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**Phonological Processes:
Characteristics of Child Language Development
– A Case Study of A Japanese-English Speaking Boy –**

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1. Introduction

Jespersen (1922) stated the observation that children in different linguistic communities show a tendency to replace velar stops with alveolar ones. The child who says [tæt] for *cat* will also say [dɔ] for *go*. This general pattern would then qualify as a sound-law for child language development. Child's words at any point could be described within this approach by specifying the sounds-law that are operating in the child's speech.

Recently, sound laws as described by Jespersen have been referred to as *phonological process*, a term used by Stampe (1969). Stampe considers these processes as consisting of universal set of hierarchically ordered procedures used by children to simplify speech. They are universal to the extent that every child is born with the facility to simplify speech in a consistent fashion. They are hierarchical in the sense that certain processes are more fundamental than the others. Stampe sees phonological development as a gradual loss of these simplifying processes until the child's words finally match their adult models.

The establishment of various phonological processes in the speech of young children has been the goal of much recent research. This research attempts to propose generalized statements to describe common substitutions in the speech of young children. This paper will attempt to describe the phonological patterns found in the words used by children between one and half years old and four years old through the establishment of phonological processes. It will begin with a description of the more common processes found thus far, with evidence provided from children learning a second language. Then an example of phonological patterns shown by a Japanese-English speaking child between the ages of 1;4 and 3;3 will be presented and discussed. The discussion will conclude that development during this stage needs to take into account phonological preferences that vary from child to child.

2. Child Language Acquisition in General

How do children learn to talk? From babbling to talking, children go through a number of characteristic stages during the first twelve months of life. The very first stage makes hardly any noise at all, except for a faint babbling sound. At the age of only a month or two, the baby can be observed to push its tongue out a little through its partly opened lips. It then brings its lips together and at the same time a little babble of saliva emerges from its mouth. The baby is

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mouthings the actions of vocalizing, coordinating its breathing with movements of their tongue and lips—the vital combination that will later provide the basis for speech. It is observed to produce a sound similar to [ə]. But as yet there is no sound to go with these movements.

Then, by the age of three months, the audible babbling begins and during the weeks ahead becomes something of an obsession. At first there are no more than experimental splutters and grunts, as though the baby is trying to blow raspberries at its parents. It produces such sounds as [e], [ɛ], [æ], [a], [o]. Then, as the weeks pass, open vowel sounds appear on the scene. This is cooing phase, with rounded *ooos* and *aaas* becoming great favorites. Between the ages of three and six months this babbling becomes more and more frequent and often takes place when the baby is quite alone. It starts to add consonants [m], [p], [b], [t], [d], [n], [k], [g] and [ŋ] to its vowel sounds, producing a variety of *ma*, *pa*, *ba*, *ka*, *da*, and *der* noises.

As the weeks pass the streams of babbling become more and more prolonged and complicated. They reach a crescendo at about six months of age and then subside slightly. This is because a new phase has been reached. In the old, simple babbling phase there was little or no relationship to other sounds being made by parents. If the baby said *ma* or *pa* it may have seemed like an identification to the mother or father, but it was not. It was simply vocal experimentation. Now, between six and seven months, several important new steps are taken. The single syllables are combined to produce such sounds as *mumum* and *dadad*, or *booboo* and *ala*. Again, parents may feel they have been identified, but for a while even these double syllables are made, not to them, but to the world in general.

Interaction does become more important. If parents talk to their babies at this stage, the babies will pause in their babbling and listen. Also, they can identify a friendly voice even when they cannot see the speaker. And they may use vocalizing to attract attention, even though the precise sounds have no specific meanings. In addition, they begin to vary the volume, pitch, and rate at which they babble. In a sense they are rather like an orchestra that is tuning up, but has yet started to play the music. That splendid moment may arrive at about the age of nine months, but only in a small percentage of babies. The majority are not so forward.

The first meaningful word is usually one directed to the parents, such as *mama*, or *dada*. Such sounds have been made before, but now, at last, they are directed at the real “mama” or “dada.” At first it is only a matter of degree. The baby is observed to say *dada* more often in the presence of its father than when he is absent. Then, little by little, the word comes to mean father.

