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A Comparison of the Effects of Tactile and Auditory Stimulation and Choice on the Problem Solving of Students with Attention Problems

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Abstract

Using a single-subject alternating treatments reversal design, the effects of three conditions, tactile stimulation, auditory stimulation, and choice of the two, were compared on the math story problem solving of elementary students with attention problems. Students attempted and solved slightly more problems and engaged in fewer off-task behaviors in the stimulation conditions than in baseline. Effects were very modest. Students chose stimulation conditions that were related to their behavior more than their accuracy.

A Comparison of the Effects of Tactile and Auditory Stimulation and Choice on the Problem Solving of Students with Attention Problems

Students with attention problems exhibit slower computation speed and attempt fewer math problems compared to control students (Barkley, Anastopoulos, Guevremeont, & Fletcher, 1991; Zentall & Ferkis, 1993). Their near average grades in computation in elementary school tend to decline in higher grades (Ackerman, Anhalt, & Dykman, 1986). For story problems, cognitive ability (including memory), sustained attention, and reading skills are needed to eliminate irrelevant information, handle multiple operations, and transform verbal information within problems (Zentall, Smith, Lee, & Wieczorek, 1994). Students with attention problems have significantly lower problem-solving scores in specific math concepts than students without attention problems (Zentall & Ferkis). Slow computation affects mathematical problem solving as it increases attention and memory demands and decreases students' ability to focus on the deeper structures of the problem (Zentall et al).

Students with attention disorders are challenged by the attention and working memory demands required to successfully solve math story problems. Their attentional differences can be understood through the optimal stimulation theory that suggests these students are biologically under-stimulated (Zentall, 2006). According to the optimal stimulation theory, each human has a biologically determined level of optimal stimulation and when insufficiently stimulated, will initiate stimulation-seeking activity to create a state of

homeostasis, or a comfort zone of optimal stimulation (Hebb, 1955). Zentall (1983) applied this theory to students with attention disorders and provided an understanding of students' inability to sustain attention in lower stimulating environments. They attend to that which is immediately salient in the environment and not their tasks, resulting in difficulty with sustained attention (Zentall, 1995).

Students with attention difficulties can pay attention; their problems have to do with what they are paying attention to and for how long. Any strong stimulus can captivate their attention and distract them from their tasks. They selectively attend to novelty such as, color, changes in size, and movement (Copeland & Wisniewski, 1981; Radosh & Gittelman, 1981). When task success is dependent upon sustained attention, as in math problem solving, it becomes imperative for students to find their optimal level of stimulation required to sustain focus.

Methods used to increase stimulation to optimal levels include pharmacological interventions and procedures that embed higher levels of stimulation into tasks (Pelham, Wheeler, & Chronis, 1998; Zentall, 2006). These methods require parents and teachers to take actions to increase performance or decrease behavior. Students with attention problems need tools to regulate their own levels of stimulation. Self-talk, self instruction, self monitoring, and self-reinforcement have been used with some success as motivational strategies to develop self-control of attention and impulsive behavior (Ervin, Bankert, & Dupaul, 1996). But these methods may add additional demands on attention during a problem solving task.

Another child-driven strategy included physical movement. Physical movement has been used successfully to sustain attention in clinical experiments (Welsh & Labbe, 1994). Studies on large muscle motor activity, such as running, have demonstrated increases in sustained attention on clinical tasks and subsequently reduced excessive motor activity and impulsive behavior (Bass, 1983). Grskovic et al (2004) utilized a fine motor activity to improve behavior of students with attention problems in time out settings. In these studies, physical activity occurred prior to academic engagement. Kercood, Grskovic, Lee, & Emmert (2007) assessed the effects of a fine motor activity during math problem solving tasks on the performance and behavior of students with attention problems. They reported that with the fine-motor activity, students demonstrated more on-task behavior and increased performance and the activity provided students with a less obvious and less distracting means of movement.

Auditory stimulation has also been used successfully as a less distracting, child-driven method for reaching stimulation levels needed to sustain attention, although this research is limited. Abikoff, Courtney, Szeibel, and Koplewicz (1996) reported that students with attention disorders performed better than baseline on the number of math problems correct in the presence of auditory stimulation. The results are promising and suggest that auditory stimulation can be beneficial to the arithmetic performance of students with attention problems. However, students with attention problems made more errors under faster, than slower, music conditions when performing a precision motor task (Klien, 1981).

In summary, students with attention problems have difficultly with fast math calculations and solving complex story problems. Increased levels of stimulation may allow them to attend longer. Fine motor tasks and auditory stimulation have been used in classrooms because they are less distracting than some other methods for increasing stimulation and can be manipulated by children. It is not yet known if one of these procedures is more effective than the other. Therefore, the purpose of this study was to compare the effectiveness of tactile and auditory stimulation on the math problem solving performance of students with attention disorders. We hypothesized that tactile and auditory stimulation would promote gains in sustained attention and allow students with attention problems to focus longer on their tasks, leading to greater accuracy. A second question examined whether students with attention problems chose effective stimulation-generating methods.

Method

This study employed a single subject alternating treatments design with reversal and choice phases. Two instructional conditions, tactile stimulation and auditory stimulation, were alternated.

Participants

Three Caucasian participants, two fifth graders and one fourth grader, were invited to participate in this study. All three participants were middle class and nominated by their teachers as having attention problems. The inattention and hyperactivity status of participants was confirmed using ratings on the Conners' Teacher Rating Scale: Revised: Short Form (CTRS-R:S) and Conners' Parent Rating Scale-Revised (CPRS-R:S) (Conners, 1997). Students with a T-score of 60 or higher (1 or more SD above the mean) on either the (a) Cognitive/Inattention Index (b) Hyperkinesis Index or (c) the ADHD Index, on either the parent or the teacher ratings, were confirmed as students with problems with attention. All participants attended a general education classroom in an elementary school in a suburban community.

Bill's teacher rating on the Hyperkinesis Index was 68 and his ADHD Index was 62. Matt received a parent-rated Hyperkinesis Index of 66 and parent and teacher ratings on the ADHD Index of 68. Erin's T-scores on the Cognitive/Inattention Index were 68 (parent) and 70 (teacher). None of the participants were on medication for attention disorders.

Materials

Worksheets were created from a pool of over 300 math story problems taken from math textbooks used in the participants' school. Since the two fifth grade participants had failed the math portion of the state standardized test, problems were selected from fourth grade level texts. Thirty math story problems requiring addition, subtraction, and multiplication were printed on white paper with black ink (8-9 problems per page), stapled together, and placed in a manila folder. Teachers had not previously assigned the selected problems to the participants but the concepts had been taught. All the problems were at the 3rd to 4th grade reading level, determined with reading software offered by

Microsoft Word. Blank answer sheets placed on clipboards, pencils, and erasers were also provided.

Experimental Design and Procedures

This study employed a single-subject alternating treatments design with an additional choice phase. All sessions lasted 20 min and were conducted in the mornings between 10:00 and 11:00 in an empty classroom in the participants' elementary school. A video camera was positioned in the room to tape all three participants during each session. Folders with math problems, empty answer sheets, pencils, and erasers were placed on worktables prior to students' arrival. Participants were escorted from their classrooms to the testing room by the examiner. The three participants were seated in different corners of the same room with their backs toward each other to reduce distraction and talking and to allow them to be videotaped at the same time.

For the tactile stimulation, students were given a Tangle Puzzle-Jr., a plastic circle-shaped toy with a series of 90-degree curves, connected, and able to pivot at each joint. The Tangle Puzzle-Jr. was chosen for tactile stimulation because it was flexible, easy to manipulate, twist, and swivel, and was not noisy. Additional description of the Tangle Puzzle-Jr. is available at www.tangletoys.com. For the auditory stimulation condition, students were provided with a personal compact disc player, headphones, and a music compact disc containing classical instrumental music.

For baseline, students were asked to complete as many math problems as they could. At the end of 20 min, students were told to stop and turn their materials in to the researcher. The researcher thanked them for participating and offered them a small reward, such as a pencil, notebook, or stickers.

During intervention, procedures were the same as in baseline except students were provided with tactile stimulation (i.e., the tangle puzzle toy), or auditory stimulation (the compact disc player and headphones with instrumental music). Before the first intervention session, students were shown how to manipulate the toy with one hand while working on the math problems. After the first session, the tangle toy was available on each student's desk for the Tactile Stimulation sessions. Before the Auditory Stimulation sessions, students were instructed on how to use the CD player and were told to keep the headphones and music on while completing the math problems. For the Choice phase, the CD player and music and the Tangle Toy were available and students were asked to choose which they wanted to use. Then that choice was provided each subsequent session in the Choice phase. A procedural check sheet was developed and followed to ensure integrity of the procedures.

Measures

The dependent variables examined in this study were (a) number of math problems completed correctly (calculated from the students' permanent product worksheets), and (b) number of off-task behaviors per 20–min session. Off-task behavior was operationally defined as looking away from the task by 90 degrees for more than 10 sec, rocking, talking out, leaving the seat, or lack of contact with academic material (e.g., manipulation of the writing instrument, reading). Inter-observer agreement for the behavioral data was

scored from video tapes for more than 30% of the sessions and was calculated to be 95–100% (formula = intervals of agreement divided by total intervals times 100).

Results

All students performed somewhat better on math problems during at least one of the stimulation conditions than in baseline, although differences are modest. All students engaged in somewhat fewer off-task behaviors during the stimulation conditions. Mean number of problems attempted and correct, and the number of off-task behaviors for Erin, Matt, and Bill are presented in Table 1 and Figures 1-6.

Discussion

The purpose of this study was to compare the effectiveness of tactile and auditory stimulation on the math problem solving and off-task behavior of students with attention disorders and to assess the effects of choice. This study lends modest support to the optimal stimulation theory in that all three students tended to perform and attend better with increased levels of stimulation. The results of this study also support the findings of Kercood, Grskovic, Lee, and Emmert (2007) who reported improvements in academic and behavioral performances with the inclusion of a fine motor tactile activity during academic engagement. When viewing the videotapes from this study, it was noted that students typically picked up the Tangle toy during, what appeared to be, mental computation, fidgeted with it while contemplating their answers, set it down, and immediately wrote their answers.

Students in the present study did not choose the stimulation method that was most related to their own increased problem solving. Erin's best performances were with tactile stimulation but when given choice, she chose auditory stimulation. Matt and Bill had their best days for problem accuracy with auditory stimulation but both chose tactile in the choice condition. It would appear that all three students chose the wrong type of stimulation. But examination of the off-task data shows that each student actually chose the type of stimulation related to fewer off-task behaviors for them. Students may have been aware of their increased level of on-task behavior with their selected stimulation method.

In the choice condition, students were asked to use their chosen type of stimulation for all three days. It is not clear what effects would have resulted if students had been allowed to vary their choices. Prior time series intervention research with students with attention disorders showed a decline in performance and increase in off-task behavior over time as students became acclimated to the intervention and its novelty decreased (e.g., Belfiore, Grskovic, Murphy, & Zentall, 1996). In the present study, this did not occur, possibly due to the variation in interventions. This supports the need for novelty and variety in the academic interventions of students with attention problems.

The results of this study are variable and will need to be confirmed through continued research and should be interpreted with caution. Another variable affecting results was

the type of headphones used during the auditory activity; light weight headphones with a metal bar over the top were used. Students voiced their preference for heavier headphones that fit snuggly on the ears. Additionally, students asked if they could bring in their own music and expressed a dislike for classical music. It was noted that Erin, who choose auditory as her preferred type of stimulation, turned the volume up as high as it would go. This probably explains her reduced performances in the auditory condition as the loudness of the music served as a distraction. Future researcher may want to limit the volume control.

Future research should continue to explore strategies that help students attain their level of optimal stimulation through the use of relevant and self-selected strategies. Teachers have the ability to identify students who have difficulty staying on task and should allow these students to use strategies, such as fine motor activity, to enhance their performance and on-task behavior. Teachers can empower students to use strategies that increase their learning across various environments, instructors, and task conditions.

References

Abikoff, H., Courtney, M. E., Szeibel, P. J., & Koplewicz, H. S. (1996). The effects of auditory stimulation on the arithmetic performance of children with ADHD and nondisabled children. *Journal of Learning Disabilities, 29,* 238-246.

Ackerman, P.T., Anhalt, J.M., & Dykman R.A. (1986). Arithmetic automatization failure in children with attention and reading disorders: associations and sequela. *Journal of Learning Disabilities,* 19(4). 222-32.

Barkley, R. A., Anastopoulos, A. D., Guevremont, D. G. & Fletcher, K. F. (1991). Adolescents with attention deficit hyperactivity disorder: Patterns of behavioral adjustment, academic functioning, and treatment utilization. *Journal of the American Academy of Child and Adolescent Psychiatry*, 30. 752-761

Bass, C. K. (1983). The effects of running on behavioral control of learning disabled children. *Dissertation Abstracts International. AAT 8319360*.

Belfiore, P. J., Grskovic, J. A., Murphy, A. M., & Zentall, S. S. (1996). The effects of antecedent color on reading for students with attention deficit hyperactivity disorder and learning disabilities. *Journal of Learning Disabilities, 29*, 432-438.

Conners, C. K. (1997). *Conners' Rating Scales-Revised: Technical manual.* North Tonowanda, NY: Multi-Health Systems.

Copeland. A. P.. & Wisniewsk N. M. (1981). Learning disability and hyperactivity: Deficits in selective attention. *Journal of Experimental Child Psychology*, 32,88-101.

Ervin, R.A., Bankert, C.L., DuPaul, G.J. (1996). Treatment of attention-deficit/hyperactivity disorder. In M.A. Reinecke, F.M. Dattilio, A. Freeman (Eds.). Cognitive Therapy with Children and Adolescents: A Casebook for Clinical Practice. New York, NY: Guilford Press.

Grskovic, J. A., Hall, A. M., Montgomery, D. J., Vargas, A. U., Zentall, S. S., & Belfiore, P. J. (2004). Reducing time-out assignments for students with

emotional/behavioral disorders in a self-contained classroom: Class-wide implications. *Journal of Behavioral Education, 13*, 25-36.

Kercood, S., Grskovic, J., Lee, D., & Emmert, S. (2007). The effects of fine motor movement and tactile stimulation on the problem solving of students with attention problems in visual and auditory tasks. *The Journal of Behavioral Education, 16 (4),* 303-310.

Klein, P. (1981). Responses of hyperactive and normal children to variations in tempo of background music. *The Israel journal of psychiatry and related science*, *18*, 157-166.

Hebb, D. O. (1955). Drives and the CNS (conceptual nervous system). *Psychological Review, 62*. 243-254.

Pelham, W., Wheeler, T., & Chronis, A. (1998). Empirically supported psychosocial treatments for ADHD. *Journal of Clinical Child Psychology, 27,* 190-205

Radosh, A., & Gittelman, R. (1981). The effect of appealing distractors on the performance of hyperactive children. *Journal of Abnormal Child Psychology*, 9, 179-189.

Welsh, M. C., & Labbé, E. E. (1994) Children and Aerobic Exercise: A Review of Cognitive and Behavioral Effects. *Journal of Experimental Child Psychology* 58, 405-17

Zentall, S. S., & Ferkis, M. A. (1993). Mathematical problem-solving for youth with ADHD, with and without learning disabilities. *Learning Disability Quarterly, 16,* 6-18.

Zentall, S. S., Smith, Y. N., Lee, Y. B., & Wieczorek, C. (1994). Mathematical outcomes of attention-deficit hyperactivity disorder. Journal of Learning Disabilities, 27, 510-519.

Zentall, S. S. & Zentall, T. R. (1983). Optimal Stimulation: A model of disordered activity and performance in normal and deviant children. *Psychological Bulletin, 3,* 446-471.

Zentall, S. S. (1995). Modifying classroom tasks and environments. In S. Goldstein, *Understanding and managing children's classroom behavior* (pp. 356-374). New York: Wiley.

Zentall, S. S. (2006). *ADHD and Education: Foundations, Characteristics, Methods. And Collaboration*. Upper Saddle River, NJ: Pearson, Merrill, Prentice Hall.

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Table 1

Mean number of problems attempted and correct and number of off-task behaviors

Condition	Problems attempted			Problems correct			Off-task behaviors		
	Erin	Matt	Bill	Erin	Matt	Bill	Erin	Matt	Bill
Baseline	18.7	30.8	30.8	9.4	17.1	17.1	17.3	7.7	7.7
Tactile	19.5	29.8	29.8	9.8	17.16	17.16	17	6.3	6.3
Auditory	13	32.5	32.5	5.4	18.2	18.2	15.7	6.6	6.6
Choice	18 A	33.6 T	33.6 T	6.3 A	17.3 T	17.3 T	17 A	3 T	3 T

Note: A = Auditory, T = Tactile

Figure 1
Number of story problems correct for Erin

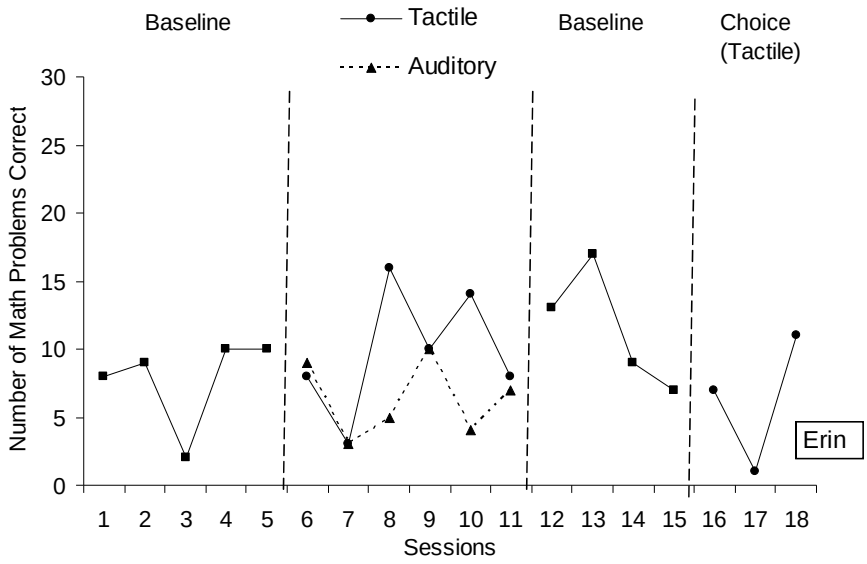


Figure 2
Number of story problems correct for Matt

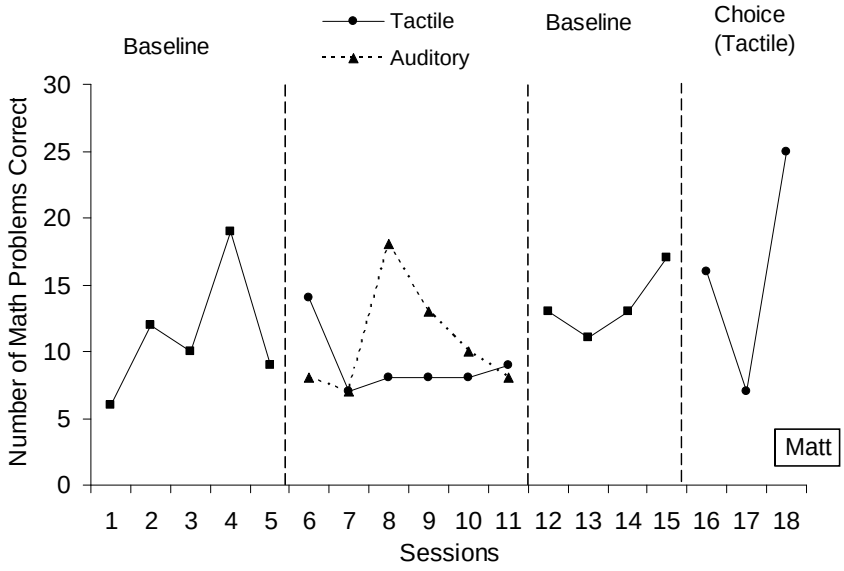


Figure 3
Number of story problems correct for Bill

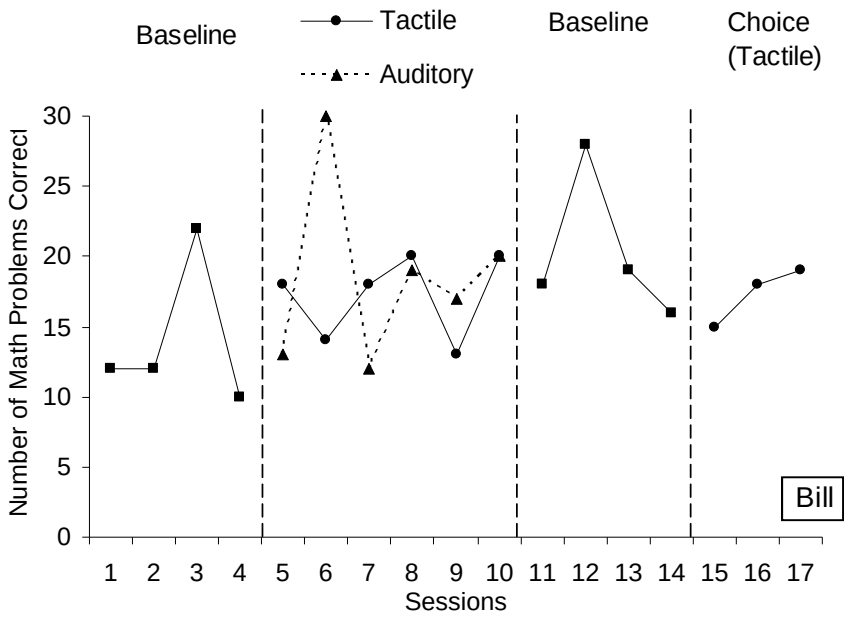


Figure 4
Number of off-task behaviors for Erin

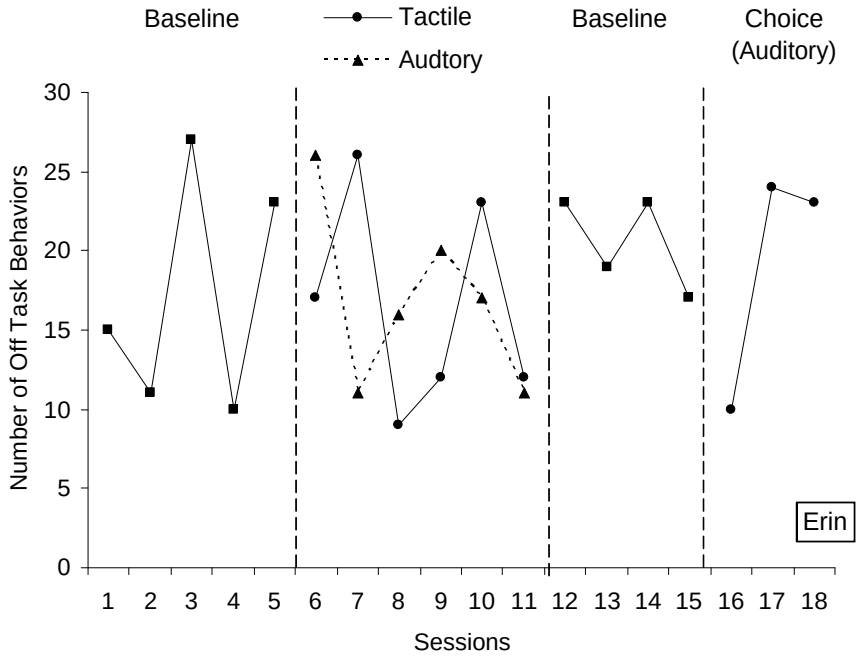


Figure 5
Number of off-task behaviors for Matt.

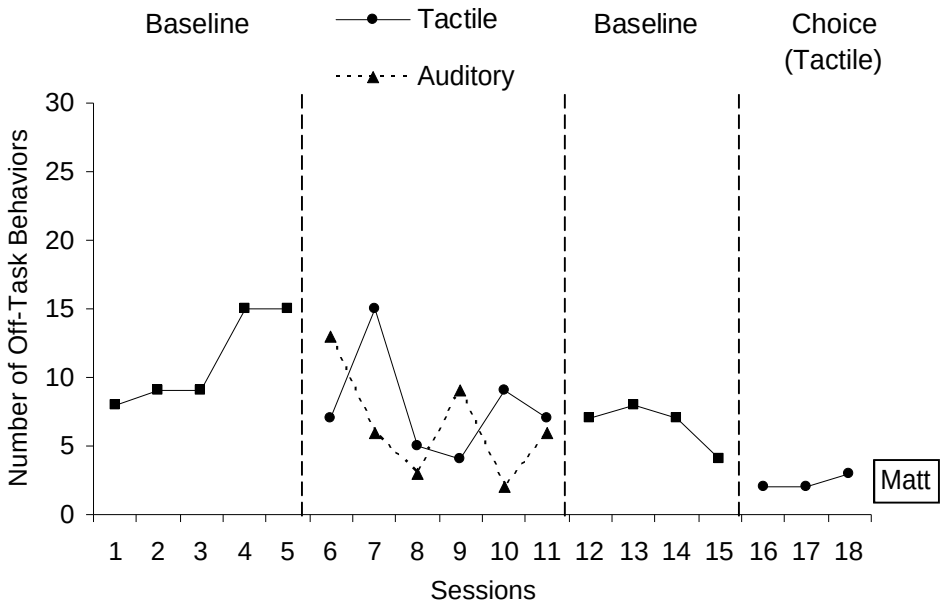
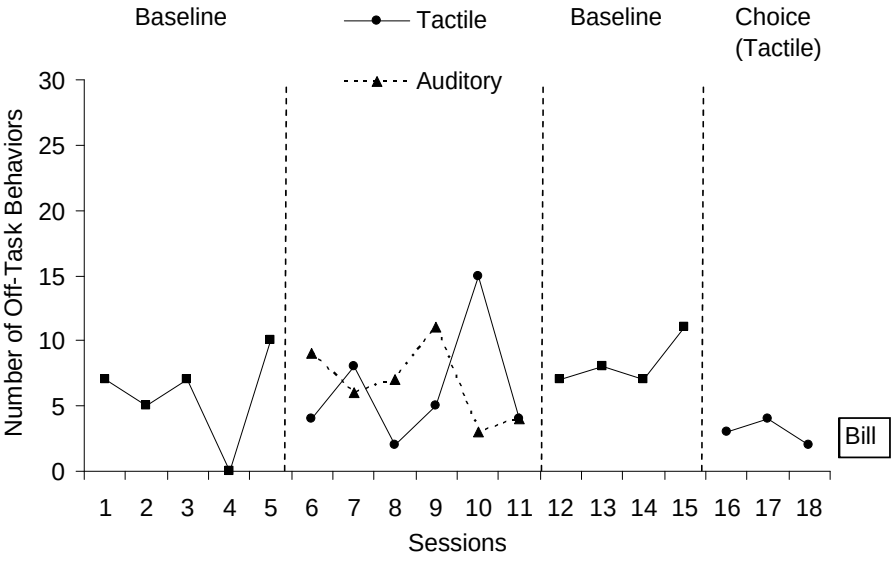


Figure 6
Number of off-task behaviors for Bill



The Effectiveness of Dimethylglycine (DMG) As Dietary Supplement and Adjunct Intervention to P.E.C.S. Approach in Treatment of Children with Autism Spectrum Disorder (ASD) and Severe Speech Delay

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Abstract

This 6½-month study, using an ABACA research design, has attempted to measure the effectiveness of dimethylglycine (DMG) as a dietary supplement and adjunct intervention to the Picture Exchange Communication System (PECS) treatment of seven young children with autism spectrum disorders (ASD) and severe speech delay. Picture recognition (using the PECS cards), word expression (in terms of number of words uttered in response to the PECS cards), and mean length of sentence in words uttered were the three main types of responses observed and measured in this study. Despite the positive results in this study suggesting that DMG as dietary supplement might be a promising adjunct in addition to the PECS approach in treating children with ASD and severe speech delay to elicit and/or improve their speech, the authors have cautioned that such preliminary findings do not mean the treatment is conclusively effective.

