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# Effects of Cleft Palate+/- Lip surgery and speech therapy on language development in children with cleft palate +/- lip.

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EFFECTS OF CLEFT PALATE+/- LIP SURGERY AND  
SPEECH THERAPY ON LANGUAGE DEVELOPMENT  
IN CHILDREN WITH CLEFT PALATE+/- LIP.

By:

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B.A., Elmhurst College, 2010

A Research Review  
Submitted in Partial Fulfillment of the Requirements for the  
Masters of Arts  
In the Graduate School  
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RESEARCH PAPER APPROVAL

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A Literature Review Submitted in Partial Fulfillment of the

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Approved by:

Valerie Boyer

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## **Introduction.**

According to the Kids Health Organization (2011), cleft palate +/- lip occur in about one or two of every 1,000 babies born in the United States each year, making it one of the most common major birth defects (2011). The European Science Foundation (2010) reported pervasiveness of cleft palate +/- lip is about one per 650 live births and is now greater than Down syndrome. It is a congenital deformity that causes a multitude of developmental delays and challenges in feeding, nutritional, linguistic, social, cognitive, dentofacial, auditory, and psychological challenges to young children who are diagnosed with this anomaly. Although many kids with cleft palates and cleft lips have many challenges to overcome, due to the increasing growth of medicine, many treatment options are available. While some researchers discovered that surgery usually improves speech and decreases hypernasality without complications, other researchers noted vast improvement in children's lexicon and language development via speech therapy (Chapman, Jones, & Halter, 2003; Fey, 1992; Hardin-Jones & Chapman, 2008; Hoffman & Daniloff, 1990). Each treatment option serves as an aid in development of speech and language. However, when using a combination of both approaches, children will make bigger leaps in development. Interference with normal development of cleft palate +/- lip occurs in the early stages of prenatal development between six to twelve weeks (medicinenet.com). Deformities of cleft lip +/- palate can be classified into different categories. Common categories are: cleft lip, cleft palate, and submucous cleft palate (Sullivan, Vasudavan, Marrinan, & Mulliken, 2010). While a cleft lip is a separation of the upper lip typically below the nose, a cleft palate is a split in the roof of the mouth. A

cleft palate can occur as complete (soft and hard palate, possibly including a gap in the jaw) or incomplete (a 'hole' in the roof of the mouth, usually as a cleft soft palate). A submucous cleft palate occurs when the muscular tissues of the soft palate are cleft, but the covering of mucous membrane is intact. Although, it is difficult to determine the exact cause of cleft palate+/-lip, most scientists believe that they are due to a combination of genetic and environmental factors such as: viral and chemical exposure during prenatal development, trauma during birth, maternal dietary imbalance, toxicity, and genetic influences (Larossa, 2000; Subramaniyan, Savitha, & Roopa, 2009; Vlastos, Koudoumnakis, HoulakNasika, Griva, & Stylogianni, 2009). Such causes contribute to a variety of challenges for children with cleft palate+/- lip. Articulation of speech sounds is perhaps one of the most prominent challenges these children face.

### **Impact of surgery on child's speech**

Development of articulate speech is not an innate ability (Haapanen & Rintala, 1993; Hoffman & Daniloff, 1990; Jones, Chapman, & Hardin-Jones, 2003; Pamplona, Ysunza, & Jimenez- Murat, 2001; Pamplona, Ysunza, & Ramirez, 2004; Pamplona & Ysunza, 2000; Pamplona, Ysunza, & Uriostegui, 1996). Instead, children learn certain sounds and attempt to approximate them by adaptation (Pamplona, Ysunza, & Ramirez, 2004; Pamplona, Ysunza, & Uriostegui, 1996; Pamplona, Ysunza & Gonzalez, 2000). They rely on a variety of senses to achieve proper articulation and make use of the spoken words around them, which result in attempts to approximate those sounds. Children rely on visual information to see the proper use of articulators. Tactile information arises from contacts between various parts of speech mechanisms such as the tongue, teeth, lips, and palate. Finally, kinesthetic sensations of articulators allow the

child to distinguish the position and movement of particular speech mechanisms.

