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Down Syndrome And Language Development

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DOWN SYNDROME AND LANGUAGE DEVELOPMENT

by

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"Down syndrome occurs in 13.65 per 10,000 live births, affecting nearly 5,500 infants in the United States each year" (Roberts, Price & Malkin, 2007) causing great concern as Down syndrome represents the main genetic source for learning disabilities (Hulten et al., 2008). The typical sequence of language development occurs in two stages, pre-linguistic and linguistic. The pre-linguistic period of language development includes elements such as babbling, gesture use, imitation and joint attention, whereas, the linguistic period of language development includes elements such as phonology, semantics, syntax and pragmatics (Roberts et al., 2007). Genetic disorders such as Down syndrome can adversely affect language development in young children. Thus, it is vital that children receive intervention services throughout their first year of life before significant delays imperative to language development are observed (Abbeduto, Warren, & Conners, 2007).

Etiology of Down syndrome

There are several genetic abnormalities associated with Down syndrome, in which chromosomes are altered resulting in the developmental disorder (Roberts et al., 2007). Roberts et al. (2007) discussed how the chromosomal anomalies translocation, mosaicism and Trisomy 21, contribute to Down syndrome.

According to Roberts et al. (2007), translocation is observed when a component of chromosome 21 latches onto another chromosome. Mosaicism is the result of a nondisjunction of the 21st chromosome that positions an extra copy of chromosome 21 in some of the surrounding cells. Mosaicism is a rare etiology of Down syndrome; the most frequent cause, accounting for 98% of cases, is Trisomy 21, in which an extra copy of chromosome 21 is observed (Roberts et al., 2007). According to Roberts et al. (2007), the presence of an extra 21st chromosome is the cause for the developmental characteristics correlated with Down syndrome. Abbeduto et al.

(2007) support findings from Robersts et al. (2007) on the high prevalence of Trisomy and describe the creation of the extra chromosome as an "error of non-disjunction during meiotic cell division" (p.247).

There is no evidence to suggest that race, socioeconomic status (SES), or geographic location are in any way linked as a potential cause of Trisomy 21 (Martin, Klusek, Estigarribia & Roberts, 2009), however, advanced maternal age has been associated with the presence of Down syndrome (Hulten et al. 2008; Martin et al., 2009).

Characteristics of Down syndrome

Individuals with Down syndrome are often characterized by their facial features, broad hands, low muscle tone and delayed growth. Cognitive deficits are also typically present, as these children often display varying degrees of cognitive abilities. The degree of cognitive ability ranges from near normal intelligence to severe intellectual disabilities (ID), with 80% of the Down syndrome population having moderate ID (Roberts et al., 2007). Individuals with moderate ID have an intelligence quotient (IQ) between 36 and 51 and demonstrate deficits with cognition and receptive and expressive language skills (Owens, 2010).

This confirms research conducted by Abbeduto et al. (2007) that most people with Down syndrome have an IQ between 30 and 70. Deficits in cognition are not demonstrated equally across its various components; for example, phonological memory, which is associated with short-term memory abilities for auditory speech sound sequences, is a challenge for these individuals evidenced by poor performance on non-word repetition tasks compared to visual-spatial short term memory or non verbal mental age (NVMA) measures, the child's cognitive age (Abbeduto et al., 2007). Martin et al. (2009) support Abbeduto et al. (2007), as they found phonological decoding to be a deficit caused by difficulties with auditory memory. Another area

of cognition that poses a challenge for children with Down syndrome is interpreting another individual's theory of mind, which is the way in which an individual envisions the mental activity of another (Abbeduto et al., 2007). The authors also reference two theories of development, emergentism and the social interactionist approach, to support the impact that cognitive deficits can have on phonological memory and the reasoning of theory of mind (Abbeduto et al., 2007). These deficits can negatively affect both language learning and language use, because these cognitive abilities are the foundation for certain linguistic success (Abbeduto et al., 2007). According to Randolph and Burack (2000), attention may be another area of concern as infants with Down syndrome demonstrated challenges when focusing on the relevant characteristics of new toys presented to them. Brown, Johnson, Paterson, Gilmore, Longhi and Karmiloff-Smith (2003) support findings by Randolph and Burack (2008), reporting that individuals with Down syndrome demonstrate challenges with attention, specifically sustained attention. Difficulties attaining to relevant information may negatively affect a child with Down syndrome's ability to develop language.