The Effectiveness of Dimethylglycine (DMG) As Dietary Supplement and Adjunct Intervention to Picture Exchange Communication System (PECS.) Approach in Treatment of Children with Autism Spectrum Disorder (ASD) and Severe Speech Delay

Our knowledge and understanding of autism come from the writings of two pioneers in the field: Dr Leo Kanner and Dr Hans Asperger. Dr Kanner published his paper on autism in 1943; Dr Asperger, in 1944. Dr Kanner's definition of autism was known as early infantile/childhood autism, which displays symptoms Wing (1996) described as triad of impairments: impaired social interaction, lack of imaginative play, and verbal communication problems. On the other hand, Dr Asperger's description of children with similar traits except that his subjects were of higher IQs and precocious language skills. Both described symptoms of two different sub-groups among a wide range of pervasive developmental disorders (PDDs). In between them are the various subtypes of autism and related anomalies and Siegel (1996) used the term "autism spectrum disorders" (ASD) to encompass them all.

The current definition of ASD emphasizes on problems in empathizing, which involves two main steps: (1) the ability to attribute mental states to other people as a natural way of understanding them, and (2) having an automatic appropriate emotional reaction to other people's mental states. Empathizing concerns what is known as the theory of mind or mind-reading. Empathizing deficits, therefore, refer to one's failure to make connection to another individual's experience and to respond appropriately to that person. However, recent studies, especially those carried out by Baron-Cohen et al. (2001) at the University of Cambridge, U.K., suggest that though individuals with autism display empathizing deficits, they have intact or even superior systemizing ability. Systemizing refers to that ability to analyze and build systems in order to understand and predict the behavior of impersonal events or inanimate or abstract entities. Baron-Cohen and Wheelwright (2004) have listed six systems: mechanical, natural, abstract, motoric, organizable, and social systems. The way an individual with autism makes sense of any of these systems is not in terms of mental states, but in terms of underlying rules and regularities. Such superior systemizing ability can be seen in those termed as autistic savants, who may have two or more savant abilities (Blake, 1989). However, there is also another lesser known sub-group of autistic crypto-savants, who, because of their inability to communicate, have savant skills that are hidden, or secret, and unknown to those around them (Rimland, 1990). This aspect is often ignored in the current definition of autism.

As more studies are conducted to understand the enigma variations of autism spectrum disorder (ASD), the operating definition of the disorder continues to change over time. Chia (2008) has provided a holistic definition of autism: "a neuro-developmental syndrome of constitutional origin, whose onset is usually around first three years of birth, with empathizing deficits that result in a triad of impairments in communication, social interaction, and imagination, but may display (especially by autistic savants) or hide (especially by autistic crypto-savants) a strong systemizing drive that accounts for a distinct triad of strengths in good attention to detail, deep narrow interests, and islets of ability" (p.10).

Literature Review

All individuals with ASD have problems with communication which Exkorn (2005) classified them under three categories of qualitative impairments in communication: (1) those with no speech; (2) those with delayed speech; and (3) those with idiosyncratic or repetitive speech. Those who can speak may be unable to initiate or hold a two-way conversation. Another sign of communication impairment is being unable to engage in make-believe play, which involves nonverbal as well as verbal communication.. "Their language (i.e., grammar, vocabulary, even the ability to define the meanings of single words) may or may not be impaired. The problem lies in the way they use whatever language they do have" (Wing, 2001, p.16).

However, it is still not fully understood how ASD is related to difficulties in spoken language development and/or speech acquisition, i.e., which specific cerebral parts are affected the speech development. There is no distinct problem with the structural aspects (an intact tongue, lips and palate) or the motor aspects (moving the tongue, lips and jaws) of speech production. Furthermore, while "children with autism may show a history of ear infections and related temporary hearing loss, as a group such hearing difficulties do not explain the general problems in developing speech" (Bondy & Frost, 2002, p.21). There is also still something not fully understood why some children with ASD rapidly develop speech (including speech with unusual features such as echolalia and palilalia), while other children with ASD remain mute for life.

One frequent question that has been frequently asked is how prevalent the problem is. There is no direct answer to it as the definitions describing who has difficulty developing spoken language and using speech in an effective manner has varied from study to study (Bondy & Frost, 2002).

Coleman (1989), Silverman (1995) and Rutter (1985) estimated that approximately 40% to 50% of the population with ASD remains mute and never develop useful spoken language. Those who are on the severe end of the ASD may be unable to speak and also have mental retardation (Siegel, 1996). Many of them will use neither sign language nor other augmentative communication devices (Coleman, 1989). According to Beukelman and Ansel (1995), it has been estimated that about 1 in 100 individuals with ASD will need significant assistance in acquiring effective communication strategies that do not depend on speech.

With aggressive early intervention using augmentative and alternative communication systems (AAC for short), the rate of mutism drops substantially to 15% or less depending upon the characteristics of these children beginning with intervention. Although there are many ACC programs with positive reports on their effectiveness, such programs have in common a strong behavioral orientation, working with well-trained professionals and parents for many hours per weeks over two or more years (Dawson & Osterling, 1997). One major concern with any ACC program is the need for pre-requisite skills, such as a get-ready position, motor imitation, and eye contact. Many children with ASD require that these skills be directly taught before communication training can begin.

One of the better known ACC programs is the Picture Exchange Communication System (PECS) commonly used with children with ASD in Singapore. It does not require any pre-requisite skills prior to the implementation of the system. This is the main reason why the program is popular with teachers, therapists and parents working with children with ASD here, although there are also professionals who are quite critical of it for various reasons.

Picture Exchange Communication System

PECS was developed to meet the specific communicative needs of those with ASD and other disabilities – especially those who lack expressive language or have severe speech delay (Frost & Bondy, 1994). One common verbal behavioral trait of individuals with

ASD is that they often do not acquire functional communication as a social means of meeting their needs and desires. Hence, the PECS program serves to address the unique communicative needs of these individuals by teaching them social initiation to meet the function of requesting (Bondy & Frost, 1998). They are taught to exchange a picture for a desired item known as reinforcer (see Treatment X under Treatments in The Study). PECS also teaches them to initiate contact with others instead of exclusively answering questions and responding to prompts that may result in prompt dependency. The PECS program "was not designed with speech as the ultimate goal for communication, but some reports of spoken language subsequent to PECS training exist" (Simpson, 2005, p.51).

Few studies have been done to demonstrate the efficacy of the PECS. Bondy and Frost (1994) reported on 85 children, aged 5 years and younger, who had undergone the PECS program while attending a statewide program for children with ASD. Over 95% learned to exchange at least two pictures while 76% of them began using speech, augmented or not augmented by PECS. Schwartz, Garfinkle, and Bauer (1998) also reported on two studies. In their first study, 31 children in a university-affiliated integrated preschool were taught to communicate using the PECS program. Of the 31 children, 16 had ASD while the rest had Down Syndrome, Angelman Syndrome, or were developmentally delayed. On average, within 14 months of beginning PECS, the children had a functional means to communicate (range: 3-28 months). In their second study involving 18 children with ASD, Down Syndrome, mental retardation, encephalopathy, or developmental delays, Schwartz et al. (1998) found 44% of them developed speech with generalized functional communication skills across time and settings. In another study, Bondy and Peterson (1990) reported that 59% of 66 children of 5 years and younger in a statewide program for children with ASD started to speak after using the PECS for more than one year.

More recently, Charlop-Christy, Carpenter, Le LeBlanc, and Kellet (2002) studied the effects of PECS training with three boys with ASD, ages 3 to 12. Each boy learned PECS rapidly and showed improvements in the amount of spontaneous and imitative speech, number of words used per interaction, problem behaviors, and social interactions (i.e., eye contact, joint attention, play with toys) in play and instructional activities. Finally, Ganz and Simpson (2004) found that PECS training (Stages 1-4) resulted in rapid mastery of the communication system, an increase in words spoken per exchange (e.g., from 0-1 words to 3-5 words), and an increase in the complexity and length of phrases used by three young children with ASD and similar characteristics.

To sum up, the PECS approach is a promising treatment whose efficacy has been evaluated in several studies discussed above. The current concern is whether there is a faster way (other than using PECS or in addition to PECS) to intervene so that children with ASD and severe speech delay could pick up speech as early as possible. Among the many complementary and alternative treatments that have claimed to elicit and/or improve speech in children with ASD is the vitamin therapy that uses dimethylglycine (or DMG for short), which is believed to assist in the metabolism of amino acids and other substances. The theoretical basis for this treatment using DMG, which is said to be metabolized to the excitatory neurotransmitter, glycine, within the liver (Schechtman,

2007), is still unclear, and in many instances, none of the claims on the benefits of DMG has been evaluated in well-designed studies of children with ASD (Angley et al., 2007; Chia, in press; also see Smith & Wick, 2008).

What is DMG?

Rimland (1990) cited two Russian investigators, M.G. Blumena and T.L. Belyakova, published a report in 1965 showing considerable improvement in the speech of 12 out of a group of 15 mentally challenged children who had not been able to use speech to communicate. The children had been treated with a substance variously known as calcium pangamate, or pangamic acid, which is also known as Vitamin B15 (Kendall, 1981), but unlike other vitamins (e.g., lacking Vitamin A can cause night blindness while Vitamin D deficiency results in rickets), symptoms of DMG deficiency are not apparent (Marohn, 2002). In addition to enriched vocabulary, these Russian children began to use simple sentences, their general mental state improved, and there was better concentration and interest in toys and games. Subsequent research has shown the essential factor in calcium pangamate to be DMG.

DMG is a rather sweet-tasting substance that has been described as a "natural, simple compound with no known undesirable side effects" (Reap & Lawson, 1990, p.481). In other words, DMG is perfectly safe, non-toxic, and relatively inexpensive, when used as a dietary supplement. DMG is legally classified as a food, found in very small amounts, in some foods, such as brown rice and liver, and does not require a prescription (Rimland, 1990). In an animal study, Meduski et al. (1980) found that consuming 1.85g of DMG per kilogram of body weight (equivalent to 130g for a 154lbs person) had no effect on blood pressure, breathing patterns, blood chemistry, oxygen intake, or body weight.

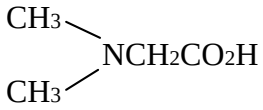
At the same time, Meduski et al (1980) also found DMG to produce a measured increase in athletic performance and a decrease in lactic acid, the compound that forms in muscles and causes tiredness. In other words, DMG is a metabolic enhancer, i.e., it improves the function of several metabolic pathways, including those involving the immune system, the cardiovascular system, and muscle performance (Medusksi et al., 1980). Although excess DMG is converted by the body into energy, it appears that its primary role in metabolism is to act as a key intermediary in the biological pathway that supplies the body with methyl groups. It maximizes the amount of energy produced for each molecule of oxygen consumed, and stimulates both branches of the immune system. DMG is an ergogenic nutrient that is, it helps produce energy and improve physical stamina (Kendall & Lawson, 2000).

DMG also acts as a detoxifying agent and antioxidant, protecting body cells from unwanted reactions caused by free radicals. Extensive animal and clinical tests have shown that DMG is a versatile normalizer of physiological functions (Medusksi et al., 1980).

Chemically and physiologically, DMG resembles the water-soluble vitamins, such as the B vitamins. The main reason it is not classified as a vitamin is that there are no specific symptoms associated with a deficiency of DMG (Marohn, 2002; Rimland, 2006). The

chemical structure of DMG is that of the amino acid glycine, in which two of the hydrogen atoms have been replaced by methyl (CH_3) groups (Kendall & Lawson, 2000) (see Figure 1).

Figure 1:



Previous Studies on DMG

Since 1967, the Autism Research Institute (ARI) at San Diego, California, USA, has been collecting parent ratings of the usefulness of the many interventions tried on their children with ASD. With regards to the administration of DMG, out of 3687 cases registered with the ARI, 50% reported no effect, 43% reported improvement or their children with ASD showed signs of getting better, while seven percent reported that their children with ASD got worse (ARI, 2000). In other words, the ratio of those getting better to those becoming worse is 6.4 is to 1. This dietary intervention looks very promising.

Research on human subjects and laboratory animals has shown that DMG strengthens the immune system (Reap & Lawson, 1990). The immune system is dysfunctional in many autistic individuals. However, the article did not pertain to the use of DMG in autism, but instead described an experiment in which DMG was used to try to enhance the function of the immune system of laboratory rabbits. It worked – the immune systems of the animals given DMG showed 300% to 1000% better response to infection than the controls.

Some autistic individuals have seizures, and there are studies that reported decreases in seizure activity as a result of DMG treatment (Roach & Carlin, 1982; Gaison et al., 1989). Roach and Carlin (1982) reported that a 22-year-old mentally retarded man who had 16 to 18 seizures per week on standard anticonvulsants, experienced only three seizures per week while on DMG. Two attempts to remove the DMG dramatically increased seizure frequency.

Two studies (see Bolman & Richmond, 1999; Kern et al., 2001) have shown no improvements from DMG in autistic individuals. The first study was conducted by Bolman and Richmond (1999) on a small double-blind, short-term trial with low dosage of DMG (125-375mg per day) using 10 males (7 children and 3 adults). The study used clinical rating scales without documentation of any significant clinical improvement. Edelson (2002) has criticized the study for using only half the recommended dosage of DMG. The other study was conducted by Kern et al. (2001) over four weeks using a double-blind, placebo-controlled trial on 37 children age 3-11 years. Both the DMG and placebo groups showed improvement but with no significant difference between the two groups. Since the period of this trial is short, it may have been insufficient for the full DMG benefits to emerge.

However, in one unpublished study reported by Rimland (1990) and Kendall and Lawson (2000), 39 autistic Korean children, ages 3 to 7 years old, at the Pusan Research Center on Child Problems were given 125mg to 375mg of DMG per day, depending on weight, for a three-month open trial period. Based on the evaluation of both parents and teachers in a number of key areas, 80% of the children improved significantly. The following results were reported by the center: 31 of the children showed improved speech, eating, excretion, willingness to socialize and 8 did not show any improvement at all. Eight children were reported to have difficulty sleeping while another six became more active for weeks 1 and 2. However, the center reported that DMG "is very beneficial for children with autism, even if it is not a cure" (Rimland, 1990, p.3).

A second unpublished study – a double-blind placebo controlled study involving 84 autistic children, divided into two groups – done in 1997 in Taiwan by Dr Shin-siong Jung of the Taipei Springtide Foundation together with Dr Bernard Rimland and Dr Stephen Edelson of the Autism Research Institute was reported by Kendall and Lawson (2000). 46 children were placed in a DMG test group; 38, a placebo group. The DMG test group showed statistically significant improvement on all five Aberrant Behavior Checklist scales used to evaluate effectiveness: irritability, lethargy, stereotypy, hyperactivity and inappropriate speech. The placebo group showed improvement only on the lethargy scale.

According to Rimland (1990), if DMG is going to work, its effect will usually be seen within a week or so, though it should be tried for a few weeks or a month before giving up. In some cases, dramatic results have been seen within 24 hours. Many parents have reported that, within a few days of starting DMG, the child's behavior improved noticeably, better eye contact was seen, frustration tolerance increased, the child's speech improved, or more interest and ability in speaking was observed (Rimland, 2006). "Speech is the most notable positive change in those children helped by DMG, behavioral improvement is also often reported" (Rimland, 1990, p.3).

Unlike PECS, DMG is regarded as a form of vitamin therapy that has been considered a controversial complementary and alternative medicine used in treating children with ASD (Smith & Wick, 2008).

The Study

Aim

The aim of this study was to find out if the combination of PECS and DMG as a treatment would be effective in eliciting and/or improving the speech of children with ASD and severe speech delay within a shorter period of time.

Design

The A1-B-A2-C-A3 reversal design was chosen as it has had wide application in several fields of special education, including the areas of communication disorders (McReynolds

& Thompson, 1986; Siegel & Young, 1987). In brief, five steps were taken when employing this reversal design:

1. Baseline data (Phase A1) were taken before the Treatment X using Picture Exchange Communication System (PECS) was instituted for three types of responses:
    a. picture recognition (PR);
    b. word expression (WE); and
    c. mean length of sentence in words uttered (MS).
2. The Treatment X (Phase B) using PECS was then initiated for a period of three months and data were taken on the same three types of responses.
3. Next, the Treatment X was withdrawn for a week to see if the responses went back to the baseline level (Phase A2).
4. If they did, the Treatment X was reinstituted, but this time, an additional Treatment Y using supplement dimethylglycine (DMG) was introduced (Phase C). The two treatments were carried out concurrently for a period of three months and data were taken on the same three types of responses.
5. Finally, both Treatment X and Treatment Y were withdrawn for a week to see if the responses went back to the baseline level (Phase A3).

The rationale for choosing this research design is twofold. Firstly, it has been recognized widely across discipline as a superior procedure for demonstrating treatment effects. Because it requires the repeated introduction and withdrawal of a treatment or an addition of another treatment (as in the case of the second part of this study), it allows the authors to make reliable statements about the functional relationship between a set of experimental procedures and related dependent variables (Tawney & Gast, 1984). Cook and Campbell (1979) indicated that "this design is obviously a very powerful one for inferring causal effects" (p.222).

Secondly, the only evidence for many controversial treatments consists of subjective information such as case reports, anecdotes, testimonials from parents or practitioners, and surveys. Reports that a child improved or that families gave high marks for a treatment in a survey are encouraging and may indicate that a treatment deserves further study as in the case of treatment using PECS and/or DMG. Unfortunately, this is not proof that the treatments are effective. Many other explanations are plausible.

As a result, the authors chose to use the single-subject experimental study design. This design involves comparing a baseline phase, in which an individual receives no treatment, with one or more treatment phases in which treatment is provided to then individual. Data are collected continuously on the outcome(s) that are being measured. If scores on the outcome measure consistently improve during treatment relative to baseline, one may conclude that the treatment was effective for that individual. However, because the design involves only one individual, the authors decided to repeat the study with multiple subjects to confirm the findings.

Subjects

Initially, there were 10 subjects but then the parents of two subjects decided not to participate in the study, while a third subject was rejected as he was on medication –

Epilim – for epilepsy. The remaining seven children – all boys of Chinese descent – ages seven to eight years old – were diagnosed at either the Child Guidance Clinic or the Child Development Clinic to have autism spectrum disorders and severe speech delay when they were three years old. All the subjects were not attending any mainstream or special school during the time when the study was conducted.

At the beginning of the study, a clinical psychologist in private practice was engaged to administer the Wechsler Intelligence Scale for Children-Third Edition (WISC-III) (Wechsler, 1991) on the seven subjects. Their pro-rated Verbal IQs (VIQs) were between 60 and 69, lower than their pro-rated Performance IQs (PIQs), between 74 and 87, and their pro-rated Full-Scale IQs (FSIQs) were between 71 and 83. According to Schreibman (1988), slightly more than 50% of the children with ASD have FSIQs below 50, with the remainder evenly split between 50-70, and 71 and above. The best prognostic or recovering indicators are a PIQ above 70 and meaningful speech by 5 years old (Bauer, 1995). In this study, all the subjects have FSIQs and PIQs above 70, and they were previously diagnosed with severe speech delay at about three years old.

In addition, the parents of the seven subjects were also interviewed to find out their children's interests and idiosyncratic habits as well as to complete the questionnaire using the Gilliam Autism Rating Scale or GARS for short (Gilliam, 1995) to obtain the Autism Quotient (AQ) of each subject. The AQs of the seven subjects were found to be in the range between 111 and 120 based on the GARS administration. According to Gilliam (1995), "… Autism Quotients equal to or greater than 111 are highly indicative of autism. The probability of non-autistic subjects receiving scores this high is very unlikely" (p. 16-17). In other words, all the seven of them were highly autistic (see Table 1).

Table 1: IQ and AQ Standard Scores

Subjects (n = 7)	Prorated VIQ	Prorated PIQ	Prorated FSIQ	Autism Quotient (AQ)
S1	64	81	76	115
S2	61	74	71	119
S3	69	87	83	112
S4	61	84	77	111
S5	60	75	71	121
S6	62	75	71	116
S7	68	84	77	114

Note: Verbal IQ (VIQ), Performance IQ (PIQ) and Full-Scale IQ (FSIQ) were pro-rated.

Setting/Schedule
All seven subjects underwent daily one-to-one remedial session at their respective homes from Monday to Friday, using the Picture Exchange Communication Systems (PECS), conducted by the same registered special needs therapist, who is specializing in autism spectrum disorders. Each treatment session lasted one hour.

Before the start of the treatment sessions, all seven subjects underwent a one week baseline assessment (April 25, 2007 to May 1, 2007). The first subject began his one-hour treatment session at 8.30am; the last subject had his from 4.30pm to 5.30pm (see Table 2). All the seven subjects underwent the PECS treatment program for three months (May 2, 2007 to July 24, 2007) before they were taken off from the treatment for the last week of July for a second baseline assessment to be administered. Then all seven were placed back in the PECS treatment program for another three-month study (August 1, 2007 to October 23, 2007). This time, however, a daily supplement treatment using dimethylglycine (DMG) was introduced from August 1, 2007, until October 23, 2007. From October 24, 2007, to October 30, 2007, a third and final baseline assessment was done to determine the progress of the seven subjects in terms of their picture recognition, word expression, and length of sentence in words they uttered (see Table 3).

Table 2: Daily Treatment Timetable

Subjects (n = 7)	Time (Session began)	Time (Session ended)	Remarks
S1	8.30am	9.30am	15min break
S2	9.45am	10.45am	30min break
S3	11.15am	12.15pm	15min break
S4	12.30pm	1.30pm	30min break
S5	2.00pm	3.00pm	15min break
S6	3.15pm	4.15pm	15min break
S7	4.30pm	5.30pm	-

The schedule on the three baselines (A1, A2 and A3) and two treatments (X and Y) is given below (see Table 3):

Table 3: Schedule of the Study

Phases	Dates began	Dates ended	Response types measured		
PHASE A1 Baseline	25 Apr ‘07	1 May ‘07	Picture recognition	Word expression	Mean sentence length in words uttered
PHASE B Treatment X	2 May ‘07	24 Jul ‘07	Picture recognition	Word expression	Mean sentence length in words uttered

PHASE A2 Baseline	25 Jul '07	31 Jul '07	Picture recognition	Word expression	Mean sentence length in words uttered
PHASE C Treatments X + Y	1 Aug '07	23 Oct '07	Picture recognition	Word expression	Mean sentence length in words uttered
PHASE A3 Baseline	24 Oct '07	30 Oct '07	Picture recognition	Word expression	Mean sentence length in words uttered

Instruments

The following two standardized assessment tools were selected as the measuring instruments for the pre- and post- Treatments X and Y and they were administered on April 24, 2007, before Phase A1, on July 28, 2007, during Phase A2, and on October 31, 2007, after Phase A3, respectively:

1. **Gilliam Autism Rating Scale (GARS)**

   The GARS is a highly standardized, norm-referenced behavioral checklist consisting of forty-two items categorized under three subtests – stereotyped behaviors, communications, and social interaction – and fourteen additional items about the child development during the first 3 years of life that helps identify persons ages 3 through 22 who are autistic. According to Gilliam (1995), the internal consistency reliability of the GARS using Cronbach's coefficient alpha (1951) is .96 with a standard error of measurement at 3.0; the test-retest reliability coefficient is .88 where the test of significance $p < .01$; and the inter-rater reliability coefficients are .94 (teacher to teacher), .83 (parent to parent), and .99 (teacher to parent) respectively. In terms of content validity, the following median coefficients were obtained (Gilliam, 1995, p.25): Stereotyped behaviors .61; Communication .65; Social interaction .69; and Developmental disturbances .61. The median coefficients for each subtest were all statistically significant ($p < .01$).

   The GARS was administered at the beginning, in the middle and at the end of study. The authors had chosen to examine the data collected from the second GARS subtest on communications for comparison among the three baselines in Phases A1, A2 and A3. The authors' reason for choosing this subtest is that communication problems are often one of the first indicators of possible ASD. These may include a failure to begin gesturing or meaningful uttering, a seeming non-interest in other people, or a lack of verbal responding (Owens, 2004).

2. **Renfrew Language Scales-Third Edition**

   The Renfrew Language Scales-Third Edition (Renfrew, 1995) consists of three subtests: (1) word finding vocabulary test; (2) test of narrative speech (also known as the Renfrew Bus Story Test); and (3) action picture test. Only the first two subtests were used in this study.

