A Comparative Analysis of the Patterns of Language Development between Children with Williams syndrome and Children with Down syndrome

Author: Erin Elizabeth Hart

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Erin E. Hart

Boston College

Typical Patterns in Language Development

Introduction

All children who develop in a typical fashion acquire speech. Regardless of the spoken tongue, opportunities for language acquisition are universal across language barriers. Situations involving communication with other people and thus exposure to language models exist for individuals of different cultures around the globe. Even with these commonalities considered, children show great variation in the timeline upon which they achieve given speech milestones. The size of a child's vocabulary, the competence levels of a child in terms of pragmatics, semantics and syntax- these aspects of language vary across individuals (Tamis-LeMonda, Cristofaro, Rodriguez, & Bornstein, 2006). As variations exist in typically developing (TD) children, those with physical and mental disorders can vary in their language capabilities as well. The understanding of language structure, language processes and communication in Language Normal (LN) individuals is crucial to the analysis and comprehension of language development in children with genetic disorders such as Down syndrome (DS) and Williams syndrome (WS).

Theories on Language Acquisition

Many theoretical approaches have attempted to explain the process by which human beings acquire language. The behaviorist perspective on language acquisition centers its views on operant conditioning. This type of learning occurs when children act on their environment, thus engaging in a particular behavior, while a stimulus following the act alters the probability that the behavior will occur again. Behaviorists propose that language acquisition occurs when parents or other caregivers reinforce babbling and other early attempts at language, thus increasing the likelihood that the child will continue to grow linguistically. Other behaviorists such as Albert Bandura believe that imitation also plays a crucial role in language development.

However, the knowledge that children create novel utterances which they have never before heard and which are not reinforced has led to the demise of this theory (Berk, 2009).

Nativist perspectives on language acquisition hold that language is a uniquely human property which is embedded in the anatomy of the brain. Linguist Noam Chomsky proposed this theory in contrast to behaviorism, believing that children are less dependent on adult reinforcement and are born with an innate ability to develop language. Central to Chomsky's theory is the Language Acquisition Device (LAD), a system by which children combine words into grammatical, novel utterances and by which they are able to comprehend the meaning of the sentences they hear (Berk, 2009). Crucial to the LAD is Universal Grammar (UG), said by Chomsky to model the mental capacity humans possess for understanding language. According to Meisel (1995), Chomsky believed UG was a part of inherited human knowledge because the knowledge required to understand the complexity of language cannot be learned. As experience comes with age, there exists in infancy a discrepancy between experience and knowledge which must be accounted for by inherited language components (Miesel, 1995). However, this theory does not consider pragmatics (which will be discussed at length below), quality of language, social experience, or the cognitive capacities of children and thus lacks the comprehensiveness required for a complete language theory.

The interactionist school of thought focuses on interactions between internal predispositions to language and environmental influences. Derived from Connectionist Theory, this line of thinking proposes that neural networks are not specific to language; rather children apply general cognitive functions to understand their complex language environment (Berk, 2009). In contrast to the nativist ideal, which holds that input stimuli are too impoverished to create a language base, interactionists believe that connectionist networks can extract

representations of linguistic structure from input stimuli (Plunkett, 1995). However, more research must be done in order to determine if these learning strategies apply to more complex language inputs in everyday contexts such as conversation. In relation to this information-processing theory, Social Interactionists emphasize the innate human desire to understand and communicate with others; children use this desire in conjunction with their language environment to discover and develop language (Berk, 2009). As will be discussed below, language socialization has a great impact on language acquisition.

Components of Language

Language is not one-dimensional; rather, there are many components that come together to allow human beings to communicate effectively with one another. Here, language will be divided into four main sections: phonology, semantics, grammar and pragmatics. Phonology provides the foundation for semantics, which provides the tools needed for true grammar and syntax. Together these pieces lay the groundwork for pragmatics and social communication. These components are all interdependent as the acquisition of each facilitates the further development of the others.

At the base level, phonology provides the rules that govern the structure and sequence of speech sounds. Phonemes are the smallest units of sound that signal a change in meaning. These sounds are not universal across languages. While the “ra” sound and the “la” sound are distinctively different to English speakers, the Japanese cannot distinguish between these two phonemes. In infancy, babies can distinguish more sounds than those present in their own language. However, by 6 months, their attention becomes more focused and they can only attend to sounds in their native tongue. This acquired ability to organize speech sounds is known as

categorical speech perception: the inclination to perceive a range of sounds from the same phonemic class as identical (Berk, 2009).

Semantics is chiefly concerned with vocabulary. This aspect of language aids in building word combinations and the concepts which underlie these words. On average, the first word develops around 12 months, though the range spreads from 8-18 months. Variations in this acquisition are due to both genetics and the child's external language environments. Early vocabulary consists primarily of object, action, and state words, such as size and color. Some children's vocabularies consist primarily of words that refer to objects. Such a lexicon would be indicative of a referential style of vocabulary, using words that primarily name things. Children with a more expressive style tend to produce more pronouns and social formulas, expressing feelings and needs (Berk, 2009).

Grammar can be subdivided into two parts: syntax and morphology. Syntax provides the rules used to arrange words into sentences while morphology works on a smaller scale to provide grammatical markers used to indicate number, person, tense, case, gender, and the active and passive voices, among other grammatical elements (Berk, 2009). The structure and rules provided by grammar and syntax are critical to the art of comprehendible communication.

The final component of language acts on a less structural level than the three which were previously mentioned. Pragmatics offers rules for engaging in effective and appropriate communication with other people. It also provides individuals with referential communication skills and allows humans to produce clear messages and recognize when messages are unclear so that they might ask for clarification in order to communicate effectively. Pragmatics is therefore crucial to sociolinguistic knowledge as it allows for effective and appropriate discourse in society (Berk, 2009).

Language Development

Pre-linguistic development.

According to Locke (1995), the path upon which infants travel toward language development is not initially linguistic, yet eventually leads to spoken language. He states that humans are placed on this path by the human genome and are guided along with the help of experiences that cultivate language. When a child is around 2 months old, he or she starts to coo, producing sounds consisting mostly of vowel-like noises. By the time the child reaches 6 months of age, he or she begins to add consonants into the mix. These repetitive, consonant-vowel combinations are known as babbling. The sound systems and syllable structures are similar across languages at this point (Menn & Stoel-Gammon, 1995). However, infants must be exposed to human speech in order for these sounds to further develop into words.

Menn and Stoel-Gammon (1995) hold that, as with any other task, practice in vocalization will help babies to increase their skill and precision in terms of language mechanics; the more the baby attempts to produce sounds and sound sequences, the easier they become to execute. Equally if not more important, these researchers believe that practice is essential for feedback. When infants are able to hear their own productions and become aware of the tactual and auditory sensations that accompany the sounds, their awareness of their own oral-motor movements increases. Such awareness acts as a precursor to the processes which underlie word production in later language development (Menn & Stoel-Gammon, 1995).

Babies are born with an inherent bias for perception and attention; they are oriented to the human voice. Within merely the first few days of life, they have an awareness and preference for the voice of their own mothers, preferring the prosodic patterns used by their mothers while

the fetus was in utero (Locke, 1995). Such early attention bias may aid in yielding joint attention, a phenomenon critical for early language development in children.

Joint attention occurs when a child attends to the same object or event as the caregiver who labels the object (Berk, 2009). Around 3-4 months of age, the infant and mother begin to take turns vocalizing, which sets the stage for dialogue formation (Locke, 1995). Parents and caregivers use child-directed speech (CDS) in an attempt to engage the child, increase his or her understanding, and aid in maintaining the child's attention. Such give-and-take can be manifested in games such as patty cake and peek-a-boo (Berk, 2009). By 8-10 months, the child begins to follow the adult's line of vision or regard, allowing him or her to realize that the object of the mother's attention is also the object of her vocalization and thus the object of her reference (Locke, 1995). By the time the infant reaches the age of 12 months, he is an active participant in the referencing relationship. He starts to point to objects, which leads to protodeclarative and protoimperative gesturing. In the protodeclarative form, the baby points to, touches, or holds up an object in an effort to ensure that others pay attention to his or her point of interest. With protoimperative gesturing, the baby reaches, points and makes sounds in order to ensure the caregiver executes a desired task (Berk, 2009). Gradually, the gestures recede and the child's efforts become word-dominant. As caregivers respond and engage infants in dialogue, they encourage early language development (Berk, 2009).

Maternal attachment also plays a crucial role in fostering sustained and intimate interactions between infant and caregiver which allow for the establishment of vocal and referential learning that is required for lexical development. A shared gaze between mother and infant contributes to the establishment of social referencing (Locke, 1995). Tomasello and Farrar's study (as cited in Locke, 1995) established that there is a positive correlation between

the amount of time spent in joint attention at 15 months and the size of the child's vocabulary at 21 months. Maternal attachment allows the caregiver and the child to recognize and interpret each other's emotions and thoughts based on both facial and vocal recognition (Locke, 1995), thus increasing the likelihood for social referencing and joint attention and enhancing the development of language.

Linguistic development.

The onset of language marks the transition from infancy to adulthood. (Tamis-LeMonda, Cristofaro, Rodriguez, & Bornstein, 2006). The development of each language component results in a comprehensive language model upon which human communication is based.

Phonological development depends on the ability of the child "to attend to sound sequences, produce sounds, and combine them into understandable words and phrases" (Berk, 2009). Much of this depends on their propensity for categorical speech perception of their native tongue. First words are dictated by the sounds the child is able to produce at that time. These are most often simple sequences with repeated syllables, frequently beginning with a consonant and ending with a vowel. Phonological acquisition is not necessarily completed first on the chronological timeline of language development. Morphology is often acquired before children have completed the mastery of phonetics. As children add more words to the lexicon, they become capable of producing more complex speech sounds (Berk, 2009). Early attempts at word formation are sporadic at best, extremely variable in pronunciation, and unsystematic in phonological relation to the true adult word (Menn & Stoel-Gammon, 1995). For example, a toddler may say "ba" for bottle. By the time a child reaches the age of 3 or 4, the phonological errors he or she produces are resistant to adult correction. Thus, maturation of the vocal tract and improved problem-solving techniques allow pre-school children to produce fewer errors and

improve pronunciation. By the age of 5, phonological development is mostly complete, though a few errors are still common. At this stage, syllable stress patterns that indicate differences in meaning often present difficulties for children. These errors are often corrected by middle childhood or adolescence (Berk, 2009).

