من خلاله لمطابقة تلك القواعد على العينات الصوتية لأطفال التوحد. كما وقد تم التحليلُ وفق نموذج نظرية التماثل بغية ابداء قيود محددة يمكن من خلالها تقديم صورة فونولوجية موحدة. ومن خلال هذه الدراسة تم التوصل الى كون حالة الإدغام لدى الأطفال التوحديين مُعتلة من الجانب الفونولوجي.

ألكلمات المفتاحية

ألمتحذلق، ألتوحد، ألاعتلالات، ألمخرجة المرشحة، ألمحدد، ألامثل

الإدغام المتحذلق في لغةِ الأطفالِ مَرضى التَوَحُّد: دِراسَة تَولِيدِّية

الأستاذ المُساعد الدكتور محمد أحمد عبد الستّار السامر

سارة فالح حَسن الدُبوني

قسمُ اللُغة الإنكليزية– كلية الآداب– جامعة البصرة