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LANGUAGE AND SWALLOWING INTERVENTION IN CHILDREN WITH CEREBRAL PALSY

by

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B.S., Northern Illinois University, 2010

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Submitted in Partial Fulfillment of Requirements for the

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Meghan E. Serlin

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in the field of Communication Disorders

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Cerebral palsy (CP) is a nonprogressive neuromotor disorder which affects the brain (Rossetti, 2001). A common misconception is that CP only occurs because of an accident during delivery. However, CP may also take place prenatally or early postnatal and can be attributed to different etiologies including, but not limited to hypoxia, asphyxia, intrauterine infection, intrauterine brain malformations, and fetal stroke (Yorkston, Beukelman, Strand, & Hakel, 2010).

Researchers previously believed that asphyxia and hypoxia were the leading causes of CP (Yorkston et al., 2010). However, according to research conducted by Schaefer in 2008, only 7% to 8% of CP cases are caused by hypoxia and asphyxia. There are four types of CP including spasticity, dyskinesia, ataxia, and mixed (Yorkston et al., 2010). Each type of CP can affect a child differently, but many children experience challenges with motor movement which lead to communication impairments (Rossetti, 2001). Therefore, it is beneficial for children with CP to receive services with a speech-language pathologist (SLP) in order to improve speech, language, and swallowing. One way a child with CP can receive services is through an early intervention program, which is treatment provided to children who have or at risk of having a developmental delay (Rossetti, 2001). The following information will provide knowledge of typically developing children, as well as information regarding speech and language delays and intervention programs for young children with CP.

Typical Development

Expressive Language

Becoming familiar with typical development is important to determine whether or not a child may have a delay. Expressive language is an important milestone of development for children. Most caregivers are excited to hear their child's first coos, babbles, words, and sentences. However, because of motor delays, children with CP often have impaired expressive language. It is essential for children to communicate their needs and wants to the caregiver using their expressive language.

In order to understand expressive language in children with CP, it is important to understand typically developing expressive language. Children ages two to four months typically engage in verbal play through cooing, smiling, and laughing (Talking Child, 2003). Children ages four to eight months begin babbling and using some consonants (Talking Child, 2003). Children ages eight to twelve months may produce their first word with typical consonants including include /p, m, h, w, b, n/ (Talking Child, 2003). Additionally, children begin using syllable variation and non-verbal communication jargon during ages eight to twelve months (Talking Child, 2003). Around 18 months children have 10 to 15 words interspersed with jargon (Talking Child, 2003). Then, around 24 months children have 40-50 words which consist mostly of nouns, and pronouns (Talking Child, 2003). Children ages 25 to 35 months have about 150 words and children at about 36 months have 300 to 400 words including consonants:/p, m, h, w, b, n, k, g, t,

d, f, v, y, ŋ/ (Talking Child, 2003). Finally, children between 24 to 36 months begin to use two and three word phrases, produce all vowel sounds, and ask simple questions (Talking Child, 2003).

Swallowing

Typical swallows provide nutrients as well as protection of the airway during the swallow. The four stages of swallowing include oral preparatory, oral, pharyngeal, and esophageal phases. The first stage of swallowing is the oral preparatory phase. In this stage liquid or food is formed into a bolus (Logemann, 1998). The bolus if formed by maintaining lip closure and masticating (Logemann, 1998). The soft palate descends to the base of the tongue which ultimately prevents the bolus from falling into the pharynx (Logemann, 1998). The next stage is the oral stage. The oral stage occurs when the bolus is propelled toward the back of the oral cavity (Logemann, 1998). The bolus is propelled back toward the anterior faucial pillars where the pharyngeal stage beings, by elevating the tongue as well as elevating the soft palate to provide closure to the nasal cavity (Logemann, 1998). During the pharyngeal stage the arytenoid cartilage rocks forward and the hyoid and larynx elevate (Logemann, 1998). The true and false vocal folds close while the epiglottis flips downward to protect the airway from the bolus (Logemann, 1998). The bolus then descends through the pyriform sinus toward the upper esophageal sphincter which begins the esophageal phase (Logemann, 1998). During the esophageal phase the bolus descends through the esophagus by means of peristalsis and into the stomach (Logemann, 1998).