As Barrett (1995) demonstrates, semantic and lexical development is heavily dependent on factors which vary considerably from person to person. Word acquisition is highly constrained by existing cognitive capabilities, the child's ability to analyze, modify and elaborate on existing internal representations, and the linguistic input with which the child is presented. Children can produce 50 words by the time they are 18 months old and when a child reaches 2.5 years of age, the size of his or her vocabulary reaches approximately 500 words in a LN individual (Barrett, 1995).

According to Berk (2009), when acquiring semantic and lexical components of language, comprehension develops ahead of production. That is to say, children develop an understanding of a concept before they acquire a word for it. Comprehension of words typically begins in the middle of the child's first year (Berk, 2009). The acquisition of comprehension can be understood via fast-mapping: the process by which children connect a new word with an underlying concept after only a brief encounter. As children learn new words, they often misapply them to concepts which are not defined by the given word. Overextension occurs when children apply words to a greater grouping of concepts than is appropriate for the given definition. For example, a child who overextends the word "cow" may use it to refer to all animals with four legs, such as cats, dogs, and horses. Underextension involves the opposite error. Here, words are applied too narrowly, not encompassing as great an array of concepts as

the word demands. A child who underextends the word "cow" may use it to refer solely to a treasured stuffed animal instead of using it to refer to all cows (Berk, 2009).

With the acquisition of syntax, child linguistic capabilities progress from lexical items to true language (Peters, 1995). As with semantics, children are more knowledgeable in the realm of grammar comprehension than they are in production during the early stages of grammar acquisition. When beginning to form true and grammatical utterances, they tend to start with simple sentences and work their way up to more complex grammar. As a part of the process, children acquire grammatical morphemes, small markers that change the meaning of a sentence. They begin with 2-word utterances known as telegraphic speech at 1.5-2.5 years when their lexicons contain a productive vocabulary of approximately 200 words. Around 2.5-3 years of age, children begin to master adult grammar structure and, for English speakers, around the age of 3, 3-word utterances begin to develop with a distinct subject-verb-object word order. Once this has been established, grammatical morphemes are added. As the learning process takes place, language learners make many mistakes. These errors typically entail overregularization, a slip in which regular morphological grammar rules are applied to irregular word forms (Berk, 2009). For example, a child might say "goed" instead of "went" for the past tense of "go".

According to Ochs and Schieffelin (1995), socialization impacts grammatical development as well. Children's understanding and concept of grammar is linked to projected cultural personas and constructed relationships. Grammar becomes linked to cultural beliefs and preferences; social order and ideologies act as forces which impact children's understanding of grammatical forms. As children are exposed to grammar in conversation within a social context, these models ultimately impact the way in which children form grammar.

As much as grammar and socialization interact, language intersects greatest with socialization in the realm of pragmatics. According to Ely and Gleason (1995), this crossover occurs in three domains. Firstly, parents teach their children explicitly what to say and what not to say, as in politeness and manners, holidays and religious affairs and other types of routines. Secondly, language acts as the medium by which to convey social and moral rules as a topic. Instructing children on what is appropriate behavior, as well as on what to say and think, provides children with lessons through media such as cultural stories. Finally, aspects of the linguistic interaction itself, as in communication among groups of people, contribute to pragmatic development.

The ability to organize discourse is also a crucial component of child language acquisition. Children can only gain full communicative competence once they comprehend the pragmatics that governs how language is organized across conversations and utterances. They must learn to regulate the flow of information in a conversation and interpret either the mutual background knowledge or newness of the information in order to proceed appropriately in the dialogue (Hickmann, 1995).

Narratives are yet another element imperative to effective communication. Parents who frequently engage in nonpresent or related-to-present speak with their children provide them with more tools to speak about the past, their feelings and their intentions, as well as other skills which are critical to narrative production. Narratives are forms of oral discourse which translate shared cultural experience to the world; they are a means of making sense of both the physical and social environment. Children's differences in their ability to engage in joint attention discussions act as a precursor to narrative development in later years as these discussions lead to conversations about the past, the future, and memories relating to a particular object (Uccelli,

Hemphill, Pan, & Snow, 2006). Such ideas further highlight the important role joint attention plays in pre-linguistic language development.

Language Impairment

According to Miller and Klee (1995), language impairment can exist in many forms. Language development may be delayed as compared to children with typical language development or the linguistic system may deviate from that of language normal children without a disorder. Additionally, grammatical, semantic, or pragmatic processing or representational deficits may present as types of language impairment. There is no set definition for language disorder (Miller & Klee, 1995).

In Specific Language Impairment (SLI), language is the only element impaired; no other conditions are suffered. Children who suffer from SLI speak less frequently and less accurately than their peers, producing more errors in speech than children with TD language patterns. These children also process information at a slower rate than LN children of the same chronological age (CA), with a slower rate of language acquisition and a later onset of language skills. Some children with SLI may never reach the linguistic level of their peers (Miller & Klee, 1995). Even in SLI, language impairment is multidimensional. Children do not exhibit language deficits at a single level, but rather in multiple language domains simultaneously; certain deficits can influence others. For example, limited phonological capabilities may hinder a child's ability to acquire a full vocabulary. The constructs involved and the subtypes of difficulties vary depending on the child (Miller & Klee, 1995).

Abnormalities in language can also be associated with a variety of other mental and physical problems. Diseases, metabolic disorders, pre- and post-natal trauma, environmental factors or lack thereof, and genetic syndromes can all give rise to varying degrees of language

impairment (Miller & Klee, 1995). DS and WS, both genetic disorders, show individual signs of language impairment. The ways in which these impairments compare and differ offer an interesting look into the varying effects different genetic disorders can have on language development. In the remaining sections of this thesis, I will focus on the similarities and differences in language development of children with either of these two syndromes.

Down Syndrome

Introduction

DS is the most common neurodevelopmental disorder among the human population, occurring in 1 out of approximately every 800 live births (Tager-Flusberg, 2007). It arises as a result of a chromosomal abnormality. In TD individuals, each cell in the body contains two copies of each of the 23 chromosomes, yielding a total of 46 chromosomes per cell (National Human Genome Research Institute, n.d.). However, in patients with DS, each cell contains a third copy of chromosome 21, thus yielding Trisomy 21 as the alternative namesake for DS (Wishart, 1988). This extra chromosome provides additional copies of the genes that are located on the chromosome. Rather than a result of genetic mutation, the phenotypic profile of an individual with DS is therefore caused by an excess of gene product produced by the extra copies of these genes. Trisomy 21 is rarely inherited, but instead arises as a result of non-disjunction, a phenomenon in which divisional errors during meiosis lead to an incorrect allocation of chromosomes to all of the daughter cells (Wishart, 1988).

While Trisomy 21 is the most common form of DS, in rare instances an additional copy of chromosome 21 is found in only some cells. This condition is known as mosaic DS and occurs in approximately 2-4% of DS cases (International Mosaic Down Syndrome Association, n.d.). In still another form of the disorder, translocation DS, each cell contains the typical duplicate copies of chromosome 21, but due to a translocation event in which pieces of one chromosome are broken off and attached to a different chromosome, cells can end up with an extra piece of chromosome 21 attached to the typical complement of chromosomes in the cell (Genetics Home Reference, 2011). This condition is found in approximately 3-4% of DS cases (Children's Hospital of the King's Daughters, n.d.).

These genetic alterations are responsible for the intellectual and physical phenotypes exhibited by individuals with DS. While the degree may vary, people with DS tend to demonstrate mild to moderate levels of intellectual disability (Genetics Home Reference, 2011) and they do not gain cognitive skills as quickly over time as do TD individuals (Hodapp, Thornton-Wells, & Dykens, 2009). At birth, infants often demonstrate poor muscle tone, or hypotonia. They are often short in stature with short, broad hands, a flat nasal bridge and a protruding tongue. Approximately 90% suffer from some degree of hearing loss, a factor which is believed to play into the language and learning deficits and lower IQ typical of DS children (Hodapp et al., 2009). Vision problems are also common (Wishart, 1988). About half of children born with DS suffer from congenital heart defects and 15% exhibit hypothyroidism, or underactive thyroid gland. Digestive abnormalities are less common, but gastroesophageal reflux and celiac disease are possible. In addition to these deficits, patients with DS also have an increased likelihood of developing Alzheimer's disease during adulthood and half of those who do suffer from its devastating effects acquire the disease as early onset (Genetics Home Reference, 2011). Individuals with DS also have an increased chance of developing leukemia (Hodapp et al., 2009).

Language Profile

In the following sections, I will explore the ways in which various language aspects are affected by DS. I will do this hierarchically, beginning with the vocal and phonological mechanisms with which children with DS produce speech. From here I will look at language on a semantic level, exploring the processes children with DS use to acquire words. An analysis on syntax will follow, relating to the ways in which these children apply their semantic knowledge to the fixed rules of language. Finally, I will examine how each of these aspects unites with the

others to form pragmatic and social skills. Such an analysis will at times be linked to the cognitive profile of this population. My analysis will conclude with a summary of my findings.

Phonology.

Phonological deficits in individuals with DS are largely characterized by the unintelligibility of speech. Speech impairment is profound in the DS population, and difficulties in speech production do not correlate to the cognitive impairments found in children with DS (Cleland, Wood, Hardcastle, Wishart, & Timmins, 2010). Speech deficits are a defining aspect of the behavioral phenotype for this population with many potential factors acting as a cause. Impairments in voice production, issues with speech fluency, atypical prosody, impaired articulation of speech sounds, and anatomical anomalies may all contribute to speech intelligibility deficits (Bunton, Leddy, & Miller, 2009). At the physical level, structural and functional oral differences can cause difficulties producing speech sounds. Individuals with DS often are born with a small oral cavity, a large tongue, and a high and narrow arched palate, as well as abnormal facial musculature (Roberts, Price, & Malkin, 2007). As precise lingual posture and control are essential for accurate speech production, deficits caused by the DS anatomical phenotype can contribute to the unintelligibility of verbal language (Bunton et al., 2009). Errors in sound patterns, reduction of word shapes, deviations in placement of sentence stress, phrasing, and rate of speech, as well as dysarthria, a motor speech disorder marked by weak mouth and facial muscles (American Speech-Language-Hearing Association, n.d., Dysarthria), and apraxia, a motor speech disorder in which the brain exhibits difficulty moving the speech organs such as the tongue and mouth (American Speech-Language-Hearing Association, n.d., Childhood Apraxia), can also contribute to poor speech intelligibility (Roberts et al., 2007). Apraxia highly correlates with the speaking difficulty found in this population

(Kumin, 2006). Ultimately, these deficits can be associated with high rates of articulation problems (Tager-Flusberg, 2007; Chapman & Hesketh as cited in Hodapp et al., 2009; Burgoyne, 2009). In addition to speech-motor control deficits, the hearing loss suffered by individuals with DS is a complication which is thought to affect language production as well. Abnormalities in the nervous system which individuals with DS may exhibit (Bunton et al., 2009; Roberts et al., 2007) such as decreased brain volume in areas such as the cerebellum (Roberts et al., 2007), a region of the brain responsible for coordinating the muscles involved in voluntary movement (Cerebellum, 2011), may also play a role in unintelligibility. Additionally, atypical hemispheric laterality is thought to cause problems in speech perception and oral motor movements (Heath & Elliott as cited in Ypsilanti & Grouios, 2008).