   2.1 Word Finding Vocabulary Test

   This subtest was administered at Phases A1, A2 and A3 to determine each subject's progress in picture recognition as well as oral naming of the pictures (also known as "word expression" which is the term used in this study) shown

to him. The total number of correct responses would provide the subject's vocabulary age equivalent.

This third edition of the test was standardized using norms collected from 540 children living in South East England and Oxfordshire during 1986 through 1988. Riley (1994) investigated the appropriateness of this edition of the test to children in the Manchester area. It was found that the means and the mid 50% ranges were lower in the 106 children she tested (3 years 3 months to 5 years 9 months in age) than were the norms collected in South England and Oxfordshire. In terms of the reliability of the test, according to Renfrew (1995), "only 11 test-retests were carried out … Of these five showed no difference in score; others no more than one point more or less in score" (p.11). As for the validity of the test, no other test was found to be suitable for comparison (Renfrew, 1995).

2.2 Test of Narrative Speech

This subtest was administered at Phase A1, A2 and A3 to determine each subject's progress in his sentence length in words.

Also known as the Renfrew Bus Story Test, this third edition (Renfrew, 1995) has been up-dated and standardized in view of the social changes that have taken place in the UK during that period.

Treatments

Coleman (1989) estimated that approximately 50% of all individuals with autism are mute and never develop useful spoken language. Many of them will use neither sign language nor other augmentative communication devices. In this study, the Picture Exchange Communication Systems (PECS) was the augmentative communication device used in Treatment X, and again in Treatment Y, which also included the dietary supplement dimethylglycine (DMG).

1. **Treatment X: Picture Exchange Communication Systems (PECS)**

   This approach was developed by Bondy and Frost in 1994 and revised in 2001 over a period of time and primarily with young children with autism. The pre-requisite is that children with autism should be able to match objects to objects prior to matching pictures to objects taught in the approach. Its primary aim of PECS is on teaching functional communication, not speech.

   Training begins with an assessment of each subject's preferred reinforcers, and subjects are repeatedly offered several combinations of materials to determine their reinforcement preferences. Reinforcer assessments may be repeated throughout training as their preferences change over time. At beginning stage, two trainers (one is the therapist and the other is the subject's parent)) work with each subject to teach the basic exchange of a two 5cm laminated line drawing for a preferred item. One trainer (i.e., the therapist) serves as the communicative partner, holding the subject's preferred reinforcer. The second trainer (i.e., the subject's parent) sits or stands

behind the subject and physically prompts him to pick up the picture, hand it to the communicative partner, and release it into the communicative partner's hand. The communicative partner immediately hands the reinforcer to the child, saying the word(s) printed on the picture. The prompter is faded out as soon as the subject is able to make the exchange independently. The program progresses in the following steps, which describe the learning process in PECS:

- Stage 1: Performs the basic exchange with a wide range of pictures;
- Stage 2: Persists in getting an adult's or peer's attention and in moving across increasing distances;
- Stage 3: Discriminates between a number of pictures in an array;
- Stage 4: Forms sentences using pictures;
- Stage 5: Answers questions using pictures; and
- Stage 6: Expands on previously mastered interactions.

According to Bondy and Frost (2002, p.70), this approach could accomplish several things:

- The child would initiate the communication (rather than depend on a cue from the adult).
- The child would find a communicative partner and approach that partner.
- The child would use a single picture and avoid confusion about the intent of the message.

Bondy and Frost (2002) also added that PECS would avoid certain potential problems (p.70):

- The child would not have to depend on prompts from the adult.
- The child would not need to have learned to imitate actions or words prior to starting the first lesson using PECS.
- The child would not have to learn to make eye contact on demand prior to starting this PECS lesson.
- The child did not have to learn to sit quietly in a chair prior to starting this PECS lesson.
- The child would quickly learn to communicate rather than initially learning to match pictures to objects.

Materials

PECS cards were prepared basing on the interest of each subject. Likewise, different reinforcers were also prepared according to different subjects' preferences.

Potential Risks of Treatment

There are no reports on potential risks associated with using the PECS program.

2. **Treatment Y: Dietary supplement treatment using Dimethylglycine (DMG)**

There is no established Recommended Daily Allowance (RDA) for DMG. Determining the right dosage of DMG depends on trial and error experimentation as there are no studies done to suggest the exact amount needed. Rimland (1997) has recommended that young children should take "on anywhere from one-half tablet to

three or four tablets a day" (p.3). The daily dosage of DMG for the seven subjects in this study was between one to four 125mg capsules (Edelson, 2002; Rimland, 1997), and then gradually increased the amount by one capsule every three days, up to a maximum of four capsules over a period of three months (see Table 4).

Table 4: Treatment Y: Consumption of DMG capsules

Dates of consumption (n = 7)	Number of 125mg DMG capsules consumed by per subject	Remarks
Aug 1 – Aug 3, 2007	01	No comments
Aug 4 – Aug 6, 2007	02	
Aug 7 – Aug 9, 2007	03	
Aug 10 – Oct 23, 2007	04	S3 and S4 showed symptoms of hyperactivity

Materials

The subjects were provided hypoallergenic, gluten-free/casein-free DMG capsules containing 125mg of DMG from DMG Hydrochloride over a period of 3 months. In addition, folic acid (250mcg per 0.5kg of body weight per day) was also given only to those who needed it over a period of 3 months.

Potential Risks of Treatment

There are no documented long-term side effects from DMG treatment. In an animal study, Meduski (1979) found that consumption of 1.85g of DMG per kilogram of body weight did not show any effect on blood pressure, breathing patterns, blood chemistry, oxygen intake, or body weight. However, in a few cases where parents reported agitation and/or hyperactivity in their children with autism, Edelson (2002) recommended that folic acid also be given to the individual. The suggested amount is two 800mcg capsules of folic acid for each 125mg capsule of DMG. Lejeune (cited in Rimland, 1997) reported that supplements of about 250mcg of folic acid per 0.5kg of body weight per day brought on major improvement in several autistic children. Some professionals suggest that DMG should always be supplemented with folic acid since folic acid cannot cause any harm, reduces then possibility of agitation/hyperactivity, and could possibly be more effective than when giving DMG alone (Rimland, 1997).

Results and Discussion

Results obtained in this study can be examined at two levels: (1) macro-level and (2) micro-level. At the macro-level, the authors refer to the Autism Quotients (AQs) based on the sum of standard scores obtained from the four GARS subtests administered three

times separately over six months of study. There was a drop noted in the Autism Quotients (AQs) for all the subjects except the subject S5 whose AQ remained very much the same. The subject S7 showed the greatest improvement with an initial AQ of 114 dropping by 19 points to a third AQ of 95. Subjects S3 and S4 with initial AQs of 112 and 111 respectively also showed a decline by 14 points to their respective third AQs of 98 and 97. They were also the two subjects, who after taking the DMG, reported to display agitation and/or hyperactivity and were subsequently given folic acid to reduce the disruptive behavior (see Table 4). Subjects S1, S2 and S6 showed a drop by 5, 4 and 4 points respectively in their third AQs.

According to Gilliam (1995), the AQ is the best overall estimate of a subject's behavior as it "takes into account all the symptomatic behaviors of autism measured on the GARS" (p.16). Any subject with an AQ of 90 and above is probably autistic. Standard scores of 8 through 12 or AQs of 90 through 110 fall within the average range for subjects with ASD in the normative sample. Standard scores above 12 or AQs equal to or greater than 111 are highly ASD-positive. "The probability of non-autistic subjects receiving scores this high is very unlikely" (Gilliam, 1995, p.17). In other words, all the seven subjects remained autistic.

All the six subjects except the subject S5 also showed a drop in their scaled score for the second subtest on communication of the GARS. The scaled scores in the subtest obtained by both subjects S4 and S7 showed a drop by 4 points, while those of subjects S1 and S3 dropped by 3 respectively. The scaled score in the same subtest of the subject S6 dropped by 2 points, while that of the subject S2 dropped by 1 point. As for the subject S5, his scaled score for the GARS subtest on communication went up by 2 points. Despite the drop in the scaled scores, all the six subjects (except the subject S5) were still within the average range of probability of being deficient in their communication or speech development. The scaled score of the subject S5 in the GARS subtest on communication put him on level of being severely deficient in communication or severely speech delayed. This means that all the seven subjects remained having speech difficulties despite the combined treatments of PECS and DMG (see Table 5).

Table 5: Communication (Gilliam Autism Rating Scale – Subtest 2)

Subjects (n = 7)	Phase A1		Phase A2		Phase A3	
	Subtest 2 Scaled score	Autism Quotient	Subtest 2 Scaled score	Autism Quotient	Subtest 2 Scaled score	Autism Quotient
S1	14	115	13	114	11	110
S2	13	119	13	117	12	115
S3	15	112	15	112	12	98
S4	15	111	14	118	11	97
S5	17	121	17	122	19	121

S6	14	116	13	115	12	112
S7	12	114	12	112	8	95

At the micro-level, the authors divided it further into two sub-levels: (1) the micro-sub-level with standardized test results based on the administration of two subtests of the Renfrew Language Scales-Third Edition (Renfrew, 1995); and (2) the micro-sub-level with non-standardized results using a set of 100 prepared picture-with-word cards based on individuals' interests. At the first micro-sub-level, there were three sets of results obtained in this study: (i) picture recognition (PR); (ii) word expression (WE); and (iii) mean length of sentence in words uttered (MS). The PR and WE (both put together is also known as picture naming) were measured using the Renfrew Word Finding Vocabulary Test (see Table 6), while the length of sentence in words uttered was measured using the Renfrew Test of Narrative Speech (also known as the Renfrew Bus Story Test) (see Table 7).

Table 6: Picture Recognition and Word Expression (Renfrew Word Finding Vocabulary Test)

Subjects (n = 7)	Phase A1		Phase A2		Phase A3	
	Raw Score	Age Equivalent	Raw Score	Age Equivalent	Raw Score	Age Equivalent
S1	0	<3:03	0	<3:03	19	3:07
S2	0	<3:03	0	<3:03	16	3:03
S3	0	<3:03	1	<3:03	16	3:03
S4	0	<3:03	1	<3:03	4	<3:03
S5	0	<3:03	0	<3:03	0	<3:03
S6	0	<3:03	0	<3:03	15	<3:03
S7	0	<3:03	2	<3:03	17	3:04

At Phase A1, the Renfrew Vocabulary Word Finding Test was administered but none of the seven subjects were able to respond verbally or appropriately to the picture cards shown to them. In other words, none of them was able to name or recognize the pictures shown. That suggested that the vocabulary age equivalent for all the seven subjects was below 3 years 3 months (see Table 6).

At Phase A2, after three months of intensive Treatment X using PECS, the Renfrew Vocabulary Word Finding Test was re-administered. This time, subjects S3 and S4

responded with a raw score of 1 each while the subject S7 managed to name two pictures correctly. The remaining other subjects S1, S2, S5 and S6 did not respond appropriately. The vocabulary age equivalent for all the seven subjects still remained below 3 years 3 months (see Table 6).

At Phase A3, after another three months of intensive Treatment X with an addition of Treatment Y using the dietary supplement of DMG, the Renfrew Vocabulary Word Finding Test was re-administered the third time. This time, however, a significant improvement in responses was noted. The subject S1 showed the greatest number of correct responses, i.e., 19. This was followed by the subject S7's 17 correct responses, and subjects S2's and S3's 16 correct responses each, and the subject S6's 15 correct responses. The subject S4 managed to name 4 pictures correctly while the subject S5 remained completely non-verbal or mute. There was a slight improvement in the vocabulary age equivalent for the subjects S1 (3 years 7 months), S7 (3 years 4 months), S2 and S3 (both at 3 years 3 months), while the vocabulary age equivalent of the other three subjects S4, S5 and S6 remained below 3 years 3 months (see Table 6).

Table7: Mean Sentence of Words Uttered (Renfrew Test of Narrative Speech: The Bus Story Test)

Subjects (n = 7)	Phase A1			Phase A2			Phase A3		
	Information	Sentences		Information	Sentences		Information	Sentences	
	Mean	A5LS Mean	SoC Mean	Mean	A5LS Mean	SoC Mean	Mean	A5LS Mean	SoC Mean
S1	0	0	0	0	0	0	5	1	0
0S2	0	0	0	0	0	0	5	1	0
S3	0	0	0	0	0	0	6	1.2	0
S4	0	0	0	0	0	0	4	0.8	0
S5	0	0	0	0	0	0	0	0	0
S6	0	0	0	0	0	0	5	1	0
S7	0	0	0	0	0	0	7	1.4	0

* A5LS mean: to ***Add*** the number of words in the ***5 Longest Sentences*** and divide by five as described in the Renfrew Bus Story Manual.
* SoC mean: ***S***ub***o***rdinate ***C***lauses mean.

As for the mean sentence of words uttered (MS) measured by administering the Renfrew Bus Story Test (also known as the Test of Narrative Speech), no measureable scores were recorded at Phase A1 and Phase A2 (see Table 7).

It is interesting to note that results obtained from the administration of GARS and the first two subtests of the Renfrew Language Scale-Third Edition failed to provide an overall positive picture of significant improvement made by all the seven subjects despite six months of intensive treatment X for three months, and then treatments X and Y for the next three months. All the seven subjects remained very much autistic as shown in their respective AQs and their vocabulary age equivalents also remained far below their respective chronological ages.

However, at the second micro-sub-level with non-standardized daily test results, when the authors examined these results obtained from the seven subjects' three baseline records and their daily treatment (X and/or Y) records on PR, WE and MS (see Appendix), there is a clear indication of progress made by all the subjects except the subject S5 (see Table 8).

Table 8: Baseline Means

Subject	A1(Mean)			A2 (Mean)			A3 (Mean)		
	PR	WE	MS	PR	WE	MS	PR	WE	MS
S1	0	0	0	15.6	0	0	70.4	17.2	1.5
S2	0	0	0	11.4	0	0	71.4	15.8	1.44
S3	0	0	0	39.2	0.6	0	69.4	15.6	1.36
S4	0	0	0	10.6	0.4	0	50.2	4	1
S5	0	0	0	2.2	0	0	5.4	0	0
S6	0	0	0	9.4	0	0	69.4	14.4	1.42
S7	0	0	0	38.2	2	0	70	15.6	1.5

PR – Picture Recognition
WE – Words Expression
MS – Mean Sentence length in words uttered
* using a set of 100 picture-with-word cards (based on individual subjects' interests)

1. Pre-Treatment Results

At Phase A1 baseline, all the seven subjects showed no responses in terms of PR, WE and MS to the daily tests using a set of 100 picture-with-word cards (based on individual subjects' interests) administered on them before the start of any treatment (see Table 8).

2. Post-Treatment Results

Post-treatment results are placed under the two following categories:

2.1 Post-Treatment Phase B

After three months of Treatment X, there was no improvement observed in WE and MS except PR in the Phase A2 baseline (see Table 8). Subjects S3 and S7 showed good performance in PR (an average of 39.2 and 38.2 pictures recognized respectively), while subjects S1, S2, S4 and S6 showed a slow but steady progress in PR (an average between 9.4 and 15.6 pictures recognized). Only the subject S5 showed lowest progress in PR (an average of 2.2 pictures recognized).

In addition, the subject S7's performance in WE was the best with an average of 2 words uttered. The other two subjects S3 and S4 gave a very weak performance in WE with an average of 0.6 and 0.4 words uttered respectively. The remaining four subjects showed no responses.

Lastly, for the MS, no responses were recorded from any of the seven subjects.

2.2 Post-Treatment Phase C

When Treatment Y was added to the on-going Treatment X for the next three months, an observable improvement was noted in WE and MS among all the subjects except the subject S5 in the Phase A3 baseline (see Table 8). Subjects S1, S2, S3, S4, S6 and S7 showed improvement in all the three areas: PR, WE and MS. The subject S5 showed the least and slowest progress in PR and almost nothing at all in WE and MS. In other words, the subject S5 showed no real improvement in all the three areas. (see Appendix)

Subjects S3 and S4 manifested symptoms of hyperactivity after three sessions of DMG treatment, while the parents of subject S7 complained that their child had sleeping problems at night.

Subjects S1, S2 and S6 showed a sharp rise in their performance in PR with an average range between 69.4 and 71.4 pictures recognized, while subjects S3, S4 and S7 were progressing steadily in PR with an average range between 50.2 and 70 pictures recognized (see Table 8). The subject S5 showed very little progress at an average of 5.4 pictures recognized.

In terms of WE, subjects S1, S2, S3, S6 and S7 showed good progress with an average range between 4 and 17.2 words uttered, while the subject S4 showed the lowest progress, i.e., an average of 4 words uttered (see Table 8). The subject S5 spoke no words at all.

Finally, for MS, all the subjects except the subject S5 showed a slight progress with an average range between 1.0 and 1.5 words uttered per sentence (see Table 8). The subject S5 remained totally mute.

Summary of Findings

It is not known why the subject S5 was not making any significant progress despite undergoing an intensive intervention using Treatment X and later with additional Treatment Y over six months. The authors also noted that all the subjects involved in this study progressed at different paces and their achievements made in PR, WE and MS also varied. The findings suggest that there is a wide spectrum of abilities as well as disabilities displayed by the seven subjects. The findings also suggest that the subjects performed best in PR amongst the three types of responses being observed and measured. That was followed by WE. These results support PECS as an effective intervention

strategy that helps to elicit and/or promote communication in children with ASD and severe speech delay. Although the subjects began naming the items shown in picture-with-word or PECS cards orally, they did not develop functional speech or speak in complete sentences. Hence, very little progress was noted in MS.

With the introduction of Treatment Y in addition to Treatment X in the second part of the study, there was a sharp rise in the responses in terms of PR and WE with only very slight or insignificant progress made in MS by all the subjects except the subject S5. The findings suggest that DMG improved three (i.e., subjects S1, S2 and S6) out of the seven subjects' performance in using PECS, especially in picture recognition, and association of words with pictures or pictures with words (i.e., WE). Another three subjects (i.e., subjects S3, S4 and S7) were already making steady and gradual progress since the start of the first part of the study. However, all the subjects remained unable to use simple sentences or engage in functional speech. One possible explanation postulated by the authors is that since autism is a spectrum disorder with several subtypes (e.g., regressive autism and autistic enterocolitis), DMG might work only for certain autism subtypes and not all of them.

Conclusion, Implications and Recommendations

PECS as an augmentative communication program has been readily and widely accepted as one of the mainstream skill-based interventions and treatments for children with ASD in Singapore. However, the treatment with DMG as dietary supplement, which is regarded as a form of vitamin therapy or orthomolecular psychiatry, based on the hypothesis that ASD is one of those disorders related to biochemical errors (Pauling, 1968), has yet to establish a legitimate role in the treatment of individuals with ASD here.

The authors want to caution that despite some positive results in this study suggesting that DMG as dietary supplement may be a promising adjunct in addition to the PECS approach in the treatment of children with ASD to elicit and/or improve their speech such preliminary findings do not mean that the treatment is conclusively effective. The authors do not want to give false hope to families, who have children with ASD and severe speech delay, thinking that a combined treatment of PECS and DMG as a blanket intervention could help elicit and/or improve their children's speech. It is still unclear how DMG as a dietary supplement works and the utility of DMG as therapy related to achieving desired outcomes is scientifically unconfirmed (Smith & Wick, 2008). The authors do not rule out the possibility that there are also other factors such as verbal and performance (or non-verbal) IQs as well as AQs that might have contributed directly and/or indirectly to the speech development of children with ASD and severe speech delay.

The authors recommend that as a follow-up to this study, a series of single-subject experimental studies may need to be followed by a randomized clinical trial (RCT) in order to test the treatment(s) with a sufficiently large number of individuals (Smith et al., 2007). The RCT involves participants who are randomly assigned to two groups: one

group receives the treatment, and the other is untreated; then the outcomes of the two groups are statistically compared. It can offer the strongest test of whether a treatment is effective. The randomization maximizes the probability that individuals in the treatment group are similar to those in the no-treatment group prior to treatment. If the groups are similar prior to treatment but differ afterward, the post-treatment difference is likely to be attributable to the treatment. Optimally, an RCT includes a large number of individuals in each group (at least 20, often considerably more) so that the statistical analyses have adequate power to detect differences in outcome between groups. It may also include multiple treatment sites and practitioners to assess the consistency of results at different sites, with different personnel.

References

Angley, M., Semple, S., Hewton, C., Paterson, F., and McKinnon, R. (2007). Children and autism: Part 2 – management with complementary medicines and dietary interventions. *Australian Family Physician, 36*(10), 827-830.

Autism Research Institute (2000 September). *Parent ratings of behavioral effects of nutrients and diets. Publication No.34.* San Diego, CA: The Author.

Baron-Cohen, S., and Wheelwright, S. (2004). The empathy quotient: An investigation of adults with Asperger syndrome or high functioning autism, and normal sex differences. *Journal of Autism and Developmental Disorders, 34*(2), 63-175.

Baron-Cohen, S., Wheelwright, S., Lawson, J., Griffin, R., and Hill, J. (in press). The exact mind: Empathaizing and systemizing in autism spectrum conditions. In U. Goswami (Ed.), *Handbook of sognitive developments* (pp.). Oxford, U.K.: Blackwell.

Bauer, S. (1995). Autism and the pervasive developmental disorders: Part II. *Pediatrics in Review, 16*(5), 168-176.

Beukelman, D.R., and Ansel, B.M. (1995). Research priorities in augmentative and alternative communication. *Augmentative and Alternative Communication, 11,* 131-134.

Blake, A. (1989). Real “rain men”: The mystery of the savant. *Autism Research Review International, 3*(1), 1-7.

Bolman,W.M., and Richmond, J.A. (1999). A double-blind, placebo-controlled crossover pilot trial of low dose dimethylglycine in patients with autistic disorder. *Journal of Autism and Developmental Disorders, 29,* 191-194.

Bondy, A.S., and Frost, L.A. (1994). The picture exchange communication system. *Focus on Autistic Behavior, 9*(3), 1-19.

Bondy, A.S., and Frost, L.A. (1998). The picture exchange communication system. *Seminars in Speech and Language, 19*(4), 373-389.

Bondy, A.S., and Frost, L.A. (2002). *A picture’s worth: PECS and other visual communication strategies in autism*. Bethesda, MD: Woodbine House.

Bondy, A.S., and Peterson, S. (1990). *The point is not to point: Picture exchange communication system with young students with autism*. Paper presented at the annual meeting of the Association for Behavior Analysis, Nashville, TN, USA.

Charlop-Christy, M.H., Carpenter, M., Le, L., LeBlanc, L.A., and Kellet, K. (2002). Using the picture exchange communication system (PECS) with children with autism: Assessment of PECS acquisition, speech, social-communicative behavior, and problem behavior. *Journal of Applied Behavior Analysis, 35*(3), 213-231.

Chia, K.H. (In press). Dimethylglycine (DMG): A dietary supplement treatment for children with autism. *Complementary Therapy, 1*(5).

Chia, K.H. (2008). *Autistic savants: A need to re-define the autism spectrum disorder*. Singapore: Cobee Publishing House.

Coleman, M.C. (1989). Young children with autism or autistic-like behavior. *Infants and Young Children, 1(*4), 22-31.

Cook, T.D., and Campbell, D.T. (1979). *Quasi-experimentation: Design and analysis issues for field settings.* Chicago, IL: Rand-McNally.

Cronbach, L.J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*(3), 297-334.

Dawson, G., and Osterling, J. (1997). Early intervention in autism. In M.J. Guralnick (Ed.), *The effectiveness of early intervention* (pp.307-326). Baltimore, MD: Paul H. Brookes.

Edelson, S.M. (2002). Dimethylglycine (DMG). Retrieved on January 8, 2008, from Autism Research Institute, San Diego, CA, USA, Website: http://www.autism.org/dmg.html.

Exkorn, K.S. (2005). *The autism sourcebook*. New York, NY: HarperCollins.

Frost, L.A., and Bondy, A.S. (1994). *The picture exchange communication system training manual*. Cherry Hill, NJ: Pyramid Educational Consultants, Inc.

Gaison, G., Patterson, B., Yearwood, K., and Slotnick, H. (1989). N,N-dimethylglycine and epilepsy. *Epilepsia, 30*(1), 90-93.

Ganz, J.B., and Simpson, R.L. (2004). Effects on communicative requesting and speech development of the picture exchange communication system in children with characteristics of autism. *Journal of Autism and Developmental Disorders, 34*(4), 395-409.

Gilliam, J.E. (1995). *Gilliam Autism Rating Scale*. Leicester, U.K.: Pro-Ed Corporation.

Kendall, R.V. (1981). *The 1981 buyers guide (4th Ed.) for DMG and the so-called Vitamin B15*. South Burlington, Vermont: FoodScience Corporation.

Kendall, R.V., and Lawson, J.W. (2000). Recent findings on N,N-dimethylglycine (DMG) a nutrient for the new millennium. *Townsend Letter for Doctors and Patients*. South Burlington, Vermont:FoodScience Corporation.

Kern, J., Miller, V.S., Cauller, P.L., Kendall, P.R., Mehta, P.J., and Dodd, M. (2001). Effectiveness of N,N-dimethylglycine in autism and pervasive developmental disorder. *Journal of Child Neurology, 16*(3), 169-173.

Marohn, S. (2002). *The natural medicine guide to autism*. Charlottesville, VA: Hampton Roads.

McReynolds, L.V., and Thompson, C.K. (1986). Flexibility of single-subject experimental designs. Part 1: Review of the basics of single-subject designs. Journal of Speech and Hearing Disorders, 51, 194-203.

Meduski, J. (1979). *Nutritional evaluation of the results of the 157-day sub-chronical estimation of N,N-dimethylglcine toxicity*. Unpublished research paper. Los Angeles, CA: University of Southern California.

Meduski, J., Hyman, S., Kilz, R., Kim, K., Thein, P., and Yoshimoto, T. (1980). *Decrease of lactic acid concentration in blood of animals given N,N-dimethylglycine*. Paper presented at the Pacific Slope Biochemical Conference, July 7-9, at the University of Calfornia, San Diego, USA.

Owens, R.E. (2004). *Language disorders: A functional approach to assessment and intervention (4th Edition).* Boston, MA: Allyn and Bacon.

Pauling, L. (1968). Orthomolecular psychiatry. *Science, 160*(825), 265-271.