Types of CP

Children with CP experience different impairments depending on the type of CP. As mentioned previously, the four types of CP are spastic, ataxic, dyskinesia, and mixed. Spastic dysarthria is the most commonly occurring type of cerebral palsy (Yorkston, Beukelman, Strand, & Hakel, 2010). Individuals with spastic cerebral palsy have excessive muscle tone known as hypertonia and hyperreflexia. Individuals with spastic dysarthria can also experience weakness in their legs (paraplegia), weakness on one side of their body (hemiplegia), weakness in all four limbs for more in the legs and arms (diplegia), and weakness of all four limbs equally (quadriplegia) (Yorkston et al., 2010). Another type of CP is ataxic cerebral palsy, which is when an individual experiences incoordination of muscles (Yorkston et al., 2010). The least common form of CP is dyskinesia cerebral palsy. Dyskinesia cerebral palsy involves constant involuntary movements that affect the production of voluntary movements (Yorkston et al., 2010). Due to different characteristics of the previous types of CP, children with CP experience different language delays (Yorkston et al., 2010). Lastly, mixed CP is a combination of any of the other types of CP, which results in variety of deficits (Yorkston et al., 2010).

Developmental Differences Associated with CP

It has been noted that “children with CP rarely initiate exchanges in conversation with familiar adults, taking largely respondent roles, while adults introduce topics and start most conversations” (Pirila et al., 2007, p. 117). This

leads to less frequent conversational turn-taking, replying, answering, and questioning. Children with more severe cases of CP face more challenges when trying to communicate with caregivers (Pirila et al., 2007). Pirila and colleagues (2007), stated that children with CP who have an intelligence quotient (IQ) at or above 70 often have services denied because they may be able to adjust to communicate in other ways (Pirila et al., 2007). However, these children will most likely still have language and speech delays and therefore should be seen for services (Pirila et al., 2007).

Children with CP experience many obstacles when producing speech and language. Some of the sources of speech problems include respiration, phonation, resonance, and articulation limitations associated with poor motor control and muscle weakness (Rossetti, 2001). Children with CP typically use vowels for an extended period of time compared to their typically developing peers (Rossetti, 2001). Since vowel sounds are easier to articulate, children with CP produce vowels for a longer period of time because of reduced muscle tone (Rossetti, 2001). Additionally, children with low muscle-tone often experience challenges raising their velum to close of the velopharyngeal port; this makes their speech hypernasal (Rossetti, 2001). In 1999, Karen Levin researched eight infants with CP who were one year old (Levin, 1999). The children were videotaped during three in-home sessions involving communication between children and caregivers, as this would be more natural for parents and child (Levin, 1999). The parents were given instructions to have their child remain in a sitting position and if the child were to move,

the parent should reposition and encourage and elicit vocalizations (Levin, 1999). The parents were provided with specific toys to use during the 30 minute sessions (Levin, 1999). The parents were instructed to become quiet when the child made vocalizations (Levin, 1999). The 30 minute sessions were divided into four components. The first component included 10 minutes to play with mom using a teddy bear, books, yellow car, a piece of cardboard, and a toy telephone (Levin, 1999). The second component included five minutes of the child playing without the parent interaction (Levin, 1999). The child was given a baby gym, a bigger teddy bear, stackable rings, a sleeping doll, and a goldfish bowl that was in sight but out of reach to play with (Levin, 1999). During the third component the parent interacted with the child for 10 minutes using, a colored timer, a hand mirror, cardboard books, and colorful building blocks (Levin, 1999). In the last component the child played without any parental interaction. The child was provided a car that flashes when used and a mobile of bright shapes (Levin, 1999). Levin analyzed the videotape samples of the infants' vocalizations over a duration of three sessions using the Infraphonological Analysis Profile (IFAP) created by Oller and colleagues (Levin, 1999). According to Karen Levin's research, children with CP produce very few utterances and syllables (Levin, 1999). Also, it is believed that children with CP use monosyllabic utterances rather than multisyllabic utterances due to poor respiration (Levin, 1999). Another hypothesis is that children who produce monosyllabic utterances rather than multisyllabic utterances could present

with early signs of dysarthria, is a speech disorder caused by brain damage and affects articulation, phonation, respiration, and resonance (Levin, 1999).