These physical conditions often make vowel and consonant production very difficult. Deficits in speech sound production become evident as children transition from prelinguistic stages of language development to their first words (Roberts et al., 2007). In a study conducted by Bunton et al. (2009), it was concluded that certain speech sounds are more susceptible to phonological errors than others. Long-short vowels and high-low vowels, voiced and voiceless initial phonemes, and fricative place and stop place are very common difficulties, among others. Abnormal jaw-tongue posture can be linked to these various phonological errors in pronunciations, as well as to delays in development of consonant clusters, vowel production, and place of production for consonants (Bunton et al., 2009).

As the children develop further, inconsistencies in speech production may also stem from difficulties in the phonological planning of speech (Bunton et al., 2009). Phonological fluency and memory can play a crucial role in this planning. If a child with DS has difficulty retaining phonemic contrasts due to poor phonological memory, it will be difficult for her to make

advanced decisions regarding upcoming speech production. In a study conducted by Law and Bishop (as cited in Ypsilanti & Grouios, 2008), poor performances on word and non-word repetition tasks were indicative of such deficits in phonological memory and were demonstrated to affect expression performance poorly. In a separate study, participants attempted to generate as many words/exemplars that began with a particular phoneme as they were able. The participants with DS produced fewer exemplars than did the TD controls, suggesting expressive deficiency and phonological weakness (Nash & Snowling, 2008) in phonological fluency and productivity.

Speech intelligibility deficits also contribute to interferences with oral communication. Social interactions occur on a daily basis. However, when the speaker with DS is unintelligible, he or she decreases attempts at speaking (Bunton et al., 2009). This in turn leads to decreased practice for language production and learning and thus manifests in simple sentence structure, decreased expressive language, and shortened utterance length (Fowler as cited in Bunton et al., 2009). Speakers with DS shorten their sentences and use only their most intelligible words to communicate what they are thinking or feeling. In return, conversational partners offer only questions which require short answers so as to increase the chances for comprehending the speaker who has DS (Bunton et al., 2009). Ultimately, the unintelligibility of speech leads to a decrease in practical language applications, in turn negatively impacting the development of other language faculties such as syntax and pragmatics.

Semantics.

Semantic areas of language are often considered a relative strength for children with DS (Grela, 2002). However, that does not mean that lexical development is on par with that of TD children. Individuals with DS still exhibit a number of difficulties and deficiencies in terms of

their semantics and lexicon. Much of this is thought to be attributed to neural abnormalities in the brain. People with DS suffer from decreased brain volume (Piner et al. as cited in Ypsilanti & Grouios, 2008) as well as significant damage to cortical and subcortical regions of the brain that are essential to language development, such as the cerebellum. Hippocampal dysfunction is said to account for poor performance on tasks involving verbal short-term memory (STM), verbal and spatial long-term memory (LTM), spatial span, syntax and receptive vocabulary (Ypsilanti & Grouios, 2008). Perhaps most significantly, breakdowns in phonological, verbal and auditory STM may have great impacts for lexical representation and retrieval. With an impaired auditory STM, children may experience difficulties in entering words into their lexicons as they may not be able to adequately remember the words that they hear in everyday conversations. Chapman and Hesketh (as cited in Ypsilanti & Grouios, 2008) found that even if new words are able to enter the lexicon, verbal STM deficits may impair children from being able to retrieve these entries for personal production, thereby yielding further deficits in expressive vocabulary. Less efficient retrieval strategies may therefore influence low expressive productivity in children with DS, a problem related to expressive deficits more so than to atypical language (Nash & Snowling, 2008).

There is debate, however, about the extent to which executive functioning in children with DS is compromised. While some researchers hold that prefrontal executive functioning is relatively intact as evidenced in tasks such as strategy and planning, both verbal and nonverbal fluency, attentional inhibition and working memory (Ypsilanti & Grouios, 2008), others believe that executive functioning is impaired due to decreased brain volume in the frontal and prefrontal cortices (Nash & Snowling, 2008). Executive deficits may be affecting word retrieval strategies, thereby eliminating atypical language as the cause for language deficits (Nash & Snowling,

2008). Still others argue that language skills are depressed in comparison to cognitive abilities such as memory in children with DS (Burgoyne, 2009; Grela, 2002).

Receptive and expressive levels of vocabulary are a major point of interest in terms of lexical development. Some researchers have argued that there is a disparity between the two types of vocabulary for children with DS, as evidenced by Chapman (as cited in Ypsilanti & Grouios, 2008). Miller (as cited in Ypsilanti & Grouios, 2008) holds that expressive language presents more of a deficit than comprehension, a suggestion which indicates difficulty accessing word knowledge. Such a difficulty could be related to speech output or insufficient STM (Ypsilanti & Grouios, 2008). Chapman et al. (as cited in Ypsilanti & Grouios, 2008) found that this discrepancy between receptive and expressive language production for children with DS begins at infancy and increases with age. Early expressive vocabulary growth is thought to be slower than receptive, a characteristic consistent with general cognitive development (Roberts et al., 2007). According to Thordardotter, Chapman, and Wagner (2002) and Roberts et al. (2007), as development progresses into late adolescence, additional life experiences aid in bolstering vocabulary abilities in terms of comprehension, thus providing further evidence for a growing gap between expressive and receptive language. Those with DS have shown increasing strengths in vocabulary comprehension development (Thordardotter et al., 2002) and an increase in the ability to produce semantic clusters in a semantic fluency task (Nash & Snowling, 2008); both of these indicate the acquisition of new word meanings as age increases, thus supporting the increasing development of receptive vocabulary as time passes on. Rondal (as cited in Grela, 2002), however, presented a contrasting viewpoint, which is that life experience contributes to larger expressive vocabulary in youth with DS than younger children of similar syntactic

development. From this view, both receptive and expressive vocabulary skills can be relative strengths for these children (Grela, 2002).

In terms of actual word development in children with DS, the onset of the first spoken words is often delayed in comparison to TD children (Roberts et al., 2007), usually by approximately 18 months (Oliver and Buckley as cited in Ypsilanti & Grouios, 2008). While the majority of children following typical developmental pathways exhibit a dramatic increase in vocabulary entries around 24 months of age, this spurt is only seen in approximately half of children with DS (Miller as cited in Ypsilanti & Grouios, 2008; Miller as cited in Roberts et al., 2007); it often occurs at a more advanced mental age (MA) in the DS population than it does in TD children (Miller as cited in Roberts et al., 2007). Despite the delay in vocabulary onset, children with DS label early words at a very basic level in the same way that TD children use early vocabulary (Tager-Flusberg, 2007).

In terms of lexical verb production, differing opinions exist. Eadie, Fey, Douglas, and Parsons (2002) hold that children with DS produce fewer lexical verbs per utterance than controls matched for Mean Length Utterance (MLU). Conversely, Grela (2002) states that children with DS produce lexical verbs just as often as TD children, but with more variety.

Syntax.

Syntax is commonly held to be a particular weakness for children with DS when compared to vocabulary (Roberts et al., 2007; Ypsilanti & Grouios, 2008). The trajectory of this gap is debatable. While Ypsilanti and Grouios (2008) contend that the discrepancy between morphosyntactic and lexical abilities stabilizes as children approach adolescence (the lower-level morphosyntactic abilities catch up to the lexical), Thordardotter et al. (2002) maintain that the gap between syntax and semantics widens over time. Syntactic development is delayed in

comparison to the development of vocabulary comprehension (Ypsilanti & Grouios, 2008; Thordardotter et al., 2002), a factor which contributes to this assumed initial gap and weakness in syntax.

Syntactical difficulties are marked by deficits in both grammar production and grammar comprehension (Tager-Flusberg, 2007; Ypsilanti & Grouios, 2008; Thordardotter et al., 2002; Vicari, Caselli, & Tonucci, 2000). Children with DS exhibit a tendency to omit tense-related grammatical morphemes (Tager-Flusberg, 2007; Ypsilanti & Grouios, 2008), as well as sentence arguments (i.e., the subject of the sentence) (Tager-Flusberg, 2007). While irregular past-tense formation appears to remain unaffected, children with DS struggle to form the regular past-tense (Ypsilanti & Grouios, 2008). Morphemes are commonly substituted in the past-tense grammatical form (Ypsilanti & Grouios, 2008). Eadie et al. (2002) suggest a possible explanation for this phenomenon: irregular forms may be stored and retrieved as vocabulary words, such that these children have to access their lexicons, an area of supposed strength, rather than rely on a set of grammatical rules. Overall, grammatical morphology is less consistent in the DS population than it is for peers with typically developing language (Thordardotter et al., 2002). Children with DS use a variety of grammatical morphemes, but they omit many types (Thordardotter et al., 2002; Chapman, Schwartz, & Bird, 1998; Eadie et al., 2002). They omit words and word types more frequently than younger MLU-matched children (Chapman et al., 1998), with a strong tendency to omit function words such as articles and prepositions (Chapman, Seung, Schwartz, & Kay-Raining Bird as cited in Eadie et al., 2002). Older children with DS use conjoined and subordinate sentence forms and they produce fewer grammatical verbs, though with more variety than TD MLU-matched children (Roberts et al., 2007; Grela, 2002).

