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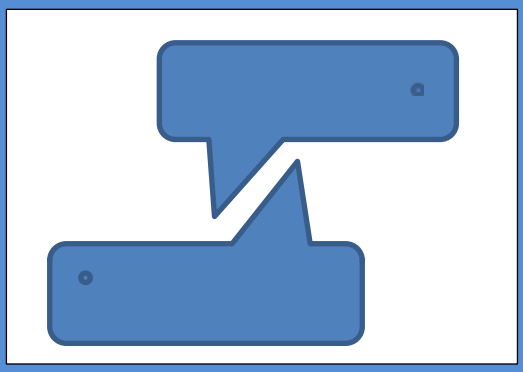

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Is the language that the mother, the father and the babysitter use to address the child similar regarding sentence types? A case study of a Persian family

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Abstract

This study examines the differences in the child-directed speech of a Persian-speaking mother, father and babysitter. Their speeches were recorded during three weeks in the dyadic sessions with the 23 month baby and the data were analyzed in terms of sentence types: declaratives, imperatives, exclamations, and interrogative. Analysis revealed differences among the language used by the mother, the father and the babysitter. The sentence modality of the father's utterances was different than the other two in imperatives and exclamations. On the other hand, the mother and the babysitter were more different when it came to interrogatives and declaratives respectively.

Keywords child-directed speech, toddler, maternal speech, paternal speech, caregiver speech

1. Introduction

Infant-directed speech (IDS), also referred to as baby talk, motherese speech, caretaker speech, caregiver speech, or child-directed speech (CDS), refers to the speech mode adults employ when addressing and talking to infants which generally involves modifying speech prosody such as higher pitch and exaggerated intonation contour, and also as lexical, syntactic, and other modulations (Burnham et al., 2002, Fernald and Kuhl, 1987; Kuhl et al., 1997;Snow and Ferguson, 1977; Stern et al., 1983). These modifications are said to be done in order to meet the communicative and emotional needs of the infants (Uther, Knoll, & Burnham, 2007). Moreover, they are present across different cultures, languages and both genders (Boysson-Bardies,

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1999; Fernald et al., 1989; Grieser and Kuhl, 1988; Kuhl et al., 1997; Papousek and Hwang, 1991; Stern et al., 1983).

Based on the revised functionalist/social interactionist model of CDS, language functions, as defined by Halliday (1977), would be operational categories of language. Each function can consist of the infrastructural model components such as sentence types (interrogatives, declaratives, and imperatives) which in turn can be made up of the smaller units such as vocabulary, intonation, gestures, and phonetic and phonological components. According to Matychuk (2005), as CDS is basically a language of interaction, formulation of questions and imperatives is logically expected to be more than declaratives.

Literature on CDS shows that children from low socioeconomic statues families are imposed to different communicative environments, comparing with children from high socioeconomic statues families. (Hoff & Naigles, 2002, Rowe, 2008). As it is reported by Hart and Risley (1995), high socioeconomic parents verbally encourage their children and provide affirmation to their children while low socioeconomic parents verbally discourage their children and prohibit their children's behavior.

Richman, Miller and LeVine (1992) in a cross-cultural research compared middle-class mothers in the United States with Gusii mothers of Kenya in terms of the way they communicated with their children. The results showed that the Gusii mothers rarely made eye contact with their children and only responded to child vocalizations if the children are in distress. Further, Levine (2004) explained that the communicative actions of the Gusii mothers are based on their beliefs that babies cannot understand speech and thus it is senseless to talk to them before they are older and can understand what is being said.

Similar conclusions have been drawn based on research by Heath (1983), he found that there is a link between parental beliefs and their communication with children. In his qualitative study, he compared the communication in low-income families of African American parents with Caucasian parents in the same region of the southeastern United States. African American parents, rarely responded to child utterances, because they thought that adults cannot make babies talk and that children will come to know on their own. On the other hand, the Caucasian parents often labeled objects for their children, and displayed beliefs which emphasize the important role of parents in children's development.

There are differences between the CDS of mother, father, and babysitter. The variations in pronunciation, intonation, vocabulary, syntax, and conversational strategies exist between men and women (Litosseliti, 2014). Women speak more to children and with more sensitivity and responsiveness than men (Hwang, 1986; Lamb et al., 1982; Snow, 1999). On the other hand, men use more directive language strategies such as imperatives (Abkarian, Dworkin, & Abkarian, 2003; Gleason, 1987; Leaper, Anderson, & Sanders, 1998) and more wh-questions (Rowe, Coker, & Pan, 2004).

Much of the previous studies focused on the effect of CDS on the language development of young children (Kempe, Brooks, & Pirott, 2001; Tare, Shatz, & Gilbertson, 2008; Williamson & Brand, 2013) while some researches focused particularly on specific linguistic structures such as sentence

structure, noun phrases, verb phrases, etc. (Blom, Kempen, Gillis, & Wijnen, 2000, Cameron-Faulkner, Lieven, & Tomasello, 2003).

Cameron-Faulkner, Lieven, and Tomasello (2003) carried out a study on child directed speech of twelve English-speaking mothers in terms of utterance-level constructions. The findings revealed that 15% of the maternal speech had SVO structure, while 51% began with item-based phrases, mostly consisting of two words or morphemes. Moreover, among the sentence structures uttered by mothers, 37% were questions, 30% declaratives and 24% imperatives.

Moreover, Giattino and Hogan (1975) analyzed a father's speech to his 2-year old language learning child and the findings showed that declarative (35%) and interrogative (34%) sentences occurred more often than exclamatory (9%) and imperative (6%) ones. Moreover, repetitions were not seen in the father's speech much.

In another study, Nwokah (1987) investigated the differences in amount and characteristics of child-directed speech between the two primary caregivers, the maid and the mother. Sixteen mothers and their 16 maids were observed with their 12-month old infants. The data depicted significant differences in the amount and type of the utterances produced by mothers and maids, however, the difference in the functions of the utterances were not significant. The mothers seemed to produce more declaratives than the maids who used more imperatives. Furthermore, the mothers used more yes/no questions while the maids posed more WH-questions.

Moreover, Rowe, Coker, and Pan (2004) examined CDS in 33 mothers and fathers in low-income families during semi-structured free play. The result showed that there were no significant differences between fathers and mothers in the amount and diversity of vocabulary produced. However, fathers used more wh-questions and more direct forms of prohibitives.

The image of a family, with the father being the breadwinner and the mother being the housewife who takes take of the house chores and is responsible for raising children, have been changing in developing countries such as Iran. Today, more women are starting to work outside of the house and the children's responsibilities are divided between mother, father, and babysitter. Despite the fact that children are not cared only by their mothers in Iran, very little descriptive information is available about the language addressed to toddlers by fathers and other caregivers.

1.1. Objectives and Research Question

Although much work has been done on CDS, a few have concentrated on the sentence structure of Persian speaking caregivers and little research has been done on the comparison of CDS of fathers, mothers, and babysitters in Iran. Thus, the present study aims at documenting the proportional distribution of the kinds of the sentence types (declaratives, imperatives, exclamations, and questions) in a Persian speaking mother, father, and their babysitter and comparing them as well.

Therefore, the following research question was addressed in the current study:

How does child-directed speech differ in a Persian speaking mother father, and their babysitter in terms of the sentence types (declaratives, imperatives, exclamations, and interrogatives)?

2. Methodology

1.1. Participants

The participant of this study was a toddler girl, aged 23 months, along with her mother, her father, and her babysitter. Respectively, they were aged 35, 36 and 40 years old. The participants were all Persian native speakers. Both father and mother who were the faculty members of university lived in one of the largest cities in southern region of Iran. The baby sitter with 10-year experience of babysitting held high school diploma degree.

1.2. Data collection

The child was observed with her mother, father, and babysitter in different situations. The observations were made in the child's home. For three weeks, the participants' speeches were audio recorded separately with dyadic interaction with the toddler. During the recordings, they were engaged in activities such as child feeding, storytelling, playing with cooking-set toys, Lego games, and play-dough. To explore the sentence types of all utterances directed to the child, parents and baby sitter were asked to engage in the same activities for the same amount of time while interacting with the child.

1.3. Data analysis

The recordings were transcribed and then the data were hand coded by the researchers to determine the sentence types. Formulaic performatives such as hello, good-morning, good-bye, please, thank-you, yes, and no were excluded from the analysis. Then, the frequencies and percentages of the utterances were summarized in a table.

All mother, father, and babysitter utterances were coded into 4 utterance levels. The categories were:

1- Interrogative: Both yes/ no questions and WH- questions were treated in this category.
2- Imperative: Requests for taking action by child which lack subjects.
3- Exclamation: Utterances which express excitement and emotions
4- Declarative: Utterances which state facts or opinion

The sentence types and some examples derived from the CDS of parents and baby sitter are listed in the Table 1.

Table 1
Mother's, father's and babysitter's CDS sentence types and examples of their utterances

Sentence type	Mother's utterances	Babysitter's utterances	Father's utterances
Interrogative	Which book do you want me to read? [*kodum ketāb ro mixāy barāt bexunam*?]	Olaf, are you alive? *[olāf, zende'i*?]	Liana! Which kind of ice-cream do you like more? [*liyānā !kodum bastani ro bištar dus dari*?]

Imperative	Sit on your chair and drink your juice.[*bešin ru sandalit o ̄abmivat ro boxor*]	Put the pot on the stove.[*qāblamaro bezār ru gāz*]	Liana, pick up the red brick and put it on the blue one. [*liyānā ! lego'e qermez ro bardār, bezāreš ruye ābiye*]
Exclamation	What a delicious pizza you cooked! [*ce pitzā'e xošmaze'i doros kardi*!]	What a beautiful doll you have! [*ce arusake xošgeli dari*!]	How intelligent are you! [*ceqadr to bāhuši*!]
Declarative	Mummy is making a house *[māmān dāre ye xune doros mikone*]	Anna is sick, she needs a doctor. [*ānā marize. doktor mixād*]	Daddy is tired, we'll play later.[*bābā xas'as,, ba'dan bāzi mikonim*]

3. Findings

The description of the mother's, father's and the babysitter's language is presented at one level of analysis which is utterance level constructions**.** The findings are summarized in table 2. For better demonstration, the results were also put in the form of bar chart (Chart 1).