Augmentative and Alternative Communication (AAC)

An intervention strategy that can be implemented for children with CP is the use of augmentative and alternative communication (AAC) systems. AAC involves compensatory methods to complement and support communication (ASHA, n.d.). AAC systems can be as simple as using gestures, sign language, and body language to produce communication (ASHA, n.d.). AAC external devices can include low technology tools such as books, communication boards, written output, and picture boards, as well as technologically advanced gadgets such as computers, Ipads and other devices that can be programmed (ASHA, n.d.).

MINSPEAK is a speech generating device that consists of a computerized board containing pictures of commonly used words that are sequenced so the child can produce sentences (Mathisen, Arthur-Kelly, Kidd, & Nissen, 2009). The MINSPEAK program is linguistically based and has potential to enhance literacy development, but researchers hypothesized it may be too complex for children in preschool to use (Mathisen et al., 2009). Therefore, Mathisen and colleagues (2009) conducted a case study about a 3 year 10 month old girl with spastic dysarthria who communicated to her family through gestures, inaccurate productions of single words, behaviors, key word sign, in order to determine if a young child could utilize MINSPEAK appropriately (Mathisen et

al., 2009). The study included 12 weeks of intervention using various materials such as children's books, with the objective of ensuring that the child could appropriately utilize the functions of the AAC icons (Mathisen et al., 2009). An average of three weeks of intervention was spent on each icon (Mathisen et al., 2009). The child in this case study reportedly increased assertiveness, used conversational repair strategies, produced several two word utterances, increased lexical knowledge, experienced less frustration when communication breakdown has occurred, and improved turn-taking abilities after utilizing the MINSPEAK program (Mathisen et al., 2009). In addition, the child's receptive language score increased to levels of typically developing peers (Mathisen et al., 2009). These results suggest that MINSPEAK can be an effective tool for communication even in young children (Mathisen et al., 2009). MINSPEAK is most effective when used at all times including school and home, rather than one or the other (Mathisen et al., 2009).

Expressive Language Intervention

Caregivers play an important role in communication between their child and themselves, especially because communication between a child with CP and the caregiver entails objectives that differ from typically developing children (Pennington, Thomson, James, Martin, & McNally, 2009). Typically, children with CP and their caregivers engage in discourse to meet needs rather than simply talking (Pennington et al., 2009). Therefore, most intervention strategies are focused on child-caregiver interaction. Caregivers of children

with CP can benefit from learning intervention techniques designed to support effective communication with their child (Pennington et al., 2009).

Communication of children with CP and caregivers

In 2009, Sandberg and Liliedahl investigated three children with CP and severely unintelligibly speech who were between two years five months and three years four months in order to compare their results to older children with CP and severely unintelligible speech (Sandberg & Liliedahl, 2009). The children were selected based on being closest in motor function and intellectual level (Sandberg & Liliedahl, 2009). None of the children used oral language; two of the children in this study communicated with eye gaze and one child communicated with physical activity (Sandberg & Liliedahl, 2009). The parents and children were given the same age-appropriate materials to use in their houses and record the child interacting with the toys (Sandberg & Liliedahl, 2009). The materials consisted of colored cups for motor activity, and picture books for linguistic communication, in addition to a video camera (Sandberg & Liliedahl, 2009). The video camera was set up in the living room so the children were able to become familiar with it before the parents began playing with the toys (Sandberg & Liliedahl, 2009). Preliminary observations indicated that the parents of the three children initiated communication more frequently (Sandberg & Liliedahl, 2009). Frequent parental initiation of communication is common amongst parents of children with disability (Sandberg & Liliedahl, 2009). Eleven communicative functions were targeted by Sandberg and Liliedahl (2009) including conformation or denial, request for attention,