In addition to production, syntactic comprehension also proves a weakness for children with DS, though production demonstrates worse impairment (Grela, 2002). Children with DS exhibit a greater difficulty understanding phrases with simple syntactic structure than do TD children (Vicari et al., 2000). Overtime, morphosyntactic understanding slows down (Roberts et al., 2007). Grela (2002) suggests that children with DS may exhibit difficulties processing the linguistic signal due to impaired hearing. Even if these children can hear, they may not be able to process well enough to properly store auditory signals in LTM (Grela, 2002). Thus auditory processing deficits provide one potential explanation for slow growth in syntax and grammatical difficulties (Eadie et al., 2002). With a compromised ability to retain auditory information in the brain, it may be difficult for children to process and learn to produce complex sentences (Thordardotter et al., 2002). Comprehension deficits are therefore linked to deficits experienced in acquiring grammar (Tager-Flusberg, 2007).

It is no longer believed that there is a critical period for syntactic development in children with DS; there is no ceiling placed on this level of linguistic growth (Tager-Flusberg, 2007; Thordardotter et al., 2002; Roberts et al., 2007; Chapman et al., 1998). While syntax develops slowly, there are no limitations to the complexity of syntax that these children acquire (Thordardotter et al., 2002). Their syntactic development continues well into adolescence and is not confined to simple syntax (Thordardotter et al., 2002). Chapman et al. (as cited in Roberts et al., 2007) found that children advance in utterance length and syntax complexity through age 20. Thordardotter et al. (2002) found that a high level of word and morpheme omissions contributes to complex utterances manifesting in lower mean length.

Pragmatics.

Pragmatic development begins with a prelinguistic stage. Before children acquire verbal language, whether or not they possess a neurodevelopmental disorder, they go through a series of prelinguistic stages. In children with DS, the onset of canonical babbling is delayed and, once acquired, is less stable than babbling of TD children (Tager-Flusberg, 2007). This babbling period also extends into the second year of life for children with DS, which is a bit later than for children with typical development patterns (Roberts et al., 2007). In addition to babbling, infants communicate with facial expressions and gestures. While this period typically exists around the 12-18 month mark in TD babies, for individuals with DS, it can last up to several years (Roberts et al., 2007). In TD children, spoken language and gesture develop alongside each other; gestures become more infrequent as language skills progress (Burgoyne, 2009). For DS children, gesturing is more effective for conveying meaning than using verbal language alone; children with DS are more likely to use gestures without accompanying speech than are TD children (Burgoyne, 2009). Children with DS gesture more often than TD children do and are more likely to use iconic gestures to convey meaning (Burgoyne, 2009). Overall, gestures are considered a strength for children with DS. Additionally, when attempting to solve problems, these children use facial expressions; they do not use words (Hauser-Cram, 2009). The more these nonverbal means of communication are used, the stronger the linguistic development process will be (Roberts et al., 2007).

In addition to gestures, eye contact is also a very important prelinguistic faculty. In developing eye contact, children with DS follow the same developmental pattern as TD children. However, the onset of such eye contact is delayed in children with DS (Tager-Flusberg, 2007). Around 6 months, eye contact catches up to individuals matched for CA. Once these children

do develop eye contact, they begin to hold eye gaze for long period of time with social partners (Hauser-Cram, 2009). They do not use it to solve problems, but rather utilize eye contact in social contexts (Hauser-Cram, 2009). Such behaviors can be indicative of the ways in which children with DS behave during social interactions. According to Kasari, Mundy, Yirmiya, & Sigman (as cited in Hodapp et al., 2009; Hauser-Cram, 2009), children with DS look to people more often than they look to objects, and they subsequently have trouble shifting attention from one to the other (Legerstee, Varghese, & van Beck as seen in Hauser-Cram, 2009). When performing problem solving tasks, these individuals look to adults for solutions. They do not make attempts to act on their environment in search of a solution. Thus, children with this disorder are social creatures; they are more concerned with interacting socially than with regulating their own environments (Tager-Flusberg, 2007; Hauser-Cram, 2009).

Individuals with DS also exhibit unique phenotypes in terms of discourse. While they demonstrate the same communicative intent as TD youth, they exhibit fewer requesting behaviors than do TD individuals (Tager-Flusberg, 2007; Roberts et al., 2007). When carrying on a conversation, they spend more turns on a topic and show higher levels of contingent responses than do TD children. They are good at revising conversations when asked, but their aforementioned lack of intelligibility and lack of syntactic knowledge often make it difficult to make adequate adjustments (Tager-Flusberg, 2007). Older children give socially appropriate responses when prompted with questions, but perform worse than children matched for MA on responses which depend on expressive language ability (Tager-Flusberg, 2007); they are less likely to introduce new topics into a conversation than are TD youth (Roberts et al., 2007). Children with DS demonstrate difficulties meeting the informational needs of the conversational partner (Tager-Flusberg, 2007); they are less likely to signal for clarification from their

conversational partner and are therefore unable to let the other person know they need help, leading to a breakdown in communication (Roberts et al., 2007).

One of the most influential social interactions a child with DS will experience is that with his own mother. This relationship can have a great impact on the pragmatic skills for the child in the long term. Both social referencing and joint attention play major roles in this interaction (Hauser-Cram, 2009). In social referencing, the child takes emotional and reactionary cues from his interaction with his mother. In this way, a child learns how to react to different situations from the people whom he trusts. Thus, if a mother takes control in the relationship, as many mothers do in order to accommodate attentional and developmental deficits exhibited by their children, asynchrony can develop in the relationship (Hauser-Cram, 2009). According to Marfo (1984), mothers can be overreactive and directive toward mentally handicapped children who generally are less responsive than TD youth. Thus the child may lose autonomy and become decreasingly alert, decreasingly playful and decreasingly persistent in problem solving (Hauser-Cram, 2009). However, Marfo (1984) also states that while mothers may match their linguistic input to that of their intellectually disabled child, mothers of TD youth match their children's linguistic levels as well. Thus this is not a behavior unique to parents of intellectually disabled children and therefore linguistic behaviors in this population may not necessarily be attributed to the diluted linguistic output of the caregivers.

As far as joint attention is concerned, this activity helps children learn language labels through the sharing of attention with his mother to a particular object of interest (Hauser-Cram, 2009). As children with DS often exhibit difficulties shifting attention from people to objects, a delay in joint attention may result (Legerstee, Varghese & van Beek, 2002 as cited in Hauser-Cram, 2009). If children cannot attend to present objects, they will exhibit greater difficulties in

applying language labels. Thus deficits in shifting attention and therefore in joint attention may impact other faculties of language such as lexical acquisition.

Narratives are essential to the understanding of language development in the DS population. Narratives are closely associated with expressive language, an area thought to be relatively weak in the phenotypic profile of DS individuals (Ypsilanti & Grouios, 2008; Roberts et al., 2007; Hodapp et al., 2009). However, narratives contain more words, more word types, and longer Mean Length of Utterances (MLU) than conversations do (Chapman et al., 1998). They strengthen with visual support, such as wordless pictures (Roberts et al., 2007), and children with DS use more words to describe episodes than do TD children. DS individuals tend to omit verbs when describing narratives, but they still describe the situation adequately. It is believed that any deficits in this area may be due to deficits in syntactic comprehension, a notoriously weak area for children with DS (Ypsilanti & Grouios, 2008).

Summary

Children with DS present with articulation problems which often result in the unintelligibility of speech. Such deficits may be attributed to the DS phenotype, such as problems with speech and motor control, hearing loss, and issues with phonological memory. Deficits in articulation may lead to decreased language practice, further perpetuating the problem. Semantics are generally viewed as a relative strength, but are not considered to be on par with the language of TD children. Issues with the auditory STM may be disrupting the word retrieval process required for expressive vocabulary. Children with DS are thought to label early words at the same level as TD children, though the development of this vocabulary is delayed in the DS population. Despite these similar early levels of labeling, a vocabulary spurt occurs less frequently in the DS population than it does for TD children. If the spurt does develop, it does so

at a more advanced MA. Researchers debate whether prefrontal executive functioning is impaired and they also offer contrasting viewpoints as to whether or not a gap exists between expressive and receptive vocabulary. While some argue (e.g. Chapman as cited in Ypsilanti & Grouios, 2008) that receptive vocabulary becomes increasingly strong compared to expressive language over time, others (such as Grela, 2002) hold that both expressive and receptive vocabulary are both relative strengths

Syntax is commonly considered a weakness in the DS population. Syntactic development is slower than lexical development, though a debate remains as to whether or not the gap between morphosyntactic and lexical abilities stabilizes or widens over time. Children with DS struggle with regular past-tense inflections, but do not demonstrate difficulties with irregular past tense morphology. They tend to omit function words and struggle with syntactic comprehension. It is generally believed that there is no critical period or syntactic ceiling limiting syntactic development.

In terms of pragmatics, gesture is considered a strength for this population; it develops alongside language and is more effective in communication for children with DS than vocal communication alone. Eye contact is delayed in onset, though it follows the same developmental trajectory as in TD children. It is primarily utilized in social contexts as these children tend to look at people more than objects; it is not often used to solve problems. The onset of babbling is also delayed, though it lasts for a prolonged period of time. Once language develops, children with DS exhibit the same communicative intent as TD children. However, they initiate fewer requests, spend more turns on a topic, and produce a higher number of contingent responses than do TD children; they are unlikely to introduce new topics. They are good at meeting requests for clarification in conversation, though their inarticulate speech can be difficult to understand.

Thus these children often exhibit difficulties meeting the needs of their conversational partners. Their maternal relationships have profound impacts on their abilities for joint attention and social referencing and while their expressive language is commonly considered weak, narratives contain many words and word types and therefore narrative deficits may be attributed to impaired syntactic comprehension.

Williams Syndrome

Introduction,

Like DS, WS is a genetic disorder. However, instead of resulting from additional chromosome copies, WS is caused by a microdeletion of approximately 25 genes located on chromosome 7 (Hodapp et al., 2009). WS is also much rarer than DS, occurring in approximately 1 in every 7,500 live births (Tager-Flusberg, 2007). With its slight phenotypic descriptors and varying degrees of mental disability, WS was formerly very difficult to diagnose. However, geneticists can now test for the deletion of the specific genes known to result in WS. These missing genes account for the "pug" or "elfin" nose typically associated with the disorder, often leading children with WS to be classified as "elfin" children. Approximately 80% suffer from cardiac abnormalities such as supravalvular aortic stenosis, a narrowing of the pulmonary arteries. Individuals with WS are also said to suffer from mild intellectual disability, with IQ scores ranging from 55-69 and remaining around the same level from childhood through adulthood (Hodapp et al., 2009).