Table 2
Frequency and percentage of major construction types in the speech of the mother, the father, and the babysitter

Sentence type	Mother		Father		Babysitter	
	Frequency	Percentage%	Frequency	Percentage%	Frequency	Percentage%
Declarative	715	41.35	650	43.04	724	45.08
Interrogative	650	37.59	550	36.42	544	33.87
Imperative	325	18.79	300	19.86	290	18.05
Exclamation	39	2.25	10	0.66	48	2.98
Total	1729	100	1510	100	1606	100

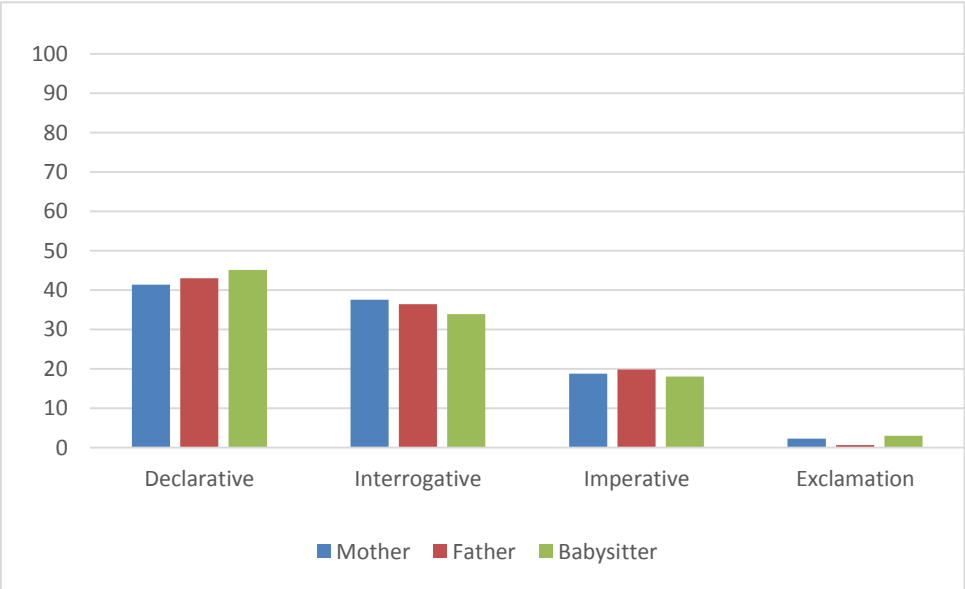

Chart 1. A comparison of the mother's, father's and babysitter's utterances

Overall, as can be seen from table 2, the father's total number of sentences is less than the mother's and the babysitter's which is in line with Snow (1999) in that fathers generally talk less. They produce fewer numbers of words and spend less time speaking.

According to table 2 and the chart above, the use of declaratives was a bit more in the speech of babysitter (45%) and the father's (43%) than in the mother's (41.3%). The results are not consistent with those of Nwokah's (1987). On the contrary, in the present case study, the mother seemed to produce fewer declaratives and more imperatives than the babysitter. Declaratives outnumbered the other forms in the speech of both the mother and the babysitter which is not in line with what Matychuk (2005) believed to be the case, i.e. the use of interrogatives and imperatives is more than the other construction types. This can be due to the fact that the mother is a well-educated woman who is probably aware of the modern psychology and understands the negative effects of using imperatives more than a certain degree on children. According to Rowe (2008), the relations between the child-directed speech composite and parent education and also family income are positively significant. More educated parents seemed to produce smaller proportion of directive utterances with their toddlers.

Moreover, based on the findings, approximately 37.5% of the mother's speech, 36.4% of the father's, and 33.8% of the babysitter's consisted of interrogatives. The use of interrogatives in the babysitter's speech was slightly less than the father’s and the mother’s in this construction type. The use of imperatives was almost the same for the mother and the babysitter, 18.7% and 18%, respectively. However, the use of this type of sentence was slightly higher in the father's speech (19.8%). The result is not in line with Rowe et al.'s (2004) study in which fathers produced more questions and fewer imperatives, however, it is consistent with the study of Leaper et al. (1998) in which fathers had more imperatives in their speech. Abkarian, Dworkin, and Abkarian (2003) also reported more frequent use of imperatives by fathers. The justification can be that traditionally in Persian culture, families used to be more male-dominated and still there are some gender-based differences seen in families. In this respect, Perlmann and Gleason (1993) pointed out the difficulty of not relating this feature of fathers' speech to the issue of power and controlling behavior of men in different societies in general and more traditional ones in particular.

Lastly, exclamations are the least used sentence type and they constituted 2.2% of the mother's, 2.9% of the babysitter's, and only 0.6% of the father's speech. This difference might be as a result of gender differences in Persian families in expressing emotions in forms of exclamations. Generally, women show more affections when talking to a toddler than men do. Other studies have also shown that mothers tend to display more affections and emotions to their children while talking to them (Hwang, 1986; Lamb et al., 1982).”

4. Conclusions

The current case study aimed at identifying the differences in the production of four major construction types (declaratives, imperatives, exclamations, and interrogatives) in the child-directed speech of a mother, a father, and their babysitter when talking to a 23 month old girl during 3 weeks. The

results revealed that the difference between the mother's and the babysitter's use of imperatives and exclamations was not a lot. However, the use of declaratives and interrogatives was slightly different in that the production of the declaratives was less, and the production of interrogatives was more in the mother's speech. Moreover, the father seemed to produce fewer exclamations and more imperatives than the mother and the babysitter.
Given the nature of case studies, the results of this study are not generalizable and there should be more studies with more families as such to confirm the findings

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Phonological processes in two Kannada speaking preschool children with repaired cleft lip and palate

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Abstract

Phonological processes in typically developing children suppress as the age increases, but this trend is not seen in children with cleft lip and palate. They not only have persisting development processes but also atypical processes which influence their speech intelligibility. The present study investigated the number, type and percentage of occurrence of phonological processes in the speech of two children with repaired cleft lip and palate (RCLP) between the ages of 3 to 4 years and compared it with age and gender matched typically developing children (TDC). The participants were asked to name age appropriate pictures or repeat from Kannada Diagnostic Photo Articulation Test (KDPAT). The responses were audio-video recorded and later transcribed by native Kannada speaking examiner using International Phonetic Alphabet (IPA) and extIPA symbols for disordered speech. Data thus obtained was analyzed and compared across children. Results revealed that children with RCLP exhibited more number of phonological processes than compared to TDC. Also, the type of processes and their percentage of occurrence noted in children with RCLP were diverse and manifold compared to TDC. The study also highlights the presence of idiosyncratic processes in children with RCLP.

Keywords: phonological processes, preschool, Kannada language, cleft lip and palate, typically developing children

1. Introduction

Phonological processes provides provisional pronunciations during the developmental period of a child as he masters adult like pronunciations (Donegan & Stampe, 1979). They also influence the lexical and grammatical competence in a child (Demuth, 2011). There are a variety of phonological processes identified in children and they vary across languages (Stampe, 1979). These processes gradually get suppressed as the child's phonetic and language skills mature (Donegan & Stampe, 1979). However, in some children, these processes remain un-suppressed indicating poor mastery on the production of speech sounds of the native language of the child (Ingram, 1989).

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Several studies suggest that the speech sound errors in children with CLP are not merely articulation disorder but are errors with phonological consequences (Harding & Grunwell, 1996). Different phonological processes have been noted in children with CLP such as, final consonant deletion, initial consonant deletion, nasalisation, velar assimilation, nasal assimilation, backing, nasal preference, and glottal insertion (Chapman & Hardin, 1992; Harding & Grunwell, 1996). Also, delayed suppression of phonological processes in children with CLP compared to age matched peers have also been reported (Chapman, 1993).

Few studies have investigated phonological processes in English speaking children with CLP (Chapman & Hardin, 1992; Harding & Grunwell, 1996). The type of phonological processes noted in typically developing children (TDC) speaking different Indian languages are reported to vary from that of western population (Sreedevi & Chandran, 2014; Kaur & Rao, 2015; Dhanavendan, 2016) which could be attributed to the change in phonetic structure of languages (Stampe (1979). Kannada is one amongst the various languages spoken in India. It is the official language of Karnataka state. It has five short and long vowels, two diphthongs, and thirty five consonants (Guntman and Avanzati 2013). Phonetic rules of Kannada is quite different from English language (Upadhyaya, 2000). There are only a few published studies reporting the phonological processes in Kannada speaking TDC (Sunil,1998; Jayashree,1999; Sreedevi, Shilpashree, & Jayaram, 2005; Sreedevi & Chandran, 2014; Bailoor, Rai, & Krishnan, 2014). Given the uniqueness of Kannada language and heterogeneity of CLP population, the findings of the western studies on children with CLP cannot be extrapolated to Kannada speaking population. Hence there is a need to explore the different type and percentage of phonological processes exhibited by Kannada speaking typically developing children and children with repaired cleft lip and palate (RCLP). Therefore, the present study was aimed at identifying the different type and percentage of phonological processes in children with RCLP and to compare the same with age matched TDC.

1.1. Objectives

a. To investigate and compare the number of phonological processes in children with RCLP and TDC.
b. To identify the types of phonological processes in children with RCLP and compare it with TDC.
c. To explore the overall percentage of occurrence of each phonological processes in children with RCLP and compare it with TDC.

2. Methodology

2.1 Participants

Two boys with a mean age of 3.5 years, who were native Kannada speakers were considered for the study. Both of them had undergone surgery for unilateral complete cleft lip and palate at the age of 2.5 years and did not avail speech therapy after surgery. They were considered for the study as they enrolled to avail rehabilitation services at the institute. Both children belonged to middle socio-economic status. Presence of history of frequent ear infections, hearing loss, upper respiratory tract infection, syndromes, and

intellectual difficulties was ruled out using the standard clinical procedure, before considering them for the study.
Two, age and gender matched TDC were considered as control subjects. These children were chosen from near-by play-homes. Children who passed an informal speech and language assessment with normal oro-motor skills were considered for this group. World Health Organisation (WHO) checklist was also administered to rule out any disability in TDC (Singhi, Kumar, Malhi, & Kumar, 2007) Parents of all the children provided a written consent before including them in the study. The research study was conducted by following the ethical guidelines (Venkateshan & Basavraj, 2009).

2.2 Stimuli

Kannada Diagnostic Photo Articulation Test (KDPAT) (Deepa & Savitri, 2010) was used to obtain articulation sample from the participants of the current study. KDPAT is a standardized and validated diagnostic test of articulation in the Kannada language for children aged between 2 to 5.6 years. It consists of total 114 words (two to five syllable words) which are divided into two parts. Part I consists of 52 words in total, with 10 vowels, two diphthongs in the initial position and 19 consonants in initial and medial positions and /ɳ / and /ɭ/ in medial position alone. Part II consists of 62 words similar in the arrangement as that of part I with additional 11 clusters in naturally occurring positions. Further, these words are arranged according to the age of acquisition between 2 to 5.6 years in six months interval. Each word is represented visually by age appropriate, familiar photographs, which can be presented to the participant by means of a computer screen. Out of the one hundred and fourteen words present in KDPAT, ninety-nine words were age appropriate for children included in the present study.

2.3 Data collection

Each participant was made to sit comfortably on a chair inside a quiet room. For the purpose of audio-video recording, a handy-cam (Sony DCR-SR88) was mounted on a tripod stand at a distance of one metre from the child. Also, a unidirectional microphone was kept at a distance of 10cm from the mouth of the participant for simultaneous audio recording by Adobe Audition 3.0. This arrangement was made to retain key acoustic cues required for perceptual analysis, which would have been otherwise lost due to fidelity and distance factors of the handy-cam. The participant was then asked to name age appropriate pictures from KDPAT when presented. In case the participant failed to name the picture, examiner named the picture and participant was asked to repeat the same. When the child was successful in naming or repeating after the examiner, he was asked to repeat the target word to check for consistency. The speech samples thus obtained were transcribed by the examiner who was native speaker of Kannada, using International Phonetic Alphabet (IPA) and extIPA for disordered populations (International Phonetic Association, 2015a; International Phonetic Association, 2015b). This was further analyzed to extract the following parameters as per the objectives of the study:

a. Number of phonological processes identified

The words transcribed were analyzed sound by sound to identify the presence of phonological processes (Penna-Brooks & Hegde, 2007; D'antonio & Scherer, 2008). A total number of processes identified was listed separately for each participant. In instances where the same phonological processes occurred more than once in the same word, the same was noted for further analysis.

b. Type of phonological processes

After identifying the number of phonological processes occurring, the data was further analyzed qualitatively for identifying the different types of phonological process across groups.

c. Overall percentage of occurrence of each phonological processes

The data was further analyzed to arrive at the overall percentage of occurrence of each phonological process across the groups. This calculation was done to compare the processes quantitatively across groups. The calculation of the overall percentage of occurrence of phonological processes was done based on the formula: "A total number of the same processes exhibited by all the subjects in a group / total no of target words spoken by all the participants * 100". This formula was adopted from the Clinical Assessment of Articulation and Phonology (CAAP) (Secord & Donohue, 2004). A phonological process was considered to be productive if its overall percentage of occurrence was ≥20% (McReynolds & Elbert, 1981).