Three percent of children utter their first true word in this way by nine months; 10 percent by ten months; 50 percent by twelve months and 90 percent by eighteen months. By the age of one year many babies have mastered the use of several words, but it will take a further year before they can join words together spontaneously to make simple sentence.

3. The Case Study

A Japanese boy whose parents are both Japanese-English bilingual serves as a subject for the following study. They speak 60% Japanese and 40% English in their daily life. Other than from his parents, the boy has the exposure to the Japanese language from television and his friends and to the English language only from television.

The data was collected by the mother, care-taker, who is always with the subject and the most dominant input provider to him. The data was first written in a small memo when she heard significant features of the sounds the subject produced. Then the data was transferred in her

diary to keep record. The diary was kept for two years from January, 1993 to December, 1994. The data was studied by the researcher and transferred into card files. It was classified into some categories according to Stampe's study and given names for the categories.

The purpose of this case study was to analyze the features of the boy's phonological production and classify into Stampe's categories. The various features of the boy's phonological process patterns were emphasized rather than the numbers of the each phonological production.

4. Phonological Processes

Between the ages of one and a half and four years old the young child undergoes considerable development in phonological ability. Starting with a small vocabulary of approximately 50 words, the child proceeds from single-word utterances of very simple phonological form to multiword utterances that are relatively high in intelligibility. Phonological ability improves through an increase in the ability to produce adult sounds and combine them into more complex phonological structures.

Jespersen (1922) characterized the distinctness of this stage of phonological acquisition. He emphasized the regularities that occur in the child's words:

"As the child gets from the peculiarities of his individual 'little language', his speech becomes more regular, and a linguist can in many cases see reasons for his distortions of normal words. When he replaces one sound by another there is always some common element in the formation of the two sounds. There is generally a certain system in the sound substitutions of children, and in many instances we are justified in speaking of 'strictly observed sound-laws'."

The sound laws described by Jespersen have been referred to as *phonological process*, a term used by Stampe (1969). Stampe considers these processes as consisting of universal set of hierarchically ordered procedures used by children to simplify speech. They are universal to the extent that every child is born with the facility to simplify speech in a consistent fashion. They are hierarchical in that certain processes are more basis than others. Stampe sees phonological development as a gradual loss of these simplifying processes until the child's words finally match their adult models.

4. 1. Substitution Processes

A common characteristic of the phonological analysis of the speech of young children is the determination of substitution in the child's words. This is done by comparing the child's word to the adult model and noting the correspondences between the two. The child who says [but] for *book* is a typical example. The correspondences between the first two segments in the child's form and those in the adult model are a match, so that no substitution has taken place. For the final segment, on the other hand, adult [k] has been replaced by [t]. The postulation of processes not only describes substitutions, but attempts to explain them. In this case, the difference between the two segments is the place of articulation. The process involved can be described as one which tends to replace velar stops with alveolar ones.

By examining samples of children's words from several children both within and across languages, it is possible to isolate the more common substitutions that occur and subsequently to postulate general processes. The first major type of processes are those that result in the replacement of one segment by another. There are five of the common substitution processes from a variety of children.

A. Stopping

Fricatives, and occasionally other sounds, are replaced with a stop consonant. For examples, [s] becomes [t] and [f] is replaced by [p], in the same way [v] is pronounced [b]. The stopping process is widespread and is one of more established patterns in children's speech. Fricatives are the most commonly affected group of sounds, although resonants will also occasionally be affected. While stopping is common, the actual patterns of its application by individual children are not. Children typically will not necessarily change all of their fricatives into stops, and it is not possible to predict which ones individual children will select.

e. g.

fishy [fiʃi:] → [piʃi:]

B. Fronting

Velar and palatal consonants tend to be replaced with alveolar ones. Fronting is also quite common across children, although some children prefer it more than others. It is important to realize that there are actually two processes involved here, fronting of palatals and fronting of velars, and children may show one and not the other. Also, the process interacts with stopping, so that it is not unusual to find an English or French speaking child replacing [ʃ] with [t].