Highly friendly personalities are often considered a hallmark characteristic of WS (Tager-Flusberg, 2007). Children with WS exhibit high levels of empathy and are even said to be overly social (National Institute of Neurological Disorders and Stroke, n.d.). They demonstrate a keen interest in faces, often resulting in abnormally long periods of time engaged in facial gaze. While people-oriented and gregarious, the children in this population are often shy and tense (Hauser-Cram, 2009), as well as extremely fearful and anxious (Hodapp et al., 2009). They show a fondness for music, often finding it therapeutic for their aforementioned fear and anxiety (Hodapp et al., 2009).

Ultimately, the children in the WS population are thought to demonstrate an uneven cognitive profile (Stojanovik, 2006). They exhibit a low IQ, as well as difficulties with planning, problem solving and spatial cognition (Stojanovik, 2006; Nazzi, Paterson, & Karmiloff-Smith, 2003), with a great weakness in visuospatial construction (Hodapp et al., 2009). However, despite these deficits, children with WS are thought to exhibit strengths in social cognition and face processing, as well as in linguistic faculties as demonstrated by their verbosity and sophisticated narratives (Clahsen & Almazan, 1998). Language development is still thought by others to be atypical (Laing et al., 2002), a notion which will be analyzed in the coming sections of this chapter.

Language Profile

In the following sections, I will explore the ways in which various language aspects are affected by WS. I will do this hierarchically, beginning with the vocal and phonological mechanisms with which children with WS produce speech. From here I will look at language on a semantic level, exploring the processes children with WS use to acquire words. An analysis on syntax will follow, relating to the ways in which these children apply their semantic knowledge to the fixed rules of language. Finally, I will examine how each of these aspects unites with the others to form pragmatic and social skills. Such an analysis will at times be linked to the cognitive profile of this population. My analysis will conclude with a summary of my findings.

Phonology.

The phonological aspect of language is often said to be a relative strength in the linguistic profile of individuals with WS (Grant et al., 1997). Gosch, Stading, & Pankau (as cited in Tager-Flusberg, 2007) note that articulation in children with WS is a relative strength when compared to MA-matched children with non-specific intellectual disabilities, indicating that articulation

presents at a higher level in WS than it does in other nonspecific neurodevelopmental disorders. Majerus, Barisnikov, Vuillemin, Poncelet, & van der Linden (2003) also hold that children with WS are articulate, producing fluent speech with few errors or phonological deficits.

Phonology is thought by some to play a most important role in language acquisition, specifically in lexical development. The ability of children with WS to learn words may depend more on speech perception and phonological capabilities than on semantics (Thomas et al. as cited in Nazzi et al., 2003). In a study conducted by (Nazzi et al., 2003), the authors sought to determine if delays in language acquisition commonly noted in children with WS could be attributed to speech processing deficits. They tested the abilities of infants and toddlers to extract bisyllabic nouns occurring in either strong-weak or weak-strong stress patterns from fluent speech. Their results indicated that infants and toddlers with WS could segment strong-weak stress patterns from fluent speech at a level similar to that of TD children. Even the youngest participants were capable of this task with their limited and immature lexicons, demonstrating that the ability to parse individual words is present at the onset of lexical development. However, while these strong-weak sound patterns presented no problems, the subjects exhibited difficulties extracting weak-strong syllabic patterns from the speech stream (Nazzi et al., 2003). Such results indicate that while strong-weak syllabic phonologies are relatively intact, weak-strong stress patterns present difficulties for infants and toddlers with WS and thus speech perception may play a role in the delay of early vocabulary acquisition. Language delays in children with WS are likely due to atypical phonological processes rather than semantic deficits (Thomas et al., 2001; Nazzi et al., 2003). Young children with WS often suffer from sensitive hearing, with certain sound frequencies causing pain (Williams Syndrome Association, n.d.).

According to Thomas et al. (2001), early auditory sensitivity may be responsible for atypical phonological representations.

Similar to these findings, Majerus et al. (2003) also support the notion that phonology is not entirely intact in individuals with WS. In their study, these authors concluded that phonological impairment may be task-specific in this population. While phonological STM was preserved on nonword tasks when compared to CA and Verbal Mental Age (VMA) controls, the same did not hold true for stimuli resembling true words, thus indicating impairment in specific phonological awareness tasks within this linguistic realm. Grant et al. (1997) found that, despite the strength in receptive and productive vocabulary, the process of word learning in children with WS does not develop beyond the level of a TD 4-year-old. They propose that this strong vocabulary depends heavily on phonological memory, creating an overdependence on STM and an absence of input from the LTM, a system which typically plays a role in lexical build-up in TD children.

Semantics.

It is commonly claimed that vocabulary is a genuine strength in the language profile of WS (Mervis & John, 2008; Tager-Flusberg, 2007; Hauser-Cram, 2009). According to Tager-Flusberg (2007), approximately half the population scores within normal ranges on standardized test scores for vocabulary. Mervis and John (2008) analyzed the patterns seen in different types of receptive vocabulary. Receptive concrete vocabulary was stronger than receptive conceptual/relational vocabulary, but concrete vocabulary was still not intact when compared to TD controls; WS children scored lower on a series of standardized tests than did the TD children. Overall, receptive language was stronger than visuospatial language abilities, which were more

limited than expected. However, relational vocabulary levels were closer to visuospatial levels than were concrete abilities (Mervis & John, 2008).

Unusual vocabulary is commonly described as a defining feature of lexical skills seen in WS. Udwin and Yule (as cited in Tager-Flusberg, 2007) refer to this feature of WS as "cocktail party language", meaning use of stereotypical social phrases and language which lacks any real content. Rare and low-frequency words are common in productive language, with atypical vocabulary potentially acting as a social device consistent with the hypersocial personalities seen in children with WS (Gosch & Pankau as cited in Thomas et al., 2010). Despite this unique vocabulary, Bertrand et al (1994) found that individuals with WS use figurative language, clichés, and idioms in inappropriate contexts, suggesting a poor understanding of the meaning of such language (Thomas et al., 2010). Individuals with WS show difficulties distinguishing jokes from lies (Sullivan, Winner, & Tager-Flusberg as cited in Thomas et al., 2010), as well as explaining the meanings of metaphors (Bertrand et al., as cited in Thomas et al., 2010). Annaz et al (as cited in Thomas et al., 2010) propose that this difficulty in understanding the meaning of figurative language may result because children with WS pull these phrases from their memories; they are invariant and are not produced as understood and relevant contributions to a conversation. A correct understanding of metaphor is essential for communication as it requires pragmatic and metalinguisitc skill, as well as semantic knowledge (Thomas et al., 2010). Thomas et al. (2010) concluded that, despite strong verbal abilities, children with WS access different and less abstract knowledge in their use of figurative language.

Conversely, (Stojanovik & van Ewijk, 2008) believe that children with WS do not posses unusual vocabularies. In a study conducted by these authors, the children with WS produced neither higher numbers of low-frequency words nor higher numbers of different words than

children with typical development patterns when asked to generate a narrative based on a wordless picture book. However, such conclusions were based on a situation in which the context of the narrative was controlled and the subjects were not permitted to speak on any topic of their choice (Stojanovik & van Ewijk, 2008). Such findings do not apply to spontaneous speech free of context.

The onset of language appears delayed in children with WS. The acquisition of first words is delayed, often by up to 24 months (Hauser-Cram, 2009). Onset occurs when children with WS are toddlers as compared to earlier in development for TD individuals (Stojanovik & van Ewijk, 2008; Tager-Flusberg, 2007). The vocabulary spurt is also delayed in children with WS and typically occurs approximately 6 months before these children can sort words into categories (Mervis & Bertrand as cited in Tager-Flusberg, 2007), though it may precede categorization and fast-mapping by up to 12 months (Nazzi et al., 2003). However, like TD children, those with WS develop base level words before they develop the subordinate or superordiante levels, or attribute object-part names, suggesting that semantic organization is not deviant in this population (Tager-Flusberg, 2007). Mervis and Bertrand (as cited in Tager-Flusberg, 2007) also suggest that an increase in auditory memory may be crucial to the vocabulary spurt. While verbal and visuospatial LTM are impaired, verbal STM remains intact (Barisnikov et al. as cited in Clahsen & Almazan, 1998) and may contribute to this phenomenon.

In terms of nonverbal lexical development, words are acquired before referential pointing and gestures. Thus, according to Tager-Flusberg (2007), children with WS acquire joint attention through means other than referential pointing . Children with WS are highly dependent on the parental labeling of objects to which the children are attending and less dependent than

TD children on speaker gaze toward the triadic object for clues about object labeling (Tager-Flusberg, 2007).

Ultimately, the varying within-domain deficits defining the WS language profile lead to the broader question of how language development occurs in WS. According to Thomas et al. (2001), language development is not just delayed, but rather takes an atypical pathway. Karmiloff-Smith et al. (1997) suggested that children with WS devote more cognitive resources to language than to other representations. They propose that such intense devotion of representational space will force children with WS to acquire more vocabulary without regards to the meanings of the words. Rather, they will undergo heightened exemplar learning with a limited ability to extract regularities and morphosyntactic and morpho-phonological rules. Such a trajectory suggests an atypical pathway in language development, one perhaps more akin to the learning of a second language (Karmiloff-Smith et al., 1997). Language development likely occurs along a unique pathway, one in which phonology plays more of a role than semantics (Thomas et al., 2001).

Syntax.

Grammar abilities are said to be on par with cognitive abilities and at the level that would be expected based on the MA of children with WS (Mervis & John, 2008; Tager-Flusberg, 2007). However, while some claim that grammar is a relative strength in this population (Tager-Flusberg, 2007), there exists a bit of controversy as to whether or not grammar abilities in children with WS are fully intact. According to a study performed by Clahsen and Almazan (1998), regular inflection and general syntactic task performance are not impaired in children with WS. Morphosyntactic processing and representation, as well as complex morphological components of language such as reversible passives are relatively well preserved. Syntactic

chains and binding principles, as in combining pronouns and their antecedents, are spared, as well as regular past tense formation (Clahsen & Almazan, 1998). Children with WS are able to successfully interpret passive language and correctly mark pronouns for case (Clahsen & Almazan, 1998) and they exhibit no difficulties in acquiring grammatical morphology (Tager-Flusberg, 2007).