3. Findings

The first objective of the study was to compare the number of phonological processes identified in children with RCLP and TDC. Table 1 indicates the number of phonological processes identified in children of both the groups. There were nine phonological processes identified in children of TDC group. The RCLP group however had 20 phonological processes, which was significantly more than that noted in TDC group. Hence children with RCLP had more number of phonological processes compared to TDC group.

The second objective of the study was to list the types of phonological processes across groups. Table 1 indicates the different types of phonological processes observed across groups. The instances of occurrence of phonological processes varied across subjects. Nine different types of phonological processes were exhibited by TDC viz., Retroflex fronting, cluster substitution, other backing, other substitutions, cluster simplification, sound addition, dental fronting, initial consonant deletion and metathesis.

On contrast, there were 20 phonological processes identified in children with RCLP group. They are, glottal replacement, nasal substitution, frication, syllable deletion, retroflex fronting, pharyngeal replacement, depalatalisation, cluster substitution, nasal assimilation, liquid gliding, deaffrication, stopping, other backing, other substitution, affrication, cluster simplification, alveolar fronting, context sensitive voicing, sound addition and glottal fronting. Out of these 20 processes, six processes viz., retroflex fronting, cluster substitution, other backing, other substitution, cluster simplification and sound addition were common to TDC group as well.

Table 1
Phonological processes identified and respective frequency of occurrence in TDC and RCLP group.

Sl. No	Phonological Processes	TDC		RCLP	
		TDC 1	TDC 2	RCLP 1	RCLP 2
1	Glottal replacement	-	-	51	58
2	Nasal substitution	-	-	36	46
3	Frication	-	-	24	17
4	Syllable deletion	-	-	28	10
5	Retroflex fronting	1	9	17	16
6	Pharyngeal replacement	-	-	0	21
7	Depalatalisation	-	-	9	11
8	Cluster substitution	1	-	8	7
9	Nasal assimilation	-	-	11	4
10	Liquid gliding	-	-	7	4
11	Deaffrication	-	-	5	4
12	Stopping	-	-	2	3
13	Other backing	-	2	2	2
14	Other substitutions	1	1	2	1
15	Affrication	-	-	2	0
16	Cluster simplification	2	3	0	1
17	Alveolar fronting	-	-	0	1
18	Context sensitive voicing	-	-	0	1
19	Sound addition	1	-	0	1
20	Glottal fronting	-	-	0	1
21	Dental fronting	1	-	-	-
22	Initial consonant deletion	1	1	-	-
23	Metathesis	1	-	-	-

The third objective was to investigate the overall percentage of occurrence of each phonological process across groups. The data was further analyzed to arrive at the overall percentage of occurrence of each phonological process across both the groups. Table 2 and table 3 depict the overall percentage of occurrence of each phonological process for TDC and RCLP groups respectively. This data was used to identify the productive processes.

Among TDC, retroflex fronting (5%) cluster simplification (3%) backing (1%), other subsitution (1%), initial consonant deletion (1%), sound addition (0.5%), dental fronting (0.5%), metathesis (0.5%) and cluster substitution (0.5%) were observed. It is to be noted that none of the processes were productive in TDC group.

Table 3 indicates the overall percentage of occurrence of each phonological processes for RCLP group. The pattern exhibited by both the groups was not similar. Amongst the children with RCLP glottal replacement was the highest with 55% followed by nasal substitution (41%), frication (21%), syllable deletion (19%), retroflex fronting (17%), pharyngeal replacement (11%), depalatalisation (10%), cluster substitution (8%), nasal assimilation (8%), liquid gliding (6%), deaffrication (5%), stopping (3%), other backing (2%), other substitution (2%), affrication (1%), cluster simplification (0.5%) , alveolar fronting (0.5%), context sensitive voicing (0.5%), sound addition

(0.5%) and glottal fronting (0.5%) . There were only three phonological processes productive in RCLP group viz., glottal replacement, nasal substitution and frication.

Table 2
Phonological processes identified listed in descending order with an overall percentage of occurrence in TDC group.

Sl. No	**Phonological Processes**	**TDC**	
		Total No. of the same processes exhibited by all the subjects in a group	Overall percentage of occurrence (%)
1	Retroflex fronting	10	5
2	Cluster simplification	5	3
3	Other backing	2	1
4	Other substitutions	2	1
5	Initial consonant deletion	2	1
6	Sound addition	1	0.5
7	Dental fronting	1	0.5
8	Metathesis	1	0.5
9	cluster substitution	1	0.5

Table 3
Phonological processes identified listed in descending order with an overall percentage of occurrence in RCLP group.

Sl. No	**Phonological Processes**	**RCLP**	
		Total No. of the same processes exhibited by all the subjects in a group	Overall percentage of occurrence (%)
1	Glottal replacement	109	55
2	Nasal substitution	82	41
3	Frication	41	21
4	Syllable deletion	38	19
5	Retroflex fronting	33	17
6	Pharyngeal replacement	21	11
7	Depalatalisation	20	10
8	Cluster substitution	15	8
9	Nasal assimilation	15	8
10	Liquid gliding	11	6
11	Deaffrication	9	5
12	Stopping	5	3
13	Other backing	4	2
14	Other substitutions	3	2
15	Affrication	2	1

16	Cluster simplification	1	0.5
17	Alveolar fronting	1	0.5
18	Context sensitive voicing	1	0.5
19	Sound addition	1	0.5
20	Glottal fronting	1	0.5

4. Discussion

The first objective of the study was to compare the number of phonological processes across groups. Results revealed that children in the TDC group exhibited less number of phonological processes than children with RCLP. Reduced number of phonological processes in TDC indicates better articulation competency (Menn, 1979). However, there is a dearth of studies reporting the age of suppression of phonological processes in Kannada speaking TDC between the ages of 3 to 4. Western studies report that by the age of 4 years most of the phonological processes are suppressed in TDC (Grunwell & Russell, 1987).

In contrast, children with RCLP had a greater number of phonological processes than TDC group. This could be due to the fact that children with RCLP are known to be at risk for not only phonetic based disorders but also phonologic disorders (Bzoch, 1956; Bzoch, 1965; Van Demark, Morris, & Vandehaar, 1979). This phonologic disorders in children with RCLP can be due to delayed acquisition of expressive language and /or due to the structural deviations present (Morris, 1962; Chapman, 1993) This may also be due to delayed suppression of developmental processes (Sunil, 1998; Chapman, 1993; Sreedevi & Chandran, 2014). The findings of this study supports the earlier studies which reported more number of phonological processes in children with RCLP (Grunwell & Russell, 1987; Chapman 1993).

The second and third objectives of the study were to list the types of phonological processes and to investigate the overall percentage of occurrence of each process across groups. There were nine types of phonological processes identified in TDC group. Amongst these, five processes viz., retroflex fronting, cluster simplification, other backing, initial consonant deletion and metathesis were developmental in nature with respect to Kannada language (Sunil, 1998; Sreedevi & Chandran, 2014). The remaining processes noted such as other substitutions, sound additions, dental fronting, cluster substitution can be termed as idiosyncratic in nature as there is lack of normative data regarding these phonological processes in Kannada speaking TDC in the age range of 3 to 4 years. Each of the processes had an overall percentage of occurrences of <20% which indicates that these children are probably in the phonological development stabilisation phase. The results support the previous findings (Grunwell & Russell, 1987). However, few processes which are different from the processes reported in the western population were observed (e.g: retroflex fronting). This could be attributed to the difference in the phonological rules of Kannada as against English languages (Upadhyaya, 2000). Each language differs from the other in its phonological characteristics. This in-turn brings out different processes unique to its language (Ingram, 1989).

Children with RCLP exhibited, 20 different processes, six of which were common to TDC group as well. Amongst the 20 processes 11 phonological processes such as retroflex fronting, depalatalization, deaffrication, stopping, other backing, affrication, cluster simplification, context sensitive voicing, liquid gliding, nasal assimilation and syllable deletion were developmental in nature (Sunil, 1998; Sreedevi & Chandran, 2014; Penna-Brooks & Hegde, 2007). The remaining of the phonological processes noted were quite unconventional compared to TDC group. They are glottal replacement, nasal substitution, pharyngeal replacement, frication, other substitutions, alveolar fronting, sound addition, cluster substitution and glottal fronting. Delay in expressive language or the inherent anatomical deficit is known to cause phonological disorder in children with RCLP (Morris, 1962; Chapman, 1993).

The articulatory errors in children with RCLP are many and complex in nature. They are dependent on the age of surgery; the type and extent of cleft, age of initiation of speech therapy etc., (Groenewald, 2011). Children with RCLP fail to develop smooth co-ordination between the velopharyngeal movement and movement between other articulators of speech (Worcester Speech and Language Center, 2013). They also develop compensatory articulations where the place of articulation of phoneme is shifted more posteriorly in the vocal tract (Kuhen & Moller, 2000). Additionally, there is inconsistency in speech sound errors of RCLP children (Van Demark, 1969; D'antonio & Scherer, 2008). This complex relation between language, articulation and phonological processes could result in presence of different types of processes in children with RCLP compared to TDC. Results of the present study are in consonance with earlier studies (Lynch, Fox, & Brookshire, 1983; Chapman, 1992)

The results of the present study also indicate that in children with RCLP the percentage of processes were greater than TDC group. This indicates that children with RCLP are far beyond TDC group in terms of phonological processes suppression. Hence the delay in suppression can also be one of the causes of more number of processes.

In terms of productivity, amongst the 20 processes only three processes viz., glottal replacement, nasal substitution and frication were found to be having an overall percentage of occurrences of > 20%. The findings of the present study support the findings of previous studies which report that children with velopharyngeal dysfunction are prone to use glottal replacement and nasal substitution as a compensatory mechanism (Bzoch, 1965; Westlake & Rutherford, 1966; Chapman, 1993).

Children with RCLP group of the current study had undergone surgery after the age of 2.5 years. Delayed surgery is known to be the primary cause of development of compensatory articulation which can become habituated. Lack of speech therapy following surgery can also be a contributing factor. Persistent use of compensatory articulation might have resulted in the productiveness of these processes in the RCLP group (Chapman, 1993). Thus the use of compensatory articulation leads to atypical phonological processes in children with RCLP, which they use to communicate with family and friends. Further, as the family and friends also would have accustomed

to children's erroneous processes, they would not have attempted to correct themselves. Thus resulting in an increase in their percentage of occurrence.