Additional characteristics commonly associated with Down syndrome that may affect language development are otitis media and its effects on hearing abilities, as well as deviations in oral motor structures and function. Otitis media, a middle ear infection, is quite common among the Down syndrome population due to features including narrow auditory canals, cranial facial differences and subtle immune deficiencies (Roberts et al., 2007). According to Roberts et al. (2007) otitis media may not severely affect language learning abilities in typically developing children; however, children with Down syndrome are more susceptible to these complications because having an intellectual disability places them at risk for language learning deficits. Another characteristic that may prove troubling for speech and language development in children

with Down syndrome is their oral structure. According to Roberts et al. (2007), there are a variety of differences observed in the oral cavity of children with Down syndrome. Among these structural variations, a small oral cavity, a narrow high arched palate, an irregular dentition and an enlarged protruding tongue can be examined. Along with internal structural differences, children with Down syndrome also display muscle abnormalities of the face, both of which are possible contributing factors to a decrease in speech intelligibility (Roberts et al., 2007).

Pre-linguistic Stage: Typically developing children

Before linguistic skills emerge, children develop pre-linguistic communication skills which, according to Rossetti (2001), are "the child's intentional communication behaviors that do not involve words" (p. 215). These skills are comprised of vocalizations, gestures, facial expressions and other movements which appear between the ages of 12 and 18 months (Roberts et al., 2007). According to Abbeduto et al. (2007), the emergence of intentional communication is between the ages of 10 and 12 months; typically developing children will then transition into communicating with words or symbolic communication such as signs or words by 12 to 18 months of age.

A significant pre-linguistic skill imperative to language development is joint attention. Joint attention is an important part of development as it is the foundation for pragmatic development and future social communicative functions. It is demonstrated as a child connects their communication partner's attention to themselves and to a topic or object of interest (Abbeduto et al., 2007). Adamson, Bakeman, Deckner and Romski (2009) believe language development and the acquisition of joint attention skills are linked, as joint attention allows children to share topics with others and allows caregivers to ease children into language learning through social interactions.

Pre-linguistic Stage: Children with Down syndrome

Babbling

The pre-linguistic stage is a relatively short period for typically developing children, as it is a way to transition into intentional verbal communication. According to Abbeduto et al. (2007), children with Down syndrome may exceed the typical developmental period of six-eight months when transitioning into symbolic communication, in which intentional symbolic communication of either words or signs is delayed, not appearing until 24-36 months or later (Abbeduto et al., 2007). When researching canonical babbling, Abbeduto et al. (2007) found only a slight delay exists when compared to typically developing children; however, they did report contradictory findings from other sources. Smith and Oller (1981) believe a small delay exists in children with Down syndrome when developing canonical babbling, and a two month delay of babbling is said to exist according to Lynch et al. (1951). Results from a study conducted by Smith and Oller (1981) on pre-meaningful vocalizations in children with Down syndrome and typically developing children revealed that children with Down syndrome are within normal limits when developing reduplicated babbling as, it emerges around eight and a half months. Conversely, Roberts et al. (2007) believe the emergence of babbling and other vocalizations in children with Down syndrome is comparable to typically developing children.