Reap, E., and Lawson, J.W. (1990). Stimulation of the immune response by dimethylglycine, a non-toxic metabolite. *Journal of Laboratory and Clinical Medicine, 115*, 481.

Renfrew, C.E. (1995). *The Renfrew Language Scales-Third Edition*. Oxon, U.K.: Winslow.

Riley, M. (1994). *Is the Renfrew word-finding vocabulary scale a useful clinical tool?* An unpublished masters dissertation submitted to the Department of Psychology and Speech Pathology, Manchester Metropolitan University, UK.

Rimland, B. (1990). Dimethylglcine (DMG), a nontoxic metabolite, and autism. *Autism Research Review International, 4*(2), 3.

Rimland, B. (1997). What is the right dosage for Vitamin B6, DMG, and other nutrients useful in autism? *Autism Research Review International, 11*(4), 3.

Rimland, B. (2006). *Dimethylglycine (DMG) for autism*. Retrieved January 8, 2008, from Autism Research Institute, San Diego, CA, USA, Website: http://www.autismwebsite.com/ari/newsletter/dmg2.htm.

Roach, E., and Carlin, L. (1982). N,N-dimethylglycine for epilepsy. *New England Journal of Medicine, 307*, 1081-1082.

Rutter, M. (1985). Infantile autism. In D. Shaffer, A. Erhardt, and L. Greenhill (Eds.), *A clinician's guide to child psychiatry* (pp.48-78). New York, NY: Free Press.

Schechtman, M.A. (2007). Scientifically unsupported therapies in the treatment of young children with autism spectrum disorders. *Pediatric Annals, 36*(8), 497-505.

Schreibman, L. (1988). *Developmental clinical psychology and psychiatry: Vol.15.* Autism. Newbury Park, CA: Sage.

Schwartz, I.S., Garfinkle, A.N., and Bauer, J. (1998). The picture exchange communication system: Communicative outcomes for young children with disabilities. *Topics in Early Childhood Special Education, 18*(3), 144-159.

Siegel, G.M. (1996). *The world of the autistic child: Understanding and treating autistic spectrum disorders*. New York, NY: Oxford University Press.

Siegel, G.M., and Young, M.A. (1987). Group designs in clinical research. *Journal of Speech and Hearing Disorders, 52*, 194-199.

Silverman, F. (1995). *Communication for the speechless* (3rd Ed.). Boston, MA: Allyn and Bacon.

Simpson, R.L. (2005). *Autism spectrum disorders: Interventions and treatments for children and youth*. Thousand Oaks, CA: Corwin Press.

Smith, T., Scahill, L., Dawson, G., Guthrie, D., Lord, C., and Odom, S. (2007). Designing research studies on psychosocial interventions in autism. *Journal of Autism and Developmental Disorders, 37*(2), 354-366.

Smith, T., and Wick, J. (2008). Controversial treatments. In K. Chawarska, A. Klin, and F.R. Volkmar (Eds.), *Autism spectrum disorders in infants and toddlers: Diagnosis, assessment, and treatment* (pp.243-273). New York, NY: Guilford Press.

Tawney, J.W., and Gast, D.L. (1984). *Single-subject research in special education*. Columbia, OH: Merrill.

Wechsler, D. (1991). *Wechsler Intelligence Scale for Children-III*. San Antonio, TX: Psychological Corporation.

Wing, L. (2001). *The autism spectrum: A parent's guide to understanding and helping your child*. Berkeley, CA: Ulysses Press.

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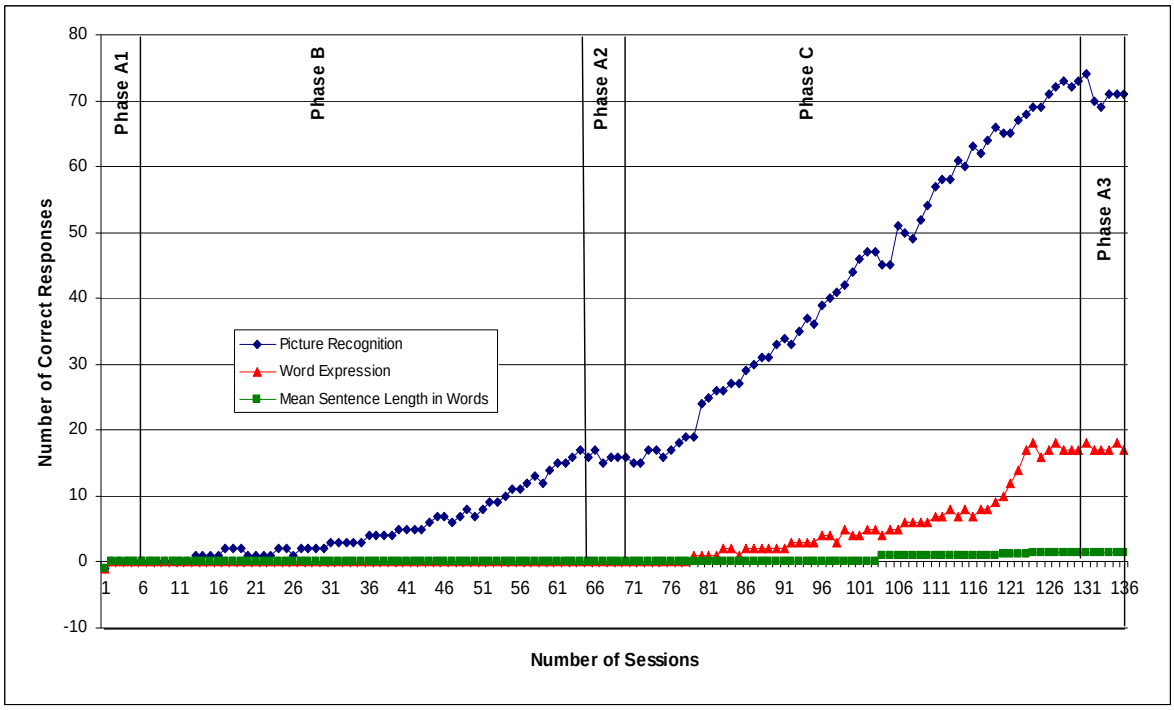
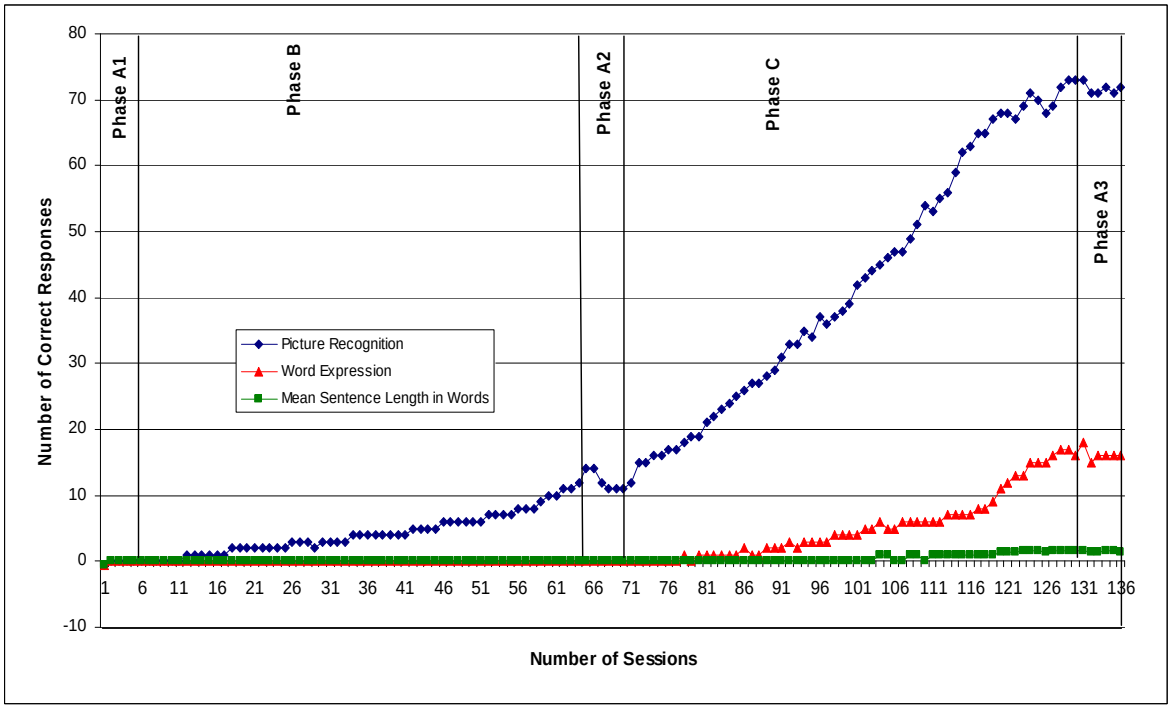
APPENDIX

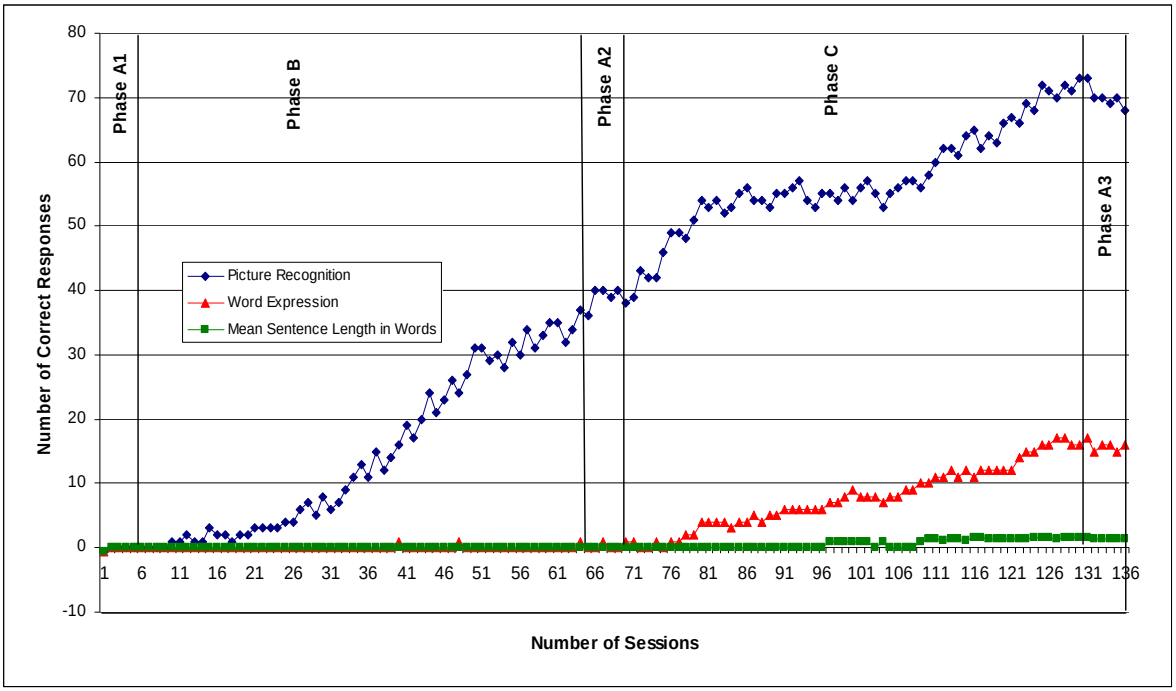
Subject S1



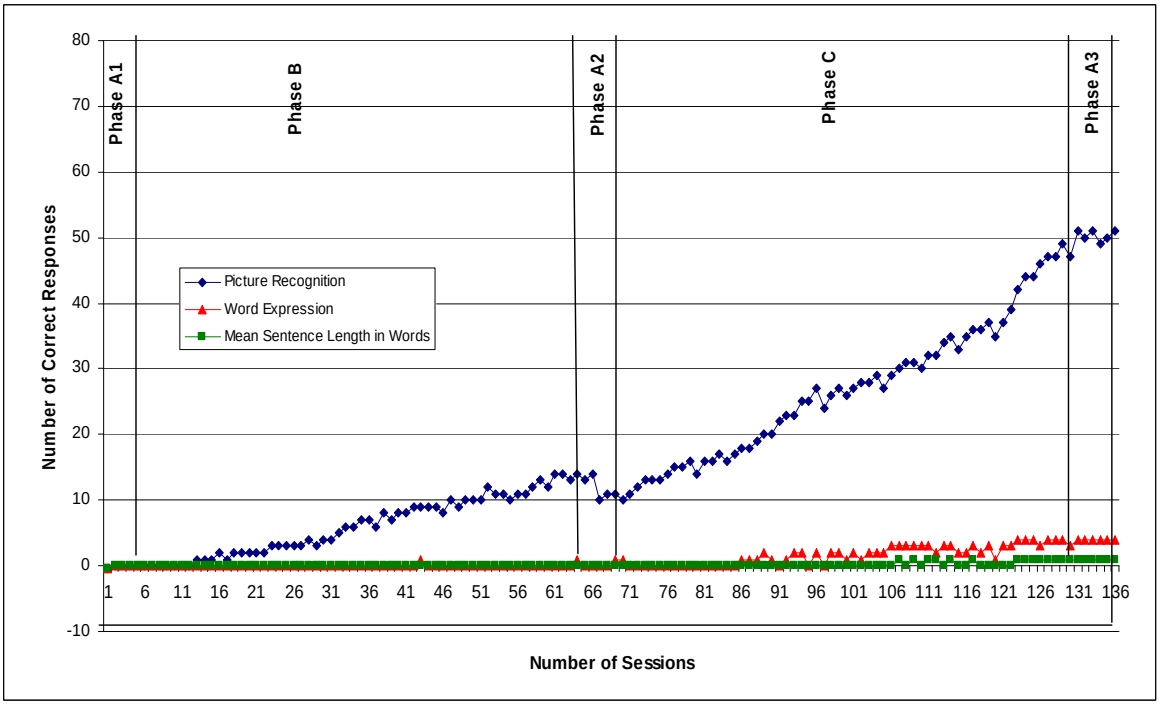
Subject S2



Subject S3



Subject S4



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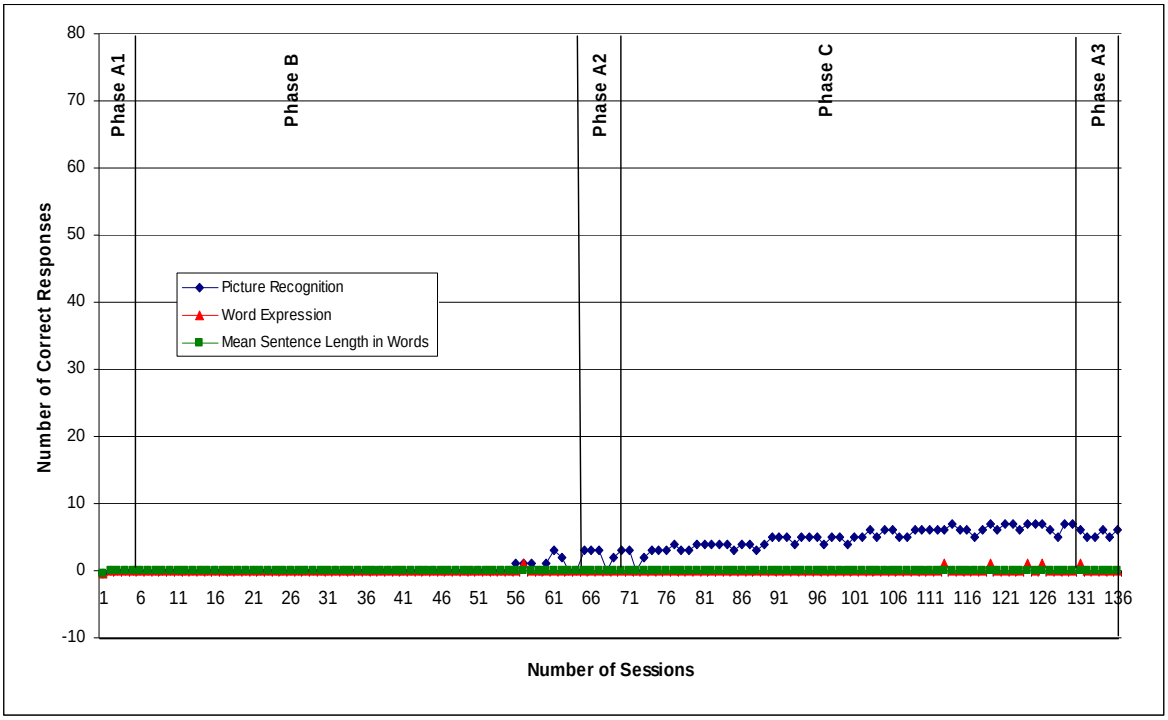

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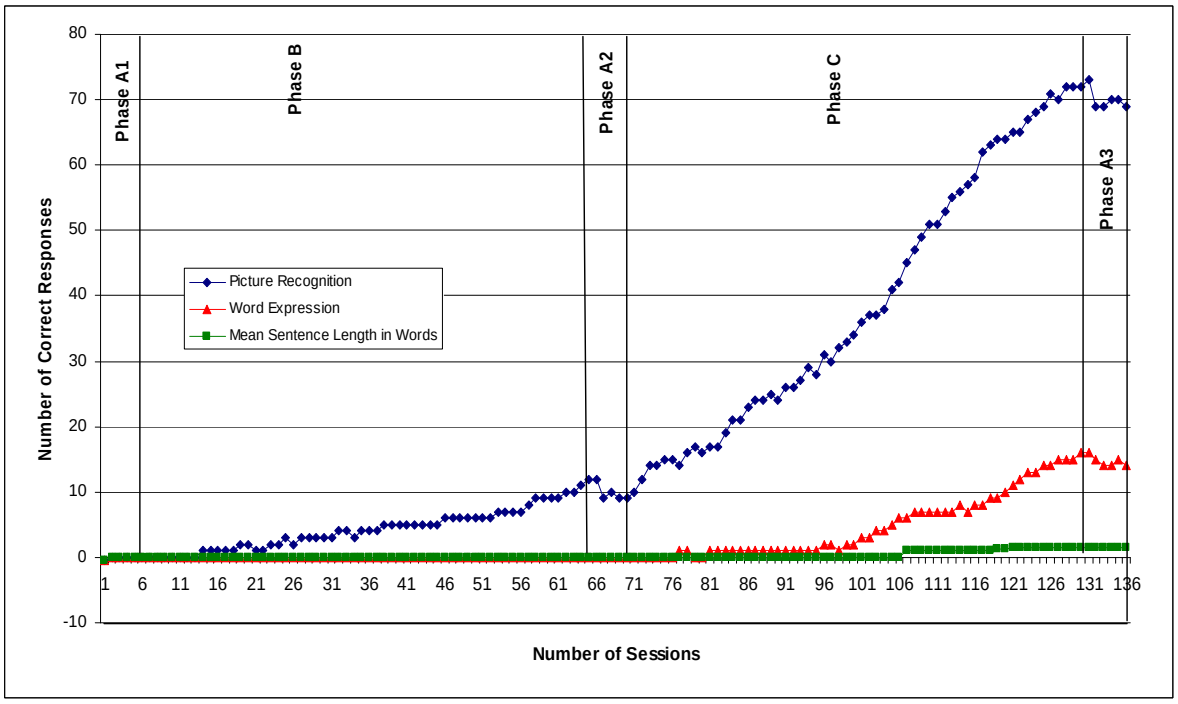
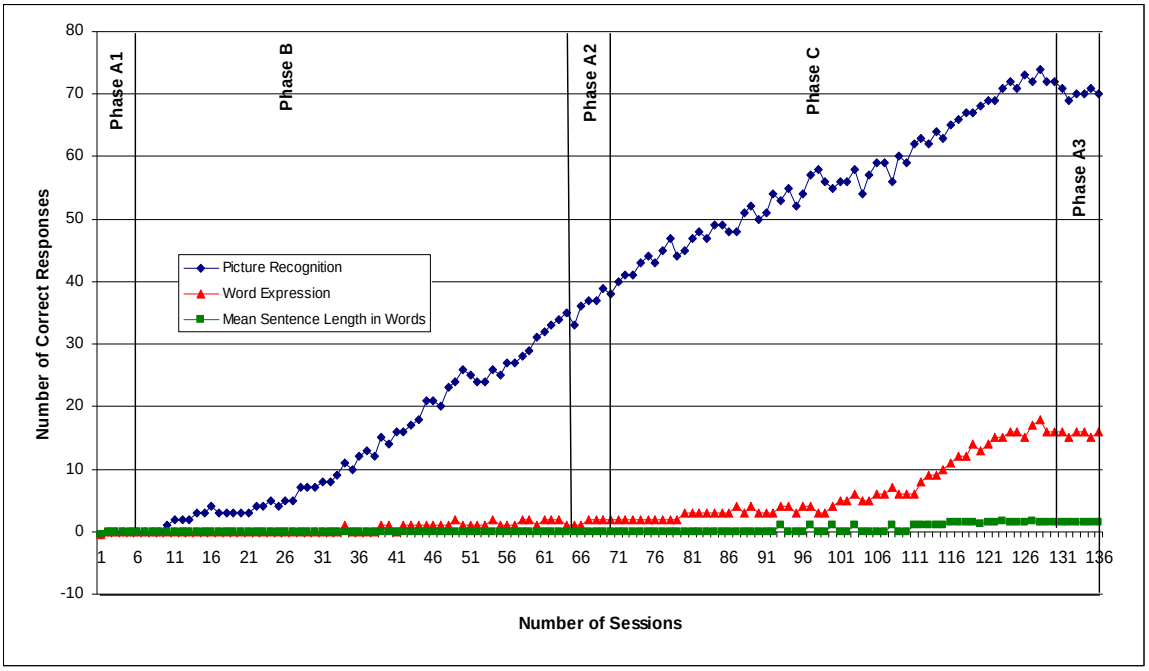


Subject S7


Phase A1
Phase B
Phase A2
Phase C
Phase A3
Picture Recognition
Word Expression
Mean Sentence Length in Words
Number of Correct Responses
Number of Sessions
80
70
60
50
40
30
20
10
0
-10
1
6
11
16
21
26
31
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41
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131
136

Significance of Multiple Intelligence Among Children with Special Needs

S.Saradha priyadarshini

"*All students can learn and succeed, but not all on the same day in the same way*"

-William G. Spady

Children's ways of learning are as different as the colors of the rainbow. Some grasp information best by reading, while others learn better through listening or discovering concepts through hands on experience. Traditionally, the concern of teachers and educators was on assessing what children learn instead of focusing how they learn which gives the child a comprehensive approach to teaching and learning. A learning style diagnosis is the key to an understanding of student learning.

Educational system today aims to design a creative and effective interdisciplinary approach to teaching, learning, and assessment taking into account the intellectual gifts of each student (Diaz-Lefebvre and Finnegan, 1997). Learning takes place best when it can be individualized, meeting the particular needs and interests of each student. It is important to know what helps students learn and then adjust teaching strategies to enhance the method of instruction. Students can learn from a combination of modalities, hands-on activities, oral and visual instruction and a combination of these methods (Perkins, 2001).

In 1983, Howard Gardner, a noted Harvard psychologist and educator, in his book "Frames of Mind" theorized that there are multiple intelligences that dictate how children process and understand information. According to Him, all individuals possess, exhibit and perceive the world in eight different and equally important but in a varying amount and combine and use them in idiosyncratic ways. Students also will come into the classroom with different sets of developed intelligences. These sets determine how easy or difficult it is for a child to process information when it is presented in a particular manner commonly referred to as a learning style.

Gardner's Theory has offered educators a comprehensive framework within which fundamentally different solutions can be implemented. A tenet of Multiple Intelligence Theory is that people learn, represent, and utilize knowledge in many different ways. These differences challenge an educational system which assumes that everyone can learn the same materials in the same way and that a uniform, universal measure suffices to test student learning.

Educators need to assess their students' learning needs in ways which will provide a clear picture of the strengths and weaknesses. Since all children do not learn in the same way,

they cannot be assessed in the same way. Therefore, it is important that an educator creates an "intelligence profile" for each student. Knowing how each student learns will allow the teacher to properly assess the child's progress (Lazear,1992). This individualized evaluation practice will allow a teacher to make more informed decisions on what to teach and how to present the required information.

Gardner's theory also has several implications for teachers in terms of classroom instruction. It implies that educators should recognize and teach to a broader range of talents and skills present in young children. A second implication is that teachers should structure the presentation of material in a style that engages most or all of the intelligences.

The influence that MI theory has on children with special needs goes far beyond the development of new remedial strategies and interventions. Though we all learn through our five senses of sight, hearing, touch, smell and taste but the bulk of learning is through sight and hearing. To learn well we must be able to harness these faculties, especially that of sight for maximum learning capacity and capability. The children with special needs might not have difference pattern of development and it depends on the residual senses they possess.

If MI theory is implemented on a large scale in both regular and special education, it is likely to have some positive effects. It provides more emphasis on the strengths and abilities of children with disabilities, increases students' self-esteem and helps to promote success among a broader community of learners. MI theory makes sense of their individual differences, their tolerance and understanding. The MI theory increases the appreciation of those with special needs; leading to their full integration into the general classroom (Armstrong, 1994).

Every teacher and parent should assess their child's multiple intelligences to address their strengths and build upon their weakness. Unless one is able to assess how the learning takes place in different domains, and by different cognitive processes, even superior curricular innovations are destined to remain unutilized. According to Gardner, "the broad spectrum of student and perhaps the society as a whole—would be better served if disciplines could be presented in a number of ways and learning could be assessed through a variety of means".

References

Armstrong, T. (1994). *Multiple intelligences in the classroom*. New York: Penguin Putnam INC., New York.

Armstrong, T. (2000). *Discovering and encouraging your child's multiple intelligences*. Penguin Putnam INC., New York.

Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. NY: Basic Book.

Gardner, H. (1993). Multiple intelligences: The theory in practice. NY: Basic Book

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Foster Youth Who Have Succeeded in Higher Education: Common Themes

Thomas Lovitt and John Emerson

Little was known regarding the numbers of young people with disabilities served in foster care and the barriers such youth face in education and the transition to adulthood until the recent report by the National Council on Disability (NCD; 2008). It sheds light on the poor education and employment outcomes and other indicators of well-being for youth with disabilities in foster care. The NCD estimates that youth with disabilities are between 1.5 and 3.5 times more likely to have experienced abuse or neglect than youth without disabilities. In addition, children born with disabilities more frequently become part of state child welfare systems.