Numerous researchers have investigated the impact of cleft lip+/- palate has on speech production. According to numerous studies, children with a cleft palate have difficulty producing high-pressure consonants and velopharyngeal insufficiency prior to corrective surgery (O’Gara & Logemann, 1987). Velopharyngeal insufficiency (VPI), contributing to deviant speech productions, was unanimously one of the biggest concerns noted among physicians and researchers (Abdel-Aziz, 2008; Andersson, Sandvik, Tordal, & Abyholm, 2010; De Buys Roessingh, Cherpillo, Trichet-Zbinden, & Hohlfeld, 2006; Sullivan et al., 2010; Vlastos, Koudoumnakis, Houlakis, Nasika, Griva, & Stylogianni, 2009; Yamanishi, Nishio et al., 2009). Velopharyngeal insufficiency is a condition that occurs due to the improper closing of the soft palate in the mouth, allowing air to escape through the nose instead of the mouth. As result, people with this condition have aberrant, nasals speech. Primary characteristics of VPI include: hypernasal resonance decreased intraoral pressures that cause weak pressure consonants, and audible nasal emissions during speech. Children with cleft lip +/- palate form deviant compensatory articulation patterns associated with VPI. Such patterns include: absence or deviant production of glottal stops, pharyngeal fricatives, and laryngeal fricatives. Insufficient breath support and hypernasality were also frequently noted as persistent problems among children with a cleft lip+/palate (AbdelAziz, 2008; AbdelAziz & Ghandour, 2011;

De Buys Roessingh, Cherpillod, Trichet Zbinden, & Hohlfeld, 2006; Sullivan et a l., 2010; Vedung, 1995; Vlastos, Koudoumnakis, Houlakis, Nasika, Griva, & Stylogianni, 2009). Despite many challenges, after palatal surgery is completed and the mechanism is repaired, children with cleft palate have the potential to produce normal speech.

Researchers have set out to examine speech development among children with cleft palate as well as speech development post surgery. One study done by Chapman, Jones, Schulte, and Halter (2001) discovered that children with a cleft palate varied from their peers in phonetic characteristics of their babbling utterances, as well as in their frequency of CV syllable shapes. A different study reported that reduced hard palate surface area might make it more difficult for children to produce sounds with an alveolar or palatal place of articulation (Lohmander, 1998). Chapman, Jones, and Halter (2003) has set out a longitudinal study where they have examined speech and lexical development of 30 children between the ages of 9 - 21 months. Infants were divided into two groups: 15 with a cleft palate, cleft lip, and 15 non-cleft children. Results revealed that children with a cleft lip+/-palate scored significantly lower on size of consonant inventory, size of true consonant inventory, number of emerging consonants, percentage of true stops, lexical items, and number of stable consonants. Although, children with cleft palate+/- lip made significant improvement over time, they continued to fall behind their peers in accuracy of production of alveolar, dental, labial, or alveolar sound productions.

Similar to previously mentioned studies, O'Gara and Logemann (1988) examined aberrant speech among children with a cleft palate in comparison to typical developing peers. They provided data on pre- and postsurgical speech development. Their results indicated that although, children with cleft palate preferred labial and glottal places of articulation, over time they showed a decrease of them and instead began to use more alveolar and palatal place features. The surgery alone enabled children to have sufficient nasal closure, allowing air to escape from the nasal cavity resulting in accurate

production of sounds, specifically weak pressure consonants and eliminate audible nasal emissions during production of speech. O’Gara and colleagues (1998) have also noted that children that had surgery done at an earlier age, produced significantly higher percentages of oral stops and overall better and accurate speech production in comparison to children who had undergone surgery at a later point in their lives.

Chapman et al. (2003) findings are in agreement with those of O’Gara and Logemann (1994). Chapman and colleagues (2003) have also noted speech improvement among children with cleft palate post surgery. Their study was administered to thirty, 2-year old infants. Participants were divided into two categories: 15 infants had a cleft lip+/- palate; the remaining 15 were non cleft palate. Participants were observed, video recorded and audio recorded in their houses pre and post surgery during play and communication with their primary caregiver. The results reveal a positive relationship between percentages of true stops produced pre and post surgically. An increase of emerging consonants, size of true consonant inventory, production of true stops, and lexical development post surgery was also noted in conjunction with speech therapy.