However, despite these preserved skills, deficits are commonly found to exist in irregular inflection. Children often overgeneralize grammar rules and apply them to the irregular past tense forms of words. While an intact computational system accounts for strong syntactic performance, Clahsen & Almazan (1998) hold that a weakened associative memory system may be the cause of impaired irregular inflection. Tager-Flusberg (2007) states that receptive grammar skills may be associated with working memory and phonological STM in the WS population more so than for TD children. Thus, children with WS may rely more on their phonological STM and less on their abilities to use LTM for recall and grammatical rule recognition. Additionally, WS children show deficits in applying appropriate gender markers (Karmiloff-Smith et al., 1997). Such deficits make it plausible that morphosyntactic deficits may represent within-domain challenges for the WS language profile (Karmiloff-Smith et al., 1997).

Morphosyntactic deficits in WS are not universally accepted, however. There exist conflicting opinions as far as morphological intactness is concerned. Musolino, Chunyo, and Landau (2010) concluded that language acquisition on the whole for children with WS does not appear to be altered because they found knowledge of core grammar principles to be on par with the grammatical skills of TD children. Pinker (as cited in Thomas et al., 2001) believes that syntax is largely spared, but impairments in associative memory lead to word retrieval deficits. Clahsen and Almazan (as cited in Thomas et al., 2001) also believe in associative memory

impairment for irregular inflection as well as in intact abilities where syntactic tasks and regular inflection are concerned. They also find expressive language to be appropriate for WS MA, demonstrating correct grammatical morphemes and complex syntax. However, in a study performed by Thomas et al. (2001), the authors found children with WS to exhibit no selective deficit on past tense irregular forms when compared to TD children matched for MA. TD children showed more difficulty with irregular inflection than regular inflection as well. Grant, Valian, and Karmiloff-Smith (2002) also found no differences between irregular and regular past tense marking. Additionally, the authors found that, despite delays seen in WS, both TD and WS children exhibited the same interaction between syntax and cognition in tasks related to relative clauses. They did, however, find that WS children demonstrate deficits in processing. Older children showed an impaired ability to repeat sentences with relative clauses. They concluded that syntactic and not vocabulary limitations were the cause as the children were able to repeat sentences which were unembedded, indicating that syntactic structure posed the difficulty in repetition. These WS children inserted pronouns when helpful for the pronunciation of the sentence, a skill indicating some level of syntactic ability, but they were unable to recognize the difference between the sentence they heard and the one which they produced, indicating a deficit in processing (Grant et al., 2002).

Pragmatics.

Pragmatic aspects of WS present a poignant debate. Strong social skills are often referred to as a "hallmark" characteristic of WS (Stojanovik, 2006). However, while these children are often extremely talkative, their pragmatic abilities are truly limited (Mervis & John, 2008). In a series of standardized language tests performed on children with WS, their performances on receptive vocabulary, receptive grammar and expressive grammar instruments,

as well as on tests for spontaneous speech and nonverbal language, were extremely deficient and variable (Stojanovik, Perkins & Howard, 2001). As seen below, various other researchers have come to similar conclusions.

As far as nonverbal language is concerned, WS children exhibit difficulties with triadic interactions. While they performed equally as well as TD controls on tasks of dyadic interaction in which no object was implemented as a third party, these exchanges did not induce joint attention because they were not triadic in nature (Laing et al., 2002). In general, the initiation of joint attention by pointing or issuing eye gaze at an object in an attempt to focus a caregiver's attention is essential to the development of expressive vocabulary (Laing et al., 2002). Järvinen-Pasley et al. (as cited in Hauser-Cram, 2009) found that WS children often attempt to turn triadic interactions into dyadic endeavors by attempting to hold and focus the attention of a novel adult. Such breaks in triadic interaction can interfere with the onset of joint attention and thus interrupt a child's language learning process (Hauser-Cram, 2009).

Laing et al. (2002) found that children with WS produced very few pointing gestures and reached out for toys less often than TD controls. These children also failed to combine reaching with eye contact as often as the TD children did. According to a study done by Mervis and Bertrand (as cited in Tager-Flusberg, 2007), children with WS do not produce referential pointing gestures until long after the onset of language. In typical language acquisition, pointing and gesturing precede early language development (Hodapp et al., 2009). Such delays in joint attention and referential gestures may reflect the visuospatial construction deficits often associated with WS (Hauser-Cram, 2009). At such a time when children do begin to speak referentially, they are unable to respond to or understand pointing gestures made by their mothers (Tager-Flusberg, 2007). In addition to gesturing, young children with WS also spend

long periods of time looking at people's faces. It may be that children with WS process faces more slowly than TD children or that they exhibit difficulties disengaging their attentional focus from faces to other objects (Hauser-Cram, 2009).

In terms of narrative and spontaneous dialogue, there exist different schools of thought on pragmatic skills for children with WS as seen in conversation. Stojanovik (2006) found several conversational deficits in youth with WS. These authors determined that this population exhibited difficulties with exchange structure and used significantly fewer continuations in conversations than did TD children, rendering them unable to carry out extended discourse. Both Stojanovik (2006) and Stojanovik et al. (2001) found that, despite popular claims regarding the verbosity of individuals with WS, these children tended to provide too little information and were highly dependent on the conversational partners throughout their interactions. Volterra et al. (as cited in Tager-Flusberg, 2007) also found that children with WS were unable to respond to questions posed in regards to narratives. WS children demonstrate a difficulty interpreting meaning from the conversation and provide frequent inappropriate responses to questions and attempts made by the interlocutor for clarification (Stojanovik, 2006). Often times, children with WS lack an understanding of the conversational partner's perspective (Hauser-Cram, 2009).

In contrast to these views on pragmatic deficits, Kelly and Tager-Flusberg (2007), found that in a task of spontaneous speech, WS subjects were able to maintain a topic over several conversational turns (Tager-Flusberg, 2007). Additionally, they found that the children with WS were able to adequately respond to requests made by the interlocutor for clarification.

Children with WS tend to demonstrate difficulties making friends and maintaining relationships (Stojanovik, 2006; Gosch & Pankau as cited in Hauser-Cram, 2009). Despite highly social tendencies (Hauser-Cram, 2009), they are likely to become socially isolated

(Stojanovik, 2006). As previously mentioned, children with WS exhibit impairments in reading the intentions of other people. While they exhibit high levels of empathy, they have difficulties interpreting emotional expressions and difficulties with these representational aspects of the mind may contribute to the friendship deprivation experienced by these otherwise talkative children (Hauser-Cram, 2009). Additionally, their inability to properly use language in conversation and their difficulties understanding the underlying meanings in language used by others may contribute to such social struggles (Thomas et al., 2010).

Summary

Generally speaking, phonology and articulation are relative strengths for children with WS. Speech is fluent and errors are infrequent, though phonological comprehension may be atypical and thus may impact lexical development. In terms of vocabulary, receptive language is thought to be stronger than visuospatial skills and concrete vocabulary stronger than conceptual vocabulary. However, contrasting viewpoints exist in regards to unusual vocabulary words. While some researchers (e.g. Udwin and Yule as cited in Tager-Flusberg, 2007) believe that children with WS use "cocktail party language" consisting of a higher number of low-frequency words than TD children, others (e.g. Stojanovik & van Ewijk, 2008) hold that children with WS do not possess abnormal vocabularies. The general onset of vocabulary, as well as the vocabulary spurt typical of TD children, is delayed in this population. Words depend heavily on parent labeling and minimally on joint eye gaze. Gestures are even more delayed, developing atypically after the onset of language.

Overall, syntax is believed to be at the level expected given the cognitive level of the WS population. The controversy lies in regards to whether or not grammar is a relative strength for children with WS. Some argue (e.g. Clahsen & Almazan, 1998) that morphosyntactic

representation and processing are largely preserved and that deficits lie primarily in irregular past tense formation. This may be due to an increased reliance on phonological STM as opposed to the LTM that is utilized in TD children. Conversely, others (e.g. Thomas et al., 2001) conclude that children with WS exhibit the same irregular past tense difficulties as TD children and thus their morphosyntactic abilities are not impaired. Rather, auditory memory processing may be to blame for syntactic difficulties, not production. In terms of broader social skills, the common belief that pragmatics represents an area of strength for this population may be a misconception. These children demonstrate poor triadic interaction, a deficit which contributes to impaired social referencing and joint attention and poor expressive vocabulary production. They produce few pointing gestures and do not combine them with eye gaze, though they tend to stare abnormally long at people's faces. Debates are still open on the issue of discourse. While some (e.g. Stojanovik, 2006) say that this population exhibits difficulties with continuations, exchange structure, and attempts at clarification in conversation, others (e.g. Tager-Flusberg, 2007) find that these are areas of strength for children with WS. Perhaps as a result of these aforementioned difficulties, children with WS have difficulties making friends.

Comparative Analysis

Introduction

In the following section, I will explore the similarities and differences that exist between the language profiles of children with DS and children with WS. This analysis will be broken down into sections according to the various components of language as they have been previously discussed. I will compare and contrast the aspects of phonology, semantics, syntax and pragmatics as they relate to the language abilities of children with DS and children with WS.

Phonology

According to Berk (2009), phonology encompasses the rules that govern both the sequence and the structure of speech sounds. In order for this component of language to fully develop, children must demonstrate an ability to recognize sound sequences, understand these sequences, produce them, and combine them into intelligible words and phrases (Berk, 2009). Processing and production therefore play crucial roles in phonological development. These capabilities differ in children with WS and children with DS.

Language spoken by children with DS is often unintelligible. Whether due to nonfluent language, impaired voice production, atypical prosody, or deficits in articulation of speech sounds, it is often difficult for listeners to understand speakers who have DS (Bunton et al., 2009). Such unintelligibility deters individuals with DS from making attempts at communication and thus perpetuates the impairments seen in speech production (Bunton et al., 2009). Children with DS also demonstrate difficulties in phonological speech planning (Bunton et al., 2009). Poor phonological memory can make it difficult for these individuals to retain phonemic contrasts and thus make advanced decisions regarding utterances that will be produced.

In contrast to children with DS, articulation is considered a relative strength for children with WS (Tager-Flusberg, 2007). Children in the WS population produce fluent speech with few errors or phonological production deficiencies (Majerus et al., 2003). However, while speech production is relatively intact, abnormal speech perception processes may be responsible for language delays in children with WS (Nazzi et al., 2003). As word learning processes do not develop beyond the level of a TD 4-year-old, these children depend heavily on phonological memory to acquire their strong vocabulary (Grant et al., 1997). Thus, while phonological memory is a detriment to language development in the DS population, it is essential to the successful development of vocabulary in children with WS.

Semantics

The semantic component of linguistic development centers on vocabulary. In order for this component to develop completely, children must understand the concepts which underlie words and use these concepts to build word combinations (Berk, 2009). While children in both WS and DS populations exhibit some deficiencies, on the whole, semantics is considered a relative strength for both groups when compared to their other linguistic faculties.