There are over 500,000 foster youth in the U.S. (U.S. Department of Health and Human Services, Administration for Children and Families, 2006). According to Yu, Day, and Williams (2002), in school, these young people are more likely than non-foster children to perform below grade level, score lower on state-wide achievement tests, repeat one or more grades, have high rates of absenteeism and tardiness, and drop out of school. About 20,000 young adults age out of state foster care systems annually (U.S. Department of Health and Human Services, Administration for Children and Families, 2006). Like many youth with disabilities, youth transitioning out of foster care tend to have very poor postsecondary education and training enrollment and completion outcomes (NCD, 2008). They are less likely to take college preparatory courses; have access to special programs, advanced placement courses, and extracurricular activities; and pursue postsecondary education. However, with 70% of youth in foster care reporting a strong desire to go to college (Martin, 2003), the barriers to college access and success facing these students need to be better understood and addressed by policymakers and practitioners alike.

All young people, including foster youth and youth with disabilities, can succeed academically given adequate support and advocacy from educators, professionals, and their caregivers. Casey Family Programs (www.casey.org), a Seattle-based national operating foundation that has served children, youth, and families in the child welfare system since 1966, interviewed eight former foster youth who recently graduated from college. With only about 3% of former foster youth earning a college degree (Pecora et al., 2005), these eight students had clearly beaten the odds. Their perspectives on going to college and obtaining a degree despite numerous barriers presents an opportunity learn how other young adults like them might be better supported. All were beneficiaries of the Casey Family Programs college scholarship program and supported by the Orphan Foundation of America (www.orphan.org). Of the eight students interviewed, five were female and three were male. Four were African American, two were Caucasian, one was Asian American, and one was Hispanic. All of them graduated from four-year universities. During the course of conversations and correspondences with them, 15 major themes concerning college success and a general outlook on life emerged:

1. ***"I've been in more than one foster home."*** Most of the eight young adults had been placed in at least 4 or 5 situations; one had been in 20. Two of them were sent to group homes and family homes. This placement instability resulted in multiple school changes. These students entered foster care between the ages of 8 and 11 and, on average, were in the foster care system for 10 years. Two of the students had siblings who were placed with them temporarily; two students never lived with their brothers or sisters. Six students had been in their last foster situation for at least five years before going to college. Four of the eight had lived with a single mother for their last placement. Although none of the students reported that their foster situations were exemplary, they did view them as primarily positive experiences. Two young people even said that the foster system had saved their lives.
2. ***"My family is important to me."*** For the most part, these youth valued what family they had. Three students held out the hope that someday they would reunite, to some degree, with their biological parents. Among the top goals of one young woman was spending more time with her biological family, with whom she had lost contact when she was a teenager. Another young woman tried to maintain contact with her immediate family, "Even when they get on my nerves." One of the young men stated, "My family is very important to me. I didn't feel I had the right to be 10 hours away from them [to attend a college]." One of the eight would not talk about her half-brother; however, in the past few years she has become very close to her younger sister. Another said that her brothers and sister are more important to her than anything else.
3. ***"I could count on someone."*** One or two adults consistently supported these youth. For two students, the essential persons were their adoptive parents. For two others, it was an aunt: a biological aunt in one case and a foster aunt (the sister of the youth's foster mother) in the other. One young man identified his grandparents, with whom he was placed when his foster parents were killed, as having the most influence. One young woman could always count on an older cousin: "I go to her when I have a problem." For yet another young woman, this "someone" was a group-home supervisor who encouraged her to attend college and supported her until she graduated. One young man said he depended on a coach.
4. ***"I didn't know how to study or manage my time."*** Although study skills and time management have been identified as keys to academic success, only two of the eight students appeared to have been provided with adequate instruction in these areas. Light (2001) found that college students' top suggestion for entering freshmen was to obtain training in time management. In the area of study skills, one foster youth said that his teachers emphasized note-taking but nothing else. On the other hand, a second youth had an English teacher who, he said, stressed study skills and "put me in good shape for college." A young woman stated that although a high school English teacher had offered this instruction, she didn't pay attention. A second young woman noted that because she didn't acquire good study skills in high school, she had great difficulty studying for college examinations. In fact, her only technique for learning was highlighting textbooks. All eight students admitted problems with managing their time in college.

5. ***"I was involved in extracurricular activities."*** Most of the students participated in extracurricular activities while in high school. One student who didn't have time in high school because of a part-time job came to see this as a deficit and actively changed her approach in college: "My objective was to get the most out of my college experience, academically and socially." One young woman took honors classes, played tennis all four years, participated in track and field, and was a cheerleader. Her motivation for being so occupied was to escape her foster home. Higgins (1994) noted that such out-of-the-house involvement is quite common for "resilient" individuals.
6. ***"Not every high school counselor was helpful."*** Six students were not satisfied with their high school counselor's assistance. Four noted that when it came to determining which courses to take and when, the counselor merely gave them a list of the offerings and told them to handle the scheduling themselves. Only one student was encouraged to enroll in Advanced Placement classes. These students also did not get the necessary assistance for obtaining financial aid and completing the FAFSA. One young woman said, "Our guidance counselor . . . stayed in her office, and it was up to you to ask her questions." A young man said that his school counselor "was a very negative person, not just with me, but with everybody." One student who was pleased with her counselor said that she visited him frequently because "I really wanted to go to college and wanted to make sure that I did everything that needed to be done." The other satisfied student said that even after high school his counselor stayed in contact with him.
7. ***"I will do it!"*** All these students told themselves that they would attend and graduate from college. One young woman said, "In high school, I figured that if I wanted to get myself out of the situation I was in, the best way to do it was to go to college." Even when she felt under extreme pressure in college, she remained committed: "I never wanted to drop out; that wasn't an option." For another student, the motivation was financial: "I didn't want to be poor forever." Two young women took a year off after their junior year to work but returned and finished their programs. One young woman's grades were quite low in a couple of classes during what would have been her senior year, but she redoubled her efforts and graduated a year later.
8. ***"I have a plan."*** All eight students had charted the course of their lives to some degree. A few wanted generally to better themselves and take advantage of opportunities that arose. As one young woman said, "My life a year from now will be very busy, yet fulfilling . . . filled with anticipation of and excitement over future obstacles." Several students planned to work toward master's degrees or attend law school. One of the eight hoped to own her own business; another wanted to pursue a career in music/video production. One young man's desire was to become involved with providing low-income housing. Still another youth had a detailed schematic, which she referred to as "the concrete plan for my life."
9. ***"Money is important."*** Although these individuals received scholarships, grants, and loans, money was a constant worry. Five of the eight incurred considerable debt in attending college, one as much as $70,000. One student confided, "One of my biggest worries is that I will not be able to support myself financially. . . . Because I do not receive any financial support from family and I do not live at

home, I am completely responsible for myself." All of the students worked various jobs while in college, and, as mentioned previously, two took a year off to earn money for school.

10. ***"I just hoped I didn't get sick."*** Only three of the eight youth had even minimal health insurance coverage while attending college, and most of them had no dental insurance. One young woman said that she had health insurance for the first time since she was 18 when she was a government intern: "I cannot tell you how many times I tried to get mental-health services when I was in college, because I was very depressed." Another student stated, "If anything could be changed [in the system] for children coming out of foster care, I would hope that it would be health-care coverage. We had state welfare from being in foster care, but once we were 18 . . . we were on our own."
11. ***"I tried to do too much."*** At one time or another, each student overextended him- or herself or came very close to it. They struggled with particular classes, held down jobs, volunteered for various organizations, juggled finances, and worried about their foster and biological families. One young woman said, "I kind of thought I was 'superwoman.' I will do this, I will do that, I will take six classes and work." A young man was working on his master's degree in business, planning to earn a doctorate, organizing a private company to work for low-income housing, and serving as a county council member. Another student volunteered at a work shelter for foster youth, a county courthouse, an HIV resource center, and the YMCA, in addition to working part-time and taking a full course load.
12. ***"Counseling is essential."*** These students were either involved in counseling, would have liked to have been, or should have been. As one student succinctly stated, "I was moving out of my first apartment, forced to quit my job, unable to focus on school, and sick like a dying dog. [This] left me barely able to pick up the phone and dial the student counseling services." Another student went to counseling just to sort out "stuff. . . . It's really a chance to get an objective voice on your feelings and just to validate how you feel." The director of the Guardian Scholars support program for foster youth at California State University, Fullerton, stated that most youth leaving foster care can become overwhelmed by having to care for themselves. Add to this common mental-health concerns, such as depression, and it is clear that they may need counseling (personal communication, May 10, 2004).
13. ***"I used support services in college and wished there were more."*** These young people took advantage of a fair number of support services their colleges offered, especially financial aid, residence and academic advising, health services, student counseling, learning centers, computer labs, and sports and recreational opportunities. Services they would have liked to use but were not available included assistance with housing during holiday or vacation breaks, ways to connect with foster youth in college, and interactions with foster youth who had graduated and could act as mentors.
14. ***"I feel older than I am."*** All eight had to grow up quickly, overcoming challenges that most young people never face. At age 22 or 23, several said they felt as though they were 35 or older. All the students knew they didn't have time

to go to parties or waste time during college. A young woman said, “At the beginning of my freshman year, I found a job and worked until I graduated from high school. While most of my peers and friends were out enjoying their youth, I was worrying about what to do with my life.”

15. ***“I am ambivalent about depending on other people.”*** One young woman confided, “I had a lot of people in my life who supported me, who were like family members, but you just cannot always depend on other people.” For example, she was skeptical of her relationship with her boyfriend, fearing he would leave her. A young man who said he is very cautious in choosing friends said, “I’ve had three or four friends that I had close relationships with, but everybody else I just considered acquaintances. Sometimes, when people don’t have the same goals you do, and if you get yourself affiliated with those people, you can get distracted. You might lose sight of your goals.”

An inevitable question concerning foster youth who have succeeded academically is “What do those individuals have in common?” The person who asks this question might want to find characteristics that he or she could instill in less successful young people, in the hopes of offering them improved opportunities to be successful. Although reasonable, this expectation may be naïve. The only trait shared by the eight young men and women we profiled was a persistent drive to succeed educationally, manifested in their graduation from college. Several reported that school was always a safe place where they could escape chaotic lives. They did, however, seem to share several similar experiences:

- First, an influential person or two—a foster parent, a cousin, an aunt or uncle, a grandparent, a supervisor, a coach—came into their lives at critical times and encouraged them to do well in school. This stable, caring, and trusted educational advocacy made an important contribution to their college success.
- Second, they reported having lived in supportive homes just prior to attending college. Several had foster parents with college experience who aimed them in that direction.
- Finally, during their adolescence, these eight foster youth began telling their stories, either informally to teachers, social workers, or other adults, or formally, as members of youth panels that addressed groups of foster children. Relating these experiences helped them begin to understand themselves. Each came to the realization that he or she could accept the past, and each found illumination concerning the future.

These young people defied the odds, achieving academic success, earning a college degree, and becoming better prepared for life after foster care.

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References

Administration for Children and Families, U.S. Department of Health & Human Services. (2007). *Services for families.* Retrieved March 26, 2008, from *http://www.acf.hhs.gov/acf_services.html#aafc*

Higgins, G. O. (1994). *Resilient adults: Overcoming a cruel past*. San Francisco: Jossey-Bass Publishers.

Light, R. J. (2001). *Making the most of college: Students speak their minds*. Cambridge, MA: Harvard University Press.

Martin, J. (2003). *Foster youth desire college, study shows, but face roadblocks to learning.* St. Louis, MO: Washington University in St. Louis. Retrieved March 26, 2008, from *http://news-info.wustl.edu/tips/page/normal/452.html*

National Council on Disability. (2008). *Youth with disabilities in the foster care system: Barriers to success and proposed policy solutions.* Washington, DC: Author. Retrieved March 19, 2008, from *http://www.ncd.gov/newsroom/publications/2008/FosterCareSystem_Report.html*

Pecora, P. J., Kessler, R. C., Williams, J., O'Brien, K., Downs, A. C., English, D., et al. (2005). *Improving family foster care: Findings from the Northwest Foster Care Alumni Study.* Seattle, WA: Casey Family Programs. Retrieved Marcy 31, 2008, from *http://www.casey.org/Resources/Publications/NorthwestAlumniStudy.htm*

U.S. Department of Health and Human Services, Administration for Children and Families. (2002). *Adoption and Foster Care Analysis and Reporting System.* Retrieved March 19, 2008, from *http://www.acf.hhs.gov/programs/cb/systems/afcars/about.htm*

Yu, E., Day, P., & Williams, M. (2002). *Improving educational outcomes for youth in care: A national collaboration*. Washington, DC: Child Welfare League of America Press.

A Mother's Story about Raising Children with Disabilities

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Abstract

The purpose of the study was to understand a mother's perspective about raising children with disabilities. This was a unique case study because the mother was a highly educated advocate in the special education profession and the process was very educational for the researcher. A detailed description of the methodology is provided to encourage new researchers and doctoral candidates to study the area of parental perspectives in special education using participant-observer case studies.

A Mother's Story about Raising Children with Disabilities

Interview Experience

The interview process was a real eye-opener for me. I found it overwhelming and exciting. Before the first interview I was nervous and unsure about the procedure, and about my ability to conduct an adequate interview. However, most of my anxieties disappeared during the first interview with Diane. We met on campus because it was a convenient site for the both of us. We chose an empty classroom to sit in. Diane said that she "could talk for hours" because the topic of disabilities was very close to her heart. As the first interview began, it became apparent that Diane indeed was passionate about the topic. She was also very emotional at different times during the interview. At on point she cried, and I was so moved that I cried with her. This incident made us both feel comfortable with each other and Diane did not feel awkward opening up to me after that. I also felt very comfortable during the interview, and the interview seemed more like a conversation between two friends. We had established rapport within the first half-an-hour of the interview.

The questions I asked Diane focused on two different areas. Firstly, I wanted to gather data related to the focus of my study, and secondly, I had a personal interest in some of the issues. For example from the beginning, I was curious if having a child with disabilities affects a parent's relationship with the other children in the family. When I asked Diane if Laura had affected her relationship with her other children, her answer surprised me, and at the same time provided me with substantial data for my study.

Case Study Participant

Before I delve into Diane's story I would like to introduce Diane as well as I can. This case study is Diane's story, and I hope to retell that story in Diane's voice.

Diane as My Instructor

In the spring of 1997 I enrolled in a class called *Families of Children with Handicaps*. Diane was the instructor. I had decided to take the class because it is in my area of interest and also because Diane was teaching it. Since Diane and I were enrolled in a course together during a previous semester, during that time I discovered that Diane had a teenage daughter with disabilities. I did not know what the disability was because Diane did not bring it up in the setting of the classroom. Towards the end of the class I found out that Diane was going to teach a class, and I knew that I had to take it. One reason was my interest and the other reason was the way the class would be structured. Diane told me that she had planned to invite a number of parents of children with disabilities, because she wanted the students to understand the plight of these parents by interacting with them and "listening to their stories."

So, in January 1997, I was one of the fourteen students enrolled in the class. All of the students were in the Special Education Master's program.

Diane began the class by describing her background. Diane said that her daughter Laura was the reason she had decided to advocate for parents of children with disabilities. "It's important to me to let teachers know that when a parent comes to a conference table, they're coming with a lot of history behind them. That has to be considered."

Diane's selection of books for the course reflected her feelings about having a child with disabilities. These books dealt with the issue of parents' plight in dealing with a society that is non-inclusive of the children with disabilities. Her choice of videos also dealt with the idea of inclusion, and how parents have to struggle to advocate for their children. A video titled "Sean's Story" dealt with a mother's struggle to give her child the opportunity to be in a regular public school. Shaun had Down's Syndrome, and his mother had to fight the system to give him a chance to be with regular children. While watching the video, I glanced at Diane who was in tears. It was evident that she knew what the mother was going through.

The class assignments also challenged the students to understand the feelings of parents of children with disabilities. We were asked to locate services that the parents could use for their child. Diane tried to instill in us a sense of responsibility for parents. She said that as professionals, it was our responsibility to help and empower parents, and become advocates for their child.

Diane as a Peer in the Ph.D. program

Diane and I initially met in a graduate seminar titled *Inclusion*. This course was designed to give an in-depth picture of what the Inclusion movement is all about. We were instructed to read research showing the pros and cons of the Inclusion philosophy. There were six doctoral students in class and Diane was one of them. Each of had ideas on what Inclusion meant in terms of teaching. However, Diane brought forth a unique perspective. She had been a special educator, and was a parent of a teenager with Cerebral Palsy. While most of us viewed Inclusion only in terms of the classroom, Diane viewed it as a basic human right. She was adamant about her believe that children with disabilities have

to be included in all walks of life, beyond the classroom environment. She talked about her struggles with the school system because she want Laura to be in the regular environment with all the other children.

Diane was very approachable both in and out of class. Since she was ahead of me in the Ph.D. program, I was able to learn from her. She was very resourceful when it came to understanding the rights of parents of children with disabilities. I did not hesitate to ask her questions related to the doctoral program, and the issue of Special Education in general.

Description of the Methods

In the following section, I will discuss the procedures I used to conducting this case study research. I will elaborate on the research method, the data collection procedures, the methods of data analysis, the ethical considerations taken, and what methods I employed to ensure the credibility of the findings. The aim of this case study to understand an issue in as much detail as possible. I do not propose to generalize the findings in anyway. However I will address the issue of transferability.

Focus of Study

The focus of my study was to understand what it's like to be a mother who has a child with cerebral palsy. I had no preconceived ideas about this topic because I had little knowledge about cerebral palsy. The daughter was a senior in high school and I had never met her. I know the mother as a fellow student and as an instructor. The mother was teaching a class that dealt with parents of children with disabilities. We had a professional relationship and she was willing to talk about her experiences.

My reasons for working with this mother had to do with her availability and her willingness to share her story.

For the purposes of this study I am using a pseudonym for my participant and all he children, so that she will remain anonymous. She told me that I had her approval and permission to use her real name, however I feel that it is my responsibility to protect her identity.

Interview Questions

In the questions that follow, I intended to collect relevant data about the focus of my study. To understand her feelings, I had to develop open-ended questions to give her the opportunity to describe her story as she saw fit. I wanted to understand what it has been like for her to have a teenage daughter who has disabilities.

My primary objective was to make sure that the mother was comfortable with the interview process and that it was a positive experience for her. Since I did not wanted her

to feel judged by me, I had informed her that I was interviewing her for the purpose of the case study and not for any other reasons.

The interview questions were general in the beginning, but became more focused towards as the conversation progressed.

1. Diane tell me something about all your children.
I wanted Diane to feel relaxed. This question gave her the opportunity to open up and give me some understanding about her family.

2. Diane what is your relationship with your children.
I did not want to start talking about disabilities right away. I wanted her to focus on all her children and in the process talk about her daughter with CP (cerebral palsy). This helped me understand the uniqueness of her relationship with each of her children.

3. Diane tell me something about Laura (daughter with CP)?
This was a direct question. However I did not think that it was out of place since it was a follow up from the previous questions. It is also very open-ended and it let Diane tell me what she chose to. She decided what she wanted to share with me since I was a stranger.

4. Diane I want you to focus on different stages of Laura's life. Describe what impact these different stages had on you?
This question gave Diane an opportunity to open up and describe her situation in detail.

5. What has your role been at each stage of Laura's life?
This was a sensitive question, but it was non-judgmental since all parents play a role in the lives of their children with or without disabilities. Since it was open-ended, Diane was able to elaborate. This question also opened the doors to further questions because it was a broad question.

6. What are your dreams for Laura?
I wanted Diane to share with me what she wanted for Laura. I also got a glimpse of her feeling about what has been like to have a child with disabilities. This question also showed me that her dreams for Laura are the same dreams that Laura has for herself.

7. Diane what advice can you give to parents who are in the same situation as yourself?
This question is designed to let Diane reflect and focus on the needs of others and at the same time share her feelings about her situation.

8. Describe what the prom means to you.
During the first interview Diane mentioned that Laura wanted to attend the prom, and how important that is for her. I wanted to understand the significance of the prom from Diane's perspective, and how it has impacted her.

Ethical Considerations

Several ethical considerations were taken in conducting this case study. I obtained informed consent from Diane before starting the process of collecting data. I approached her with an exact explanation of what I wanted to know and what I was planning to do with the data. I did not want her to feel intimidated about the project. I wanted to help Diane feel like my partner in this study, and therefore I had to show her that I had no set agendas.

I met Diane in the education building for the interviews, and she gave me her official consent to use her first name during class discussions and in writing up the case study. There was some information that she did not wanted me to share with the class and I strictly followed this. I also told Diane that if she wanted a copy of the case study, I would be more than willing to provide one.

I informed Diane that although I was tape recording the interview, at the end of the data collection process, I would not share the tapes with anyone. I feel that the tapes contain a lot of private information that has to be guarded. I did not use certain sections of the tape because they were not useful for my purposes, and Diane was reluctant to share some of the information about her personal life. I did not make any extra copies of the tapes. I also assured her that I would not share the tapes with the instructor.

Methods of Data Collection

Interviews

Interviews were the primary method of data collection. Four open-ended interviews were conducted to gather the pertinent data. The first interview was used to establish rapport and to answer some basic questions related to Diane's family structure and her relationship with her children. This interview took place in one of the empty offices in the education building.

During the follow up interviews, which were conducted in the education building and the biological sciences building, specific ideas were explored in depth and clarified. These interviews were conversational in style to promote partnership between Diane and myself. The time duration for these interviews was an hour to an hour and a half each.

I audio-taped all the interviews and transcribed them. I took down some notes during each of the interviews, but most of the time, I simply listened to Diane describe her story. Although my questions were open-ended, I asked the same question in different contexts to ensure that the answers I was obtaining were consistent. In doing so, my objective was not to interrogate Diane, but rather check to see if she understood the questions the way I thought she would.

Class Observations

Since I was a student in Diane's class, I was able to take in-depth note in class. I used these notes to gain additional information about my topic, and to develop further questions. The class observations also provided with an opportunity to gather information that gave me further insight about my topic. During the lecture Diane would talk about certain issues that she had not mentioned during the interview. For example, she mentioned how important inclusion is to parents of children with disabilities. I made a note of her remarks and later approached her for clarification. She desperately wanted her daughter to be included in all the mainstream activities. Diane invited several guest speakers who were parents of children with disabilities. They also mentioned the need for inclusion. Diane used their stories to describe what she had gone through. During follow-up discussions Diane gave the class insights into her feeling about her daughter, and why inclusion was a basic human right of every child with a disability. She compared her own experiences with those of her guest speakers, and thus I was able to relate better to her ideas and feelings.

Articles

Diane also mentioned articles that described her experiences with her daughter Laura. Diane mentioned that the grieving process that parents of children with disability go through is similar to that of those of parents who are mourning the death of a child. It is the death of a normal child. I examined these articles that made this comparison. I sought these documents to corroborate data that I had collected from the interviews. Since I had also completed a literature review before the study, I had a framework to evaluate her responses with.

Analysis of Data

I employed the constant comparative method of qualitative data analysis in analyzing my data. After I transcribed the interviews, I printed out my transcriptions. In the margins of the transcripts, I made single-word notations for the themes that emerged from the transcripts. After I had completed this process I was able to see the emergence of certain key themes.

I saved the original print out of the transcripts. On the computer, I began reading the transcript to find the units. As soon as a unit was identified, I hit the enter key so that each unit would be separate. After all the units were identified, I saved the document and printed it out. Since I had clearly identified units, I simply had to cut them out. I listed the page number of the transcript behind each unit.

As I began grouping units into themes, I started typing the themes on the computer. When all the themes were typed up, I started cutting and pasting the units into the category. I was able to pull up the exact unit from the transcript because I had the page number listed on the back. When all the units fit into the themes, I began reading the new document. If I sensed that some units did not fit adequately into the existing themes, I moved them around. At the end of this process I was able to work on the organization of the case study.

The themes that evolved centered around not only what Diane's relationship is with Laura, and how Laura's disability has affected her, but also around what her relationship is with all her children.

While writing up the case study, I used the themes as the titles for introducing different aspects of Diane's life.

Ensuring Credibility of the Finding

Trustworthiness
Several criteria exist in qualitative research that ensure the credibility of the finding. In qualitative research, standards of trustworthiness have to be adhered to. For this case study I have taken the following measures to ensure that my findings be given serious consideration.

Peer debriefing
Peer debriefing is a term that means inviting others to review and discuss the research as the researcher proceeds along. This method ensures trustworthiness. It helps to build credibility by allowing an informed peer to analyze the questions asked, listen to the researcher's ideas and concerns, and to raise concerns that might arise from the research. I met with three fellow students from class to review the questions that I proposed to ask. We had in-depth conversations in person and over the phone. We discussed my interpretations of the themes that were emerging from the transcripts of the interviews. I met with one student three times outside of our class. With the other two participants I met during class. As a result of collaboration I clarified some of my questions and eliminated some questions that appeared to be leading.

Member checks
In order to present an insider's view, it becomes crucial that the participant agree with the interpretations of the researcher. The interpretations presented need to be verified by the participant. I made a point to retell the different sections of the story before conducting the follow up interviews. I also gave Diane the completed account of our interviews, so that she could make changes where needed. She verified or negated interpretations and conclusions. I made an effort to use as many quotations as possible while telling Diane's story, so that her voice could be heard clearly. After Diane completed her analysis of what I had written, I made the changes that she suggested by rephrasing or rewording certain sections of the case study, and confirmed the changes with her. I emailed the entire case study and Diane had a chance to read it. She told me that I had fairly and accurately represented what it is like to be a parent of a child with disabilities.

Time

There was a prolonged engagement with the respondent. This helped me develop an emic perspective. I was able to establish rapport with Diane because of the time I spent with her during the course of a semester.

Triangulation of Data
Triangulation is a method of increasing the trustworthiness and the credibility of the study. I triangulated my data using interviews, documents, observations, and audio-taping Diane's son during class. He was a guest speaker and he talked about what it has been like for him to be a sibling of a child with disabilities. He made several references to what his mother had to go through because she had a child with a disability. I clarified this information with Diane.