5. Conclusion

The results of the present study indicated that the number of phonological processes occurring in children with RCLP was much greater than in TDC group, possibly due to delay in surgery as well as not availing speech language therapy. With respect to the type of processes, children with RCLP had different processes compared to TDC, amongst them Glottal replacement, nasal substitution and frication were the most productive processes. Both these observations could be due to the presence of structural variations and persistent use of compensatory articulation by children with RCLP. The type of phonological processes noted in the current study was specifically different from previous studies which could be due to the difference in the language rules. Children with RCLP hence require to undergo corrective surgery at an early age and to avail speech language therapy which will promote the development of normal speech and language skills. The study further highlights the need for assessing phonology and phonetics to have an insight on the issues related to speech and language in children with RCLP.

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Tone Acquisition at the One-Word Stage in Taiwan Mandarin: A corpus study

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Abstract

Evidence for early developmental patterns of tone acquisition was found by investigating a longitudinal study of 8 children (0;6-1;8) in Taiwan Mandarin. The present study found that in terms of the order of the emergence of tones, there seems to be a universal tendency whereby high-level tones are likely to be acquired earlier than high-falling tones, followed by low-falling tones and rising tones. As for the distribution patterns of tones in monosyllabic words, high-falling tones are the most common, high-level tones are the next common, and low-falling tones are the least common. In disyllabic words, a language-specific phenomenon in Taiwan made the endearment tone, T3+T2, the most common pattern, with the high-level sequence, T1+T1, taking second place, followed by the morphologically-conditioned pattern, T2+T3. Binary foot structure has been supported; however, no rhythmic effect has been found between tones and disyllables. Although children acquired four tones early, they were not able to stabilize the system at the one-word stage. Articulatory theory, physiological effort, phonetic cues, Markedness constraints, and influence from the caretakers' speech and linguistic environment provide some explanations for the order of emergence of tone acquisition and the distribution patterns of tones.

Keywords tone acquisition, one-word stage, age and order of emergence of tones, age of stablizaton of tones, distribution patterns of tones, endearment tone, Taiwan Mandarin

1. Introduction

A number of studies have suggested that infants are sensitive to prosodic cues during their early developmental stage, and children start to acquire suprasegmental features such as stress, intonation, pitch and tone very early in the developmental process (e.g., Clumeck, 1980; Demuth, 1996; Kaplan & Kaplan, 1971; Mehler et al., 1988). Most researchers have pointed out that suprasegmental features, such as intonation and stress, are acquired earlier and better than segments (e.g., Crystal, 1986; Demuth, 1996; Mehler, Jusczyk, Lambertz, Halsted, Bertoncini, & Amiel-Tison, 1988). Tone is considered one of the most salient features in tone languages, and a number of studies have discussed tone acquisition in Cantonese, Mandarin,

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Taiwanese, and Thai (e.g., Mandarin spoken in the United States: Chao, 1951, 1968; Clumeck, 1977, 1980; Taiwan Mandarin: Chen & Kent, 2009; J. Hsu, 2003; Li & Thompson, 1977; Wong, 2008, 2012, 2013; Wong, Schwartz, & Jenkins, 2005; Beijing Mandarin: Zhu, 2002; Zhu & Dodd, 2000; Cantonese: So & Dodd, 1995; To, Cheung,& McLeod, 2013; Tse, 1991; Taiwanese: H. Hsu, 1989; Tsay, 2001; Thai: Tuaycharoen, 1977).

Taiwan Mandarin has four distinctive lexical tones and a neutral tone. The conventionally accepted inventory of tones involves T1, high-level tones [55], T2, rising tones [35], T3, low-falling tones [21], and T4, high-falling tones [51]. Note that these tone numbers are not intended to indicate underlying sequences, but simply to show the pitches involved in the contour tones. In addition, Taiwan Mandarin is analyzed as having a range of possible surface monosyllables: V, CV, GV, VG, VN, CVG, CVN, CGV, GVG, GVN, CGVG, CGVN. The maximal syllable is CGVX, with C a [+consonantal] segment, G a glide, V the nucleus vowel, and X either a nasal or a glide.

1.1. Previous studies

In Mandarin, the majority of previous research dealt with production, and few focused on perception (For an integrated view on the studies related to tone acquisition, see Singh and Fu (2016) for more evidence from perceptual and production perspectives). In perception, evidence from a habituation-based paradigm suggested that tone categories in Cantonese and Mandarin infants seem to emerge at the age of 4 months (Yeung, Chen, & Werker, 2013). In the production studies, at least one of the following three issues has usually been discussed: (1) the age and order of emergence; (2) the age and order of stabilization; (3) the distribution patterns of tones.

In the past, the majority of the relevant studies focused on the chronological order of tone development (i.e., the emergence of tones) and error patterns or error rates of tones. Three ways of data collections have been adopted, and the studies prior to the year 2000 were largely based on longitudinal data, which involve descriptive diary reports or case studies (e.g., Chao, 1951, 1968; Clumeck, 1977, 1980; J. Hsu, 2003; Li & Thompson, 1977). The second approach was to present experimental methods (Zhu, 2002; Zhu & Dodd, 2000) and the third one included acoustic analysis for children's developmental course of tone acquisition (Chen & Kent, 2009; Wong, 2008, 2012, 2013; Wong et al., 2005).

Most of the prior studies focusing on the age and order of emergence found that high-level tones are acquired earlier than high-falling tones and rising tones, which are acquired earlier than low-falling tones whereas Clumeck's study (1977) suggested a conflicting order in which rising tones occur earlier than the rest of three tones. Secondly, children have mastered their tonal systems with few errors by the age of 2;0, possibly at the one-word stage (e.g., Li & Thompson, 1977). However, a late tonal development was proposed by Clumeck (1977, 1980), suggesting that the children would not complete the acquisition of the tonal system at the two-word utterance stage or around the age of 2;4 to 3;0. Finally, very few studies discussed the issue involving the distribution patterns of tone acquisition, and they seemed to lump the tone inventory together with monosyllables, disyllables and multisyllables. Li and Thompson (1977) and J. Hsu (2003) found that

children are more likely to produce high-falling tones, followed by high-level tones, and rising tones and low-falling tones are the least frequent.

The new approach including elicited production experiments also confirmed some of the aforementioned studies. Zhu (2002) and Zhu and Dodd (2000) presented quantitative and qualitative measures by using 66.7% criterion in a cross-sectional experiment for providing a certain degree of phonological accuracy and consistency in defining when the tonal system is considered stabilized. They found that rising tones emerged about one month after high-level and high-falling tones had first emerged. Low-falling tones were the last to emerge at the age of 1;4, and children emerged and mastered the four tones at age of 2.

However, using acoustic evidence for children's developmental course of tone acquisition yielded difference analyses. Chen and Kent (2009) investigated the early prosodic development of children at underdeveloped ages (0;7-1;6). They documented the children acquiring Taiwan Mandarin tones along with caretakers' speech by systematically measuring F_0 variation at the transition from babbling to producing the first fifty words. They agreed with most of the prior studies and found that falling tones are more prominently produced than high-level and rising tones, high-level tones occur more frequently than mid/low tones, and the distribution patterns of F_0 contours in babbling and early-word stages are pretty much alike; the ones in infants' reflect their caretakers' data as well. On the contrary, Wong (2008, 2012, 2013) and Wong, Schwartz and Jenkins (2005) presented a phonetic evidence with a more rigorous experimental control in a low-pass filtered speech to eliminate lexical information and reserve tone information from Taiwan Mandarin speaking children. They suggested that children produce the most adult-like tones at the isolated monosyllabic words in the following order: high-level tones > high-falling tones > rising tones > low-falling tones. However, in their studies, children did not stabilize the four tones in monosyllabic words even when they reached the age of 3, and children did not stabilize the four-tone system in disyllabic words till they reached the age of 5 or 6.

Cross-linguistic studies from Thai, Cantonese, and Taiwanese generally agreed that level tones are in general acquired earlier than contour tones; however, it is uncertain whether high-level tones would have a better chance of being acquired earlier than mid- or low-level tones (Thai: Tuaycharoen, 1977; Cantonese: So & Dodd, 1995; Tse, 1991; Taiwanese: H. Hsu, 1989; Tsay, 2001). Tuaycharoen (1977) in Thai showed what is to date the earliest age of mastery of a tonal language system to be 1;4. So and Dodd (1995) and Tse (1991) both agreed that the Cantonese children generally control and master the production of lexical tones by the age of 2 at the two-word stage. Tsay (2001) in Taiwanese presented percentages of error rates as criteria for defining how tones are maintained and she also adopted the phonetic measurements based on the corrected tokens. The lower error rates were also in support of an early completion of tone acquisition for Taiwanese children, and the phonetic result showed that Taiwanese children acquire an entire phonetic gesture including the pitch dimension and duration of tonal contrasts among different tones found in adult speech.

In conclusion, except for Clumeck (1977), who suggested the early emergence of rising tones, the rest of prior studies in general agreed that high-level tones are acquired earlier than high-falling tones which emerge earlier than rising tones, and low-falling tones emerge in the last order. A few studies discussed the age and order of stabilization, and the results showed a discrepancy between the early and late developmental course of tone acquisition. Very few studies worked on the distribution patterns of tones, and by combining tones in monosyllables with tones in disyllables or multisyllables, children were more likely to produce high-falling tones, followed by high-level tones, and rising tones and low-falling tones were the least frequent.

1.2. Theoretical analyses of tones

A number of relevant studies provided articulatory explanations, markedness, phonetic cues, or theoretical phonological framework to account for universal patterns or language-specific phenomenon on tones. Evidence from the articulatory effort theory led Ohala and Ewan (1972) and Ohala (1978) to report that rising tones are cross-linguistically longer than falling tones, and need more energy with muscular control, so rising tones are supposedly more difficult than falling tones to produce. Vihman (1996) proposed that there is a degree of markedness to pitch, and suggested that a falling pitch movement is a natural gesture of speech production and required less physiological effort than rising pitch movement.

Many scholars in production and perceptual studies have discussed Mandarin tones in relation to the phonetic cues, including duration, intensity and F_0. In duration, Fu and Zeng (2000), Tseng (1990), and Xu, Tsai and Pfingst (2002) all found that low-falling tones have longer duration than rising tones, followed by high-level tones and/or high-falling tones. In intensity, Ong and Yang (1997), and Xu et al. (2002) agreed that high-falling tones are the strongest in intensity, and high-level tones are the next strongest, and the least strong are the low-falling tones. Tsao (2008) investigated tone discrimination in Taiwan Mandarin infants between 10 and 12 months of age by testing their abilities to distinguish tone contrasts. The result showed that high-level tones and low-falling tones are a highly distinct tone pair, followed by a moderately distinct tone pair of rising and high-falling tones, and rising and low-falling tones are minimally distinct from one another.

Regarding theoretical implications, Yip (2002) presented a theory of the markedness of tone in which contour tones are more marked than level tones, rising tones are more marked than falling tones, and high-level tones are more marked than low-level tones. Such a theory would predict that high-level tones are acquired earlier than other contour tones, falling tones are acquired earlier than rising tones, low-level tones are acquired earlier than high-level tones.