Pragmatics, Imitation & Joint Attention

Although children with Down syndrome use communicative gestures for longer periods of time than most typically developing children, the use of gesture is considered a general strength for children in the Down syndrome population (Roberts et al., 2007) because it provides significance to communication (Abbeduto et al., 2007). To support the relevance of gesture use, Abbeduto et al. (2007) referenced findings from two studies suggesting pre-linguistic children with Down syndrome not only produced more gestures than typically developing peers, but

possessed a larger inventory of gestures. According to the authors, imitation is another strength demonstrated by children with Down syndrome displayed by their ability to imitate others, as well as their use of imitation in social play and intervention techniques (Abbeduto et al., 2007). Generally, children with Down syndrome are attracted to social interaction; however, this interest does not prevent them from demonstrating difficulties with certain elements of joint attention. Aspects of joint attention that appear to be of particular difficulty are reciprocal eye contact and length of time spent on a skill, evidenced by their engagement in a particular activity for a longer period of time and with a heavier concentration level than typically developing peers (Abbeduto et al., 2007).

Adamson et al. (2009) believe that children with developmental disorders, such as autism and Down syndrome, who demonstrate deficits in early joint attention skills, also demonstrate difficulties with language development. Specifically, they believe the deficits in expressive language displayed in children with Down syndrome limit their ability to engage in joint attention to objects in their immediate environment. The authors conducted a study based on their previous research regarding the appearance of symbol-infused joint engagement in typically developing toddlers. This study included thirty month old toddlers with Down syndrome and thirty month old toddlers with autism to determine if effects of problems regarding the development of joint attention and effects of problems regarding language delay predict specific language outcomes. To target this relationship, Adamson et al. (2009) observed interactions of toddlers with Down syndrome and toddlers with autism with their mothers in a variety of communicative environments. This procedure allowed them to obtain information on how parent-infant interactions are affected by the developmental disorders and how symbol-infused joint engagement emerges when these disorders present detrimental effects on joint attention and

language skills. The research design included a coding system comprised of two essential differences that are observed when a child is engaging in joint attention. The first essential difference was between supported and coordinated joint attention. Supported joint attention according to the authors, is usually observed during mother-infant interactions rather than infant-infant interactions. This joint engagement begins to emerge at one and a half years of age and is observed as children "actively share events and objects without explicitly acknowledging the social partner" (p.2). Coordinated joint engagement, also according to authors, usually begins between the ages of nine and 15 months. This period is observed as children maintain joint engagement with a communication partner and "punctuate actions on a common topic with explicit communicative actions such as well-timed glances at their partner's face" (p.2). The second difference noted by the researchers concerns the child's attention to symbols. According to Adamson et al. (2009), it is well into the first year of life when children start centering on and understanding symbolic content as well as, producing symbolic acts; thus, initial periods of joint engagement are characterized as non-symbol infused and then symbol infused.

Adamson et al. (2009) provide examples of the various forms of joint attention to further explain their relevance. First, non-symbol infused supported joint attention is exhibited when a child focuses his attention on a puzzle after a caregiver positions it front of him and hands him a puzzle piece. As the child picks up the puzzle piece and attempts to place it within the puzzle, the caregiver names the object on the puzzle piece. Although there was no direct verbal communication from the child to the caregiver, both caregiver and child were actively engaged with one another. Second, non-symbol infused coordinated joint attention would look exactly the same; however, the child would have to show clear attention toward the caregiver. Clear attention would be demonstrated by, looking at the caregivers face when picking up the puzzle

piece, smiling toward the caregiver while placing the puzzle piece within the puzzle or handing a piece toward the caregiver and stating, “your turn.” Third, symbol infused interaction is observed when children explicitly demonstrate they are attending to symbols or adhering to the caregiver’s commands. These interactions can be observed as children state a word associated with the puzzle such as, “A cow” while readjusting a puzzle piece after the caregiver states, “turn it that way.” This study revealed that children with Down syndrome were less likely to attend to symbols during periods of interactions, which is typically developed by 30 months. The authors do note, however, that the toddlers with Down syndrome willingly shared topics with communicative partners (Adamson et al., 2009).