In a more recent longitudinal study, Andersson et al. (2010) noted improvement in speech post surgery. They set out to investigate factors associated with the incidence of pharyngoplasty in patients with clefts of the secondary palate. Pharyngoplasty is a surgical procedure that improves the function of the soft palate. It is usually performed on children who had undergone a cleft palate surgery, however are still experiencing VPI characterized by nasal sounding speech. This occurs because the repaired palate is too short or does not move adequately. Anderson and colleagues investigated 351 children born with cleft palate alone, undergone primary cleft palate surgery and were still

experiencing VPI. As result, children had undergone necessary pharyngoplasty. Results indicated that 19% of patients had an improvement of speech post surgery.

Based on extensive amount of research done on cleft palates, it is safe to conclude that cleft palate surgery is the first step in acquisition and formation of adequate speech. The principal goal of cleft palate surgery is to provide children with cleft palate with adequate velopharyngeal function or typical speech development (Abdel-Aziz, 2008; Andersson et al., 2010; Agrawal, & Panda, 2011; Bardach, Morris, & Olin, 1984; De Buys, et al, 2006; Golding-Kushner, 2000; Jones, Chapman et al., 2003; Lohmander-Agerskol et al., 1993; Marrinan, LaBrie, & Mulliken, 1998; Murray, Arteche, Bingley, et al., 2010). According to Mossey et al. (2009) surgical intervention to the palate interferes with maxillofacial growth. Concerns regarding the proper acquisition of speech and maxillary development have caused a great amount of debate on the optimal timing of the cleft palate repair, severity of the cleft palate, and the most suitable technique. This literature review examines the impact of cleft palate surgery when used in conjunction with speech therapy to expedite speech development and social growth among children diagnosed with cleft palate.

### **Factors associated with surgery**

#### **Optimal timing of surgery**

Despite the fact that surgery to repair a cleft lip+/-palate can be performed soon after birth, often the preferred age is at approximately 10 weeks of age, following the "rule of 10s" coined by surgeons Wilhelmmesen and Musgrave in 1969. The rule of 10's states that a child must be at least 10 weeks of age; weighs at least 10 pounds, and has at

least 10g hemoglobin. Although, research done by Agrawal and Panda (2011) do not oppose the “rule of 10”, and agree that surgery performed at an earlier age will result in quicker articulate speech production, their finding reveals that the majority of surgeons accept 6-12 months as the optimum age for palatoplasty.

A study set forth by Marrinan et al. (1998) discovered a substantial connection between age of repair and surgery. Their research shows that the earlier cleft repair surgery was performed the less likely the pharyngeal flap was needed. This finding supports those of Haapanene and Rantala (1993) who compared 108 children with non-syndromic cleft palate in whom the cleft palate had been closed at the mean ages of 13 months to children who were operated on at a later time of their life. The results indicate that children who were operated on at an earlier age were significantly better speakers than those operated on later. Being an efficient and successful speaker plays a major role in being an effective communicator.

Communication is key to forming a bond. A bond with mothers is crucial for a child’s linguistic, social, and emotional growth. Since children with cleft palate experience communication barriers, Murray, Arteche, Bingley et al. (2008) investigated the impact of timing of cleft palate +/- lip repair on mother-infant interactions. Their study included 94 infants with cleft lip +/- palate and 96 non-affected infants. Infants with cleft palates were divided into two groups: 48 infants who had undergone early repair (12 weeks) and 55 infants at who had late repair (3-4 months). Interactions among infants and mothers where assessed at two, six, and 12 months. Their results indicated that mothers who had their children’s’ cleft-palate repair early had a much stronger bond and communication patterns in comparison to mothers of children who received surgery

later. Mothers were observed to interact and play with children who had cleft repair at an earlier age in comparison to children who had undergone cleft palate repair at a relatively later age. Researchers explain that mothers who had infants undergone late repair, had to adjust to the child's aberrant anatomy and speech patterns. It was more difficult for mothers to distinguish and therefore respond to their children's social cues. In turn, children were more likely to talk less and be less sociable.