1.3. Spoken corpus

As with the occurrence of frequency, high-falling tones had greater frequency than rising tones in the world's languages (Li & Thomspon, 1978). Token counts from a speech corpus (N=604,916), *NCCU Corpus of Spoken Chinese*,

showed a rank order in which high-falling tones had the highest frequency of occurrence (39%), followed by low-falling tones (23%), then high-level tones (21%), and finally rising tones, being the least common (17%)[3]. If each tone is expected to occur with approximately equal frequency, the frequency of the actual tokens is greater than the 25% expected by chance for high-falling and high-level tones (i.e., there are four tones in Taiwan Mandarin).

1.4. Binary foot structure

Citation tones in Mandarin are nearly always discussed in isolated words, and only when tone sandhi processes are involved will more than two syllables in sequences be discussed. Lin (2007) listed the four basic tones in monosyllables and 15 tonal combinations in disyllables, showing all the possible distribution patterns of tones in Mandarin. Note that the pattern T3+T3 is not allowed in the surface form[4].

Recently, the preference for disyllables in language acquisition has shed light on binary foot structure in cross-linguistic studies (e.g., Demuth, 2006; Demuth & Johnson, 2003; Demuth & Tremblay, 2008; Miyokada, 2012; Ota, 1999), suggesting a universal tendency. Many phonologists treated binary foot structure as a higher constraint than faithfulness or markedness in optimality theory. As for prosodic phonology, there was a rhythmic effect in the relative metrical prominence between tones and disyllables. H. Hsu (2006) and Lu (2011) found the preference of low-high or weak-strong (i.e., iambic) contrast in pitch from dialectal studies and experiments, respectively, in Mandarin.

1.5. Research issues

The most controversial issue in the aforementioned studies seemed to be children's stabilization of tones at the developmental stage of two years of age and beyond, and few studies were related to the developmental course at prelinguistic stages. In addition, many of the studies were collected from diary reports and they might include meaningful and non-meaningful utterances in the children's spontaneous speech and imitative responses as Li and Thompson (1977) included non-meaningful tone tokens, and Zhu (2002) involved imitative forms in the studies. Moreover, very few studies have discussed the distribution patterns of tones by sorting out disyllables from monosyllables, and the studies in Wong (2008, 2012, 2013) and Wong et al. (2005) by far were probably the first series of work presenting evidence on tones from monosyllabic and disyllabic words. Finally, dialectal differences might offer different results; studies such as Zhu (2002) or Zhu and Dodd (2000) had the speech samples in Beijing Mandarin, and for the contour pattern on the third tone, there was a pitch falling downward to the

[3] The corpus was collected and provided by Prof. Kawai Chui at National Chengchi University. The data contained four tones plus neutral tone in spontaneous speech. Since the present study focused only on the four tones, the token and type for the neutral tone were excluded for the discussion.

[4] Such a pattern is not a legal phonological output in phonetic representation due to the tone sandhi rule where the low-falling tone in the first syllable would change to a rising tone when the two syllables in sequence both have underlying low-falling tones.

low pitch and rising upward at the end point in Beijing Mandarin, but there was a rather simple low pitch falling downward in Taiwan Mandarin. Another dialectal difference was the special phenomenon addressed by Duanmu (2007), the endearment tone T3+T2 specially used in the reduplicative words (low-falling tones plus rising tones). Such a pattern has been found to be very popular in Taiwan Mandarin. However, no report on tone acquisition has ever been done in relation to such a special phenomenon.

Due to some inconclusive and inconsistent findings in cross-linguistic studies, the present study aims to investigate the developmental patterns of tone acquisition at underdeveloped stages in Taiwan Mandarin by investigating digitally recorded spontaneous vocalizations of 8 children, aged 0;6 to 0;7 in the beginning and 1;6-1;8 by the end of one-word stage. The data to be included involved meaningful monosyllabic and disyllabic words, and were collected and dated before the children started to enter the two-word stage[5]. Multisyllabic words were insufficient for computing results, so they were not compared quantitatively for the present study. Topics involved in the present study include the following: (1) the age and order of emergence; (2) the age and order of stabilization; (3) the distribution patterns of tones in monosyllables and disyllables detected by age-tracking children's speech samples at one-word stage in Taiwan Mandarin-speaking children.

2. Methodology

2.1. Participants

Eight children (3 boys, 5 girls) were assessed longitudinally in their earlier development in this study. Seven Taiwan Mandarin children began to enter the two-word stage at 1;6 and one child began to produce two words at 1;8. To gain information concerning the acquisition of tone, eight paid children (3 boys, 5 girls), who acquired Mandarin only as their first language, were assessed longitudinally between the ages of 0;7 and 1;8[6]. At the beginning of the data collection, the children's ages were between 0;6 and 0;8 (mean age= 0;7.17, SD= 0.4 months). At the end of the one-word stage, the children's ages were between 1;4 and 1;8 (mean age= 1;5.53, SD= 0.09 months). The eight participants were all healthy and had not been diagnosed with any hearing or intellectual impairment, and all uttered their speech in Mandarin only with their main caretakers.

2.2. Data collection and processing

The entire data collection session followed the criteria proposed by Vihman (1996), Vihman and McCune (1994), and Zhu (2002). Before the data collection session began, the mothers were trained to get detailed guidelines and procedures as to what they were expected to assist the children to produce more speech output, and they did not help collect the data. Data collection took place every other week and was recessed for three weeks

[5] One of the children did not enter the two-word stage till 1;8, whereas the rest of the children in this study completed the one-word system before 1;6.

[6] The other 10 children's data were not included in the present study since they acquired Mandarin (70%) and other Chinese languages (e.g., Taiwanese or Hakka) (30%) as the first languages.

during Lunar New Year.
All children were video-recorded and digital-recorded at their homes during bi-weekly 60-minute sessions. Audio recordings were made with the AKG cardinal microphone and SONY digital voice recorder (ICD-UX513F) along with SONY Handycam digital video camera recorder (SONY DCR-SR40). The video files helped the authors and the research team members easily decode the spontaneous utterances by the children's gestures and eye movements, and the sound files provided high quality audio signals.
The usual methodology for collecting tone data is to rely on the native-speaker linguist's intuitions as to the categorization of the tone in the spoken utterance with lexical information. This methodology is subject to some problems of listener/transcriber bias, as noted in Wong's (2013) study. However, one could still argue that the perception that tones carried with lexical information might be more valid psycholinguistic measure than the acoustic properties of tones. As stated in Demuth (2006), the challenge with the field of phonological acquisition has been the lack of longitudinal phonetically transcribed data from multiple children between the ages of 1 and 2. Besides, it is difficult to perform elicited production experiments with children at underdeveloped stages below the age of 2. In the first author's other corpus based on a picture-naming task in a cross-sectional study from 225 Taiwan Mandarin children (0;7-6;00), the author has adopted a program for automatically aligning the transcript of acoustic signal to proper sound files from the forced alignment system, *HTKAlignementScript_ILAS*.[7] Such a program helped distinguish the meaningful words from non-meaningful ones, and the ratio in the elicited production experiment at underdeveloped stages (Mononsyllables: Meaningful words vs. Non-meaningful words = 1.2 vs. 1; Disyllables: Meaningful words vs. Non-meaningful words: 2.1 vs. 1) was similar to the one found in the spontaneous speech. Out of 729 tokens in monosyllabic words, and only 379 words that were selected are meaningful, and out of 957 tokens in disyllabic words, 660 words show the meaningful form, suggesting a rather strict screening process for this study; assuming that the data to be discussed below are sufficiently reliable to support the analysis.

2.3. *Data analysis*

Meaningful words were classified under the following three conditions: 1) when children's vocalizations would be identified as words that are matched more than two segments of the adult form; 2) when children's tone matched the adult target; 3) when children produced the words more than twice with similar phonological shapes across different uses. For example, in [twej51] 'correct', [tɕʰjow35] 'ball', and [fan51] 'rice', many children would produce them as in [tej51], [tʰjow35], and [fa51]. Since more than two segments

[7] Professor Chiu-yu Tseng and her research team in the Phonetics Lab at Academia Sinica have been developing the Mandarin forced alignment system for many decades. The program is a Hidden Markov Model Speech Recognition Toolkit along with Praat tools (Boersma, 2001). This forced alignment package can be used for elicited production, but does not provide good alignment results for spontaneous speech.

matched the adult form, examples like these that appear more than twice in different contexts were considered meaningful words. However, if the tones were not recognizable, they were classified as non-meaningful words. In the study, 379 meaningful monosyllabic words were selected from 729 tokens (Meaningful words vs. Non-meaningful words: 1.1 vs. 1), and 660 meaningful disyllabic words were selected from 957 tokens (Meaningful words vs. Non-meaningful words: 2.2 vs. 1)[8].

The recording was started before their pre-meaningful speech occurred, and a tone was considered to have emerged when a child could produce it more than twice in a meaningful word in spontaneous speech. The utterances of children along with the utterances of their main caretakers have all been transcribed in broad phonemic transcription. In this study, the data collection was drawn from the point when these children began to produce the first meaningful word. For IPA transcription, 10% of audio recordings of the database were phonetically transcribed by the second author; 90% by six trained research assistants, and 30% (311 syllables) of samples, which were selected from the database at random, were verified by the first author to have a 90% interrater reliability (Cronbach's alpha=.899). Intrarater reliability was calculated as the percent agreement between the coder's original transcription and his/her repeated transcription for 935 syllables (Cronbach's alpha=.948). When there appeared to be a questionable utterance such as a tone that was not clearly audible, or when there was a conflict between the two transcribers, the data were not included in the study. Transcription conventions were based on Chao's tone markers. An imitative response to a verbal stimulus has not been considered as a word, and such data were not considered in this study.

Following the same criterion for an accuracy rating formulated in the studies of Zhu (2002) and Zhu and Dodd (2000), a tone in the study was considered to have reached the level of stability at the point when the accuracy rating in the child's sample had reached 66.7% of phonological accuracy and consistency.

- Accuracy rating = the number of times a tone is produced correctly / the number of opportunities for the tone in the sample x 100%.

3. Results and Discussion

The following table summarizes the children's information, the age range during which the children contributed the data for the current study, the emergence of the children's first word and tone, and the total number of tokens for the one-word stage involving monosyllables and disyllables in the eight children.

[8] The current study is selected from a corpus which is by far the largest database involving Taiwan Mandarin-speaking children's spontaneous speech, approximately estimated over 300,000 tokens (N=18, 0;6-5;10). This corpus has been collected by the first author and the research team from 18 Taiwan-speaking children between 2011 and the present.