Linguistic Stage: Typically Developing Children

Generally, between the ages of 18 and 36 months, the pre-linguistic stage of development ends and the linguistic stage emerges Roberts et al., 2007). During this stage, children are expected to start producing single words and eventually expand into two word combinations and sentences as they learn the rules and regulations regarding sound, grammar, meanings and uses (Roberts et al., 2007). The elements of language learned by children are phonology, syntax, semantics and pragmatics, all of which comprise the components that allow children to obtain basic vocabulary, sentence structure, and eventually appropriate social communicative interactions with peers (Roberts et al., 2007). Phonology is the construction of speech sounds, also known as phonemes and the various ways to arrange them to create meaningful words. Semantics refers to the meaning or content of words. Syntax is the construction of phrases and sentences through the strategic combination of words, it accounts for word inflections, parts of speech such as nouns and verbs, word order and components of sentences (Roberts et al., 2007). Abbeduto et al. (2007) provide a similar definition, describing syntax as the rules of how words

may be untied to create larger units of meaningful complex speech. Roberts et al. (2007) describe pragmatics as the way in which language is used for communication in a social context. It includes social communication aspects such as turn taking during a conversation, initiating and monitoring conversation topics, recognizing communication breakdowns, revising one's own speech to provide a clearer interpretation, narrating events and requesting, and protesting objects. According to Abbeduto et al. (2007), individuals need to comprehend how communication functions, how to adopt a communication partner's point of view and how to remember previous conversations in order to develop appropriate pragmatic skills.

Linguistic Stage: Children with Down syndrome

Phonology & Semantics

Of the many deficits observed in children with Down syndrome, the greatest detriment is apparent in language development. As language bridges most people together through communication, language delays may have damaging effects on future abilities such as independent living and complete acceptance into their immediate environment (Abbeduto et al., 2007). Kumin (1998) however, argues that speech and language characteristics are not unique to children with Down syndrome, as similar delays are displayed in typically developing children. A variety of language difficulties are present among children with Down syndrome, but Kumin (1998) believes that children with Down syndrome do not present with consistent speech and language characteristics. Roberts et al. (2007) dispute findings by Kumin (1998), as they explain several patterns of language development typically observed in children with Down syndrome start with deficits in phonology. Martin et al. (2009) agree with Roberts et al. (2007), as they report the commonality of deficits in children with Down syndrome does exist; specifically, they found that it is typical for these children to have lower speech intelligibility than nonverbal

mental aged matched typically developing peers. In addition to phonological deficits, Martin et al. (2009) reported expressive vocabulary, syntax (expressive & receptive) and pragmatic characteristics to be a deficit amongst the Down syndrome population. Children with Down syndrome begin to demonstrate phonological deficits when transitioning from babbling to speaking their first word, which occurs around 21 months of age (Abbeduto et al., 2007), evidenced by a slower elimination time of phonological processes such as the deletion of final consonants on words. According to Roberts et al. (2007) speech intelligibility affected by phonological factors is a lifelong challenge for those with Down syndrome. The exact etiology is not as explicit, as it may be due to several factors including sound error patterns, reduction of word shapes, apraxia of speech, dysarthria, rate of speech, improper stress placement and voice quality. Martin et al. (2009) support this as they report that speech intelligibility may be affected by voice quality, apraxia of speech, and dysarthria. Decreased speech intelligibility not only creates communication barriers between individuals, it may also negatively affect the development of appropriate language skills (Martin et al., 2009).

Abbeduto et al. (2007) believe delays in early vocabulary development manifest from general cognitive delays, since their first word appears at the same mental age as typically developing children. Receptive vocabulary observed in children with Down syndrome appears to be consistent with typically developing children, although some research appears to contradict this belief with evidence of delays in this area (Abbeduto et al., 2007). Martin et al. (2009) also found contradictions in research regarding receptive vocabulary skills in children with Down syndrome; however, their reports described several studies suggesting that children with Down syndrome can understand spoken language in the same manner as their mental aged matched typically developing peers.