Although, in previous years the optimal timing has been debatable among doctors and researchers alike, they all appear to unanimously agree on an earlier time of cleft repair surgery rather than later.

### **Severity of cleft palate**

The severity of the palatal cleft is another controversial topic among professionals. Incidences of pharyngoplasty are associated with the severity of clefts. Children with total clefts of the secondary palate are more likely to need pharyngoplasty in comparison to children with clefts of the soft palate alone. De Buys Roessingh (2006) compared the effect of a cranial-based pharyngeal flap on the speech among children born with a unilateral cleft lip and palate (UCLP), bilateral cleft lip and palate (BCLP), and children with cleft palate (CP). A total of 234 children born with clefts and 22 children born with primary VPI were examined in the study. The results revealed that the need for pharyngoplasty is greater in children born with a UCLP or CP than in those born with a BCLP. This finding is in agreement with Pearson et al. (2002) who reported that children with a cleft palate alone and children with clefts of the soft palate gained greater advances in accurate speech productions when compared to children with clefts in both hard and soft palate.

Since hypernasality is one of the greatest difficulties children with cleft palate face in their daily lives, Brunnegard and Lohmander (2007) investigated hypernasality in relation to the severity of clefts. Their results revealed that 67 % of children with unilateral cleft palate had much more pronounced hypernasality and audible nasal air leakage in comparison to 25% of children with a cleft palate of the soft palate.

Based on this research, it is safe to conclude that children with more severe degrees of cleft palates will require surgery sooner rather than later due to extensive challenges required to achieve the proper articulation of speech.

### **Optimal surgical intervention technique**

Among a stir of controversy that surround the topic of cleft palate, the optimal surgical intervention technique for treatment of the congenital cleft palate deformity continues to be the biggest source of controversy among researchers and surgeons alike.

Although, the optimal intervention technique for the treatment of cleft-palate repair remains controversial, a number of studies have suggested that superior speech results are obtained via the Furlow double-opposing Z-plasty method. The primary purpose for the repair of cleft palate is to expedite normal speech and hearing without significantly affecting the facial growth of a child (Jones et al., 2003; LaRossa et al., 2004; Subramaniyan et al., 2009). Conversely, two other important factors should be reflected upon for assessing the success of palatoplasty: the incidence of oronasal fistulas and the quality of speech.

Dieffenbach (1837) first described the use of relaxing incisions to aid in palatal closure. Bernard von Langenbeck was among the first proponents of palatoplasty. His method used mucoperiosteal flaps for the repair of the hard palate region (Kushner,

2001). To make it a bipedicle flap, Langenbeck (1988) maintained anterior attachment of the mucoperiosteal flap to the alveolar margin. To achieve full closure, Langenbeck incised the cleft palate edges, made a lateral incision, and elevated the flap from the hard palate. The palatine musculature was then later separated and sutures were applied.

Since Longenbeck's method (1988), a large variety of surgical techniques for the cleft palate have been invented and applied. Some of the most common methods practiced are Wardill-Kilner V-Y pushback, intravelor veloplasty, and Furlow double opposing Z plasty (AbdelAziz, & Ghandour, 2011; Furlow, 1986; Furlow, 1992; Haapanen & Rintala, 1993). Wardill-Killner pushback palatoplasty was developed in 1937 and was found to be more suitable for wide clefts. This technique is done so that the whole mucoperiosteal flap and the soft palate are retroposed and the palate is lengthened. In comparison, the intravelor veloplasty is performed by dissection of the Levator Palati from the posterior border of the hard palate, nasal and oral mucosa. Posterior pharyngeal flaps are based superiorly or inferiorly and the velum was split along the midline.

