CHAPTER II

LITERATURE REVIEW

II. 1. RELATED THEORIES

II. 1. 1. CEREBRAL PALSY

According to Umphred (1995:263) in her *"Neurological Rehabilitation"*, Cerebral Palsy (CP) is a neurological disorder affecting the brain's ability to control and coordinate muscles and to move the body. While *World Commission for Cerebral Palsy* (1966, cf. Poerwadi, 1999:2-3) stated that *"Cerebral Palsy is a persistent but unchanging disorder of posture and the movement due to a dysfunction of the brain present before its growth and development are complete"*. In an international review of population studies since 1950, data on the occurrence of cerebral palsy indicated an estimate of 2 per 1000 school-aged children (Lewis, 1996:640). CP is typically caused by an injury to the brain before, during, or shortly after birth. It is also used to describe disorders, which impair the control of movement resulting from faulty development of areas of the brain.

Children with CP have the inability to control their muscle coordination. Depending on where the damage to their brain occurred, they may have muscle tone that is too tight, too loose, or a combination of both. In addition, some children may have abnormal sensation, perception and disabilities, such as: impaired sight (25%), hearing and speech (greater than 50%), seizures (1/3),

mental retardation (50-75%, depending on motor severity), feeding difficulties, learning disabilities, difficulty breathing due to postural difficulties, and frequently have social and emotional problems (Scherzer and Tscharnuter, 1982, cf. Lewis, 1996:641).

II. 1. 1. 1. Types of Cerebral Palsy

The basic classification of clinical motor dysfunction in cerebral palsy adopted by the American Academy of Cerebral Palsy includes the following (Lewis, 1996:641):

1. *Spastic*: characterized by stiffness of the muscles, slow and jerky movement. There is a tendency toward greater involvement and contractures affecting antigravity muscles. They often have a hard time moving from one position to another. They may also have a hard time holding and letting go of objects.
2. *Ataxic*: characterized by low muscle tone and poor coordination of movement due to disturbance in the sense of balance. Affected children often walk unsteadily with a wide footstep, placing their feet unusually far apart, and have a lot of shakiness, like a tremor we may see in a very old person, especially when they are trying to handle or hold a small object.
3. *Athetoid*: characterized by an abnormal and uncontrolled movement. Damage to the cerebellum or basal ganglia areas, which are responsible for processing the signals that enable smooth and coordinating movements as well as maintaining body posture may cause a child to

develop uncontrolled, purposeless movements, especially in the face, arms, and trunk. These involuntary movements often interfere with speaking, feeding, reaching, and other skills requiring coordinated movements.

4. *Mixed* Cerebral Palsy. These children have both the tight muscle tone of spastic cerebral palsy and the uncontrolled movements of athetoid cerebral palsy. This is because they have injuries to both the pyramidal and extrapyramidal areas of the brain. Usually the spasticity is more noticeable at first, with uncontrolled movements increasing when the child is between nine months and three years old. The most common mixed form includes spasticity and athetoid movements, but other combinations are also possible.
5. *Rigidity*: characterized by decrease motion. The muscles are partially contracted all of the time. The antagonist and the antigravity muscles are mostly involved.
6. *Tremor*: characterized by uncontrolled movement of rhythmical performance due to agonist and antagonist contractions.
7. *Atonia*: characterized by lack of tone and failure of muscles to respond to stimulation.

Poerwadi (1999:4) has also make some clinical classifications based on the affected body parts, they are:

a. *Hemiplegia.* Children with this condition have mainly the arm and leg on the same side involved, while the other side is not involved.

b. *Monoplegia.* Only one limb is affected, it may be the arm, or the leg.

c. *Diplegia.* Children with this condition have mainly the legs affected than the arms. They may have some minor involvement of their arms too.

d. *Paraplegia.* Both legs are affected, while the arms can function completely normally.

e. *Triplegia.* Three limbs are affected, mostly both legs and one arm.

f. *Quadriplegia* (also called *Tetraplegia*). Children with this condition have all limbs (arms and legs) involved. They may not be able to walk and represent the most severely involved cases.

II. 1. 1. 2. Causes and Symptoms

There is no specific cause of cerebral palsy. Cerebral palsy may be acquired after the birth of a child. The results from the brain damage may be present in the first months or years of life. The injury may be a brain infection (bacterial meningitis, viral encephalitis) or head injury following an accident.