Table 1
Participants

Child	Gender	Age range	Emerge T	Emerge W		N		%
KL	M	0;7-1;6	1;1	Monosyllable	1;2	Monosyllable	53	31%
				Disyllable	1;1	Disyllable	117	69%
DD	M	0;7-1;6	0;10	Monosyllable	0;10	Monosyllable	77	47%
				Disyllable	0;11	Disyllable	86	53%
SH	M	0;7-1;6	0;9	Monosyllable	0;11	Monosyllable	38	30%
				Disyllable	0;9	Disyllable	88	70%
JJ	F	0;8-1;6	1;0	Monosyllable	1;0	Monosyllable	80	47%
				Disyllable	1;1	Disyllable	91	53%
WW	F	0;8-1;6	0;10	Monosyllable	0;10	Monosyllable	25	25%
				Disyllable	1;2	Disyllable	74	75%
YC	F	0;7-1;6	1;0	Monosyllable	1;0	Monosyllable	46	35%
				Disyllable	1;1	Disyllable	85	65%
YJ	F	0;6-1;8	0;9	Monosyllable	0;9	Monosyllable	17	40%
				Disyllable	0;9	Disyllable	25	60%
LC	F	0;7-1;6	1;0	Monosyllable	1;1	Monosyllable	43	31%
				Disyllable	1;0	Disyllable	94	69%
				Total		Monosyllable	379	36%
						Disyllable	660	64%

Table 1 shows that eight children (3 boys, 5 girls) were assessed longitudinally in their earlier development in this study. Seven Taiwan Mandarin children began to enter the two-word stage at 1;6 and one child began to produce two words at 1;8. Each child had a different time point for the emergence of their first meaningful word, and Emerge T and Emerge W in the column referred to the age recorded the first time a child was able to produce a tone or a word, respectively. This table showed the age at which monosyllables and disyllables emerged in children's first words: four children produced monosyllables earlier than disyllables, three children showed the opposite order, and 1 child produced the two syllable types almost simultaneously. Generally speaking, disyllables (N=660, 64%) far outnumbered monosyllables (N=379, 36%) across children and within children. This result suggests that disyllables are more likely to emerge at children's first-word stage.

The fact that these children preferred to produce disyllables might have largely been influenced by the caretakers' speech, which had more disyllables (N=6,172, 78%) than monosyllables (N=1,729, 22%) as well as by linguistic environment, in which the speech corpus (N=604,916), *NCCU Corpus of Spoken Chinese,* showed Taiwan Mandarin speakers had a preference to produce more disyllables (N=368,997, 61%) than tri-syllables

(N=96,789, 16%), monosyllables (N=90,738, 15%), and multisyllables (N=48,392, 8%). The children's data might also confirm the universal preference in cross-linguistic studies for binary foot structure, which can be viewed as a higher constraint than faithfulness or markedness (e.g., Demuth, 2006; Demuth & Johnson, 2003; Demuth & Tremblay, 2008; Miyokada, 2012; Ota, 1999;).

3.1. Age and order of the emergence of tones

With regard to the age and order of the emergence of tones, Table 2 presents the age when each child uttered his or her first meaningful word with recognizable lexical tone.

Table 2
Age of the emergence of tones

	KL	**DD**	**SH**	**JJ**	**WW**	**YC**	**YJ**	**LC**
High-level tone	1;1*	0;10	0;9*	1;0*	0;10*	1;0*	1;0*	1;0*
Rising tone	1;3	0;10	0;11	1;0	0;11	1;0	1;2	1;0
Low-falling tone	1;2*	0;10	0;11	1;0	1;2*	1;1*	0;9	1;0
High-falling tone	1;1*	0;10*	0;11	1;0*	0;11*	1;2*	0;9*	1;1*

*Note: * = The child uttered a recognizable meaningful word for the first time.*

This table summarizes the age at which the four tones emerged in Taiwan Mandarin. High-level or high-falling tones were the earliest and existed in the children's data collected at the time when they were about to produce first recognizable meaningful words. This table shows that high-level tones were earliest in the sample of the children's speech; 4 out of 8 children acquired high-level tones, and 2 out of 8 children acquired high-falling tones. As for rising tones, all children had great confusion and variation in their production systems so some of the data were not recognizable. The following table presented the developmental course of each tone.

Table 3
Order of the emergence of tones

Participant \ Month	KL	DD	SH	JJ	WW	YC	YJ	LC
0;6	N/A	N/A	N/A	N/A	N/A	N/A	None	N/A
0;7	None	None	None	N/A	N/A	None	None	None
0;8	None	None	None	None	None	None	None	None
0;9	None	None	1	None	None	None	4	None
0;10	None	4	1, 2	None	1	None	4	None
0;11	None	1	1, 2, 3	None	4	None	3, 4	None
1;0	None	1, 4	1, 2, 3	1, 4	1, 4	1	1, 3, 4	1
1;1	1, 4	3	Complete	2, 3	1, 2, 4	1, 3	1, 3, 4	1, 4
1;2	1, 3, 4	Complete		Complete	1, 2, 4	1, 3, 4	1, 3, 4	1, 4
1;3	Complete				Complete	Complete	Complete	Complete

Note: The numbers 1-4 refer to high-level, rising, low-falling and high-falling tones, respectively. "N/A" means the data had not yet been collected at that age. "None" means that the child has not yet acquired any of the four tones in Mandarin while "Complete" means that the child had acquired, but not necessarily stabilized, all four tones of Mandarin at that age.

All these children in general showed a similar pattern of order of tone acquisition. Four children first acquired high-level tones, two children first acquired high-falling tones, and the other two children acquired both tones simultaneously. At the end of tonal completion, four children had acquired rising tones, one child had acquired low-falling tones, one child had acquired high-falling tone, and two children had acquired rising and low-falling tones at the same time. Although there were some individual differences, not all of the children first acquired high-level tones before high-falling tones; no data have been reported so far regarding the fact that children acquired rising or low-falling tones earlier than high-level or high-falling tones. All children had completed their four tones by 1;3, but they had not entirely stabilized the tonal production system. Based on the data, the rank order of the emergence of tones is suggested as follows: high-level tones > high-falling tones > low-falling tones > rising tones. Such an order of tone acquisition showed a slightly different order from the one found in the majority of scholars who agreed that children emerge low-falling tones in the last order.

3.2. Theoretical explanations

Evidence from articulatory effort theory (Ohala, 1978; Ohala & Ewan, 1972; Vihman, 1996), phonetic cues, involving duration and intensity (Fu & Zeng, 2000; Tseng, 1990; Xu et al., 2002), or the theory of markedness of tone (Yip, 2002) can all provide some explanations for such a rank order found in Taiwan Mandarin children. First, high-falling tones required less physiological effort so children need less energy and muscular control to produce such a natural gesture of falling pitch movement. Rising tones were the last tone to emerge in children's speech production since the level of difficulty would be greater for children as they would need more articulatory and physiological effort to produce the rising pitch. Secondly, phonetic cues might suggest that children easily acquired shorter duration and stronger intensity than vice versa, and falling tones have shorter duration and stronger intensity than rising tones. The physiological factors and articulatory complexity in relation to the order of tone acquisition have also been supported by Wong (2013). Finally, Yip's (2002) theory predicted the right rank order in which high-level tones are acquired earlier than other contour tones, and high- and low-falling tones are acquired earlier than rising tones. In her theory, rising tones would be the last one to be acquired. Therefore, all these relevant studies provide explanations for why rising tones are in the last order to emerge in the four-tone system, and this study showed a conflicting result to Clumeck (1977) who proposed the early emergence of rising tones over the rest of three tones.

In comparison to cross-linguistic studies, level tones seem to be acquired earlier than contour tones in Taiwan Mandarin as well as in Cantonese, Thai and Taiwanese, and as for contour tones, the study confirmed the cross-

linguistic findings in which high-falling tones are acquired earlier than low-falling tones.

3.3. *Distribution patterns of tones*

The final issue deals with the distribution patterns of tones, which are classified into monosyllables and disyllables. This study followed Lin's (2007) work which shows four basic tones plus 15 possible tone patterns in disyllables.

Table 4 *The distribution patterns of tone acquisition*

Tone	0;9	0;10	0;11	1;0	1;1	1;2	1;3	1;4	1;5	1;6	1;7	1;8	Total
Monosyllables													
T_1 (High-level)	1	1	1	1	3	4	5	6	1	7	N/A	N/A	30
T_2 (Rising)	0	0	0	0	0	1	2	12	7	3	1	2	28
T_3 (Low-falling)	0	0	0	0	4	2	2	6	1	1	N/A	N/A	16
T_4 (High-falling)	6	2	2	2	15	11	4	4	0	12	N/A	N/A	58
Subtotal	6	2	5	3	24	30	18	20	3	21	N/A	N/A	132
Disyllables													
T_1+T_1	0	0	0	1	5	12	6	6	4	0	N/A	N/A	34
T_1+T_2	0	0	0	0	0	1	1	2	0	0	N/A	N/A	4
T_1+T_3	0	0	0	0	0	0	0	0	0	0	N/A	N/A	0
T_1+T_4	0	3	2	0	0	1	1	0	0	0	N/A	N/A	7
T_2+T_1	0	0	0	0	0	0	0	0	0	0	N/A	N/A	0
T_2+T_2	0	0	0	0	0	3	0	0	0	0	N/A	N/A	3
T_2+T_3	0	0	0	0	3	3	9	2	7	3	N/A	N/A	27
T_2+T_4	0	0	0	0	0	0	0	3	0	0	N/A	N/A	3
T_3+T_1	0	0	0	0	2	2	5	0	0	0	N/A	N/A	9
T_3+T_2	0	0	0	0	7	13	13	7	4	3	N/A	N/A	47
T_3+T_4	0	0	0	0	1	0	0	0	0	0	N/A	N/A	1
T_4+T_1	1	0	0	0	0	0	0	1	0	0	N/A	N/A	2
T_4+T_2	0	0	0	0	1	0	0	0	0	0	N/A	N/A	1
T_4+T_3	0	0	0	0	0	0	0	0	0	0	N/A	N/A	0
T_4+T_4	1	0	1	0	0	5	2	5	2	0	N/A	N/A	16
Subtotal	2	3	6	2	15	37	28	25	7	3	N/A	N/A	154

Note: The tokens presented in this sample were the stabilized tones that had reached 66.7% of phonological accuracy and consistency; No data were found at 0;6-0;8 . Only one child stabilized rising tones at the first-word stage at 1;7-1;8. The rest of the children had entered the two-word stage after 1;6, so the columns were marked "N/A".

Based on the 66.7% criteria of phonological accuracy and consistency and compared to the tokens (Monosyllables=379 vs. Disyllables=660) presented at the stage of emergence of tones in Table 1, the table shows that 35% of monosyllables and 23% of disyllables were the corrected or stabilized tones, suggesting that the children do not stabilize the four-tone system yet, and they seem to have more difficulties in stabilizing the tones in disyllabic words at the one-word stage. In addition, this table shows that the tone patterns in the children's speech samples were not distributed evenly.

Regarding tones in monosyllables, this shows that at the one-word stage, high-falling tones occurred more often than high-level tones, followed by rising tones, and low-falling tones were the least common. Note that the distribution patterns in the children were deeply influenced by the caretakers' speech for monosyllabic words (N=1,729), in which an informal count of tone frequency showed that, for caretakers, high-falling tones were, in fact, more frequent than the other three tones (32%, N=553); high-level tones, 21% (N=363); rising tones, 19.7% (N=341); low-falling tones, 19.4% (N=335), neutral tones, 7.9% (N=137). In addition, the token counts from the speech corpus (N=604,916), *NCCU Corpus of Spoken Chinese*, showed that high-falling tones are the most frequent, suggesting that the linguistic environment seem to be related to children's preferred patterns as well.

Regarding tones in disyllables, there were in total 15 possible tone combinations in sequences of disyllables to be expected by chance, but so far the tonal patterns T1+T3, T2+T1, and T4+T3 have not been found. The endearment-tone pattern, T3+T2, was the most remarkably common one in the reduplicative forms, followed by the high-level sequence T1+T1, and T2+T3 was the third most common type. Preference for the 12 available tonal patterns is not equally distributed in the tokens. This suggests that Taiwan Mandarin children have a preference for such tonal patterns involving T3+T2, T1+T1, and T2+T3 when they produce disyllabic words at the one-word stage.