Transferability
Transferability of a qualitative study is dependent on the thick description that the researcher provides. For example, the researcher should try to describe the chosen topic of research in as much detail as possible. The aim is to demonstrate the applicability of the findings from one setting to the next similar setting. The researcher, however, does not state the applicability. Instead through rich, thick description, the reader should be able to see the applicability.

I have attempted to describe my participant and the topic of my case study in detail. Through this, I hope to convey to my readers a sense of what parents of children with disabilities feel. I have covered several aspects of Diane's life that show how she feels, being a mother of a child with disabilities. Her story can be the story of any parent in her situation.

Dependability
Since there is a chance of researcher bias in research, it is important for the researcher to be object during each stage of the research. From the beginning I used outside sources to confirm the truth of what I was learning. I made an effort to stay focused on my topic, by asking questions that were relevant. I also used articles to confirm what I was hearing from Diane. I was an objective listener during the interview, and after the interview, I clarified with Diane what I had understood.

Confirmability
Confirmability deals with the question, "Do the data help confirm the general findings, and lead to the implications?" (Marshall & Rossman, p. 145). I kept all the audio tapes of the interviews, and all the transcripts. The notes that I took during the interview were separate from the actual transcripts. The summaries of all the transcripts were shared with the respondent for confirmation. I also used peer-debriefing as a means of critically evaluating my research questions, and data-analysis. I checked the data (transcripts) several times against my own notes, to make sure that I was not misrepresenting my respondent.

Limitations of Study

There are some limitations to this study. Since Diane was my instructor, and the fact that she was also in the doctoral program made me feel intimidated at times. I was wondering whether I was doing an adequate job of interviewing, and if my questions were as insightful as Diane said they were. I tried to remedy the situation by preparing more carefully for the interview. I made sure that I listened to the tapes of the interviews several times before asking questions. Also, I made a serious effort to ask Diane to let me know if I was doing a poor job.

Although Diane's story can be any parent's study, it is not the story of a minority parent. It is also not a story of a parent from a low socio-economic background. These are some of the limitations. However since having a child with disabilities is a unique challenge for any parent, in some ways this issue transcends the cultural and economic boundaries.

Diane and Her Four "Great" Children

Diane's most defining role is that of a mother. She has a unique bond with each of the children. She told me about each of them with great enthusiasm. The birth of each child was exciting and unique, and brought forth with it new challenges. Diane also discussed her relationship with each of them and what impact they have had on her.

Tom: The Athlete

When I asked Diane to tell me something about her children, she seemed excited and eager to talk. She began her discussion about them by saying that "They are great!" She chose to talk about them in their birth order, but elaborated on Laura after she had discussed all of them. The discussion began with Tom, her eldest. It was evident during the conversation that she admires Tom immensely. She is extremely proud of his achievements.

> *Tom is my eldest, and he is twenty. And when he was born he did everything according to the book, and you never worried about any of the milestones. As a matter of fact I thought he was a genius. And I remember going to his three-year conference, and the teacher told me that she always gauged everything by Tom because she thought of him as being sort of normal. And I was just appalled, because I just thought that he was incredible. Anyway. He really taught me a lot about parenting. I had been a teacher for years and years and from him I learned how exciting it was just to watch those different stages and respond to him, and all that stuff.*

When I asked Diane to discuss her feelings for Tom, she smiled and said:

> *Since he is my first born, for some reason there is a hook. And because it is a mom-son thing. They all pull my heart strings, but he can really jerk them! But he was a great kid to raise. He was very athletic, very popular, and so we experienced a lot with his high school, because a lot of our social life was around the things he had done. He is pretty much a star in terms of what he was able to do athletically.*

In terms of the current relationship, Diane expressed some concern.

> *With Tom, hopefully my relationship will be improving. In his last couple of years in high school, he rebelled a lot. And got pretty angry at me. And really rebelled against our life style, parenting and all that kind of stuff. And since he has gone away to college, he turned to the family for support. He struggled a lot in college. Right now that relationship is tentative. Part of what is happening is moving from parent-to-child to more adult-to-adult. And trying to help, and guide, and give the benefit of your experience. But yet not be over parenting.*

He is at UCLA, and, although "he got away as far as he could go," Diane felt that it was very healthy for him.

Oliver: The Entertainer of the Family

Since Laura was born with a disability, Diane decided to wait before having the next baby. They waited quite a while. It was six years after Laura before they had their next child. According to Diane, Oliver was just an "absolute treat." She said that he was her hardest baby to deliver, and he also had a disability, but it is not as profound as Laura's. At his birth they were aware that something was wrong, but they did not know what it was. According to Diane, when he was born, his soft spot was big at the top of his head. With a huge smile on her face, Diane recalled what Oliver looked like at birth.

> *He had this heart-shaped head, and curly red hair. And so he just came out looking like this little imp! And he has sort of maintained those characteristics all along. He is the joker of the family. He is into theater, and that sort of all about what he is.*

Diane described her relationship with Oliver as the best relationship. She referred to him as an "open" child who says the most "outrageous things." For example, Oliver approached Diane to find out what the rules were about having his girl friend in the basement. When Diane asked him what he thought the rules were, he said, "Why don't you yell downstairs 'are you having sex?'" Both of us began to laugh and she said that she told him that she was going to be with him in the basement with his girl friend.

He is the one who asks Diane how her day is and how she is feeling. He is twelve years old yet he cuddles up in her lap.

Mary: The Youngest

The fourth baby was born five years after Oliver. Diane did not talk about Mary in great detail. She mentioned with a smile that Mary is "exhausting," and that she enjoys reading Dr. Seuss.

> *And that was just wonderful. Mary must have known that she had to come out with a very strong character and she did. From the minute she was*

born, she has let her presence be known. She screams, she yells, she demands, with hands on her hips and that's the way she is. But she is delightful.

In terms of her relationship with Mary, Diane felt guilty.

I probably feel the guiltiest about Mary. I am not in synch with the parents of kids that are Mary's age. I am also at a stage that I am looking at a second career, and I've been gone, and so the play group and the swim lessons, and the long bike rides are just not there as much as they were there for the other kids. And so a lot of my relationship with Mary is guilt. It might not be as natural as it was with some of the other kids. There isn't that sort of a normal routine of hanging around and cooking dinner. But the kids are real close. So you see that when you have families the size of our families. And so she gets the benefit of other experiences that I am not able to give her.

Laura: Committed to Succeed

Laura was born almost two years after Tom and Diane described her birth experience in more detail after she had completed talking about the other siblings. Diane took a deep breath and began her story. She stated that "from her birth on, it was just a very different experience." Diane was absolutely overwhelmed at having two children, both in diapers. But she was thrilled to have a boy and a girl. When she and her husband were in the recovery room, they cried because it was just so incredible to see a baby that had just been born. She described what had occurred at birth and what life was like after she and the baby came home. Diane described Laura's birth as "very quick." "In fact, we barely made to it the hospital. And there was something very scary about that, and I did not know what that was about." But for a while at least, everything seemed fine. Her APGAR score was between 7 and 8. Diane recalled that there were some reason for concern but "everybody said it was fine."

With a lot of love and jubilation, the new parents brought their baby girl home. However, at about three or four months, they realized that her development was very different from that of the other children. Her muscular development was very tight on one side, and quite loose on the other side. "But the thing we keyed into the most was that her left hand was fisted all the time, and contracted to her chest. And she had very low affect." So they went to the doctor and raised these questions.

Finally, at about seven months, Diane went into a panic. The parents decided that they would take things into their own hands, and consult with a neurologist and an orthopedic doctor to see what was going on. Diane made an appointment with the pediatrician to discuss her concerns. When she went in to see him, he gave her a file on Laura. What he had been doing was consulting with a neurologist and an orthopedic through letters. They had diagnosed that Laura had Cerebral Palsy. "And that's how I found out about her diagnosis. I was alone because we did not know that anything was going to come up in this meeting. I went to a friend of mine, and we both cried."

This was the beginning of lots of hard work and perseverance for Diane and her husband Dave. As soon as they got that diagnosis they were immediately introduced to the medical system. Laura was hospitalized for about a week. She went through extensive neurological testing, which confirmed the label of Cerebral Palsy. The doctors explained to Diane that Laura had had a stroke during the pregnancy, and that they had never been able to detect it. Nor could they ever give a reason for why it happened. Diane remembered a doctor who was trying to help her, explain that the stroke could have been caused by a sneeze, or a hiccup, or even when Diane had walked up the stairs.

> *It could have been anything. But the "anything" he said was the stuff I had done. And that was very difficult, because I held the responsibility. There was a lot of guilt thinking about the glass of wine I had had, that I probably shouldn't have. And the time I went water skiing when I was pregnant. You go back through everything you might have done.*

While the parents were grappling with the medical diagnosis, they were also plunged into the educational system. They were told to get Occupational Therapy services, Physical Therapy services, Speech and Language services, and Social Work help. Diane remembered feeling "clueless." She had never known anybody with a disability, and she had no idea what it meant to have Cerebral Palsy. She remembers vividly the reactions of members of the community. People from her church called her up and told her how sorry they were, and that the disability would impact Laura's life expectancy. "The way people responded to me was difficult."

> *We started into a 0-3 (zero-to-three) program, and it was every single day. I had to drag Tom to Laura's therapy all the time. And from those therapies you were supposed to do certain things at night. The doctor told us he did not know if she would ever walk or talk. The prognosis that we were given was just horrible. There was this constant struggle to enjoy the baby but then feeling you were not doing enough, and you had to do more. On one hand you would see the kid as a kid. And on the other hand it was medical. It was very confusing.*

One of Diane's strongest memories revolves around a social situation at a park where a woman exercised her freedom of speech!

> *I remember taking Laura to a park. A mom and a kid came up to me and asked, "what's wrong with your child?" I said she had Cerebral Palsy. And I really needed to say those things, because I needed to let people know that there was a reason. And I needed that for a long time. But when she heard those words she picked up her child and left the park. So there were things that kept telling me from professionals and community people that having a disability was not acceptable. That it was bad and it was a*

burden. It was hard, because she was my baby and I wanted to enjoy her. But there were these other messages.

The messages that Diane received from her family ranged from pity to no concern at all. Diane's mother responded with incredible sympathy. She would get angry at Diane because Diane would push Laura. Laura had a high chair that was crafted for the purposes of therapy. She was supposed to hold on to it for therapy. Sometimes she would cry and the parents would push her to hold on to it some more and for a longer time.

I remember my mom getting real angry at me for pushing her. It was really the poor and pitiful, and "lets take care of her" attitude. And my thing was to get the most of it and it was hard to keep pushing Laura.

Diane's husband's family, on the other hand, reacted as if nothing was wrong, and that Laura was just fine and "we were making this all up, what's our problem. So we had these two responses that were totally different."

Moving on to her current relationship with Laura, Diane expresses some concerns. She worries a great deal about her relationship with Laura for many reasons. She feels that often-times she has had to play the role of teacher.

I don't think that Laura and I have had a chance to just be playful in our relationship. And she is big in teenage stuff right now, and so there is that push pull. You know people say that, before you go away, you dirty the nest. She is rebelling, and there is some of that push pull kind of stuff. One minute she is that little girl, and one minute she is really screaming that I am bugging her and that she is not a baby. So I say that in this relationship I have had to be much more guarded with. Much more distant and even more objective. I think that much of the guardedness is because if I would allow myself sometimes to get so much into it, it would overwhelm me.

There were tears in Diane's eyes, although she tried to laugh it off by reminding me that she had told me that she would cry.

Laura is aware of her mother's sensitivity and she has told Diane that she does not like to tell her things sometime because "you have too much sentiment Mom." Diane admits that she reveals her emotions. Diane realizes that it is hard for Laura sometimes because she feels responsible for "keeping me happy." ‘

It's hard, because she is cautious with me. Sometimes I think that to protect myself in all this is to protect her from feeling like she has to take care of me. I am more guarded in that situation.

The Impact the Disability Has Had on Diane

Attending to the needs of Laura's siblings

I was very anxious to find out if having a child with a disability had impacted Diane's own life in any way. Diane confirmed that it had affected the ways in which she responds to her other children, and the way she feels.

> *From my perspective, I feel that there have been times when we have had to give more attention to Laura, especially when she was little, and there were so many things we had to do in terms of therapists and doctors. But even as she is growing up, the expectations are clearly different for everyone in the house. There have been times when the kids have complained that Laura doesn't have to do that much.*

I was curious to find out how the siblings felt about their mother's treatment of Laura, and whether it had had an impact on them. Diane had only eluded to the feelings of her other children towards her treatment of Laura, and I wanted triangulate her story with that of her other children. Diane had scheduled her eldest son Tom to come and talk to the class about what it has been like to be a sibling of a sister with Cerebral Palsy. I recorded the lecture, and found him to be an amazing person. While talking about his feelings about his sister, he also talked about Diane's treatment of him.

Tom began his discussion by introducing himself and his family, and proceeded to talk about Diane:

> *I don't exactly remember when I realized that my sister had a disability. I don't remember when I came to the realization that there were things that I can do that she couldn't, or that she was different from me. I don't know that I ever came to that realization entirely.*

He proceed to talk about the way he was treated by his family. He said that as a young child he was annoyed when he would have to do more physical work around the house than his sister. He mentioned that his father was "really into chores," and that Tom would have to mow that lawn in the heat, while Laura had to empty the dishwasher. "It made him really mad." He said that when he realized that Laura had a difficult time doing physically demanding tasks, he stopped complaining. He also pointed out that he realized how hard his sister worked in school while he "hardly finished his homework." She would spend four or five hours a day trying to finish her homework, and she would get very angry that he was watching television. "So things balanced out."

When I asked him if he felt that he was treated unfairly, he said "Not really. Because Laura had to do some things that I didn't have to." However he voiced one concern: "I wish my parents had told me why Laura did not do certain things. I wish I had known that she had Cerebral Palsy when I was younger."

Diane had mentioned several time during class that her children had a very solid relationship, and Tom confirmed this by telling the class that he really loves his sister. He also read a letter Laura had written for a project.

My brother influenced me by telling me that I could do a sport even if I had Cerebral Palsy. My brother's name is Tom. He is seventeen years old. Whenever I would try to play a sport, and do it with my left hand, he would encourage me, and not be a kid who would put me down. I liked that, because it would give me a lot of courage. He has changed my life over the years, because he is kind and a wonderful brother, and I won't change him for anyone else. At times he can be mean, but he tries not to hurt me. He tries to make me see if I am doing something right or wrong. He's a cool guy, once you get to know him.

Diane mentioned that she had tried to instill in all her children a sense of responsibility for each other, and after meeting Tom, I think she has been very successful. Diane is also very cautious of the needs of her other children.

I think sometimes I flip the other way. You know Laura could really hang out with Oliver's friends who are in 7th and 8th grade, and I won't let that happen, because I don't want Oliver to feel that he has to take time to entertain, or always be with his sister. So sometimes I think I go the other way. It is a hard balance.

She as a mother wants her children to be responsible for each other on one hand, but on the other hand tries to respect their needs, for privacy and independence.

Diane felt that Laura has had an impact on her siblings because: they felt a need to explain for whatever reason Laura's behavior. They have seen Laura through a fit. By that I mean get out of control and not being able to talk through it and stuff. I know Tom had to and Oliver probably had to defend her in front of his friends.

Diane has also set a high standard for all her children because of how hard Laura has worked. Laura's level of determination is used as an example for the other siblings.

I think that since Laura has such determination, that sometimes my frustration level is higher with Oliver and Tom, who are so capable and when you see them not working to their full potential, in contrast to Laura, who gives it her 150% all the time.

Although Diane admitted to treating all her children differently, she is not apologetic about why she has chosen to do what she does.

Everybody is who they are, and their needs are different at different times. So one kid will get more one time, and another kid will get more another time. It's that way with Christmas presents, it's that way with attention, and it's that way with our time.

When I asked Diane if her treatment of her children would have been any different if Laura did not have a disability, she said:

> *Maybe. But Laura taught me because of who Laura is. I am more sensitive to it. I want each of my kids to recognize their gifts and use those gifts wisely. Laura has served as a model for me, and as a model for the kids. The impact of having her there has made it more meaningful to them, and to all of us.*

The Grieving Process

Several times during the course of the semester, Diane referred to the grieving process. During class she showed the students videos that described the grieving process. Although Diane made comparisons between herself and other parents who experience this process, she did not describe why she was grieving. I asked her to describe to me what the grieving process has been for her. Diane described it as:

> *It has been on-going, and there have been different periods where I have been really aware that this is about grief, about acceptance, although I don't like the word acceptance. I don't feel that there is non-acceptance. It's a deeper understanding of what it is like to have a child with a disability.*

Her strongest memory of when it really "hit" revolves around a time when she had an exchange student. Diane and her family have exchange students who come yearly, and the family fosters them. They are usually graduate students, but one year they had an eighteen year old girl from Paris. She was "absolutely lovely." She was there to understand how an American family worked. She would "hang out" with Diane in the kitchen and she would stay up and talk. She wanted to understand what parents' expectations were in terms of boys and girls and she would talk about her mom and dad. She was also home sick. She spent a lot of time with Diane. "There was something that hit me in that relationship that I think I got very sad realizing that I probably wouldn't have that kind of a relationship with Laura." However, Diane, upon reflection concluded:

> *Now that I have raised two teenagers, I think I never would have had that kind of relationship (laughs), just because she is my daughter. But at that time it really hit me because Laura was about eleven years old, and Tom was twelve. And it hit me that that was what I had lost. I had lost the daughter that would be real connected and would be cognizant enough to ask me all those "what if" kinds of questions, futuristic kinds of questions.*

When Laura was younger Diane remembers going past playgrounds and it would "grab" her that "she (Laura) was not part of the group." "You know that this is not the kind of life she has. She does not have a group of kids that she hangs out with."

Diane was also grieving the loss of a close friendship that she had with her sister growing up.

> *The loss was that I grew up with one sister, and the loss was replacing that sister relationship, and that closeness, and looking to Laura as doing that. I think I am more realistic now that I think that some of these things might have happened anyway. But it is exaggerated for me because she does have a disability*.

Grieving has been "sort of cyclical." For Diane it has been more profound at the transitional times like junior high and high school. Also knowing that Laura's career is not like that of Diane's or "even close to it, or like that of her brother," has caused Diane to grieve.

Diane's Role in Laura's Life: An Advocate

In Diane's own words, she described what her main role has been in Laura's life:

> *I think that probably the biggest role that I've had to play has been that of an advocate for making sure that things were on track. We have done it through a couple of ways. We've done it through the school and we've had outside resources to help us help Laura stay in the mainstream as much as possible.*

She also stated she would not be getting her doctorate in Special Education if it were not for Laura.

> *There is that personal side of it too that changes you. When I saw her schooling in a segregated environment, I knew that would not do, and so I got my Master's in Special Education.*

Early school years

I asked Diane to describe what it was like for her when Laura began school. After the struggles with the early childhood programs it was time to deal with the public school system. Laura was placed in a Special Education school although she lived in a neighborhood where the school was practically in her backyard. All she would have had to do was walk through her backyard with Diane and arrive at school. However, she could not go to that school. She was bussed for forty-five minutes to the Special Education school, and she was bused with the same kids that were in her class. She was one of two girls, and one of two whites. The other girl was a minority student. Laura went there for three years and had the same teachers for three years. The parents watched their daughter's school experience patiently. She had no social life. The family of the other little girl wanted nothing to do with Laura, and therefore there was no social life after school either. Diane kept looking at Laura's educational experience and comparing it to Tom's, and it drove Diane "absolutely crazy."

This awful experience resulted in Diane fighting for her daughter and becoming an advocate for her. She made a commitment to get Laura out of the Special Education, and Diane decided to go back to school and get her Master's in Special Education. She had always believed that one had to change the system from within.

Changing the system was going to be an uphill battle. Her first encounter with the system set the stage for what Diane had to face later. Since Laura was in the Special Education system, the parents had to call a meeting to discuss their plans for a different placement. The first IEP (Individual Educational Plan) meeting was a nightmare for the parents who were so proud of themselves. They felt that they had experienced what they thought was a horrible school experience. They thought that they had "really done their homework." Without any help from the school system, they went and looked in the district and found the perfect school. They were very excited, because they thought this was the perfect school for Laura.

Their happiness did not stand a chance at the meeting. At the meeting, they requested that Laura be transferred to this school. The reaction of those around them was that of outrage.

> *It was just horrible. We had the principal tell us that what we were doing was immoral, because what it meant was we would have to change her label from LD (Learning Disabled) to DD (Developmentally Disabled). But we were not going for the label, but for the environment. Even though she was going to be labeled DD she was going to be in a least restrictive environment. We wanted a better educational experience. We were told we were immoral. That we were unethical, and that it was illegal. People were standing up in this meeting and yelling at us.*

As terrifying as that experience was, it did not stop Diane from fighting back. Diane and her husband had to threaten a lawsuit to get Laura into that school. Diane was convinced that Laura received the placement in the Special Education school because the school needed a white child, and the fact that she was girl was an added advantage. Recent research confirms Diane's speculations. There is an over representation of minority students in Special Education for several reasons including mislabeling, and sometimes the system is criticized for that.

By the time they were able to get her into the regular school, she was in fourth grade. Diane recalls

> *How absurd the entire situation was and when you look back on things like that you feel really stupid. We should have known better, but you have professionals telling you that this is the way things should be.*

She did conclude that since it was the early 1980's, the idea of inclusion was unheard of, and they were going against the grain.

The Middle School Years

From grades six through eight, Diane felt that she could take a break. The advocacy piece was still present, but the school's philosophy coincided with Diane's philosophy of education. Laura was thoroughly involved in the process of attending IEP meetings and advocating for herself. She gave a presentation in her social studies class, on what it means to have Cerebral Palsy, which was so well presented that the teacher called Diane to congratulate her. Laura was understanding what her rights were and she was taking the initiative in demanding what was rightfully hers. During a school assembly the principal honored all the students who had received A's and B's on their report cards. However he failed to call Laura's name and this prompted Laura to approach him. He told her that since she was a Special Education student, the criterion was different. However in the process of telling her that her A's and B's were not the same as those of students in a regular setting, he realized how absurd his explanation was. And so Laura and the principal changed the school policy. As a Special Education teacher in Chicago Public Schools, I could relate to this experience. On my first day at my job, I was told the I could not give my students A's or B's, or F's. When I questioned my supervisor, she told me that my students were not performing at the same level as their peers, and therefore all they could get was a C or a D. I was not allowed to give out F's because I cannot retain Special Education students. Diane described these middle school years as a "time where I could sit back and watch."

The High School Years

Although the educational setting was under control for Laura, the social arena presented problems in high school. Diane found it difficult to see that Laura did not have a social life. Because of the lack of social opportunities available to Laura, another role that Diane had to play was that of a social network coordinator. The parents have created a social network around Laura, and a lot of it has been with the church. Diane and her family are extensively involved with their church, and, through this involvement Laura has been able to get in touch with young adults. Many of the connections she has made are with the young adults in the church or youth group leaders who are in their early twenties. Also, Diane has always presented a picture of success to of Laura by giving her the opportunity to meet successful individuals who have disabilities.

To facilitate the process of socialization further, birthday parties have been family parties. For example, Laura's sixteenth birthday party was a huge bash. Her parents and other family members made an elaborate album for Laura and everybody gave Laura advice. The family transformed the birthday into a ceremonial occasion.

Diane credits Tom for playing the biggest role in Laura's life. When he was in high school and as popular as he was, he brought "tons of friends around and since he was older he was sort of able to see what was going on." He included her in everything. But since he has been gone for three years, that network of friends has disappeared. Laura tried to pull some of Oliver' friends and that has been hard for Oliver. Laura invited

Oliver' girlfriend to go shopping and she agreed to. However that made Oliver upset because he wanted to be with her. Diane expressed her concerns by telling me that:

> *Whenever Oliver' friends are there Laura is there. Sometimes it really isn't appropriate because Laura is a teenager and is very hormonal. She does not have a boy friend and wants one more than anything in the world. She talks a lot about boys and what she would do if she had a boyfriend. And it is not appropriate around these seventh and eighth graders. That has been that hardest thing to watch.*

Attending the Prom

Diane began talking about the prom by saying that "more than anything right now she wants to go to prom." Both Mom and daughter have gone out and looked at dresses. But Laura does not have a date. Laura has compiled a list of three or four people whom she would like to invite. They are Tom's friends. And Diane is "so afraid that they will say no, and watching her go through that is real painful."

Since I grew up in a culture that did not create the pressure about having a date for the prom, I was curious to find out what the prom meant for Diane. Since I went to an all girls high school, I looked forward to having a huge girls' party. Since we hated our principal, we had our own graduation ceremony without her. However after listening to Diane describe the significance of the prom, I realized how painful it was for her to watch Laura not get that opportunity.

According to Diane, the prom is the culmination of the senior year of high school. There is the sense of getting over the hurdle of high school. Teenagers go a little crazy, and they drive their parents crazy worrying about them for a night. Diane sat back in her chair, and with a smile described the purpose of the prom.

> *It is sort of the rite of passage. It is the biggest dance that they really have. And they make it sort of spectacular. The date becomes important because people usually go with a date. Sometimes a group of kids go together but Laura does not have that group.*

There was also a personal aspect of the prom that Diane described. She wants Laura to share the same positive experiences that Diane had growing up.

> *What it has brought out for me is how prom was for me, and how special it was , and all the activities, and the guy that I went with. I mean all the stuff that she doesn't have. So that sense of loss is there.*

Dreams for the Future

College

Diane told me in her first interview that "the doctor told us that Laura was never going to walk or talk, but now Laura is going to college. I never dreamed that Laura would ever go to college." This is a big moment in Diane's life.