e. g.

ready [redi:] → [wedi:]

C. Vowel rising

Lower vowels such as [æ] [ɑ] [ɔ] [ɛ] and [o] are replaced with higher ones like [i] and [u].

e. g.

bear [beə] → [pu:]

special [speʃəl] → [spi:ʃəl]

pea [pi:] → [pu:]

camera [kæməɾə] → [kæmirə]

senbei [senbei] → [senbi]

tempura [tɛmprə] → [timpə]

denwa [denwə] → [dinwə]

ramen [rə'mɛn] → [rə'min]

poi [poi] → [pai]

D. Gliding

We know less about the process of gliding, although it is well-documented in English and Japanese. A glide [w] or [j] is substituted for a liquid sound, such as [l] or [r].

e. g.

kiru [kiru] → [kiju]

E. Palatalization

Palatalization is applied in describing a process in which the primary articulation is changed so that it becomes more palatal. Thus sounds are said to be palatalized if the point of articulation moves toward the palatal region in some particular circumstance. For example, alveolar fricatives tend to be replaced with palatal ones.

e. g.
boots [bu'ts] → [bu:tʃ]
juice [dʒu:s] → [dʒu:f]
pants [pənts] → [pəntʃ]
fishy [fiʃi] → [pitʃi]
boshi [bo:si] → [bo:tʃi]

4. 2. Assimilatory Processes

Another general group of processes that will result in mismatches between the child's form and the adult model is the one that is composed of tendencies to assimilate one segment in a word to another. Even if the child has acquired a particular adult sound in some words, there may be certain contexts where its production may be changed. While detailed research is necessary on this topic, the following processes are relatively common.

A. Voicing

Consonants tend to be voiced when preceding a vowel, and devoiced at the end of a syllable. Voicing as described actually refers to two separate but related processes. One of these, the devoicing of final consonants, is well-documented as a characteristic of languages. The other, voicing of prevocalic consonants, requires some discussion. To date, this process has been predominantly observed for English.

e. g.
paper [peipə] → [beibə]
bed [bed] → [bet]
boots [bu'ts] → [pu:tʃ]
bear [beə] → [peə]

B. Consonant Harmony

In CVC contexts, consonants tend to assimilate to each other in certain predictable ways. Three frequent patterns are velar assimilation, labial assimilation, and denasalization. Young children show various kinds of consonant harmony or assimilation. This is an area that is not particularly well documented, and one that requires more research. One problem is that some children appear to assimilate more than others; also, the various possibilities for assimilation are quite numerous. It may be that the phonological preferences determine a great many of the variations that occur.

e. g.
tub [tʌb] → [bʌb]
jungle book [dʒæŋl buk] → [dʒænbl buk]

C. Progressive Vowel Assimilation

An stressed vowel will assimilate to a preceding or following stressed vowel. Since vowels develop rapidly, progressive vowel assimilation is a process that is usually lost early. Children begin quite early in development to differentiate vowels within a word, although isolated cases of assimilation occur for several months.

e. g.
big bird [big bə:d] → [bu: bu:]
baby [beibi:] → [bibi]

4. 3. Syllable Structure Processes

While it has not been explicitly mentioned, it is clear that the notion of syllable is quite important in understanding all the processes discussed so far. Substitution processes will vary according to the place of the sound in the syllable. For instance, stopping of fricatives is usually lost for final fricatives before it is for syllable-initial ones. In other words, fricatives are easier to produce postvocally than prevocally. The notion of syllable is also important in assimilatory processes. The voicing of consonants varies according to the place in the syllable. For consonant harmony, it is known that children often have an early restriction that the consonants in CVC structures must be homorganic. With vowel assimilation and denasalization, the important factor is that a segment in an unstressed syllable is likely to weaken or assimilate to segment in the stressed syllable.

Other than these syllabic influences, there are specific phonological processes which are directly motivated by the tendency of young children to simplify syllable structure. For most children, the direction is toward a basic CV syllable. Some of the more basic syllable structure processes are classified into the following groups.