Denhoff (1976, cf. Lewis, 1996:641) describes an etiologic classification based on time of onset and cause of cerebral malformation or injury:

- Prenatal (80% of reported cases): genetics, chromosomal abnormality, and congenital (acquired in utero); maternal illness during pregnancy or disorders affecting the fetus such as high blood pressure or diabetes, or unknown biochemical or genetic factors, abnormal fetal brain development, an infection, an accident in which the mother was injured;

- Perinatal/during birth (10% of reported cases): Asphyxia, trauma, consequences of premature babies, lack of oxygen or an injury upon having a difficult delivery;
- Postnatal/early infancy (10% of reported cases): baby being born prematurely where his or her body is not ready to survive outside the mother's womb, an accident where the baby is injured (i.e., motor vehicle), or bleeding in the brain, trauma, infections, toxins, nutritional and metabolic factors.

There are many factors that suggest the injury occurred as a result of improper medical care, or insult to the brain during the birthing process:

- The infant demonstrates poor sucking after birth
- Seizures develop within 24 to 48 hours
- The child is limp at birth
- The skin is blue or dusky at birth
- The infant needs revitalization shortly after birth because he/she is not breathing
- The infant has problems maintaining temperature after birth

II. 1. 1. 3. Diagnosis

Cerebral palsy is diagnosed by a complete examination of the child's current health status. Doctors will test the child's motor skills and look carefully at his or her medical history. However, early diagnosis is importantly held in order to get early rehabilitations and have good prognosis (Poerwadi, 1999:8). Doctors will also look for slow development, abnormal muscle tone, and

unusual posture. When diagnosing cerebral palsy, doctors must rule out other disorders that can cause abnormal movements. Doctors may order a CT scan (Computed Tomography), EEG (electroencephalography), or MRI (Magnetic Resonance Imaging). These test may generates a picture of the brain to determine areas that may be damaged. In addition, intelligence testing is also used. This helps to determine if a child is behind from a mental standpoint. In addition to diagnose cerebral palsy through a complete and thorough examination of the child's abnormalities and behaviours, a review of the mother's pregnancy and delivery is also conducted.

II. 1. 1. 4. Treatment

While there is no cure for cerebral palsy, there are several effective treatments available to improve muscle coordination and function. The child with CP should be involved in a program that deals with movement, speech, learning, and social and emotional development (Umphred, 1995:278–282). Physical therapists may help children with such tasks as walking, operating their wheelchair, and standing. They can also work on more pleasurable skills such as throwing a ball or learning to ride a bike. Speech and language therapists can work with the child to teach them how to speak, use sign language, or use a communication device. They can also help to develop better control of the jaw and mouth muscles, which can improve speech and language skills and eating abilities. They also help develop creative communication methods for those who cannot speak. Children who are able to talk may work with a speech therapist to

make their speech clearer or build their language skills by learning new words, learning to speak in sentences, or improving their listening skills.

II. 1. 1. 5. Speech Characteristics of Cerebral Palsy

Children with cerebral palsy usually have abnormal muscle tone and abnormal reflex, and some of them also have sensory motor disorder with different degree of mental problem. Speech and swallowing problems are usual for them.

Some children with CP are able to speak normally, but others have impaired control of muscles involved in speech production resulting in articulation problems (dysarthria) or in complete inability to speak (anarthria). Thus, according to Bishop and Rosenbloom's Medical Toxonomy (1987, cf. Donaldson, 1995:16), CP could be classified either as involving a sensory motor defect of the speech organs or as arising from brain damage/dysfunction acquired prenatally or perinatally. The particular characteristics of articulation problems vary. Cartwell and Baker (1987, cf. Donaldson, 1995:16) report that consonants are more likely to be affected than vowels, thus, children with dysarthria usually speak more quickly. In many cases, there are associated problems with feeding behaviour, such as sucking and chewing. There is also variation in whether or not the expressive language problems are associated with by receptive language problems. Based on his research evidence, Bishop (1993, cf. Donaldson, 1995:17) concludes that children whose expressive language problems are related to CP (or other physical problems) typically have receptive language abilities in the normal range, and their hearing and intelligence are also

normal. The difficulties occurred in cerebral palsied children generally relate to the physical aspects of speech production.

According to Berry and Eisenson (1956, cf. Istiqomah, 2001:8), speech characteristics of cerebral palsied children are:

- Spastic children have articulatory problems that reflect the inability to coordinate movement of the tongue, lips, and jaw.
- Athethoid children have articulatory problems that vary from the extreme mutism or extreme dysarthria to a slight awkwardness in lingual movement.
- Ataxic children are characterized by rudeness of articulation which fall into unintelligibility if speech is continued further than phrases or short sentences.