> *And probably the most important thing in the world is that she is going to college. We are so excited. We applied to ten places. What we have basically gone for has been the environment. We had some good experiences and we had some bad experiences. Our first experience was really horrible.*

Diane described the first experience in detail. She pointed out with pride that Laura's resilience beams through in that experience. The family drove up to Milwaukee to see a small Christian school that had an LD program. Diane had a very frank discussion with Laura about what kind of program Laura wanted to pursue. Laura said she wanted to try for the next level of programming which demands a 90 IQ. Since this is what Laura decided she wanted, Diane wanted nothing less. They were welcomed and taken around the college. They talked to the dean of education because Diane wanted to be very frank. She did not want to set Laura up for failure. After the tour of the campus they went back to the main office. The admissions officer asked Laura if she had a good time. She asked Diane if she would like to talk to the a financial aid officer. Everything seemed to be going as planned until the admissions officer turned to Laura and said "We will not even consider your application." She went on to say that,

> *I want you to know that you did the right thing by coming here, and we are so glad you came up here, but given your grades and the classes you have taken we are not even going to consider your application.*

Laura was shocked but kept her composure. However Diane who has "too much sentiment" started crying. While telling me this story Diane started to laugh and she said:

> *But to show you Laura's resilience, we were getting out the door and Laura said "that's the rudest thing that anyone has ever done," and we both started to laugh. That is who Laura is. She has been hit with a lot of crap all her life. She has been to places where she hasn't been accepted because of who she is. Yet she has this determination and persistence.*

Independent Living

I asked her what she expects for Laura, and she said that her goals for Laura were Laura's goals for herself. Laura desires what we all do. She wants a family of her own, a loving spouse, a home, and a career. Laura wants to be an aide in an early childhood center. She has worked very hard, although school has not been easy for her. She is determined to do what she wants to do.

> *Well it's what Laura wants to do. She wants to live in an apartment by herself or with a roommate. She wants to be an early childhood aide in*

> *a classroom. She definitely wants to be married. She wants to have kids. She clearly sees herself as a Mom. I think she sees herself living close to family. She wants to be part of a church. And if those are things that Laura wants, I want her to have those things. Those are my expectations for her as well.*

Diane added that she wants to make sure that Laura is safe, and that she doesn't get into a vulnerable situation. She wants to place her in situations where her strengths can be enhanced. Diane sees her role as "working frameworks around her, so that she can do what she wants to do." She has "had an impact on an incredible amount of people, and people have rallied behind her wanting to help her reach her goal." Diane informed me that Laura just got a summer job. She described what "frameworks" she and her husband had to build to help Laura reach her goal.

> *In order for her to get that job, we had to make a grid for her. She wanted to work at a summer camp. We broke it down to the name of the camp, the contact person, the phone number, follow up and a what happened column. When she sort of had the structure, and we listed all the things that needed to be done, she kept walking through, we provided that structure that allowed her to get the job. She sent resumes.*

Diane does not see those structures being removed, and she feels that Laura will always need someone to check on her financial situation on a regular basis. Diane and her family hope to help Laura figure out what supports Laura needs in order to reach those goals that she has set for herself. Diane firmly believes that Laura can be independent the framework of structures that the family provides.

Socialization

Socialization has been an area of ongoing concern for Diane. In the future, Diane wants to create "some sort of social life around her." She pointed out that it is easier to create a social life for young children. But as the child gets older, the job gets tougher. Diane has some ideas on how she plans to create the social structure for Laura.

> *Maybe that's being part of a volunteer group or something. Maybe being well-connected to a young single group at church. But I see us as figuring out resources for her to be able to plug into. So we are sort of this net. But they wouldn't be things that she would initially instigate on her own.*

Conclusion

The struggles that have arisen from having a child with a disability have clearly impacted Diane. However Laura is not a burden on Diane. There are changes that she has had to make, but having any child changes a parent's life. Diane wants all her children to succeed and Laura is no exception. She admires her daughter and credits her for giving her a focus in life. Diane knows that Laura will succeed in life because of her

determination and a strong desire to succeed. Diane's admiration for and awe of Laura were evident in her voice:

> *I admire her incredibly (started to cry and so did I). She has been very clear about what she wants in life. I am learning a lot from her. The doctor told me she would never walk or talk and then she walked. She did things much slower than everyone else but I was so surprised. You don't have to predetermine anything. She will let you know. Just watch.*

Laura has taught Diane how profound ordinary life is. Diane considers herself to be Laura's student. Laura has taught her about people and human relationships, and how important it is to include all sorts of people. Laura has been able to instill in Diane the value of relationships. For Diane, life is "really about relationships and about supporting one another, and I don't think without Laura I would have learned as much about myself." Having Laura has made Diane look at people differently. She has the need to "get to know people better and in a different way, than I might not have otherwise had."

In conclusion, Diane believes that Laura has changed her life in many ways.

> *I don't know if I would have taken the time to do some things had it not been for Laura. I know that there is much more than meets the eye. And clearly Laura is the catalyst for why I am doing what I am doing.*

Identifying and Differentiating Children with Hyperlexia and its Subtypes: A Meta-Analysis of Results from WISC-III Subtests and Standardized Reading Tests

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Abstract

Hyperlexia is a term often associated with autism spectrum disorders. However, its place on or outside of the autistic spectrum is still very much a debatable topic. In this article, the authors presented their findings on 53 children with comprehension deficit or suspected hyperlexia (based on the diagnostic symptoms described in the Educator's Diagnostic Manual of Disabilities and Disorders), aged between 10 and 14, of both genders, grouped according to four disorders that these children were diagnosed to have: (1) dyslexia (or specific learning disability); (2) non-verbal learning disability; (3) autistic disorder; and (4) Asperger syndrome. Based on selected results of the Neale Analysis of Reading Ability (3rd Edition), the Oral and Written Language Scales: Listening Comprehension Scale and Oral Expression Scale, and the WISC-III, a meta-diagnostic analysis of the psycho-educational assessment results was done to identify and differentiate children with hyperlexia and its subtypes.

Identifying and Differentiating Children with Hyperlexia and its Subtypes: A Meta-Analysis of Results from WISC-III Subtests and Standardized Reading Tests

In Singapore, few people know exactly what hyperlexia is unless it is associated with autism and as such, little is done to help or identify children with such condition. In one unpublished study (see Chia, 1995) based on a survey done by the first author with 25 parents and 36 professionals (including speech-language therapists, reading specialists, psychologists and school teachers), 47% said hyperlexia was an autistic symptom, 21% thought it was related to dyslexia, and the remaining 32% replied that they had not heard of the term. Even the professionals themselves are not certain if hyperlexia is a disorder of language development or a disability of social imperception or both. Parents with dyslexic children can always turn to the Dyslexia Association of Singapore for help while those with autistic children can approach the Autism Resource Center and/or the Autism Association Singapore. However, there is no official body (like the American Hyperlexia Association in the United States) to look into the interest of these hyperlexic children or parents with such children in Singapore. As far back in 1999, one concerned parent wrote

to the local newspaper highlighting the plight of hyperlexic children and their families and argued the need to raise the awareness and support for them (see Phua, 1999).

Literature Review

Research studies (e.g., Cobrinik, 1974; Parker, 1917; Philips, 1930) in the west (especially the United States, Canada and the United Kingdom) on hyperlexic children have been sporadic since the turn of the twentieth century. Hyperlexia, also known as direct dyslexia (Tyre & Young, 1994), constitutes a rare condition where such children despite having a good word decoding facility show very poor comprehension ability. Unlike dyslexic children whose phonological coding deficit has forced them to rely heavily on their prior knowledge for reading, hyperlexic children have direct phonological processing of any given text with apparent ease and often well beyond their vocabulary usage but without real listening and/or reading comprehension. To these children, though they can recognise and read the words, words appear meaningless to them. In other words, their ability to read is often dismissed as barking at print without real understanding. As a result, it has been suggested that the word recognition skills and the general verbal functioning employed in the reading process probably exist separately and apart from each other (Silberberg & Silberberg, 1967).

The term *hyperlexia* was not originally meant to denote a form of reading disability (Aaron, 1989). To understand how it came to be a disorder, we have to trace the historical development of research on hyperlexia that, as Aaron (1989) argued, has undergone three major phases of change. They are briefly discussed below.

Phase 1: The Awareness of Hyperlexia

This phase began in the early part of the twentieth century when sporadic reports (e.g., Cobrinik, 1974; Philips, 1930; Snowling & Frith, 1986) in educational literature described children with amazing reading ability but failed to understand what they had read. Often, such an unusual ability to read fluently despite defective comprehension were described within the framework of other forms of disabilities such as mental retardation (Bronner, 1917; Mehegan & Dreifus, 1972), schizophrenia (Silberberg & Silberberg, 1968, 1971), and autism spectrum disorders (Parker, 1917; Philips, 1930) which also includes Asperger syndrome.

One early study done by Bronner (1917) reasoned that such children who performed badly in reading or listening comprehension had severe defects in their power of reasoning, judgment and ability to deal with abstraction. Most of them displayed spontaneous advanced word-calling abilities before age 5 but their expressive language skills, prosody and articulation and reading comprehension were defective. Other studies (e.g., Burd, Kerbeshiian, & Fisher, 1985; Whitehouse & Harris, 1984) reported symptoms characteristic of neuro-physiological anomaly, overt seizure disorders or autism being observed in such children.

Phase 2: The Recognition of Hyperlexia

In the late 1960's and early 1970's, the term *hyperlexia* was used by Silberberg and Silberberg (1967) to describe the word decoding ability that is out of proportion to comprehension ability. This was the beginning of the recognition phase in the field of hyperlexia studies. Silberberg and Silberberg (1971) proposed that children be classified as hyperlexic if "their measured reading level was above their expected word recognition level by the following amounts: 1.5 in grades 1 and 2; 2.0 in grades 3 and above" (p.236). In addition, it was noted that hyperlexics had been retarded children; "sometimes, however, they were children with normal and bright normal conceptualization ability" (Silberberg & Silberberg, 1971, p.238).

Aaron (1989) argued that defining hyperlexia "on the basis of the discrepancy between the expected and actual decoding skill alone resulted in a criterion that is over-inclusive" (p.31). It could lead to labelling some normal or even superior readers as hyperlexic. As a result, certain studies (e.g., Niensted, 1968; Pennington, Johnson, & Welsh, 1987) rejected hyperlexia as a disorder and instead considered it a manifestation of a unique and accelerated cognitive ability in word recognition.

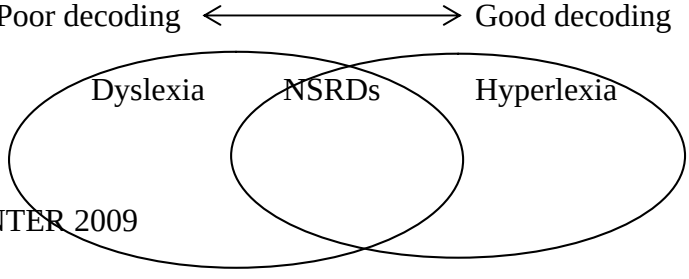
Phase 3: The Conceptualization of Hyperlexia

Since 1971, research studies (e.g., Chia, 1996; Healy, 1982; Richman, 1997) became more interested in re-defining hyperlexia by determining the causes of comprehension deficits among hyperlexic children, i.e., what had caused the breakdown in comprehension despite good decoding process.
Basing on the information collected from other studies and accumulated over several decades, Chia (2000) put forth four different theoretical concepts of hyperlexia that have been derived. They are briefly described as follows:

The Theoretical Concept of an Accelerated Cognitive Ability
Early research studies (e.g., Elliott & Needleman, 1976; Niensted, 1968) suggested that hyperlexia is not a disorder and thus should be described as a syndrome, but a manifestation of a unique and accelerated cognitive ability. Niensted's (1968) definition of hyperlexia includes all children with a one-year discrepancy between word recognition and comprehension scores.

The Theoretical Concept of Bipolarity of Reading Disabilities
This concept proposed by several research studies (e.g., Aaron, 1989, 1997; Gough & Tunmer, 1986) describes dyslexia and hyperlexia as two different reading disabilities that occur at opposite extremes of the reading continuum with a mixture of both in the middle range of the continuum, resulting in a wide range of non-specific reading disabilities (NSRDs) (see Figure 1).

Figure 1: Model of Bipolarity of Reading Disabilities



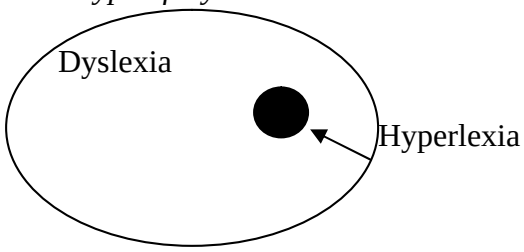
Good comprehension $\longleftrightarrow$ Poor comprehension

The Theoretical Concept of Hyperlexia as a Subtype of a Disorder

Another concept of hyperlexia found in research literature described the condition as a subtype of a disorder that can either be dyslexia (Chia, 1996; Tyre & Young, 1994) or autism (American Hyperlexia Association, 2005; Richman, 1997). In other words, hyperlexia can be a disorder of language development or a disability of social imperception or even both. To understand this concept, there is a need to understand that hyperlexia is a syndrome that results in a breakdown in inter-textuality as well as inter-subjectivity. Three questions that the present authors have asked are: (1) What is inter-textuality? (2) What is inter-subjectivity? (3) How does a breakdown in either inter-textuality or inter-subjectivity result in hyperlexia?

Inter-textuality: Whatever an individual reads and how he/she interprets the text depends very much on the degree of inter-textuality he/she can achieve between the text type (also known as genre) and his/her mental text (Wong, 2003). This is done by establishing the relationship between the given text and other relevant texts the individual reader has encountered previously and are retrieved from his/her long-term memory (de Beaugrande, 1980; Kristeva, 1980). Reading, therefore, can be defined as a complex process in which inter-textuality provides one of the key links for readers to make meaning of the texts for the purpose of achieving reading comprehension (Chi, 1995). It is more than just decoding words and that is why it is also sometimes known as direct dyslexia (Tyre & Young, 1994): an ability to read print easily and surprisingly well beyond the vocabulary usage but without comprehension. In other words, hyperlexia is seen as a facility in word calling with inferior reading comprehension that represents a special instance within the larger category of dyslexia syndrome (see Figure 2).

Figure 2: Model of Hyperlexia as a subtype of Dyslexia



Inter-subjectivity: This refers to "both recognition and control of cooperative intentions and joint patterns of awareness" (Trevarthen, 1980, p.530). It is an essential part of social imperception, which Myklebust (1975) described as an individual's ability or lack of ability to understand his/her social environment, especially in terms of his/her own behaviour. Inter-subjectivity is achieved through both verbal and non-verbal communication through which participants are required to recognize and coordinate their understanding of the links between others' mental states of mind (or theories of mind) and their actions, and to consequently regulate their own role responses to sustain a communicative act (e.g., conversation, role-play, interview, etc.). In this sense, it involves

an understanding of other minds through the understanding of the partner as a person who intentionally perceives a situation that is the same or different from one's own (Tan-Niam, 2003). A breakdown in inter-subjectivity will result in an inefficiency of social imperception that "ultimately contributes to immaturity and difficulty making routine judgments necessary to succeed in everyday life" (Leavell, 1998, p.4). This in turn causes defective theory of mind (also known as mind-blindness) resulting in autism (Baron-Cohen, 1999). Hence, it is not surprising to note that hyperlexia carries autistic traits and may represent a subtype within the autism spectrum disorder.

The Theoretical Concept of Hyperlexia as a Syndrome or Generic Class of Comprehension Disability

There are research studies (e.g., Aaron, 1989; Chia, 1996; Healy, Aram, Horwitz, & Kessler, 1982) that suggest hyperlexia should be regarded as an independent generic class of listening and/or reading comprehension deficit disorder separated from dyslexia. The term "syndrome" is used to describe hyperlexia (i.e., hyperlexia syndrome) because the disorder consists of signs and symptoms that collectively indicate or characterize it as a form of psychologically abnormal condition different from dyslexia and other types of literacy disorders (Manzo & Manzo, 1994).

According to Turkeltaub et al (2004), hyperlexia is a rare disorder that is essentially the opposite of dyslexia – instead of having a difficult time reading, children will read early, often and with extreme skill. Hyperlexia is conceptualized as a specific and identifiable syndrome with the following three key symptoms: (1) a spontaneous reading of words before the age of five; (2) an impaired comprehension of both listening and reading tasks; and (3) the word recognition of decoding skill is superior (Healy et al, 1982).

There are also studies (e.g., Burd, Kerbeshian, & Fisher, 1985; Snowling & Frith, 1986; Whitehouse & Harris, 1984) that suggest hyperlexia is a syndrome associated with autism spectrum disorder. According to the Autism Support Network (2002), its three main characteristics are: (1) early precocious or intense fascination with letters or numbers; (2) delays in verbal language; and (3) social skills deficits (also see EDM, 2007, p.258). According to the American Hyperlexia Association (2005), whether hyperlexia is or is not part of the autism spectrum disorder is a matter of much debate. It is a common trait found in autism and such individuals "have a unique learning style and a better prognosis than those without this reading skill" (p.1).

Although a large number of hyperlexic children manifest autistic symptoms, not all of them do (Aaron, 1997). About two in every 10,000 children with autism spectrum disorders have hyperlexia, and the present authors believe that studying autistic children's development may help explain why some children naturally pick up reading the same way that others pick up spoken speech. The results, they hope, may also improve the understanding of disorders such as dyslexia and autism, and also help children with hyperlexia. Hyperlexia should not be dismissed as a "meaningless splinter skill but it is much more than that even if comprehension lags because reading can be a very useful tool for learning other skills and can be the doorway to language in general" (American Hyperlexia Association, 2005, p.1).

The Study

Subjects

In the response to an advertisement placed by the authors in a local newspaper, parents of 141 children, from as young as 4 years old to as old as 16 years old, who manifested serious problems in word recognition, reading and listening comprehension problems, called up and expressed their interest to participate in the study. Several interviews with interested parents were conducted over two weeks by the second and third authors at the Learning Disabilities Center, Singapore. Once the authors felt that there was a possible case of hyperlexia, the diagnostic symptoms of hyperlexia listed in the Educator's Diagnostic Manual of Disabilities and Disorders (EDM) (Pierangelo & Giuliani, 2007) under the disability category of autism (see AU 5.00, p.258) were used to determine it. Next, an arrangement was made to observe each child with suspected hyperlexic traits to perform certain reading and listening tasks in an observation room at the Learning Disabilities Center. In addition, the first author made a thorough evaluation of every psycho-educational assessment report submitted by the parents of the selected child to make the final decision if the child would be accepted for the study. The number of participants was eventually narrowed down to 32 children (25 boys and 7 girls), aged between 10 and 14 years (see Table 1).

In addition, the authors also chose 21 children (17 boys and 4 girls) with dyslexia to make a comparative study in terms of performance in reading accuracy, reading and listening comprehension, and intellectual abilities with three other groups of children with NVLD, autistic disorder, and Asperger Syndrome, respectively. A formal permission was obtained from their parents through signing a consent form in agreement to release their children's psycho-educational assessment reports to the authors to be used in their study. Among the various assessments, which include the Vineland Adaptive Behavior Scales-Second Edition (Sparrow, Cicchetti, & Balls, 2005), the Autism Diagnostic Observation Schedule (Lord, Rutter, DiLavore, & Risi, 2001) and/or the Bangor Dyslexia Test (Miles, 1997), that all the 53 children have undergone, the authors selected to focus on the results based on the following three standardized tests:

1. Neale Analysis of Reading Ability-Second Edition (NARA-III) (Neale, 1990);
2. Oral and Written Language Scales: Learning Comprehension Scale and Oral Expression Scale (OWLS:LC&OE) (Carrow-Woolfolk, 1995); and
3. Wechsler Intelligence Scale for Children-Third Edition (WISC-III) (Wechsler, 1991).

All the assessments were administered by various psychologists, speech-language therapists and reading specialists between 2004 and 2008.

Table 1: Participants

Age Range (years;months)	Gender		Educational Level
	Male	Female	
10;00 to 10;11	9	3	Primary 4

11;00 to 11;11	11	2	Primary 5
12;00 to 12;11	14	4	Primary 6
13;00 to 13;11	3	1	Secondary 1
14;00 to 14;11	5	1	Secondary 2
Total number	42	11	
Grand total number	53		

Table 2 shows the number of participating subjects of both genders (male and female) in terms of four different disorders: 21 (17 boys and 4 girls) were diagnosed with dyslexia (specific learning disability), 5 (3 boys and 2 girls) with non-verbal learning disability (NVLD), 12 (10 boys and 2 girls) with autistic disorder, and 15 (12 boys and 3 girls) with Asperger Syndrome.

Table 2: Disorder Groups: (1) Dyslexia Group; (2) NVLD Group; (3) Autistic Disorder Group; and (4) Asperger Syndrome Group

Disorder Groups	Male (Number of children)	Female (Number of children)
Dyslexia Group (N = 21)	17	4
NVLD Group (N = 5)	3	2
Autistic Disorder Group (N = 12)	10 (5 out of these 10 have been identified as having High-Functioning Autistic Disorder)	2
Asperger Syndrome Group (N = 15)	12	3

Research Assumptions

The authors have made two main assumptions about hyperlexia and how to identify and differentiate it and its subtypes.

The first assumption is that hyperlexia is a condition that manifests superior decoding (word recognition) ability but poor reading and listening comprehension (Aaron, 1989). This hyperlexic language pattern can be identified through administration of appropriate standardized language assessment tools such as the Neale Analysis of Reading Ability-Third Edition (NARA-III) (Neale, 1999), and the Oral and Written Language Scales: Listening Comprehension and Oral Expression (OWLS:LC&OE) (Carrow-Woolfolk, 1995).

The second assumption is that whether a child is hyperlexic per se (Aaron, 1989; Chia, 2000) or hyperlexic in co-morbidity with another disorder (e.g., autistic disorder) (Kutscher, 2005; Richman, 1997), this can be determined through a proper and thorough psychological assessment using formal IQ tests, such as Wechsler Intelligence Scale for Children-Third Edition (WISC-III) (Wechsler, 1991), to establish the cognitive pattern of hyperlexia.

Instrumentation

In view of the two assumptions stated above, the authors reviewed all the psycho-educational assessment reports of the 53 children and chose decisively to focus on the results of the following three standardized test instruments: the Neale Analysis of Reading Ability-Third Edition (NARA-III) (Neale, 1999), and the Oral and Written Language Scales: Listening Comprehension Scale and Oral Expression Scale (OWLS:LC&OE) (Carrow-Woolfolk, 1995), and the Wechsler Intelligence Scale for Children-Third Edition (WISC-III) (Wechsler, 1991). Selected results (i.e., reading accuracy and reading comprehension from the NARA-III, listening comprehension from the OWLS:LC&OE, and WISC-III subtests) from these test instruments were used in the meta-analysis. Each of the three tests is briefly described as follows:

The Neale Analysis of Reading Ability-Third Edition (NARA-III) (Neale, 1999)
This standardized diagnostic assessment is an individually administered test of reading, measuring the accuracy, comprehension and rate of reading in children from the ages of six to 12, but it is also used with older individuals with special needs (such as reading difficulties).

The NARA-III (Neale, 1999) provides standardized scores, reading ages, parallel forms for testing and extension passages for use with more able or older students. The assessment consists of two alternate standardized tests so that children's performance can be monitored without them becoming too familiar with the passages and one diagnostic test. According to the manual (Neale 1999), the average duration taken to complete the assessment is about 20 minutes.

During the administration of NARA-III (Neale, 1999), the time taken to read is recorded, in seconds, using a stopwatch. Reading errors or miscues, such as mispronunciations, substitutions, refusals, additions, omissions, and reversals, are noted on the examinee's individual record form. On completion of the test administration, an analysis is made of the number and type of error made and recorded as an error count. These procedures provide three raw scores: accuracy, comprehension, and rate. The raw scores are then converted to standardized scores, percentile ranks, and equivalent reading accuracy age, reading rate age, and reading comprehension age.

Table 2 shows what the NARA-III (Neale, 1999) and its supplementary tests measure as well as its word lists extracted from the passages. A more detailed explanation of the reading assessment can be found in the NFER-Nelson website at www.nfer-nelson.co.uk/documents/Assessment.

Table 2: NARA-III, Supplementary Diagnostic Tests and Word Lists

Main Test	Measures
Six reading passages	(1) Reading accuracy in terms of the words correctly read;

	(2) Comprehension ability by asking the examiner several questions after he/she has finished reading each passage; and (3) Reading speed in term of seconds, using a stopwatch.

Supplementary Diagnostic Tests
• Discrimination of Initial and Final Sounds • Names and Sounds of the Alphabet • Graded Spelling • Auditory Discrimination and Blending

Word Lists	Measures
	Accuracy in word recognition

Evidence of concurrent validity is provided via correlations of the NARA-Revised (Neale, 1982) with the Schonell Graded Word Reading Test (Schonell & Schonell, 1950) and the Vocabulary and Similarities subtests of the WISC-R (Wechsler, 1974) ranged from .41 (Rate vs. Similarities) to .96 (Accuracy vs. Schonell). Correlations of the Darmouth Advanced Reading Test (N = 200) with the NARA-III (Neale, 1999) have yielded coefficients ranging from .70 to .77. According to Neale (1999), "… these results generally confirm that the subscores of the Neale Analysis do measure discrete components of the reading process" (p.75). None of these validity data, however, apply to the Supplementary Diagnostic Tests.

According to Neale (1999), the test-retest reliability with testing conducted after an 8-week interval (teachers did the original testing; trained assessors, the second) on a sample of 100 young children yielded coefficients of .95 for Reading Rate, .95 for Reading Accuracy, and .93 for Reading Comprehension. Parallel forms reliability is high. The coefficients were all in excess of .90 for whole-year age groups. The internal consistency was calculated using KR21. Whole-year age groups (N = 140) were employed. These studies provided coefficients of around .95 for Accuracy; Rate around 0.94; and Comprehension in the high .80s. Particularly high levels of reliability were obtained for the younger age groups. No reliability data have been reported for the supplementary diagnostic tests.

In this study, the authors considered only the results (i.e., age equivalents) of Reading Rate and Reading Comprehension from the NARA-III (Neale, 1999) in their meta-analysis of the participants' psycho-educational assessment reports.

The Oral and Written Language Scales (OWLS): Listening Comprehension Scale (LC) and Oral Expression (OE) Scale (Carrow-Woolfolk, 1995)
The OWLS:LC&OE (Carrow-Woolfolk, 1995) is a theoretically based, individually administered assessment of receptive and oral expressive language for children and

young adults aged 3 through 21 years. The OWLS:LC&OE (Carrow-Woolfolk, 1995) consists of two co-normed scales: Listening Comprehension (LC) and Oral Expression (OE). The LC scale consists of 3 examples and 111 items and takes approximately 5 to 15 minutes to administer, depending upon the examinee's age. The OE scale consists of 2 examples and 96 items and takes approximately 10 to 25 minutes to administer, depending upon the examinee's age.