The semantic aspect of language is often considered to be a strength in the DS population. Word development, though delayed, occurs on the same basic level for early labels as it does for TD children and at a level expected for MA (Tager-Flusberg, 2007). Despite these claims, children with this disorder present with several deficiencies in terms of their lexical skills. These difficulties are often attributed to neurological abnormalities such as hippocampal dysfunction and breakdowns in phonological, verbal and auditory STM which are essential for lexical representation and retrieval (Ypsilanti & Grouios, 2008). Thus children with DS often demonstrate difficulties entering words they hear throughout the day into their mental lexicon

and retrieving these words for personal production. The vocabulary spurt seen in TD children occurs in only half of the DS population (Roberts et al., 2007), though the reason for this percentage is unknown.

Semantics is also held to be a strength relative to the other aspects of language development in the WS population (Mervis & John, 2008; Tager-Flusberg, 2007; Hauser-Cram, 2009). Lexical abilities exceed the level expected for MA (Tager-Flusberg, 2007). These children acquire rich vocabularies as they get older, though the lexicon is often described as being unusual. Individuals with WS produce high levels of rare and low-frequency words (Thomas et al., 2010), unlike the children in the DS population who produce word types comparable to TD children in the early stages of object labeling (Tager-Flusberg, 2007). However, these words tend to be produced by the WS group in inappropriate contexts, suggesting that vocabulary words are pulled from memory as invariant forms with little regard to meaning (Thomas et al., 2010). Overall, the language development pathway in individuals with WS is thought to be atypical (Thomas et al., 2001). Children learn vocabulary terms as exemplars with little regard for their meaning or for grammatical rules (Karmiloff-Smith et al., 1997). Such a method of learning indicates that phonology plays a larger role in language acquisition than does semantics (Thomas et al., 2001).

Like in DS, the onset of language is often delayed in the WS population as well. Interestingly though, words develop before gestures and referential pointing. A vocabulary spurt occurs but is delayed as well, though an increase in the abilities of the auditory memory may account for this rapid increase in the lexicon of these individuals (Mervis & Bertrand as cited in Tager-Flusberg, 2007). Thus, while STM is impaired considerably in the DS population, it is a strength which aids in the expansion of the lexicon in WS individuals.

The difference between receptive and expressive vocabulary is somewhat debatable in the DS population. Most researchers argue that there is a gap in skill level between these two types of vocabulary which grows over time, with receptive vocabulary skills becoming increasingly superior to expressive levels (Ypsilanti & Grouios, 2008; Thordardotter et al., 2002; Roberts et al., 2007). According to Ypsilanti & Grouios (2008), expressive deficits likely relate to impairments in STM in terms of accessing word knowledge stored in the brain. Life experience is thought to add to the ability of these children to understand word meanings better over time, thus improving their receptive vocabulary skills. Those arguing in favor of superior expressive language, such as (Grela, 2002), are in the minority.

In the WS population, receptive vocabulary is often compared to the particularly weak visuospatial abilities seen in these children, with receptive vocabulary existing at a higher level (Mervis & John, 2008). Receptive concrete vocabulary abilities are superior to receptive conceptual and relational vocabulary skills. Semantic organization in terms of base level, subordinate and superordinate word entries is believed to be intact in the WS population (Tager-Flusberg, 2007).

In comparing the two populations, (Ypsilanti & Grouios, 2008) found that children with WS have significantly superior skills in the realm of expressive vocabulary than do children with DS, though neither group exhibited expressive vocabulary as a strength when compared to TD children.

Syntax

Syntax is the component of language that concerns itself with grammar; it provides the rules necessary for arranging words into sentences. Part and parcel to syntax is morphology, an aspect of syntax that is used to provide grammatical markers to words as they are combined into

sentences (Berk, 2009). The syntactic skill levels exhibited in children with DS differ from those seen in children with WS.

Syntax is considered a weakness when compared with lexical abilities in the DS population. The debate exists as to whether or not the gap between these skill levels expands or shrinks over time. While irregular past tense inflection is intact, children with DS struggle with inflection in the regular past tense (Ypsilanti & Grouios, 2008). They omit tense-related morphemes and various words and word types, especially function words (Thordardotter et al., 2002; Chapman et al., 1998; Eadie et al., 2002). They tend to use conjoined and subordinate sentence forms and they produce fewer grammatical verbs than TD children, though the verbs they do produce constitute a larger variety than TD-MLU matches (Roberts et al., 2007; Grela, 2002). Despite these difficulties, in the DS population, there is no syntactic ceiling; while syntax develops slowly, no limits exist as to the complexity of the syntax these children can produce (Tager-Flusberg, 2007; Thordardotter et al., 2002; Roberts et al., 2007; Chapman et al., 1998).

Unlike the DS population, syntax is generally perceived to be a strength for individuals with WS. Grammar abilities are on par with cognition (Mervis & John, 2008; Tager-Flusberg, 2007). Morphological processing and representation are well preserved and there are generally no difficulties observed in acquiring grammatical morphology (Clahsen & Almazan, 1998). However, syntax is not fully intact in this group. In children with WS, the opposite pattern of regular and irregular past-tense difficulties is demonstrated than that which is seen in the DS profile. Regular inflection is intact, but irregular past-tense inflection is impaired due to a weakened associative memory (Clahsen & Almazan, 1998). Children with WS rely more on their strengths in phonological STM and less on their abilities to recall grammar rules through LTM, thus struggling with the rules for irregular word forms. In DS, irregular forms may be

stored as individual lexical items which, as Eadie et al. (2002) suggest, plays into their semantic strengths. However, this is questionable as breakdowns in memory in DS patients affect lexical retrieval and representation (Thordardotter et al., 2002).

Despite the many differences, these disorders do share a common syntactic deficit. Children with DS exhibit impaired syntactic comprehension, though production impairment is more severe. They have a hard time understanding simple syntax, a deficit which may be due to impaired hearing and auditory processing (Thordardotter et al., 2002; Grela, 2002; Eadie et al., 2002). Children with WS also exhibit deficits in syntactic processing as they were found unable to distinguish between a sentence they heard and one which they produced due to additional syntactic pronouns (Grant et al., 2002).

Over all, research has found that children with DS have morphological processing mechanisms which are deviant from those of TD MA-matched children and children with WS, while children with WS exhibit semantic processing mechanisms which deviate from those of TD MA-matched children and children with DS (Ypsilanti, Grouios, Alevriadou, & Tsapkini, 2005). According to Tager-Flusberg (2007), such differences in processing mechanisms could explain the impaired phonological representations that present in children with DS while speech is relatively intact in children with WS, as impairments in morphosyntactic aspects of language tend to co-occur with impairments in phonology.

Pragmatics

Pragmatics is the aspect of language that offers rules for engaging in effective and appropriate communication. It provides individuals with referential communication skills and allows humans to produce clear messages as well as to recognize when these messages are unclear so that they may ask for clarification in order to communicate effectively. Children with

WS and children with DS exhibit different profiles where this component of language is concerned.

Prelinguistic language development in the DS population is marked by many communicative tools. Babbling is delayed in development as compared to TD children (Tager-Flusberg, 2007) and is thereafter prolonged (Roberts et al., 2007). Vocalizations, facial expressions, and gestures also develop as key prelinguistic tools and these last for an extended period of time as well (Roberts et al., 2007). While gestures tend to fall away when verbal language abilities begin to strengthen in TD children, gestures are used in favor of verbal language in the DS population (Burgoyne, 2009). Ultimately, gestures represent a strength for these children.

The WS population is defined as very social and talkative, but even with this considered, their pragmatic skills are limited. They are highly empathetic, yet they have difficulties making friends and often end up socially isolated (Stojanovik, 2006; Hauser-Cram, 2009). Such difficulties may arise from the struggles children with WS tend to exhibit when involved in discourse. Their inability to use language properly in responding to questions and their difficulties understanding the communicative needs of their conversational partner may make it difficult for these children to engage in social relationships, further highlighting the importance of social skills in communication (Thomas et al., 2010).

In contrast to children with DS, those with WS use very few pointing gestures (Laing et al., 2002). Gestures are not produced until after the onset of language, a delay which may reflect the visuospatial deficits seen in this population (Tager-Flusberg, 2007). Typically, pointing precedes early language development and is a fundamental part of joint attention and social referencing. However, these delays in gesture, as well as the struggles these children face with

triadic interaction, interfere with the onset of joint attention, a process essential to language development.

Karmiloff-Smith et al. (1997) studied these differences between the two populations. While pointing occurs before speech in children with DS, the reverse is true of children with WS: speech is acquired before the ability to initiate pointing gestures. Additionally, according to Ypsilanti & Grouios (2008), children with DS produce a higher number of words on average as gesture than do children with WS, indicating an increased use of gesture in the DS population.

In both populations, maternal relationships play an important role in social referencing and joint attention which, respectively, are essential for learning how to react in social situations and learning language labels (Hauser-Cram, 2009). A mother who takes too much control can develop an asynchronous relationship with her son or daughter, potentially causing the child to lose autonomy (Hauser-Cram, 2009; Marfo, 1984). Mothers can be overreactive and extremely directive in relationships with their children with intellectual impairments as the children are generally less responsive than TD children (Marfo, 1984). Mothers also tend to input language at the same developmental language that their child produces it, though this is typical in parental relationships with TD children as well (Marfo, 1984).

Eye contact develops as another prelinguistic mechanism along the same path for DS children as it does for TD children. Its onset is delayed, but ultimately abilities reach the same level in both populations (Tager-Flusberg, 2007). They tend to hold eye gaze for long periods of time with their partner, preferring to look at people instead of objects (Hauser-Cram, 2009). They use eye gaze socially and look to adults to solve problems, preferring to interact socially than to act on their environments (Tager-Flusberg, 2007; Hauser-Cram, 2009). Nonverbal cues may aid linguistic development. This same pattern is observed in children with WS. They spend

long periods of time gazing at people's faces, exhibiting difficulties disengaging their attention. Children with DS also demonstrate these difficulties with attentional shifts.