II. 1. 2. DEVELOPMENTAL PHONOLOGICAL DISORDER

The term 'developmental phonological disorders' generally refers to a group of linguistic disorders in children, evident by the use of abnormal patterns in their speech and the impairment of their general intelligibility (Ingram, 1976, cf. Hoffman, Schuckers, and Daniloff, 1989:112-117). Phonological acquisition commonly has four basic related components: auditory perceptual, cognitive, phonological, and neuromotor. It depends on the developmental readiness of the children and also facilitative psychosocial factors in their communicative background. Ingram describes that phonological development during the

conceptual stage (from 18 months to 4 years) is the foundation of natural phonological processes.

Phonological process rules used by Ingram to describe normal phonological development of children are:

1. Syllable Structure Processes:
    a. *Reduplication* involves the complete repetition of a syllable or partial repetition of a syllable (e.g., *mama, mommy, papa, daddy, baby*). Reduplication is commonly seen at about age 18 months.
    b. *Deletion of unstressed syllable* involves the production of multi syllabic words with fewer than needed syllables (e.g., *banana* is produced as /nænə/). While *deletion of stressed syllable* is opposed to the deletion of the unstressed one.
2. Substitution Processes, in which a class of phonemes is replaced by another class phonemes as substitution, such as:
    a. *Stopping* is the use of a stop consonant in place of another manner of articulation, usually a fricative or affricate. For example, production of *sue* and *chew* as /tu/.
    b. *Fronting* is the substitution of alveolar or dental sounds for velar and palatal sounds. For example, production of *gay* as /de/. While *backing* is the opposite of fronting process.
    c. *Liquid gliding/liquid vowelization* is substitution of glides /w/ or /j/ for liquids /l/ and /r/. for example, production of *rim* as /wɪm/.

3. Assimilation Processes:

   a. *Devoicing* is the production of voiced consonant as voiceless consonant. While *voicing* is the opposite devoicing process.

   b. *Labial assimilation* is the production of non labial sound (e.g., /t/ or /k/) as labial when preceding or following a labial consonant. For example, production of *thumb* as /fʌm/. This process shows the changing of the place of articulation of a consonant in the word. Other processes are *alveolar assimilation* and *velar assimilation.*

By the age of four, normal children are fully intelligible in speech and producing nearly 100% of speech sounds correctly. If errors remain, they are likely to occur on the last sounds to develop, such as /l/, /r/, /s/, and /θ/. Children older than four years, who retain use of significant number of these processes, so that the intelligibility of their speech is affected, would be considered to have an articulation, or phonological disorder (Lewis, 1996:195).

II. 1. 3. INDONESIAN PHONETICS BY MARSONO.

He classifies Indonesian *monophthong* (pure vowel) into ten types, diphthongs into three types, and consonants into eleven types including semi vowels. *Monophthongs* or pure vowels are single vowel sound produced by tongue as speech organ, which its quality is unchanging from the beginning until

the end of articulation in a syllable (Marsono, 1999:36, cited from Kridalaksana, 1982:109).

Table 1. Indonesian Vowels

Vowels	Tongue height	Part of the tongue involved	Stricture	Lip rounding	Examples
[i]	High, upper	Front	Closed	Unrounded	ibu, kita, jari
[I]	High, lower	Front	Semi-closed	Unrounded	Pinggir, kelingking
[e]	Middle, upper	Front	Semi-closed	Unrounded	Ekor, enak, eja
[ɛ]	Middle, lower	Front	Semi-closed	Unrounded	Nenek, dendeng, leher
[a]	Low	Front	Closed	Unrounded	Ada, apa, pada
[ə]	Middle	Central	Semi-closed	Unrounded	Emas, iseng, elang
[ɔ]	Middle, lower	Back	Semi-closed	Rounded	Otot, tokoh, roti
[o]	Middle, upper	Back	Semi-closed	Rounded	Toko, kado, prangko
[U]	High, lower	Back	Semi-closed	Rounded	Ukur, urus, turun
[u]	High, upper	Back	Semi-closed	Rounded	Udara, bulan, paku

Sources: Marsono. 1999. Fonetik. 4th ed. Gajah Mada University Press. Yogyakarta. (cited from Soebardi, 1973:5 – 8).