expression of self, provision of information, expression of frustration, request for information, request for object or action, request for clarification, helping, interpretation of partner, and explicitly leaving the floor (Sandberg & Liliedahl, 2009). The children with CP only used five of the 11 communicative functions including confirmation or denial, request for attention, expression of self, provision of information, and expression of frustration (Sandberg & Liliedahl, 2009). Typically developing children used three additional communicative functions including, request for information, request for object or action, and request for clarification (Sandberg & Liliedahl, 2009). The parents used the following communicative functions more frequently: request for information, provision of information, and helping where as parents of typically developing children did not use helping as frequently (Sandberg & Liliedahl, 2009). Sandberg and Liliedahl (2009) also found that the parents of children with CP initiated communication more frequently than parents who had typically developing children. In addition to caregivers providing additional information that the child did not request, the parents did not wait long enough for their children to respond (Sandberg & Liliedahl, 2009). Children with CP often gave subtle cues, such as eye gaze towards a preferred activity to redirect parents to a different activity (Sandberg & Liliedahl, 2009). However, parents often did not recognize the cues (Sandberg & Liliedahl, 2009). The child's attention was eventually redirected back to the parent and the current activity (Sandberg & Liliedahl, 2009).

The Hanen Program

In 2009, Pennington, Thomson, James, Martin, and McNally investigated if there was a change in interaction between children with CP and their mothers using the "It Takes Two to Talk-The Hanen Program for Parents of Preschool Children with Cerebral Palsy" (Pennington, et al., 2009). The Hanen Program was implemented using 11 mothers and their children, ages 19-36 months old (Pennington,et al., 2009). The mothers went through training and were observed interacting with their child using many different toys before the program was implemented (Pennington, et al., 2009). After initial observations were complete the mothers were provided additional training to identify the child's style of communication, follow the child's routines, find what motivates the child to communicate, and change their language in order to communicate more effectively (Pennington, et al., 2009). At the end of the Hanen Program the mothers were observed again playing with their children. After the conclusion of the Hanen Program, Pennington and colleagues (2009) reported that mothers initiated less, increased responses to their children, and requested less (Pennington, et al., 2009). On the other hand, children initiated more communication and exhibited more requests (Pennington, et al., 2009). Additionally, children also had more yes and no responses as well as physical responses, proving the Hanen method to be a successful intervention technique (Pennington, et al., 2009).

DUET

DUET is another intervention technique, proposed by Gilboa and Roginsky in 2010. DUET may be used to increase communication and the relationship between caregivers and children (Gilboa & Roginsky, 2010). Research regarding music therapy and dyadic therapy has been conducted previously, however Gilboa and Roginsky were the first to publish the effects of music therapy and dyadic therapy combined (Gilboa & Roginsky, 2010). Gilboa and Roginsky (2010) designed DUET to be a short term intervention to make the process easier on the child and caregiver (Gilboa & Roginsky, 2010). There was only one dyad, a mother and her 4 year old son with spastic-hemiplegic CP, who participated in the research. The child's speech began developing at 30 months despite a normal cognitive diagnosis (Gilboa & Roginsky, 2010). Gilboa and Roginsky (2010) reported that the child had difficulties communicating to other peers as well as his mother (Gilboa & Roginsky, 2010). Therapy was conducted in a room filled with musical instruments located at the child's kindergarten (Gilboa & Roginsky, 2010). Gilboa and Roginsky (2010) conducted intake interviews pertaining to child's history, the relationship between mother and son, and motivation for therapy (Gilboa & Roginsky, 2010). There were eight therapy sessions conducted for 30 minutes each for the child, and his mother stayed for 30 minutes of feedback (Gilboa & Roginsky, 2010). The therapy sessions were designed in short segments consisting of one occurrence of musical, verbal, or combined interaction (Gilboa & Roginsky, 2010). The researchers reported that the child would play the instrument for a brief period