In discourse, children with DS exhibit the same communicative intent as TD children. However, their behavior in conversation differs greatly. They make fewer requests and though they do not introduce new topics into conversation often, they spend more turns on a topic than do TD children (Tager-Flusberg, 2007). They produce high numbers of contingent responses, suggesting this as a relative strength, and produce socially appropriate responses to questions (Tager-Flusberg, 2007). However, they do not tend to recognize the needs of their conversational partners. They revise statements and clarify information when asked, but they are unable to signal for clarification when they fail to understand their partner and communication breaks down (Roberts et al., 2007). Even when clarifying information, their lack of intelligibility and syntactic skill often prevent successful revision (Tager-Flusberg, 2007).

Children with WS demonstrate difficulties with exchange structure in conversations. Unlike children with DS who can spend multiple turns on a topic, children with WS have trouble extending discourse and providing continuations in conversations (Stojanovik, 2006). Additionally, while children with DS provide socially appropriate responses to questions, children with WS often provide information that is contextually inappropriate (Stojanovik, 2006). While children with DS provide clarifications that are unintelligible but often appropriate, children with WS struggle to provide relevant clarifications (Stojanovik, 2006). They also fail to understand the perspective of their conversational partner (Hauser-Cram, 2009), a struggle similarly exhibited by their counterparts with DS.

In narrative, children with DS produce more words and word types, as well as longer MLU, than they do in conversation (Chapman et al., 1998). They omit words, but still manage to

effectively communicate their stories (Ypsilanti & Grouios, 2008). Narratives are largely associated with expressive language, an area considered to be a deficit in this population (Ypsilanti & Grouios, 2008; Roberts et al., 2007; Hodapp et al., 2009), though as evidenced by the variety in word type, deficits in narratives may result not from expressive language difficulties, but from impairments in syntactic comprehension (Ypsilanti & Grouios, 2008). Children with WS produce words for which they cannot understand the meanings (Thomas et al., 2010; Karmiloff-Smith et al., 1997). Such difficulties could make for narratives which do not always make complete sense.

Summary

Though they do share a few common characteristics, children with WS and children with DS exhibit largely different patterns of language development (See Figure 1). While for children with DS speech is often unintelligible and phonological memory is poor, children with WS speak clearly and fluently with few errors; their phonological memory proves a great asset in the onset of vocabulary growth.

These two populations also greatly differ in their syntactic abilities. While this area of language presents a strength for children with WS, syntax is relatively impaired in children with DS who omit various morphemes and form conjoined and subordinate sentences. These populations present with opposite struggles in terms of regular and irregular past tense inflection, with regular inflection presenting problems in DS and irregular inflection impaired in children with WS. On a more similar note, both groups demonstrate difficulties in the auditory processing of syntax.

Semantics is considered to be a relative strength in both populations; lexical development occurs at rates expected for MA or exceeding that expected by MA, for DS and WS populations

respectively (Tager-Flusberg, 2007). Children with DS exhibit early, basic vocabularies that are comparable to basic labels used by TD children and children with WS demonstrate rich, diverse vocabularies with words rarely even used by TD youth. However, each group exhibits deficits in this field as well. Language onset is delayed in both populations and only half of all children with DS ever see a vocabulary growth spurt. However, while auditory STM proves a deficit in the DS population, it is an asset to WS individuals, aiding in vocabulary growth.

The pragmatic aspect of language yields some surprising findings. Although it is commonly assumed that children with WS excel socially, this group shows more difficulties in discourse than do their DS counterparts. While children with DS are able to provide appropriate responses to questions and clarifications, children with WS cannot do this. Although children with DS can carry on a conversation about a topic for many turns, children with WS have trouble continuing conversations. Additionally, children with WS are more deficient in the use of gestures than are the children with DS who use them frequently. Similarly, children in both groups hold facial gaze for extended periods of time, with difficulties disengaging their attention.

While both WS and DS can be characterized by some degree of intellectual disability, these conditions clearly present with distinct language profiles. Although some similarities do exist, these populations exhibit different patterns of strengths and weaknesses where language abilities are concerned. Therefore this analysis demonstrates the importance of looking beyond the shell of intellectual disability and probing deeper into these unique patterns as they have implications for different methods of intervention.

		Down syndrome	**Williams syndrome**
Phonology	*Articulation*	Unintelligible speech; many errors in speech production	Intelligible speech; few errors produced
	Phonological Memory	Poor; causes difficulties planning speech	Heavily relied upon for vocabulary spurt as a result of poor speech processing
Semantics	*Skill Level*	Relative Strength*	Relative Strength
	Deficiencies	Expressive vocabulary deficits; deficient memory leads to difficulties in word storage and retrieval	Rich vocabulary, but do not use words in appropriate contexts
	Word Development	Develop at rate expected for MA; delayed compared to TD children; only half experience vocabulary spurt; vocabulary spurt also delayed; early word labels exist at same basic level as for TD children	Lexical knowledge greater than predicted for MA; delayed compared to TD children; vocabulary spurt also delayed; vocabulary unusual; semantic organization unimpaired; words develop before gestures (abnormal)
	Neurology	Neurological abnormalities, such as breakdown in auditory STM, may account for lexical deficiencies	Auditory memory may help with vocabulary growth
Syntax	*Skill Level*	Relative Weakness; omit morphemes, conjoined/subordinate sentences	Relative Strength
	Irregular/Regular Inflection	Regular impaired, irregular intact	Regular intact, irregular impaired
	Processing	Impaired hearing/auditory processing yields difficulties in processing simple syntax	Early auditory sensitivity; Difficulties processing differences between syntax produced and syntactic input
	Syntactic ceiling	None exists	Unknown
Pragmatics	*Babbling/vocalizations*	Delayed but prolonged	Unknown
	Gesture	Relative Strength; used in favor of verbal language	Relative Weakness; Used infrequently; develops after language onset
	Eye contact/facial gaze	Spend long periods of time looking at faces; prefer people to objects; difficulty	Spend long periods of time gazing at faces; difficulties disengaging

		shifting attention	attention
	Joint Attention/Social Referencing	Mother can play important role in these faculties; joint attention can influence language development	Mother can play important role in these faculties; joint attention can influence language development; trouble with triadic interaction important for joint attention
	Narrative/Discourse	Spend many turns on a topic; responses to questions socially appropriate; can clarify but may be unintelligible; difficulty understanding perspective of conversational partner	Difficulty with continuations and extending discourse; difficulty with exchange structure; respond inappropriately to questions; cannot clarify adequately; difficulty understanding needs of conversational partner

Figure 1: ***A breakdown of the similarities and differences in various language categories within the four basic language components as they exist between the children in populations of individuals with WS and DS***

* A relative strength or weakness in skill level is indicative that a particular language aspect is a relative strength or weakness for the DS or WS population as compared to the other aspects of language development

Implications for Intervention

As evidenced by the distinct language profiles exhibited by these populations, it is likely that the underlying linguistic mechanisms utilized by children with WS and children with DS vary (Ypsilanti et al., 2005) not only between the two populations, but within them as well. Therefore these children should be treated with forms of speech and language intervention unique to each disorder and each individual.

Firstly, children with DS present with speech intelligibility and phonological memory deficits from which children with WS do not suffer. Thus it is highly important to start children with DS on early intervention programs from a young age (Roberts et al., 2007). If intervention occurs when the child is young, it will be more effective as the child's language system will still be developing. If too long a period lapses between diagnosis and intervention, it may become more difficult for the child to adapt to the new methods prescribed by the early intervention practices. In my opinion, a speech-language pathologist will be needed to provide the family with the best techniques possible to improve motor-speech production in children with DS. Memory games and exercises to help a child with DS improve her phonological memory may help increase the child's ability to plan future speech and thus enhance communication.

In considering children with WS, they produce intelligible speech and have an intact phonological memory, but they exhibit difficulties in speech processing. Thus, aural interventions which allow the child to focus closely on individualized speech sounds, as well as combinations of sound sequences, may help to improve the child's aural speech perception. For example, playing repeated speech sounds into a headset may help the child to focus on specific sound sequences.

Early intervention may also prove crucial in aiding the onset of vocabulary in both WS and DS populations. As the onset of vocabulary terms is delayed in both these groups, intervention techniques using flash cards, objects and pictures may help these children learn new vocabulary words and build up their lexicons at earlier ages. In conjunction with vocabulary, the use of pictures may also be of use in supporting narrative development in the DS population (Miles, Chapman, & Sindberg, 2006). Frequently switching the picture prompts may help the children improve their skills for initiating new topics in conversation. Conversely, children with WS may benefit more from being given the opportunity to speak on any topic of their choosing. Since these individuals demonstrate difficulties continuing and extending discourse, it is possible that they may be able to speak on a topic of their interest with more ease. Once the child begins speaking, the interlocutor can respond with questions and comments geared toward eliciting continued responses from the child.

Instead of using pictures to improve narratives for children with WS, pictures, objects and other types of prompts may be useful in attempting to initiate pointing gestures. In the DS population, since gestures are a relative strength, gestures may be useful in enhancing language development by pointing to an object or picture repeatedly and combining the pointing gestures with vocalizations. In my view, this may aid in enhancing spoken language for children with DS. Alternative methods of communication such as these gestures and picture aids may prove very useful in improving speech and language impairments for both of these populations (Windsor, Reichle, & Mahowald, 2009). They may also help children in both populations improve their abilities to shift attention away from faces and focus on the objects and picture prompts at hand.

In terms of syntax, children with WS exhibit difficulties in distinguishing between syntactic input and output. Simple repetition exercises may be useful for them in terms of recognizing the discrepancies between the two. Children with DS present with many more syntactic impairments, including difficulties processing simple syntax and the tendency to omit function words and grammatical morphemes. In their case, it may be beneficial to present them with exemplars of verbs of varying tenses. In this way, the children with DS may be able to pull these exemplars from their memories when attempting to process simple syntax or produce their own simple sentences.

Additionally, it is important to remember that parents can be tools to promote linguistic advancement (Schoenbrodt, Eliopoulos, & Popomaronis, 2009). As parents are generally the caregivers who spend the greatest amount of time with their child, it is important that doctors and therapists train parents in the techniques they would like to use to improve the child's quality of life. If parents practice interventions at home on their own time, it will provide more practice for the child and thus hopefully improve the chances that the interventions will be effective.

Regardless of the specific language issue or the population on which it is used, the most important aspect of intervention to keep in mind is that all programs should be highly individualized (Roberts et al., 2007). Children with WS and children with DS present with different language impairments and to varying degrees. The only way to ensure successful implementation of these methods is to ensure that each tactic is geared toward the individual patient. Although syndrome-specific difficulties in language development can be predicted, each child brings individual characteristics to the development of language and these must be carefully considered when planning intervention therapies.

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