Syntax

Past research has demonstrated that syntax difficulties in spoken language may be more present than expressive and receptive vocabulary problems (Martin et al., 2009) in children with Down syndrome. According to Owens (2010), children with Down syndrome may also present with less mature syntax in association with the use of jargon, perseveration and difficulties with presuppositions. Roberts et al. (2007) agree with these findings as they note delays in transitioning from one to two words in speech. Furthermore, this type of delay progresses into multi-word speech evidenced by a decreased mean length of utterance (MLU). Additional syntactic deficits observed in the Down syndrome population are related to the production of grammatical morphemes including copulas, the auxiliary verb to be, articles, and the use of grammatical function words such as prepositions, tense and non-tense bound morphemes like 'ed', past tense, and third person singular 's' (Roberts et al., 2007). According to Abbeduto et al. (2007), expressive syntax tends to be more delayed than receptive syntax in children with Down syndrome when compared to typically developing children matched by NVMA or by a composite measure of receptive syntax. The authors point out however, that the degree of the delay relative to nonverbal cognition or receptive syntax will depend on the type of expressive syntax that is being measured and how it is being measured. The authors also believe several elements including NVMA, auditory short-term memory, hearing ability, and age contributes to the rate of syntax development among individuals with Down syndrome (Abbeduto et al., 2007).

Pragmatics

Roberts et al. (2007) report that pragmatic skills are a strong attribute in children with Down syndrome. Typically, children with Down syndrome are extremely social, engaging, and caring (Martin et al., 2009). Conversely, Roberts et al. (2009) reported there is evidence that not

all areas of pragmatics are consistent; for example, some children with Down syndrome demonstrate difficulties with requesting while others display skills similar to typically developing peers with topic maintenance thus, further research is needed to assist in defining pragmatic skills at different linguist levels and ages. Martin et al. (2009) and Abbeduto et al. (2007) believe that children with Down syndrome and typically developing children share similar pragmatic functions. Martin et al. (2009) found similarities amongst individuals with Down syndrome and typically developing peers in functions such as commenting, answering and protesting. Abbeduto et al. (2007) found similarities demonstrated in their language attempts, since typically developing toddlers and preschool children with Down syndrome answer yes/no questions when interacting with adults. According to the authors, these one word answers are typical of young language learners. This evidence implies that children with Down syndrome look at language as a way to reach a communication goal just as typically developing children. However, the authors indicate this concept appears much later in development for those with Down syndrome (Abbeduto et al., 2007). Martin et al. (2009) found that although pragmatic skills are strong amongst the Down syndrome population, these individuals could benefit from topic initiation intervention, as they may initiate topics less often than typically developing children.

Treatment Strategies

Prevention

It is imperative to conduct preventive measures whenever possible to preserve language abilities in the Down syndrome population. Martin et al. (2009) provided assessment techniques to facilitate the prevention of language delay. Among several measures, hearing screenings and continuous speech assessments have been discussed. According to Martin et al. (2009), regular hearing screenings are beneficial for individuals with Down syndrome, as middle ear infections

are very common and often lead to hearing loss. Specifically, Martin et al. (2009) found hearing screenings to be appropriate when middle ear infections last three or more months. Speech assessments should also be conducted due to the prevalence of decreased speech intelligibility. According to Martin et al. (2009), not only should speech be observed at both the word and conversational level, but possible etiologies of the observed speech deficits should be considered too. Such causes may involve, oral structures and function and vocal quality.

Early Intervention

There is much evidence indicating significant language impairments in both the pre-linguistic and linguistic periods of development in children with Down syndrome. Thus, the use of evidence based practice is significant in determining treatment that is appropriate for individuals with genetic disorders, as there will be aspects of language development that dramatically differ from typically developing children. Roberts et al. (2007) believe that it is vital to consider initiating communication intervention early; to support this suggestion, authors indicate infants with Down syndrome who received early intervention at one month of age had higher language scores at eighteen months of age than those who received intervention at three to six months of age. Martin et al. (2009) agree with these findings, as they found that early intervention is beneficial for children with Down syndrome.