of time and then would communicate with the caregivers, concluding child's verbal and non-verbal communication became more effective and more intelligible because of the growing relationship between the child and parents (Gilboa & Roginsky, 2010). Gilboa and Roginsky (2010) conducted a follow-up interview a month after the intervention conclusion, to obtain the mother's perception about the impact of the intervention (Gilboa & Roginsky, 2010). Prior to the DUET intervention, the mother felt the need to follow her child wherever the child went, however, at the conclusion of the intervention the mother noted feeling comfortable with her child's growing independence and a stronger relationship between each other (Gilboa & Roginsky, 2010). These results illustrate success, there has only been one case study using DUET, thus further research is highly recommended (Gilboa & Roginsky, 2010).

Swallowing Intervention

Bonding through Feeding

Mothers of young children with CP may experience different emotions through their child's development especially when the delay is affecting the child's eating (Sayre, Pianta, Marvin, & Saft, 2001). Fifty-eight mothers and children, ages 16 to 52 months with CP, participated in a study using interviews to determine relationships between mother and child during feeding (Sayre et al., 2001). Sayre and colleagues (2001) reported that mothers who focused on their children's responses to their demands often demonstrated less sensitivity, less acceptance, and less delight while feeding their child (Sayre et

al., 2001). In addition, mothers who experience emotional pain demonstrated more hostility during feeding (Sayre et al., 2001). Lastly, mothers who worried about feeding displayed sensitivity and delight while feeding their child (Sayre et al., 2001).

Behavioral Feeding Therapy

Schadler, Suss-Burghart, Tosche, von Voss, and von Kries (2007) researched feeding treatment with 35 children with CP born prematurely who had severe feeding disorders. More than 50% of the children were fed with a gastric feeding tube (g-tube) and few were fed orally (Schadler et al., 2007). The children who were fed orally ate for a period longer than 30 minutes (Schadler et al., 2007). Behavioral intervention was applied by a skilled psychologist. The children were fed no longer than 15 minutes and were only given small amounts of liquids and solids (Schadler et al., 2007). The children were provided natural reinforcement of verbal praise and physical touch on the head or shoulder (Schadler et al., 2007). Negative behaviors including head turning to reject the food and crying were instructed to be ignored (Schadler et al., 2007). Once the child was successfully eating from a trained professional the caregivers gradually began feeding the child (Schadler et al., 2007). Following the conclusion of the intervention program, 40% of children showed improvements and 94% of those children sustained intervention 3 years post intervention (Schadler et al., 2007). However, children who were initially fed by a g-tube showed less desirable outcomes (Schadler et al, 2007). 47% of

children that responded to intervention after discharge (Schadler et al., 2007). Two children transitioned from being on a g-tube to being fed only orally (Schadler et al., 2007). Lastly, seven children were fed orally with additional nutrients through a g-tube (Schadler et al., 2007).

Oral Motor and Behavioral Intervention with Parent Education

According to research performed by Clawson, Kuchinski, and Bach in 2007, children who have spastic diplegic cerebral palsy have shown to benefit from behavioral intervention, oral motor exercises, and parent education (Clawson et al., 2007). The children partook in intervention that was six hours a day, Monday through Friday, with four therapeutic meals each day (Clawson et al., 2007). Oral motor exercises were preformed for about 30 minutes before oral feeding which helped to increase range, strength, and controlled movement of lips, cheek, jaw, and tongue (Clawson et al., 2007). Children also engaged in behavioral intervention which included differential attention, prolonged presentation of food, and reinforcements (Clawson et al., 2007). Reinforcements included natural reinforcement such as food and verbal praise, as well as unnatural reinforcements such as preferred toys and videos (Clawson et al., 2007). When a child exhibited negative behaviors including crying and rejecting food, behavior was not reinforced (Clawson et al., 2007). Reinforcement began immediately after child stopped exhibiting negative behavior (Clawson et al., 2007). The caregivers were provided with training. Training included becoming educated about food preparation, appropriate nutrition, and IPC (instruction,

prompts, and consequences) (Clawson et al., 2007). IPC training required caregivers to provide instruction to eat a bite of food, then used a prompt with the utensil and food, and last the consequence is the child eating or not eating the food (Clawson et al., 2007). Caregivers became accustom to learning what their child's diet should include or be left out (Clawson et al., 2007). This intervention strategy improved behaviors for oral intake, mealtime skills, mouth opening, consuming more food, increased oral intake for children on g-tubes, and increase transit time of swallow (Clawson et al., 2007). The children's negative behaviors decreased, including reduction of inappropriate responses and tolerating longer mealtime (Clawson et al., 2007).