The Furlow double opposing Z-plasty (1992) is a single stage palatoplasty, which treats the hard, and soft palate separately, by a Z-plasty of the oral side and of the nasal side. Resulting in the lengthening of the soft palate, without additional movement of the tissue from the hard palate. Bringing the mucoperiosteal flaps horizontally without pushback and lateral incisions closes the hard palate (Agrawal & Panda., 2011; Sullivan, et al., 2010). Although the optimal intervention technique for the treatment of cleft-palate repair remains controversial, a large variety of series have suggested that superior speech results may be obtained with the Furlow double-opposing Z-plasty (Abdel-Aziz & Ghandour, 2011; Kirshner, Wange, et al. 2010; Larossa, 2000; Sullivan et al., 2010).

Abdel Aziz and Ghandour (2010) have conducted a comparative study between

the V-Y pushback technique and Furlow technique. They have based their assessment of velopharyngeal function on four goals: to assess structure, movement, extent, and timing of closure. Their results concluded that Furlow palatoplasty is a better operation for repair of clefts due to increased and better velopharyngeal adequacy and speech outcome, less incidence of palatal fistulas, less operative duration time and intra-operative blood loss in comparison to the V-Y pushback method (Abdel-Aziz & Ghandour, 2011). In their study, complete velopharyngeal closure and normal speech were achieved in 50% of cases subjected to V-Y pushback technique and in 77.2% of cases introduced to the Furlow technique.

Another study by Yu, Chen, and Chen (2001) set out to compare the Furlow palatoplasty and the Von Langenbeck palatoplasty. Their results designated that 98% of patients who had undergone Furlow palatoplasty had velopharyngeal adequacy in comparison with the 70% of the von Langenbeck palatoplasty patients.

McWilliams and Musgrave (1996) findings are in agreement with the previously mentioned studies supporting the Furlow method. In their comparison of the Furlow method, intravelar veloplasty and, the V-Y pushback, McWilliams et al. found superior scores on measurements of hypernasality, articulation and fewer pharyngeal flaps requirements.

A study set forth by Kirshener et al. (2010) yielded similar results regarding optimal surgical intervention. Their study included a sample size of 390 cleft palate patients who had undergone Furlow palatoplasty were used to compare to other surgical techniques. They reported that patients who had undergone the Furlow palatoplasty yielded better speech outcomes. A reported 93.4 percent of patients who had undergone

the palatoplasty had mild or no hypernasality, 88.4 percent demonstrated no or inaudible nasal escape and 97.2 percent demonstrated no articulation errors associated with velopharyngeal incompetence (Kirshner et al., 2010).

Although the primary purpose for the repair of cleft palate is to improve normal speech and hearing, incidents of oronasal fistulas are equally as important due to its impact on speech production, mainly hypernasality and nasal regurgitation. 3%-45% incidences of palatal fistulas have been reported (Emory, Clay, Bite, and Jackson, 1997). Sadove, Aalst & Culp (2004) reported post palatoplasty fistula rates ranging from 0-34% among patients who had undergone the pushback method.

Abdel- Aziz and Ghandour (2011) examined the incidence of post-palatal fistulas among 2 of the most common techniques: Wardill-Kilner Palatoplasty and the Furlow technique. A reported 12% incidence of postoperative fistulas has been documented following the Furlow technique in comparison to 47% incidence of following the Wardill-Kilner.

Although the optimal intervention technique for the treatment of cleft-palate repair remains contentious, extensive amount of studies lean toward the Furlow double-opposing Z-plasty as the optimal intervention technique due to large number of successful speech outcomes. Some of the positive outcomes of the Furlow technique reported highest successful rate and achievement in velopharyngeal insufficiency and in the highest degree of palatal lengthening.

Based on many studies, it is evident that surgery helps children with velopharyngeal insufficiencies and increases accurate articulation of phonemes. Surgery alone may not be sufficient in promoting language development. Having accurate

structures is a very promising start, however, children rely on auditory, visual and tactile cues as well as modeling and communication to promote articulation and language development. These types of learning, stimulating, scaffolding, and prompting are offered via speech therapy. Numerous studies have proved speech therapy effective in correcting speech and language abnormalities among kids with cleft palates. Currently, speech therapy offers four different approaches (articulatory, phonetic, phonological, and naturalistic) in treating speech and language among kids diagnosed with cleft palates. Although concerns regarding the best type of therapy are still unclear, many researchers lean toward the naturalistic approach while incorporating parental units.