This finding was not surprising since the endearment tone T3+T2 was a unique language-specific phenomenon in Taiwan Mandarin, and such a pattern has been reported to be very frequent, particularly in Taiwan (Duanmu, 2007).

Yang (2013) examined the tone combination in sequences of disyllables in motherese, and found that the caretakers tended to produce the endearment tone, T3+T2, in their child directed speech most often. Since high-level tones were easily acquired and emerged, it should not be surprising to find that the high-level sequence, T1+T1, is the second most preferred pattern. The third most common pattern could be viewed as a morphologically-conditioned tone pattern, T2+T3 (N=27). Twenty-six cases in the current study were derived from the tone sandhi rule, and the underlying form was

the low-falling sequence, T3+T3, and in only one case was the true rising-low-falling combination of T2+T3 in the underlying representation.

Evidence from the speech corpus, *NCCU Corpus of Spoken Chinese*, showed the preferred rank order in adults' spontaneous conversation in the following order: T2+T3 > T4+T2 > T2+T1 > T4+T4 > T1+T4 > T4+T2 > T3+T4 > T1+T1. Children's disyllabic word production seemed not to have a close influence with the linguistic environment.

As for prosodic phonology, iambic foot structure was proposed in support of low-high contrast in pitch from H. Hsu's (2006) and Lu's (2011) studies. Although the present data supported binary foot structure, the children did not show a preference for low-high (iambic) pitch contrast in the disyllabic words. Tsao (2008) presented a perceptual study where rising and low-falling tones are the minimally distinct pair for the infants aged of 10 and 12 months to distinguish tone contrasts; however, such a minimally distinct pair turned out to be the preferred combination in disyllabic words for the present study.

The present study showed that children will not be able to stabilize and master the four-tone system at the one-word stage since the tones in monosyllables contained only 35% of accuracy rate, and the ones in disyllables included even lower, 23%, of accuracy rate. In the earlier study from Li and Thomspon (1977) in which children mastered their tonal systems with few errors by the age of 2;0, possibly at the one-word stage, and in the phonetic study of Chen and Kent (2009) where the distribution pattern of F_0 contours in babbling and early-word stages are alike, the lower accuracy rate in the present study instead provided a conflicting result. Since this study mainly focused on the tone acquisition at the one-word stage, and it might not be able to fully compete with the claims of Wong (2008, 2012, 2013) and Wong et al. (2005) for a support of the lengthy developmental course of tone acquisition.

Mandarin has only four tones, and one would possibly imagine that more complex tonal system such as Cantonese, Thai and Taiwanese would require longer period of timeline to stabilize the entire course; however, evidence from the majority of cross-linguistic acquisition studies on tone production, for which data have been reported so far, showed that the order of emergence-stabilization interval seems to be very short. Another perceptual study suggested that phonetic categories for tone evolve earlier than those for vowels and consonants even at the age of 4 months from Cantonese and Mandarin infants (Yeung et al., 2013). Although perceptual and production studies have sometimes showed conflicting results, the question remains unsolved to explain why Mandarin children are able to distinguish the four-tone system at the age of 4 months, acquire tonal production early, but stabilize the system after the age of 3; there is a long delay between the age of 4 months and the age of 3 or beyond. Moreover, conflicting statements have always raised another question as to whether the data sources are drawn from production/articulation or from acoustics/perception since they might yield different results (Myers, 2016a, 2016b).

4. Conclusions

Evidence from the current study has shown that, in terms of the child's age and the order of tone acquisition, there seems to be a universal tendency whereby high-level tones are likely to be acquired earlier than high-falling tones, followed by low-falling tones and rising tones. In terms of the stabilization of tone acquisition, this study does not support the early developmental course of tone acquisition, and children do not stabilize the four-tone system before 1;8 at the one-word stage. As for the distribution of tone patterns, high-falling tones are the most common in monosyllabic words, and the endearment tone, T3+T2, is the most preferred combination in disyllabic words at the one-word stage. Many sources from the points of view of articulatory theory, physiological effort, phonetic cues, and markedness constraints have provided some explanations to account for both the universal tendencies and the language-specific patterns found in the present study. Few studies have ever discussed the relative frequency of occurrence of tones in terms of perceptual explanations, so there is a need to find out whether children have a perceptual preference or bias towards any particular tonal patterns. The linguistic environment (i.e., caretaker's speech or speech corpora) might also provide a greater influence in modifying children's acquisition system by using innate articulatory and auditory templates (Locke, 1980, 1983; Kent, 1992).

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The structure and interpretation of a child's single word utterance

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Abstract

All normal human children go through systematic and universal stages in their first language production including cooing, babbling, one-word or holophrastic, two-word, and telegraphic stage. The purpose of this paper is to shed light on the structure and interpretation of one-word utterances or holophrases produced by children as they acquire their first language. Some major studies on this issue and their findings including the holophrastic hypothesis with its two versions are presented and discussed. The results of the body of research on this issue indicate that children's single-word utterances are functionally-oriented and serve to fulfill communicative purposes rather than expressions of structural relations.

Keywords holophrase, holophrastic hypothesis, functional version, structural version, child language

1. Introduction

The process of first language acquisition by children has been shown to follow certain universal stages, regardless of the particular language being acquired. It seems that first language acquisition schedule has the same basis as the biologically determined development of motor skills and the maturation of the infant's brain (Bloom, 1973; Yule, 2014). Children are born with an innate propensity to acquire their first language in a relatively short time and at a fast rate. By the age three, all normal human children will have acquired the language they are exposed to and not only are able to comprehend their first language but are also capable of producing that language to fulfill different functions. The universal stages that children go through in acquiring their first language starts with a stage called 'cooing'. In this first stage of production, the child gradually becomes capable of articulating sequences of vowel-like sounds, particularly high vowels similar to [i] and [u]. By four months of age, the developing ability to bring the back of the tongue into regular contact with the back of the palate allows the child to produce sounds similar to the velar consonants [k] and [g], hence the common description as 'cooing' or 'gooing' for this type of production (Yule, 2014).

The second universal stage of child first language acquisition is 'babbling'. Children between six and eight months produce a number of different vowels

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and consonants, as well as combinations such as *ba-ba-ba* and *ga-ga-ga* . This is called 'reduplicated babbling' for the child repeats a consonant-vowel sequence. Later on in this stage, when the child is around nine to ten months of age, there are distinguishable intonation patterns to the consonant and vowel combinations such as *ba-ba-da-da.* Babbling is considered to be a form of play in which various sounds are practiced and acquired before they are utilized in communicative ways. There are several reasons to justify this claim. One reason is that sounds created during babbling are similar to, but phonologically more sloppy than the corresponding sounds made later on. Another reason is that babies have been observed to babble more often when an adult is not present than when one is present (Nakazima, as cited in Carroll, 2008).

The third universal stage in child language development is the *one-word* or *holophrastic* stage. Children between twelve and eighteen months of age begin to produce single words which serve different functions. This stage of language development in children is characterized by the production of a variety of single unit utterances. Since these one-word utterances function as a phrase or a sentence, they are also referred to as holophrases, or whole phrases or sentences. Examples of holophrases include the names of people or objects such as *Karen, Sarah*, *chair, ball, milk, cat* and so on. Children whose native language is Farsi frequently produce single-word utterances such as *kafsh(shoe), aab(water), baba(father), maman(mother), baazi(play), etc.*

The fourth stage of child language development is 'the two-word' stage. Children aged between eighteen to twenty months produce utterances which consist of two words, such as *baby chair, mommy eat*, *cat bad*, and the like. . Children acquiring Farsi as their first language produce telegraphic utterances such as *maman aab(mommy water), gorbe oomad(cat came), mashin baba(father's car).* Adults usually interpret these utterances with reference to the context in which they are produced. As an example, *baby milk* can be interpreted as an expression of possession (e.g. It is baby's milk), a request (e.g. give baby some milk), or a statement (e.g. baby is drinking milk). Whatever it is that the child actually intends to communicate through such expressions, the significant functional consequences are that the adult behaves as if communication is taking place. That is, the child not only produces speech but receives feedback confirming that the utterance works as a contribution to the interaction. Moreover, by the age of two, whether the child is producing 200 or 300 distinct words, he will be capable of understanding five times as many and will typically be treated as an entertaining conversational partner by the principal caregiver (Tavakoli, 2012).

When children are between two and two-and-a-half years old, they are capable of producing a large number of utterances that are classified as 'telegraphic' or 'multi-word' speech. The salient characteristic of this stage is not the number of words produced but the variation in word forms that start to emerge. Now the child is able to correctly combine lexical morphemes to produce sentence-like strings of words such as *daddy go bye-bye, this shoe all wet,* and *cat drink milk* Examples of telegraphic utterances in Farsi produced by children include *maman bere biroon (Mother go out), Elnaz*

*ghaza bokhore(Elnaz eat food), Nazanin bazi kone(Nazanin wants play).*The interpretation of telegraphic speech is relatively much easier for adults as children's language at this level has considerably approximated the language of adults. As noted earlier, in one-word stage of language development, children are only capable of producing single-word utterances which are expressed in longer stretches of words and in the form of sentences by adults. A holophrase has been defined as a single-word utterance that is used by a child to express more than the meaning usually attributed to that single word by adults (Rodgon, 1976). Different child language researchers have adopted different positions and perspectives regarding how to approach and interpret holophrases and what children mean by producing them.

The purpose of this paper is to investigate how children's one-word utterances or holophrases, which are produced when children are between twelve to eighteen months, are interpreted by adults and to explicate what children mean when they can only produce one word. Some previous studies on the interpretation of holophrases produced by children and hypotheses related to this issue will be presented and reviewed.

1.1. Literature Review

Children usually begin to say their first words at about twelve months of age. For the next few months, their utterances consist of single words which are created in isolation from one another, and it is usually not until the latter half of the second year of life that the child eventually begins to combine these single-word utterances together to form rudimentary multi-word utterances (Brown, 1973) . Now, it has frequently been observed that during the period of single-word speech, a word which is produced by the child seems to convey more than the normal adult meaning of that word, an observation which was first made in the 1980s:

When a very young child says *water,* he is not using the word merely as the name of the object so designated by us, but with the value of an assertion something like *I want water,* or *there is water.* (Stevenson, as cited in Barrett, 1982)

The definition of the term 'holophrase', however, is ambiguous since it is not clear whether the single-word utterances produced by children are considered as being structurally or functionally equivalent to whole phrases of adult language; and it is, therefore, possible to identify two quite different versions of the holophrastic hypothesis. A structural version of the holophrastic hypothesis, which was advocated by McNeill (1970), suggests that children at the single word stage of development possess a knowledge of certain syntactic relations although they do not yet know how to formally express these relations in their speech, grammatical relations such as predication, object of verb, and subject of sentence, etc. being implicitly , although not formally, expressed in their single-word speech (McNeill, 1970). According to this version of the holophrastic hypothesis, the single-word utterances of children are structurally equivalent to whole phrases and sentences of adult language, the structural relations of something like full sentences being implicitly expressed in these utterances. However, a distinct version of the holophrastic hypothesis was advocated by McCarthy (1954). McCarthy claimed that it is difficult to establish what part of speech the first

words are, for these single words are used in isolation. Instead, McCarthy suggested that these words function as one-word sentences, using different gestures and intonations of the voice, the child expresses a variety of different meanings in various situations. For instance, the one-word utterance *ball* may mean *there is the ball* if it is produced in the presence of a ball and is accompanied by a pointing gesture, or it may mean *where is the ball?* Or *I want the ball*, if it is uttered with a questioning or demanding inflection, and is accompanied by searching behavior.