Postural Control

Postural control is very important to improve swallowing and feeding. According to Redstone and West (2004), the safest position for swallowing is to sitting upright 90 degrees and use chin tuck (placing chin down toward the chest) which directs food away from the airway (Redstone & West, 2004). This can be difficult for children with CP because of decreased or increased muscle tone, therefore parents should be instructed about how to position their child for safe swallowing (Redstone & West, 2004). Also, the mandible is typically more stable when using the chin tuck strategy, which will improve the suck and swallow reflex of an infant (Redstone & West, 2004). When the child is about six to eight months old the child may sit in and high chair or booster seat which helps to align the head and trunk (Redstone & West, 2004).

Positioning the chin downward will protect the airway and may be done easily by having the caregiver sit below the child (Redstone & West, 2004). Children with oral control will aid in mouth closure and facilitate oral movements (Redstone & West, 2004). A caregiver can assist in oral control by placing their thumb on their child's chin and middle finger under the chin which helps with jaw and tongue movement (Redstone & West, 2004).

Conclusion

Young children with CP face many challenges relating to poor neuromotor control which affects their language and eating (Rossetti 2001). Some early intervention strategies such as caregiver training, swallowing intervention, and use of AAC devices have proven to be beneficial for young children with CP. Expressive language may be improved with the help of intervention strategies beginning at a young age (Pennington et al., 2009). Dysphagia treatment including postural changes can help to improve a child's intake of food (Redstone & West 2004). AAC devices that can be individualized to the child's needs will help children who are struggling develop expressive communication skills (Mathisen et al., 2009). Lastly, caregivers' relationships with their children have an effect on expressive language growth as well as swallowing and feeding behaviors (Schadler et al., 2007). Overall, intervention in children with CP at a young age has proven to improve the deficits the children acquired as a result of CP.

Future Research

Future research should include investigations regarding CP in premature infants. Further studies in this area should examine differences between children born prematurely with CP and children born full term with CP. Investigation should include swallowing and expressive language development and deficits. Areas of deficits in children born prematurely with CP should be compared to deficits of children born full term with CP.

Additionally, more research should discuss the use of AAC devices and children with CP in early intervention. AAC devices are utilized among children with a variety of age ranges, however due to neuromotor impairments, some AAC devices may be more challenging to use rather than being helpful to communicate. New research could be done using an Ipad as an AAC device with specific applications that are considered to be user friendly for younger children with CP.

Music therapy was found to beneficial using the DUET program, however only one child participated in the program. Additional investigation of implementing music therapy programs for young children with CP could be beneficial to discover what areas of expressive language improve. Relationships between the child and caregivers should be examined throughout the course of intervention to measure if the relationships become stronger. Another aspect of music therapy that could be researched is if there are differences between

implementing the intervention in a natural setting versus a clinical setting and which is more effective.

There has been plenty of research regarding relationships between the children and their mothers. However, there has been very little research regarding the relationships between the children and their fathers. Further research should look at relationships between the children and their fathers. The studies could include the duration of time the father is home and the expressive language output by the child. Oral communication between the children and fathers should be documented and compared amongst the verbalizations the children used while verbalizing with their mothers.

Finally, additional research should be conducted regarding swallowing in children with CP. Most research at this time is centered on the feeding or intake of the child. Research regarding the anatomy and physiology during a swallow of a child with CP can open doors of what swallowing techniques would be useful during mealtime. In addition, signs and symptoms of aspiration should be documented to ensure the child is safely eating and swallowing.

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