### **Speech intervention and optimal approach**

Speech outcomes in children with cleft palate depend on articulation and nasal resonance. Compensatory articulation errors are a primary concern among children with a cleft palate (Norris & Damico, 1990; Pamplona et al., 1996). Articulation disorders are considered as compensatory behaviors due to structural deviations associated with the cleft palate and are secondary to velopharyngeal insufficiency. According to a study done by Pamplona, Ysunza, and Guerrero (1996) many articulation errors include lack of velopharyngeal sphincter closure. During speech production the velopharyngeal sphincter must close off the nose to properly pronounce strong consonants such as /p/, /b/, /g/, /t/, and /d/. However, if velopharyngeal sphincter is not closed, all speech sounds come out nasally. The irregular articulation patterns are usually referred as compensatory articulation disorder (CAD). Due to its nature, this disorder greatly decreases intelligibility. Articulation disorders may be phonetic or phonological in nature.

Altered movements of articulators (lips, palate, tongue) are the classic

signs of a phonetic disorder and was one of the earliest concerns targeted in therapy among speech language pathologists (Pamplona, Ysunza, & Espinosa, 2000). Phonetic disorders are related to inaccurate learning or anatomic, physiologic and motor deficits. Therefore, a compensation production is considered phonetic, when a child is attempting to produce the sound in an unconventional manner in order to compensate for the incapability to establish oral pressure due to the cleft palate (Pamplona, Ysunza, Patino, Ramirez, Drucker, & Mazon, 2004; Pamplona, Ysunza, & Espinosa, 2000; Pamplona, Ysunza, Gonzalez, 2000). Traditionally, phonetic approach considers articulation learning as a specific type of motor learning. In a phonetic approach, Fey (1992) claimed that therapy procedure is almost based exclusively on the concept that articulation errors are due to deficient control of articulators.

In contrast, a phonological approach requires children to learn more than a set of complex articulatory patterns associated with words. It is a much broader concept and is considered to be linguistically based and reflect difficulty in the child's organization and representation of the sound system of the language (Pamplona, Ysunza, Ramirez, 2004; Pamplona, Ysunza, Patino, Ramirez, Drucker, & Mazon, 2004; Pamplona, Ysunza, Gonzalez, 2004). The phonological approach involves the range of phonemes, as well as the alternations that phonemes undergo when they occur in diverse phonetic contexts. Pamplona and colleagues (2004) reported that a small percentage of children diagnosed with a cleft palate exhibit CAD and that only a very small percentage continues to produce CAD despite the early effective repair of the cleft. In another study, Pamplona, Ysunza, and Espinosa (2000) suggest that other factors other than the inability to establish sufficient oral pressure contributes to the development and maintenance of

aberrant articulatory patterns. Hoffman and Daniloff (1992) suggested that various central, cognitive phonological processing must be included in any description of phonological gain.

The debate between phonological and phonetic approaches have been debated upon and studied by professionals for several decades. Chapman (1993) has examined the phonological processes among children with cleft palate. Her results revealed that children with cleft palate produced the same types of phonological errors as younger typically developing children. The results imply for assessment and organization of children with cleft palate include analysis of phonologic processes in addition to phonetic analysis. It also suggests that phonological principles should be employed during speech therapy.

Pamplona, Ysunza, and Espinosa (2000) compared treatment results among children with cleft palates using phonological and phonetic approaches. Their study included 29 participants, age ranging from 3-7 years old. 15 participants received speech therapy via articulatory approach and the remaining 14 participants received speech therapy via phonological approach. They have reported that using the phonological rules resulted in faster learning of the target productions as well as faster incorporation into the language rules and therefore more immediate carryover into conversational speech.

In agreement with previous studies, Ysunza, Pamplona and Gonzalez (2000) have done a study between language development and the presence of CAD among children with cleft palates. The results revealed that children diagnosed with CAD presented with a significantly higher frequency of delay in language development in comparison to children with a cleft palate that present with velopharyngeal insufficiency without CAD.