Parent Participation

Treatment of speech and language in individuals with Down syndrome may be best if started early, but will be a continuous activity as it may be helpful throughout different points in life (Kumin, 1998). Thus, information, resources and guidance provided by speech language pathologists will be beneficial for parents in assisting their children during the various stages of development, as this allows them and others in the child's environment to provide significant

contributions to the communication outcome (Kumin, 1998). Educating parents on assisting children at home proves beneficial again, as individuals with intellectual disability increase their chance for improved communication opportunities by engaging in intervention held in a natural environment, such as their home (Owens, 2010). To support this, Roberts et al. (2007) provided several parent-oriented language interventions deemed beneficial during early development, such as the Hanen Program, a parent training program that focuses on both pre-linguistic and linguistic behaviors and Milieu teaching, a teaching technique that manipulates the child's environment to increase certain behaviors such as requesting. Abbeduto et al. (2007) agree with Roberts et al. (2007) regarding the Hanen program for parents and Milieu teaching; however, the authors suggested combining the two techniques for maximal effects. Martin et al. (2009) also supported for parent participation, as they reported on responsivity education and prelinguistic milieu teaching (RE/PMT) as a beneficial teaching tool. This approach focuses on prelinguistic communication skills through instructions of eye gaze coordination, vocalization and gestures. These can be achieved through prompting, arranging environments and parent education of how to respond appropriately to children's verbal and nonverbal characteristics. Parents may also facilitate their child's speech accuracy by focusing on listening and production practice (Martin et al., 2009). Findings that promote intervention with parent assistance have several clinical implications on speech language pathologists (SLPs), as they are responsible for teaching techniques to parents and educating them on intervention strategies rather than exclusively focusing on therapy that solely involves the child.

Learning styles

Due to individual differences among children with Down syndrome, it is important to target both strengths and challenges throughout intervention in order to create an individualized

treatment approach that focuses on communication needs and current level of functioning. The treatment should also focus on goals that will have meaningful impacts on all aspects of life such as communication, social interaction and academics (Roberts et al., 2007).

For example, visual prompts can be very useful, as children with Down syndrome are typically strong visual learners (Owens, 2010) and demonstrate strengths in visual processing (Martin et al., 2009; Stratford, 1980). When considering visual cues, it may be beneficial to choose colored prompts and objects, as Wilkinson, Carlin, and Thistle (2008) found color to be imperative, not only in the categorization of objects, but in the immediate recall and long-term retention of them as well. Stratford (1980) supports Wilkinson et al. (2008), suggesting children with Down syndrome match objects and stimuli based on color or size. Repetition, which can be accomplished by training with multiple examples, may enhance the child's learning ability, since repetition increases the child's familiarity with objects and skills. When introducing a concept for learning it is best to start with objects, as they are the most concrete, facilitating the child in easily acquiring the skill. Lastly, as many individuals with intellectual disabilities demonstrate difficulties with discriminating stimuli, it may be beneficial for children with Down syndrome to engage in an intervention strategy that addresses relevant versus irrelevant cues (Owens, 2010). Additional strategies for intervention are discussed by Roberts et al. (2007) such as targeting speech intelligibility, vocabulary, syntactic and pragmatic skills, as well as focusing on promoting generalization. Martin et al. (2009) found that breaking down sentences to a more straightforward layout for communication purposes using the most essential words is a beneficial compensatory learning strategy.