Diphthong is a sequence of two sounds. It is produced when the position of the tongue is different in producing one vowel to another vowel sound (Jones, 1958:22, cited from Marsono, 1999:19). All of Indonesian diphthongs are rising diphthongs, which are when the second vowel is produced, the position of the tongue is higher than producing the first one. Indonesian diphthongs are also called as closed diphthongs since the stricture is getting closed when the tongue is rising (Marsono, 1999:50).

Table 2. Indonesian Diphthongs

Diphthongs	The tongue position	Stricture	Examples
[ai]	Up, closed, forward	Closed	Pakai, nilai, sampai
[oi]	Back, closed, forward	Closed	Amboi, sepoi-sepoi
[aU]	Up, closed, backward	Closed	Saudara, lampau, kacau

Sources: Marsono. 1999. Fonetik. 4th ed. Gajah Mada University Press. Yogyakarta. (cited from Soebardi, 1973:8-9).

Table 3. Indonesian Consonants

Places of Articulation	Produced by/when	Consonants	Examples
Bilabial	Moving the tongue and lips together	[p [	Pita, apa, tetap
		[b]	Baru, abu
		[m]	Mana, lama, malam
Labiodental	Lower lip and upper front teeth	[f]	Fajar, nafas, taraf
		[v]	Valuta, devisa
		[w]	Warna, awan

Apikodental	Tip of the tongue is raised to the upper	[t]	Tiba, peta, lebat
Apiko alveolar	Tip of the tongue is raised to the alveolar ridge	[n] [l] [r]	Nama, ini, saran Lama, pula, asal Rata, baru, segar
Apiko palatal	Tip of the tongue is raised to the hard	[d]	Datang, madu
Lamino alveolar	Tip and blade of the tongue is raised to	[s] [z]	Sama, nasi, lekas Ziarah, lezat
Lamino palatal	Tongue blade and back of the alveolar	[ʃ]	Syarat, mahsyur
Medio palatal	Middle of the tongue is raised to the hard palate	[c] [j] [ñ] [y]	Cara, baca Jurang, baja Nyaring, sunyi Yang, saya
Dorsovelar	Back of the tongue is raised to the soft palate	[k] [g] [ŋ] [x]	Kaca, saku, cantik Gaya, tiga Ngarai, langit, senang Khidmat, akhir, syekh.
Laringeal	Glottis in the open position	[h]	Hemat, bahan, indah
Glottal	Vocal cords are held tightly together	[?]	Ma'af, rakyat, kakak

Source : Marsono. 1999. Fonetik. 4th ed. Gajah Mada University Press. Yogyakarta.

II. 2. RELATED STUDIES

Mexliessiana (2001:63-67), in her study of "Phonological Alteration of Indonesian Children with Mental Retardation", concluded that mental retarded children often delete and exchange apiko alveolar /r/, dorsovelar /k/, /g/, and labiodental /f/ and /v/, while more specific alterations may be individually different for each child.

Prather, Hedrick, and Kern (1975, cf. Hoffman, Schuckers, and Daniloff, 1989:117) asked 2 to 4 year-old children to label pictures, which included the consonants of English in word- initial and word-final positions. The results show that more than 50% of :

- 2-year-old children correctly articulate stops (/p/, /t/, /k/, /b/, /d/, /g/), nasals (/m/, /n/, /ŋ/), fricatives (/h/, /f/, /s/), and glides (/w/),
- 3-year-old children correctly articulate fricatives (/ʃ/), glides (/j/), liquids (/l/, /r/), and affricates (/ʧ/, and /ʤ/), while
- 4-year-old children correctly articulate fricatives (/θ/, /ð/, /z/, /ʒ/, and /v/).

A study of cerebral palsied children held by Istiqomah (2001:64-65) showed that cerebral palsied children tend to alter consonant sounds rather than vowel or diphthong sounds.

McMahon, Hodson, and Allen (1983, cf. Hoffman, Schuckers, and Daniloff, 1989:135) described articulation errors of 10 cerebral palsied children between the ages 4 and 6 years in their research. All of these children showed

several error patterns, such as liquids were produced as glides in syllable-initial position (e.g., *lake* /weik/) and as off-glides in syllable-final position (e.g., *candle* /kændou/). Clusters were produced as single consonants (e.g., *tree* /ti/). Voiceless obstruent consonants were produced as voiced in word-initial position. Voiced obstruent consonants were produced as voiceless in word-final position, while fricatives were distorted via lateralization (e.g., *sun* /lʌn/) and dentalization (e.g., *sun* /θʌn/).

CHAPTER III

DATA PRESENTATION AND DATA ANALYSIS