The results concluded that CAD should be considered as a phonological disorder that is linguistically based and requires higher levels of linguistic organization.

According to numerous comparative studies among the phonological and phonetic modalities, one can determine an increasing number of professionals prefer the phonological approach due to its more expedient and promising results.

As the years progressed, professionals began incorporating other linguistic approaches as well (Fey, 1992; Norris & Damico, 1990; Pamplona, Ysunza, & Ramirez, 2004; Pamplona, Ysunza, Patino, Ramirez, Drucker & Mazon, 2004; Pamplona, Ysunza, Espinosa, 2000; Pamplona & Ysunza, 2000; Pamplona, Ysunza, & Uriostegui, 1996). One of the newer therapy approaches among children with cleft palates and CAD is the Naturalistic approach. Similar to the phonological approach, it incorporates higher levels of linguistic organization rule in conjunction with naturalistic contexts in the child's everyday life (Pamplona, Ysunza, & Ramirez, 2004; Pamplona, Ysunza, & Uriostegui, 1996., Pamplona & Ysunza, 2000). For example, when playing doll with a child the mother produces comments and expressions (“shh! She is sleeping”, “she is hungry, let give her milk”) for appropriate information according to child's level of play and relevancy of speech sounds. Doing so, the mother reinforces the child's participation in the activity and provides a model of appropriate communication for child to carryover.

In comparison to the phonological approach where children learn language components that govern the manner in which speech sounds are patterned, the naturalistic approach take the phonological approach a step further by implementing a new and different concept known as the “whole language philosophy”. The whole language philosophy incorporates productions of relevant speech sounds as they occur

naturally in our daily lives and are taught and reinforced within the situation instead of selected specific words ahead of time. Intrigued with the new approach Pamplona, Ysunza, and Ramirez (2004) have set forth a comparative study between the phonological and naturalistic approach. Their study included 30 children with cleft palate, velopharyngeal insufficiency, and CAD were included in the study. All subjects were between three to seven years of age. The subjects were divided into two groups. The first group received therapy according to the phonological approach while the second group received naturalistic approach. Intervention for both groups consisted of one-hour sessions, two times a week. The results of the study revealed that although, the time required for correcting CAD using the naturalistic method was not reduced, their overall language performance including semantic and language organization increased exponentially.

Pamplona and Ysunza (1996) reported that children with cleft palate not only have deviant speech development, but also communicate less frequently. They identified that kids with cleft palates initiate, elaborate and expand on their statements very sporadically when compared to typically developing kids.

Due to articulation problems, and less willingness to involve oneself in conversations, socio-emotional difficulties arise within this group as well. (Murray, Hentges, Hill et al., 2008). Children with a cleft palate are frequently treated as “outsiders” among their many peers. Murray, Arteché, Bingley et al. (2010) examined the effects of cleft lip on socio-emotional functioning in school-aged children. A thirty-minute observation by trained psychologists, were made of child behavior during playground break following the system of Sylva, where time sampled ratings were made

of children social engagements in seven different categories (positive group play, positive one-on-one play, standing on the fringe, alone, distressed and aggressive behavior). The results revealed that kids who had a cleft palate were more likely to spend time alone and less likely to engage in-group play. It was also noted that kids with a cleft lip were more likely to receive negative responses to their approaches, and they were also more likely to respond negatively themselves.

The studies that report positive results when using the naturalistic approach argue that speech development is influenced by the events in which children participate and learn to communicate with their peers and immediate family members. Children and adults are involved in predictable daily routines that enhance their communication skills within specific context. Hence, speech development is largely influenced by the quality and quantity of social interaction.

Based on numerous previous studies, it can be concluded that although, the time for correcting CAD may not be significantly reduced when implementing the naturalistic approach when comparing it to the phonological approach, it appears reasonable to provide children with CAD with a more global treatment including linguistic aspects. Interventions, that simultaneously address both the CAS and language delay suggest superior results.