Targeting specific deficits

As most individuals with Down syndrome display deficits in speech intelligibility, it is important to assess all areas that contribute to this element of speech such as pitch, rate, oral motor structures and functions and phonological processes. To address intelligibility deficits, speech production is targeted through continuous oral motor exercises and activities to increase coordination and strength of articulatory muscles (Kumin, 1998). In order to target phonological processes, intervention should focus on the specific phonological process continuously exhibited by the child (Roberts et al., 2007). Martin et al. (2009) support the beliefs of Roberts et al. (2007), stating the particular phonological processes exhibited by the individual creating the low intelligibility should be targeted in intervention. Specific approaches may also be beneficial in targeting unintelligible speech, such as the cycles approach, in which certain phonological processes are targeted during specific cycles or time periods (Martin et al., 2009; Bauman-Waengler, 2008).

It is also just as important to engage the child in interventions that exclusively focus on syntax, vocabulary and conversational skills in order to achieve a meaningful impact on the individual's life. There are several approaches to address the production of grammatical morphemes, comprehension of directional words and expansion of topic initiations, including clinician directed therapy, child directed therapy or a combination of both (Roberts et al., 2007). Vocabulary can be targeted during the period of development in which children produce one to three words, as this will increase semantic skills and the length of spoken utterances (Kumin, 1998). Martin et al. (2009) found focusing on functional vocabulary to be a beneficial learning strategy.

Introducing appropriate social interactions and conversational skills can be targeted through play based therapies and games such as Peek-a-boo and others that employ appropriate

turn-taking interactions. Pragmatics may also be targeted through activities that provide the opportunity to ask for help, comment, request and respond, greet others and role play (Kumin, 1998). Children with Down syndrome often display an inability to generalize communication skills; thus, this should also be introduced throughout intervention. Many strategies can be implemented to increase generalization including models, prompts, conversational recasts and milieu language teaching as the environment is manipulated to elicit requests from the child. These strategies allow for increased generalization to occur by providing multiple examples and opportunities for practicing communication skills efficiently in a natural environment whether it be a classroom, home, or neighborhood and by providing communication opportunities with a variety of communication partners including teachers, parents, siblings and peers (Roberts et al., 2007).

AAC Devices

To further supplement the communication abilities of children with Down syndrome, important transitional tools are utilized to increase the child's ability to communicate with others while simultaneously decreasing frustration from being unintelligible to those around them (Kumin, 1998). These transitional tools are augmentative or alternative communication (AAC) methods which can be utilized as either a primary means of communication or a short term use that merely enhances verbal productions. Two types of AACs, aided and unaided may be utilized with the Down syndrome population. Aided systems are external symbol systems which can be used through communication boards, books or computerized speech production devices (VOCA). The symbol systems are comprised of objects, pictures, graphics, and/or the alphabet (Roberts et al., 2007). Kumin (1998) supports the use of aided systems such as pacing boards as they provide visual and motoric cues which utilize strengths of children with Down syndrome.

An unaided system is a natural gesture produced by an individual. It may be a simple visual gesture that can be deciphered without difficulty, such as a facial expression, finger pointing, or manual sign language (Roberts et al., 2007). Roberts et al. (2007) advocated for the use of sign language as they reported that signing is a common means of communication among the Down syndrome population, and report findings from Kay-Raining Bird et al. (2000) that indicate that children with Down syndrome imitate more words when paired with sign rather than when presented auditorily or in signing alone. As children with intellectual disabilities may be non-verbal, Yoder, Warren, and McCathren (1998) agree with findings from Kay-Raining Bird et al. (2000), as they believe nonverbal children can receive greater benefit from alternative modes of communication such as AACs, rather than receptively listening to spoken language. Abbeduto et al. (2007) also support the use of sign as a means to communicate early in development, as gesture appears to be a great strength in children with Down syndrome. The use of multimodal methods including aided and unaided systems has been promoted because it provides children with Down syndrome a variety of ways to communicate in environments (Roberts et al., 2007).