A. Cluster Reduction

A consonant cluster is reduced to a single consonant. The reduction of clusters is one of the most widespread processes observed. The direction of the deletion is also predictable in many instances. One of the most regular patterns is the deletion of sonorants when they occur in combinations with stop consonants. The deletion of [s] is also common, although there are cases where [s] has been retained instead of the stop.

e. g.

clown [klaun] → [kaun]

train [trein] → [tein]

careful [kɛəfl] → [kə'fu:]

ninja turtle [nindja tɜtl] → [nindja tl]

tempra [tempɾa] → [tenpa]

B. Reduplication

In a multisyllabic word, the initial CV syllable is repeated. Reduplication occurs quite early in children's speech and is often lost by the time the stage under discussion begins. Some reduplications persist, however, and other partial reduplications continue to occur. Of some interest is the fact that to do it a lot, whereas others rarely do it. There is also a relation between this process and the deletion of final consonants.

e. g.

melon [melən] → [melən melən]

potato [poteito] → [pota pota], [potɛ potɛ]

C. Addition

Certain syllable is added inbetween two words.

e. g.

giant robo [dʒaɪənt robɔ] → [dʒaɪənt dɔrobɔ]

zekkyou machine [zekjoː məʃiːn] → [zekjo tɔməʃiːn]

D. Reverse in order

Certain syllables are reversed in order.

e. g.

makimodoshi [makimodoʃi] → [makidomoʃi]

pekochan [pekotʃən] → [kopetʃən]

kuma [kumə] → [məku]

satokun [satokun] → [sakuton]

E. Reduction

Some syllables are reduced and sounds are simplified.

e. g.

gingerbread man [dʒindʒə brɛd mæn] → [dʒindʒə mæn]

Q.P. chan [kju: pi: tʃən] → [pi: tən]

obaachan [oba:tʃən] → [ba:tʃən]

hai [hai] → [ai]

5. Conclusion

This paper began with a description of general language development that takes place between the ages of 0 and 1;6. Then the discussion moved onto an observational data of phonological processes that a Japanese-English speaking boy exhibited between the ages of 1;4 and 3;3. Through the data analysis, there is an aspect that is important as describing a child's system.

$$\text{adult form} + \text{phonological processes} = \text{child's form}$$

Evidence of the sort discussed before suggested that this description is inadequate. It is necessary to consider the possibility that children actively operate on adult forms to establish their own phonological representations of words. That is, there is (1) the adult form; (2) the child's representation of the word; (3) the child's spoken form. With new words that show advanced form, we can say that the child has not yet established a representation, so that the form has not yet conformed to the child's system. The claim that the child has a system of his or her own is controversial, yet it seems to account for some otherwise inexplicable aspects of young children's phonological patterns.

The child's language is dynamic in nature, so that any analysis needs to take into account both old and new developments, as well as the gradualness of phonological change. We also have to consider the child as an active organizer of its own system. The process that a child may exhibit in these cases look very different from those more commonly found in the literature, and they show a willingness on the child's part to break down the more frequent isomorphic relation that is maintained between adult forms and the child's production. The use of different organization principles can account for some of the individual variation between children if we can observe some more children at the same time. Phonological development at this stage can be seen to consist of both very general phonological processes and also the child's unique phonological preferences shown through various productions of speech forms for the language he is acquiring.

References

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[和文要約]

Jespersenは幼児の言語発達過程における調音・音韻体系の特徴から一つの規則性を導き出そうと試みた。その規則性の特徴は後にStampeによってPhonological Processと名付けられた。この調音・音韻体系の特徴は世界の諸言語の話者において共通にみられるもので、幼児が言語を修得し、大人と同じ様な調音能力を身につけるまでの1歳6カ月から4歳頃までに顕著に表れる。そこで本論文では、日本語と英語を同時に習得している日本人男児が1歳から3歳に至るまでの2年間に発話した音声の分析に基づき、幼児の言語発達過程における調音・音韻体系の特徴に関して報告する。