Early Intervention (EI) is a big proponent of providing therapy to the entire family as a unit and by doing so, speech language pathologists along with immediate family are strengthening and reassuring carryover, Pamplona and Ysunza (1996) decided to take naturalistic approach a step further and include parents as active participants in therapeutic interventions. They report that mothers who have become active participants

during speech intervention improve their communication style and mode of interaction, thereby enhancing speech development in their children.

A more recent study set forth by Pamplona and Ysunza (2001) supports their previous findings regarding including parents as active participants in therapeutic interventions. Their study included 41 children at approximately same language level. Children were randomly assigned to either the control group or the experimental group. Twenty eight children that were included in the control group participated in small working groups consisting of a speech pathologist and two children. The remaining 31 participants were included in the experimental group, where mothers were included as active participants. Each group received three, one-hour sessions of speech and language therapy for one year. The intervention consisted of play activities and representations of everyday events. Both groups were videotaped. Each child's gestures, utterances and other verbal and non-verbal communications such as facial expressions were transcribed and analyzed. The results revealed that the 21 children in the experimental group with their mothers present during speech therapy have made more significant gains in complexity of play and expressive language.

Blakeley and Brockman (1995) investigated the impact of direct and indirect articulation therapy in children with a cleft palate including parents as active participants in their therapy sessions. Participants consisted of 41, 12-24 months old children with cleft palate who were enrolled in a four-year treatment program. Parents were trained by the speech language pathologists to provide speech stimulation. The results revealed that 93% of children displayed normal articulation and 88% displayed normal expressive language by five years of age.

A more recent study done by Pamplona, Ysunza, Patino, Ramirez et.al (2004) investigated and compared two modalities of speech therapy to determine which of the two modalities would contribute to greater articulation gains among children with cleft palates. The first modality was an orthodox approach, providing speech therapy in one-hour sessions, twice a week, where the mothers were active participants. While the second modality, was a speech summer camp in which children received therapy 4 hours per day, 5 days a week for a period of 3 weeks where mothers were active participants. All activities in the summer camp were designed to maximize opportunities for articulation in a naturalistic environment within a linguistic context. On the campsite all patients and their parents were participants of a large variety of activities enhancing speech production. Whole language philosophy approach was constituted in both groups in which all interventions addressed speech production to relevant events. Results indicated a non-significant difference between the two groups. Both groups' language and speech has improved using the naturalistic approach with parents included as active participants.

Based on extensive studies regarding optimal therapeutic technique, it can be determined that many professionals tend to lean toward the naturalistic approach in conjunction with having parental units as active participants in therapy to expedite positive results. Family support is crucial to improvement in ones' overall language ability. Having parents be included as active participants in therapy contributes to greater and faster improvements in the child's overall language ability and carryover.

## Conclusions

Children with cleft palate face a variety of challenges in their daily lives, including hypernasality due to velopharyngeal insufficiency, articulation problems and language delay. As technology advances, more and more solutions are offered. Two solutions offered to children with a cleft palate +/- cleft lip are surgery and speech therapy. According to many findings, surgery increases velopharyngeal functions and articulation, while speech therapy increases children's articulation and lexical development in naturalistic settings. Both treatment options play a significant role in promoting children's social, emotional, and speech development and both promote progress. To increase likelihood of rapid success and treat all areas of delay surgery, treatment must be done in conjunction with speech therapy.

Although there is no definite optimal surgical procedure, an extensive amount of reports lean toward the Furlow double-opposing Z-plasty (2011) as the optimal intervention technique due to vast amounts of successful speech outcomes, highest successful rate in velopharyngeal insufficiency, and achievement in the highest degree of palatal lengthening.

Regarding optimal therapeutic technique, it is safe to conclude that many professionals lean toward the naturalistic approach while including parental units as active participants in therapy to expedite positive results. As studies indicate, parental involvement plays a significant role in the child's progress. Including parents as active participants in therapy contributes to faster improvements in the child's overall language ability and carryover. Optimal surgical techniques combined with the most successful

therapeutic intervention offer the best prospects for the patients' rapid and strong progress.

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