Conclusion

An individual's quality of life can be severely impacted by genetic disorders as they may have detrimental effects on their ability to function as typically developing peers. According to research, genetic disorders such as Down syndrome lead to deficits in language development (Abbeduto et al., 2007). As Down syndrome significantly affects language development, it is important for SLPs to fully comprehend how typically developing children acquire language both pre-linguistically, as it is the foundation to linguistic development, and linguistically. This knowledge will facilitate them in applying evidence based practice appropriately to provide the best intervention strategy for that individual. Authors encourage intervention to begin as early as possible, therefore researchers offer a multitude of treatment approaches that have been deemed

appropriate for children with Down syndrome. Many intervention approaches focus on the strengths demonstrated by children with Down syndrome by using visual stimuli and AAC devices to enhance communication opportunities (Roberts et al., 2007).

Future investigations still need to be conducted in this area, in order to develop an even greater understanding of how Down syndrome affects the development of language and the most efficient ways to treat the deficits these individuals will endure. Future research investigations could examine the degree to which sign has been helpful for communication purposes, to expand the current research that regards the use of sign as a valuable supplement to communication. Expanding research to determine how effective signing is as a facilitator for communication may have a vast impact on intervention and signing as a language.

It would also be beneficial to examine the number of signs that are generally in the repertoire of a child with Down syndrome, as this could lead to a specific sign language used amongst the Down syndrome population. This line of future research could not only increase the amount of sign that is introduced by SLPs during intervention, but it may also increase the value people place on sign language.

Adamson et al. (2009) discussed specific deficits observed in joint attention skills due to language deficits. Future research investigations should examine if there is a specific type of language delay that causes these joint attention skills and to what degree. This would be extremely advantageous for the knowledge in the language area, providing a greater understanding of how joint attention and language development are connected, impacting intervention on joint engagement and language development. Investigations could also be dedicated to determining if a link between the type of cognitive delay present among children with Down syndrome and lack of joint attention skills exists. This information could not only

provide parents and family members with knowledge to help them understand and prepare for their child's development, but also give researchers the opportunity to develop prevention strategies. Future research on this topic could also be advantageous for SLPs, as it may provide a deeper understanding of joint attention, ways in which to treat deficits in intervention and brain development in individuals with Down syndrome.

Targeting specific deficits observed in individuals with Down syndrome is one of many intervention strategies deemed beneficial for language development. Research has found targeting specific phonological processes, and functional vocabulary to be common strategies. However, further research should be conducted to determine if there is a strategy deemed consistently beneficial amongst all individuals with Down syndrome. There is conflicting evidence on whether a common profile exists among individuals with Down syndrome; if such a profile exists, future research should examine if there are precise strategies to target these common deficits. This type of investigation could provide a new outlook on how language development is affected by Down syndrome and may provide a faster more efficient treatment time, as trial and error of intervention techniques will not be necessary.

Future research investigations should examine the development of prelinguistic skills in individuals with Down syndrome to determine if a delay within this stage will establish future linguistic skills. Contradicting evidence on babbling currently exists among researches. Investigating how each prelinguistic stage is developed may provide insight to researchers on how early delays can be detected. It may be possible to identify a pattern of crying and fussing patterns and cooing and vocal play before looking at babbling among individuals with Down syndrome that act as precursors to their linguistic development. This information could provide researchers with a way to supply parents, families, and health professionals with information on

how the child will develop language and possibly a more precise time frame in which they are most likely to develop each milestone. This information may relieve caregiver's stress from the uncertainty of their child's future and provide hope for language intervention for this population.

Lastly, expanding this research on Down syndrome and its effects on language development to all developmental disabilities would provide the opportunity to discover if specific deficits exist between the various developmental disorders and language development. Conducting more research investigations on this may prove extremely beneficial for individuals with developmental disabilities, as it could prepare them and their families for the various delays they will endure. Being aware of the deficits to be faced could ease the stress related with the disorder and help prepare them for future endeavors. This investigation may also provide researchers the opportunity to develop both intervention strategies and preventative measures for individuals with developmental disabilities

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