According to the functional version of the holophrastic hypothesis, then, holophrases are functionally equivalent to whole phrases of adult language, meaning that each one-word utterance serves a particular communicative function (e.g. indication, questioning or demanding). This function is communicated to the listener by the intonation and the gestures of the child which accompany the utterance. Whereas the structural version of the holophrastic hypothesis considers the single-word utterances of children as expressions of structural relations, the functional version of the hypothesis views each one-word utterance as consisting of a single lexical item serving a particular communicative function which is to be communicated to the listener by the intonation and gestures of the child.

A survey of the first 40–50 words reported in diary studies for a variety of languages showed that children's first 50 words fall into a fairly small number of categories (Clark, 1979). They include people, food, body parts, clothing, animals, vehicles, toys, household objects, routines and activities or states (Fenson et al., 1994).

Table 1

Early Word Production: First words said by at least 50% of the monthly sample

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People: daddy (1;0), mommy (1;0), baby (1;3), grandma (1;6), grandpa (1;6)
Food/drink: banana (1;4), juice (1;4), cookie (1;4), cracker (1;5), apple (1;5), cheese (1;5)
Body parts: eye (1;4), nose (1;4), ear (1;5)
Clothing: shoe (1;4), sock (1;6), hat (1;6)
Animals: dog (1;2), kitty (1;4), bird (1;4), duck (1;4), cat (1;6), fish (1;6)
Vehicles: car (1;4), truck (1;6)
Toys: ball (1;3), book (1;4), balloon (1;4), boat (1;6)
Household objects: bottle (1;4), keys (1;5)
Routines: bye (1;1), hi (1;2), no (1;3), night-night (1;4), bath (1;5), peekaboo (1;5), thank you (1;6)
Activities (sound effects, motion, state): uh oh (1;2), woof (1;4), moo (1;4), ouch (1;4), baa baa (1;4), yum yum (1;4), vroom (1;5), up (1;5), down (1;5)

Source: Fenson et al. (1994), p.93.

As one can expect, children say words about what is going on around them: the people they see every day; toys and small household objects they can manipulate; food they themselves can control; clothing they can get off by themselves; animals and vehicles, both of which move and so attract

attention; daily routines and activities; and some sound effect (Clark, 2009). The terms for all of these are used first as single-word utterances so it is not possible to assign them yet to any grammatical word-classes such as noun or verb. The first words children learn to produce tend to be used in highly restricted ways, often in very limited contexts. They may say *hi*, for example, only when standing in a particular doorway or *shoe* only for shoes inside a cupboard. These uses have been characterized as context-bound, but they rarely last more than a few weeks and rarely affect more than two or three words (Barrett, 1995) . After several weeks or months of adding slowly to their initial arsenal of words, many children seem to increase their rate of production rather suddenly. This increase normally occurs around 1;5 to 1;8 as they approach the fifty-word level in production (Bloom, 1973; Nelson, 1973). It often consists of an increasing number of words for objects.

Research revealed that this spurt in words produced marks a significant step forward in acquisition because it marks the point at which children show they have recognized the symbolic value of words, when they discover that everything has a name (McShane,1980). Gentner (1982) investigated reports of early vocabularies and found that children seemed to use more object words than action words in languages as different as English, German, Japanese, Mandarin, and Turkish. She suggested that this reflected a bias towards objects that were bounded perceptually and conceptually, in comparison to events. Objects were more readily identifiable and therefore more readily associated with linguistic expressions. The result, she argued, was a bias towards object words (a noun bias) in children's early vocabularies. Because verbs are relational in nature and take account of participants in an event, they are more complex than nouns for objects and are therefore harder to acquire. This provoked both interest and argument. Subsequent studies of languages like Mandarin Chinese which all allow more extensive ellipsis of arguments than languages like English had mixed results: Some researchers found that children created more action words (verbs) than object words (nouns) at around 1;8 to 1;10 in these languages (Brown, 1998; Choi & Gopnik, 1995; Tardif, 1996; Tardif, Shatz, & Naigles, 1997). But others reported there was no evidence of an action word (verb) bias, for example, in Korean (Au, Dapretto, & Song, 1994). Reanalyses of the English data have also suggested there is less of an object word or noun bias than was originally claimed (Bloom, Tinker, & Margulis, 1993; Gentner & Boroditsky, 2001).

It is noteworthy that both child speech and child-directed speech in different situations normally contain different proportions of object and action word uses, even within a single language. When children read books with their parents, they produce more object words than when they play with mechanical toys in both English and Mandarin (Gelman & Tardif, 1998). Gelman and Tardif (1998) also compared the word-type proportions in children's spontaneous speech with the proportions found in maternal recall using the McArthur inventory checklist to identify child vocabularies. For both languages, mothers underreported the number of action words (verbs) their children used. Somewhat younger children (1;4 to 1;8) learning either English or Korean at the fifty-word level all had more nouns than verbs (Kim, McGregor, & Thompson, 2000). But the children learning Korean learnt

significantly more verbs than the children acquiring English. They heard more activity-oriented utterances from caregivers, more verbs, and more salient cues to verb meanings (Choi, 2000; Ogura et al. 2006; Kauschke, Lee, & Pae, 2007).

In one study of English, some children (aged 1;7 to 2;5) had acquired the word *door* and used it consistently for opening things and for getting access to things – opening boxes, taking lids off jars, removing nuts from bolts, taking clothes off dolls. But other children the same age used *open* in the same range of contexts to express the same range of meaning (Griffiths & Atkinson, 1978). That is, some had chosen what for adults was a noun, and others had chosen a verb, but the child uses for the two terms appeared identical. One solution is to wait until children start to produce utterances in which the structure reliably identifies the words in question as nouns or verbs. But this means waiting until children use both the appropriate word endings to distinguish nouns from verbs and consistent word order in predicates, verb before direct object (Bowerman, 1973).

Child uses of single words can often vary from adult uses as the observations of *door* and *open* indicate. Meanwhile, children may use a larger number of adult nouns for talking about objects and of verbs for talking about actions because these are the terms that have been offered and made most accessible to them for talking about those things. When adults talk to young children, they are more likely to use nouns for objects and verbs for actions so this is reflected in children's early word use (Clark, 2009). At the same time, for those languages with more (pronoun) argument ellipsis, children will hear proportionally more utterances containing only verbs, or verbs with fewer noun arguments, and this is also reflected in child usage. To label the terms in single-word utterances as nouns or verbs attributes additional knowledge about these word-classes to very young children, knowledge they are still unlikely to have (Stern & Stern, as cited in Clark, 2009). McNeil (1970) has argued that children at the holophrase stage have some knowledge of certain syntactic relations but are not able to express them formally in their speech. According to this view, a single utterance such as *dog* might refer to subject in the complete sentence *The dog is drinking water*. The functional view of holophrases fits well with the body of research that have shown that one-word producers are capable of using either intonation or gesture to accompany their single words (Barrett, 1982; Dore, as cited in Carroll, 2008)

1.2. Chomsky and Bruner's Approach to Language Acquisition

Language Acquisition Device(LAD), according to Chomsky, is a hypothetical mental organ which refers to children's putative 'innate' ability to learn their native (first) languages. All children throughout the world seem to be able to learn and master their native language in a relatively straightforward manner, regardless of the context in which the child is developing (e.g., rich/poor, literate/illiterate, etc.). The main factors necessary for language acquisition in children seem to be a brain and exposure to linguistic input. The reason for proposing the LAD stemmed from the following observations by Chomsky which contributed to his development of the nativist or innate view of language acquisition. First, all neurologically healthy children pass

through similar stages of developmental progress with respect to how their L1 develops; Babbling precedes the one-word stage, which is then followed by the two-word stage, etc. This observation seems to be independent of which L1 is being learned by the child and the socioeconomic, linguistic and cultural circumstances surrounding the child's development. Second, children seem capable of learning their L1 despite the fact that much of the natural language input that they are exposed to is not itself perfectly grammatical (i.e., people make performance errors when they talk). Finally, children acquire their L1s despite the fact that they receive no negative evidence (an indication of what is not grammatically possible in their L1) (Tavakoli, 2012).

Bruner' s theory of scaffolding emerged around 1976 as a part of social constructivist theory, and was particularly influenced by the work of Russian psychologist Lev Vygotsky. Vygotsky (1962, 1978) argued that we learn best in a social environment, where we construct meaning through interaction with others. His Zone of Proximal Development theory, where we can learn more in the presence of a knowledgeable other person, became the template for Bruner' s model. Bruner believed that when children start to learn new concepts, they need help from teachers and other adults in the form of active support. To begin with, they are dependent on their adult support, but as they become more independent in their thinking and acquire new skills and knowledge, the support can be gradually faded, that is, language is acquired as a socialization system. This form of structured interaction between the child and the adult is reminiscent of the scaffolding that supports the construction of a building. It is gradually dismantled as the work is completed In a very specific way, scaffolding represents a reduction in the many choices a child might face, so that they become focused only on acquiring the skill or knowledge that is required.

2. Conclusions

The purpose of this paper is to shed some light on the issue of what children's first single words mean. From the day they say their first words, children are surprisingly adroit at finding ways to express their intentions and at interpreting what adults say to them. Children's first utterances consist of just single words, but they are often articulated to express a sentence-like meaning. Single word utterances are often called 'holophrases' (whole sentences). Adults use them, too as when we say *butter* for *pass the butter please* or *stop* for *stop yelling in my ear,* but for children, that is all there is at first. It is not easy for a child to convey all that she wants to say in single-word sentences. It necessitates a lot of ingenuity to be that economical, and children seem to follow a sensible policy; they tend to select a word that expresses what is new or changing or uncertain about that particular situation. A proposition about the human perceptual system is that human attention tends to focus on what is novel, changing, and uncertain in the surrounding world (Greenfield, Reilly, Leaper, & Baker, 1985). This has the potential to explicate why a child trying to get down from a chair will say *down* rather than *me* or *chair*. She is describing the kind of change she wants to happen.

Two different approaches to the interpretation of single-word utterances or 'holophrases' were presented. The first approach considers child's first single-word utterances as having functional values which serve communicative functions such as requesting or questioning are interpreted with reference to the context and to the specific gesture and intonation of the child producing them. For instance, when a child points to some milk on the table and says *milk* with the specific intonation associated with requesting, they are actually saying *give me some milk*. It is worth underlining that the interpretation of these utterances are much easier for the child's caretaker who spends much time with the child than for others. The second approach to the interpretation of child's single-word utterances considers child's single words as expressions of structural relations and holophrases as implicit sentences. In fact, the argument is that there is greater continuity in development at the functional stage than at the structural stage; albeit the child has little grammatical knowledge, she is able to express complete thoughts that will be expressed via grammatical phrases and whole sentences by expressing those aspects of a situation that are most interesting, novel, unusual or informative.

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