The LC scale is designed to measure the understanding of spoken language. The OE scale is designed to measure the understanding and use of spoken language. Tasks in LC address the lexical (vocabulary), syntactic (grammar), and supra-linguistic (higher order thinking) skills. Tasks in OE address lexical, syntactic, supra-linguistic, and pragmatic, or functional language, skills. Test results may be used to determine broad levels of language skills as well as specific performance in the areas of listening and speaking. In this study, the authors considered only the results of the LC scale.

Table 3 shows the OWLS:LC&OE subtests and what they measure. A more detailed explanation of the language scales can be found in the Pearson Education website at http://ags.pearsonassessments.com/assessments/technical/owls.asp.

Table 3: Subtests of OWLS: Listening Comprehension Scale and Oral Expression Scale

Listening Comprehension	Measures
Lexical Skills	Comprehension of nouns, verbs, modifiers, personal and demonstrative pronouns, prepositions, idioms, words with multiple meanings, words that represent direction, quantity, spatial relations, etc.
Syntactic Skills	Comprehension of noun and verb modulators (e.g., number, tense, gender, voice, person, and case
Syntactic Construction Skills	Comprehension of embedded sentences, coordination, subordination, negation, direct/indirect objects, etc.
Supra-linguistic Skills	Language analysis on a level such as comprehension of figurative language and humour, derivation of meaning from context, logic, and inference, and other higher-order thinking skills.
Oral Expression	**Measures**
Pragmatic Language Skills	Appropriate responses in specific situations, such as questions, courtesy responses, reasonable explanations, etc.

According to Carrow-Woolfolk (1995), the OWLS:LC&OE has internal consistency reliabilities of .84, .87 and .91 for LC, OE and Oral Composite scores respectively. In addition, the test-retest reliability coefficients of the test are .76, .81 and .85 for LC, OE and Oral Composite scores, respectively. The test has an inter-rater reliability coefficient of .95. The manual also reports high correlations of OWLS scales with other measures of receptive and expressive language as well as the tests of cognitive ability and academic achievement (Carrow-Woolfolk, 1995).

The Wechsler Intelligence Scale for Children-Third Edition (WISC-III) (Wechsler, 1991)
The WISC-III (Wechsler, 1991) is one of the most widely used, individually administered IQ assessments for children aged six and 16 years. It consists of 13 subtests and is administered to determine, among other things, the presence of a learning disability. It is best characterized as an assessment that gathers samples of behaviour under fixed conditions, is a measure of an individual's past accomplishments, and is predictive of success in traditional school subjects (Kaufman, 1994; Searls, 1997; Thomson, 2003). Scores on the WISC-III (Wechsler, 1991) correlate highly with academic achievement and it provides valuable information as one of the measures in the diagnosis of various learning disabilities such as dyslexia (Pierangelo, 2003), non-verbal learning disability (Leavell, 1998), and autism spectrum disorders (Sigman et al., 1987).

Table 4 shows the WISC-III subtests and what they measure. A more detailed exposition of the WISC-III, its subtests and their interpretation can be found in Kaufmann (1994).

Table 4: Subtests of the WISC-III

Verbal Scale Subtests	Measures
Information	General factual knowledge, long-term memory
Similarities	Abstract reasoning, categories, relationships
Arithmetic	Attention, concentration, numerical reasoning
Vocabulary	Word knowledge, verbal fluency
Comprehension	Social judgment, common sense reasoning
Digit Span	Short-term auditory memory, concentration
Performance Scale Subtests	**Measures**
Picture Completion	Alertness to essential detail
Coding	Visual motor co-ordination, speed, concentration
Picture Arrangement	Sequential, logical thinking
Block Design	Spatial, abstract visual problem solving
Object Assembly	Visual analysis, construction of objects
Symbol Search	Speed of processing novel information
Mazes	Fine motor co-ordination, planning, following directions

One advantage of the WISC-III (Wechsler, 1991) is the strong evidence of its reliability and validity. According to Kline (2000) the split-half reliabilities of the Verbal IQ (VIQ) and the Performance IQ (PIQ) are both beyond .9 and the Full-Scale IQ (FSIQ) has a reliability of .97, which is exceedingly high. However, the reliability of the subscales varies from .65 to .94 (Kline, 2000). It should also be noted that some of the questions asked in the WISC-III (Wechsler, 1991) may be culturally biased and that the test does not allow for the distinction of Full-Scale IQs (FSIQs) below 40, making it less useful in distinguishing among levels of retardation (Pierangelo, 2003). Of particular relevance to the present study is the point that the WISC-III (Wechsler, 1991) should not be used alone in the diagnosis of any learning disability (Pierangelo, 2003; Searls, 1997).
In addition to a FSIQ, the WISC-III (Wechlser, 1991) indicates how a student performs on verbal tasks, performance tasks, and on each separate subtest task. For this reason, the

WISC-III (Wechsler, 1991) has been useful in the assessment of learning as well as developmental disabilities. For example, disabled learners diagnosed with dyslexia often have FSIQs (with a higher PIQ than VIQ) in the average range or above, has led investigators to observe how they score on different tasks presented by the subtests (Searls, 1997). In another example, the FSIQs of children with high-functioning autistic disorder fall in the range between borderline and average (50-85 range) (with a significantly lower VIQ than PIQ) while the FSIQs of children with Asperger Syndrome fall in the range between average and high average (90-120 range) (with a higher VIQ than PIQ) (McLaughlin-Cheng, 1998). This will be discussed further in the next section under Diagnostic Analysis using WISC-III Profiles.

Criteria for Identification of Hyperlexia

In selecting and interviewing suitable subjects with suspected hyperlexia for this study, the authors examined the subjects' psycho-educational assessment reports to check their results of reading accuracy and reading comprehension from the NARA-III (Neale, 1999) and the results of listening comprehension from the OWLS:LC&OE (Carrow-Woolfolk, 1995) as well as selected WISC-III verbal and performance scale subtests. In addition, the diagnostic symptoms of hyperlexia as listed in the Educator's Diagnostic Manual of Disabilities and Disorders (EDM) (Pierangelo & Giuliani, 2007) were also used.

Educator's Diagnostic Manual of Disabilities and Disorders (Pierangelo & Giuliani, 2007)

The disorder of hyperlexia is not listed in both the Diagnostic and Statistical Manual of Mental Disorders-4th Edition-Text Revision (DSM-IV-TR) (American Psychiatric Association, 2000) and the International Classification of Diseases and Health Related Problems (Second Edition) 10th Clinical Revision (ICS-10-CR) (World Health Organization, 1994). However, the authors have found it listed in the recently published Educator's Diagnostic Manual of Disabilities and Disorders (EDM) (Pierangelo & Giuliani, 2007) under the disability category of autism (see AU 5.00, p.258). Based on the definition and explanation given in EDM (see p.258-259), the authors used the given diagnostic symptoms to identify 32 out of 141 children suspected to have hyperlexia.

Results from the NARA-III (Neale, 1999) and the OWLS:LC&OE (Carrow-Woolfolk, 1995)

As mentioned earlier, results in terms of age equivalents for reading accuracy and reading comprehension from the NARA-III (Neale, 1999) and that of listening comprehension from the OWLS:LC&OE (Carrow-Woolfolk, 1995) were compared with the mean chronological ages (CAs) of the subjects categorized under four disorder groups described earlier. According to research (e.g., Aaron, 1989; Aram, Ekelman, & Healy, 1984; Chia, 1996), children with hyperlexia perform better in decoding or word recognition (also known as reading accuracy) but poorly in both reading and listening comprehension. This forms the first research assumption that there is a hyperlexic language pattern, which the present authors proposed the following criteria to identify children with hyperlexia (see Table 5):

Table 5: Results from the NARA-III and OWLS:LC&OE for Identification of Hyperlexia

Disorder Groups	Chronological Age (CA) (Mean)	Reading Accuracy Age Equivalent (Mean)	Reading Comprehension Age Equivalent (Mean)	Listening Comprehension Age Equivalent (Mean)
Hyperlexia		Excellent (Above CA)	Poor (Below CA)	Poor (Below CA)

WISC-III Subtests in identifying Hyperlexia

There is no clear VIQ-PIQ profile for children with hyperlexia. It can be VIQ significantly greater than PIQ or VIQ significantly lower than PIQ (Richman, 1997). Similarly, hyperlexic children can have low or high FSIQ depending on the type of disorder that co-exists with hyperlexia (Chia, 2000).

Besides poor performance in both listening and reading comprehension tests, Fontenelle and Alarcon (1982) and Goldberg and Rothermel (1984) reported that on the WISC, hyperlexic children did better on the Block Design subtest than on Vocabulary, Digit Span, and Coding subtests. In a later study, Aram and Healy (1987) reported that hyperlexic children also performed poorly in the Picture Completion and Picture Arrangement subtests, and concluded that these children might be skilled in visual-perceptual tasks involving visual discrimination and untransformed visual memory. However, these children might be impaired in tasks that require decision-making and judgment (Aram & Healy, 1987).

Based on these three studies, the authors proposed the following WISC-III subtests to be used as criteria to establish the cognitive pattern to identify hyperlexia (Kutscher, 2005) in children between 6 years 0 months to 16 years 11 months (see Table 6). This constitutes the second research assumption about hyperlexia:

Table 6: WISC-III Subtests for Identification of Hyperlexia

Disorder Group	Info	Sim	Arith	Vocab	Comp	DS	PC	Cd	PA	BD	OA	SS	Mz
Hyperlexia				↓		↓	↓	↓	↓	↑		X	X

Keys: ↑ Significantly better performance in the subtest when comparing with the other subtests

↓ Significantly worse performance in the subtest when comparing with the other subtests

X Subtest was not administered

Results and Discussion

The authors used the psycho-educational assessment reports of the 53 participants and categorized them under four disorder groups: (1) Dyslexia Group: (2) NVLD Group; (3) Autistic Disorder Group; and (4) Asperger Syndrome Group. The first author made a meta-analysis of the results based on three standardized test instruments (i.e., NARA-III,

OWLS:LC&OE, and WISC-III) taken from the 53 participants' psycho-educational assessment reports. The results of each disorder group are tabulated and discussed under two sub-headings (based on the two research assumptions) as follows:

- Reading Accuracy (Word Recognition), Reading Comprehension and Listening Comprehension (see Tables 7A, 7B, 7C and 7D); and
- WISC-III (see Tables 8A and 8B):

Reading Accuracy (Word Recognition), Reading Comprehension and Listening Comprehension

The Dyslexia Group: Children in this group performed very poorly in their reading accuracy (word recognition) as a result of their phonological processing deficit, which is the main cause of dyslexia. Table 6A shows the mean CAs of 11 years 1 month for the boys and 12 years 6 months for the girls. The mean age equivalent for reading accuracy based on NARA-III (Neale, 1999) for the boys was 8 years 8 months (2 years 5 months behind mean CA for the boys) while the girls' was 9 years 4 months (3 years 2 months behind mean CA for the girls). In terms of their mean age equivalent for reading comprehension based on NARA-III (Neale, 1999) for the boys was 10 years 5 months (8 months behind the boys' mean CA) while the girls' was 10 years 9 months (1 year 9 months behind the girls' mean CA). One explanation for this low reading comprehension age equivalent is that poor decoding has impaired their overall performance in reading comprehension and thereby, affected their ability to answer the comprehension questions correctly during the NARA-III administration. However, their performance in the listening comprehension based on OWLS:LC&OE (Carrow-Woolfolk, 1995) was excellent with a mean age equivalent of 12 years 7 months for the boys (1 year 6 months ahead of their mean CA) and 13 years 2 months (8 months ahead of their mean CA) for the girls. Both mean age equivalents for listening comprehension were way above their respective CAs. This finding seems to appear consistently with previous studies (e.g., Aaron, 1989; Ng, 1996; Stanovich, 1991) that despite having to struggle with their reading comprehension, dyslexic children do not have problems in their listening comprehension. This is because reading comprehension depends on visual-oral (see-say) decoding process (i.e., word expression) while listening comprehension involves aural-visual (hear-see) decoding process (i.e., word recognition) (Chia, 2006). Hence, although "reading and listening involve identical comprehension skills" (Kintsch & Kozminsky, 1977, p.498), their underlying process involves two different sub-processes of decoding.

Table 6A: Results based on age equivalents (in years and months) of Dyslexia Group for reading accuracy, reading comprehension and listening comprehension

Ages (Years : Months)	Dyslexia Group (N = 21)	
	Male (N = 17)	Female (N = 4)
Chronological Age Range	10:03 to 14:07	11:01 to 13:03
Mean Chronological Age	11:01	12:06
Reading Accuracy Age (NARA-III)	7:09 to 11:01 (X = 8:08)	8:11 to 10:08 (X = 9:04)
Reading Comprehension Age	8:11 to 12:10	9:07 to 11:02

(NARA-III)	(X = 10:05)	(X = 10:09)
Listening Comprehension Age (OWLS:LC&OE)	11:04 to 16:10 (X = 12:07)	12:03 to 15:09 (X = 13:02)

Note: X = means age equivalent

The NVLD Group: Unlike the Dyslexia Group, children in this group performed better in their reading accuracy than reading and listening comprehension (see Table 6B). Their mean age equivalents for reading accuracy based on NARA-III (Neale, 1999) were 12 years 9 months (6 months ahead of the boys' mean CA) for boys and 12 years 1 month (also 6 months ahead of the girls' mean CA) for girls. Both age equivalents were above their CAs of 12 years 3 months for boys and 11 years 7 months for girls, respectively. Their mean age equivalents for reading comprehension based on NARA-III (Neale, 1999) were 10 years 5 months (1 year 10 months behind their mean CA) for boys and 10 years 7 months (1 years behind their mean CA) for girls. Although both mean age equivalents for reading comprehension were above those of listening comprehension, they still remained way below their respective CAs. This finding is consistent with one previous study done by Johnson & Myklebust (1967), who explained that such children exhibited excellent auditory skills, accelerated speech milestones, and their word reading was appropriate, but reading comprehension was rather deficient. However, their worst performance was in listening comprehension based on OWLS:LC&OE (Carrow-Woolfolk, 1995) with mean equivalent ages of 8 years 7 months (3 years 8 months behind their mean CA) for the boys and 9 years 2 months (2 years 5 months behind their mean CA) for the girls. Among the test items in OWLS:LC&OE, they performed worst in their supra-linguistic skills which include tasks that require language analysis on a level such as comprehension of figurative language and humor, derivation of meaning from context, logic, and inference, and other higher-order thinking skills. One explanation why these children with NVLD did poorly in listening comprehension could be due to their weakness in pragmatics and speech prosody (Leavell, 1998). Although they performed better in reading than listening comprehension, it is because they possess well-developed rote verbal capacities and rote verbal memory skills (see EDM, p.34 for more information), but would still find difficulty in tackling inferential comprehension questions involving cause-and-effect relationships, for instance (Leavell, 1998). As the sample of subjects in the NVLD Group was far too small to make this finding significant, the authors suggested that a future study with a bigger sample of subjects to be carried out to compare the performance of children with NVLD in listening and reading comprehension.

Table 6B: Results based on age equivalents (in years and months) of NVLD Group for reading accuracy, reading comprehension and listening comprehension

Ages (Years : Months)	NVLD Group (N = 5)	
	Male (N = 3)	Female (N = 2)
Chronological Age Range	11:06 to 12:09	11:05 to 12:02
Mean Chronological Age	12:03	11:07
Reading Accuracy Age (NARA-III)	11:07 to 12:11 (X = 12:09)	11:10 to 12:04 (X = 12:01)
Reading Comprehension Age (NARA-III)	9:10 to 11:02 (X = 10:05)	10:01 to 11:02 (X = 10:07)
Listening Comprehension Age	7:11 to 9:02	8:03 to 10:01

(OWLS:LC&OE)	(X = 8:07)	(X = 9:02)

Note: X = mean age equivalent

The Autistic Disorder Group: The mean CA for the boys in this group was 11 years 6 months while the girls' was 12 years 2 months (see Table 6C). Among the 10 boys, five were diagnosed by their psychologists and speech-language therapists as having high-functioning autistic disorder (HFAD for short). HFAD is often taken to be synonymous with Asperger Syndrome; for others, it implies milder autism without retardation (Kutscher, 2005). However, Chia (2008) and McLaughlin-Cheng (1998) argued that HFAD is not the same as Asperger Syndrome nor it is mild autism. This will be elaborated further in the *Summary of Findings and Conclusion* of this article. These same five children were able to read and the mean age equivalent for their reading accuracy based on NARA-III (Neale, 1999) was above the ceiling age equivalent of 12 years 11 months (estimated to be 1 year 5 months ahead of their mean CA). The remaining five boys and two girls were moderately to severely delayed in their speech development. They displayed much vocal self-stimulatory behavior as mentioned in their psycho-educational assessment reports. In terms of the age equivalents for reading comprehension based on NARA-III (Neale, 1999) and listening comprehension based on OWLS:LC&OE (Carrow-Woolfolk, 1995), they could not be assessed and/or scored at all. Echolalia and palilalia were mentioned in their reports, too.

Table 6C: Results based on age equivalents (in years and months) of Autistic Disorders Group for reading accuracy, reading comprehension and listening comprehension

Ages (Years : Months)	Autistic Disorder Group (N = 12) (5 have been identified to have High-Functioning Autistic Disorder/HFAD)	
	Male (N = 10)	Female (N = 2)
Chronological Age Range	10:09 to 12:09	11:11 to 12:07
Mean Chronological Age	11:06	12:02
Reading Accuracy Age (NARA-III)	No verbal response to >12:11** (X = could not be determined)	No verbal response (X = could not be determined)
Reading Comprehension Age (NARA-III)	Could not be scored* (X = could not be determined)	Could not be scored* (X = could not be determined)
Listening Comprehension Age (OWLS:LC&OE)	Could not be scored* (X = could not be determined)	Could not be scored* (X = could not be determined)

Note: X = means age equivalent * echolalia/palilalia noted

**Results from the 5 HFAD boys

The Asperger Syndrome Group: The mean CA of the boys in this disorder group was 13 years 4 months; the girls, 10 years 10 months (see Table 6D). Their mean age equivalent for reading accuracy based on NARA-III (Neale, 1999) was above 12 years 11 months (the highest ceiling age level to be scored on NARA-III) (estimated to be about the same as the boys' mean CA) for both the boys and (estimated to be about 2 years ahead of the girls' mean CA) the girls in this group. In terms of the mean age equivalents for reading comprehension based on NARA-III (Neale, 1999), for the boys, it was 8 years 11 months (4 years 5 months behind their mean CA), and for the girls, 8 years 2 months (2 years 8 months behind their mean CA); and for listening comprehension based on OWLS:LC&OE (Carrow-Woolfolk, 1995), for the boys, it was 9 years 4 months (4 years

behind their mean CA), and for the girls, 9 years 3 months (1 year 7 months behind their mean CA). Both the age equivalents for reading and listening comprehension were below the CAs of the boys and girls respectively. In other words, these children with Asperger Syndrome performed poorly in both reading and listening comprehension but excelled in reading accuracy (word recognition).

Table 6D: Results based on age equivalents (in years and months) of Asperger Syndrome Group for reading accuracy, reading comprehension and listening comprehension

Ages (Years : Months)	Asperger Syndrome Group (N = 15)	
	Male (N = 12)	Female (N = 3)
Chronological Age Range	12:01 to 14:01	10:08 to 11:03
Mean Chronological Age	13:04	10:10
Reading Accuracy Age (NARA-III)	>12:11 (X = >12:11)	>12:11 (X = >12:11)
Reading Comprehension Age (NARA-III)	8:05 to 9:10 (X = 8:11)	7:07 to 9:03 (X = 8:02)
Listening Comprehension Age (OWLS:LC&OE)	8:11 to 10:07 (X = 9:04)	8:10 to 10:02 (X = 9:03)

Note: X = mean age equivalent

WISC-III Results

From the psycho-educational assessment reports of the 53 participating children, the authors were able to obtain the ranges of standardized scores of three WISC-III IQs (see Table 6):

1. Full-Scale IQ (FSIQ);
2. Verbal IQ (VIQ); and
3. Performance IQ (PIQ).

In addition, the first author also examined the scaled scores of the various verbal and performance scale subtests, especially those with significantly better and/or worse scaled scores for a comparative study among the four disorder groups (see Table 7).

Full-Scale IQs (FSIQs)

Children with dyslexia often have an average or above average FSIQ (i.e., 90 and above). Similarly, those with NVLD and Asperger Syndrome also display an average or above average FSIQ within the 90-120 range. However, children with autistic disorder and, especially if they have moderate to severe speech delay, will have low FSIQ (i.e., below 70). Among this group of children, the FSIQ of those with high-functioning autistic disorder (HFAD) falls in the range between borderline and average (i.e., 50-85 range) (see Table 7).

Table 7: Full-Scale IQs, Verbal IQs and Performance IQs

Disorder Groups	WISC-III IQs		
	Full-Scale IQ range	Verbal IQ range	Performance IQ range

Dyslexia Group	93 to 132	81 to 110	113 to 136
NVLD Group	87 to 119	96 to 122	73 to 108
Autistic Disorder Group	<70 to 85 (pro-rated)	<70 (pro-rated)	81 to 96 (pro-rated)
Asperger Syndrome Group	90 to 115 (pro-rated)	100 to 117 (pro-rated)	70 to 85 (pro-rated)

Verbal and Performance IQs

Table 7 shows that children in both the NVLD Group and the Asperger Syndrome Group shared the same VIQ-PIQ profile where the VIQ is significantly greater than the PIQ. However, children in both the Dyslexia Group and the Autistic Disorder Group shared the following same VIQ-PIQ profile where the VIQ is significantly lower than the PIQ. However, a further examination of the verbal and performance scale subtests will reveal the cognitive differences among the four disorders.

Verbal and Performance Scale Subtests

Results based on the scaled scores of the WISC-III verbal and performance scale subtests found in the psycho-educational assessment reports of the 53 children were gathered and analyzed by the first author. Only the WISC-III subtests with significantly better or worse results found in each disorder group (i.e., Dyslexia Group, NVLD Group, Autistic Disorder Group, and Asperger Syndrome Group) were recorded in the chart (see Table 8) using five key symbols to represent:

1. A = average performance in the subtest as shown by the majority of the subjects;
2. ↑ = significantly better performance in the subtest when comparing with the other subtests as shown by the majority of the subjects;
3. ↓ = significantly worse performance in the subtest when comparing with the other subtests as shown by the majority of the subjects;
4. ↕ = varied performance, could be either better or worse, in the subtest as shown by the subjects; and
5. X = subtest was not administered.

Table8: WISC-III verbal and performance scale subtest results

Disorder Groups	Info	Sim	Arith	Vocab	Comp	DS	PC	Cd	PA	BD	OA	SS	Mz
Dyslexia	↕	↑	↓	↓	↕	↓	↑	↓	↑	↑	↑	↓	X
NVLD	X	↑	↓	↑	↕	↕	A	↓	↕	↓	↓	X	X
Autistic Disorder	↓	↓	X	↓	↓	↓	X	X	X	↑	↑	X	X
Asperger Syndrome	A	↑	X	↑	↑	X	X	X	X	↓	↓	X	X

The Dyslexia Group: From the 21 children diagnosed with dyslexia (specific learning disability), 9 of them showed significantly poor scaled score on the verbal scale subtest Information; the remaining 12 scored in between the average and high average range of 8-12 and 13-14 respectively. All of them did poorly on the following verbal scale subtests: Arithmetic (Arith), Vocabulary (Vocab), Digit Span (DS); and also poorly on two performance scale subtests: Coding (Cd) and Symbol Search (SS). However, they scored better results in three performance scale subtests: Picture Completion (PC), Picture Arrangement (PA), and Block Design (BD). One interesting finding from this disorder group is that their scaled score for the subtest Similarities was significantly better than the subtest Vocabulary (Vocab).

The findings in this study agreed with the findings of Huelsman (1970), who reviewed 20 studies of the WISC subtest scores of disabled readers, spanning the years 1952 to 1962. He found that 100% reported significant low scaled scores in the Arithmetic (Arith) subtest, 95% reported low Coding (Cd) subtest scores, 80% reported low Information (Info) subtest scores, and 60% reported low scaled scores in Digit Span (DS) subtest. These four verbal scale subtests formed a pattern known as the WISC syndrome for disabled readers (Searls, 1997). In another similar report, Searls (1972) reviewed 33 WISC and reading disability studies, covering the years 1952 to 1970, and found percentages of similar magnitude to Huelsman's (1970): 91% reported low Arithmetic (Arith) subtest scores, 76% reported low Coding (Cd) subtest scores, 65% reported low Information (Info) subtest scores, and 62% reported poor scaled scores in Digit Span (DS) subtest. These subtests came to be known as the ACID profile (Swartz, 1974) and it has also been discussed in the WISC-III manual (Wechsler, 1991, pp.185 & 212).

However, evidence from several studies (see Watkins, Kush, & Gutting, 1997a, 1997b) on the ACID profile found that children with dyslexia did not always score badly on the Information (Info) subtest. As a result, Kaufman (1994) advocated the replacement of the ACID profile with the SCAD profile (Symbol Search/SS, Coding/Cd, Arithmetic/Arith, and Digit Span/DS). According to Kaufman (1994), children with reading difficulties did poorly on the Symbol Search (SS) subtest more so than on the Information (Info) subtest.

The NVLD Group: From the five children diagnosed with NVLD, on the verbal scale, all of them obtained an average scaled score in the Information (Info) subtest, scored well in the Similarities (Sim), Comprehension (Comp) and Vocabulary (Vocab) subtests, but did poorly in Arithmetic (Arith) subtest. Their scaled scores varied widely between low average and average for the Digit Span (DS) subtest. In addition, they did poorly in the following performance scale subtests: Picture Arrangement (PA), Coding (Cd), Block Design (BD), and Object Assembly (OA). Their scaled score for Picture Completion (PC) subtest was average.

Rourke (1989, 1995) and Kutscher (2005) found that the Verbal IQ (VIQ) of children with NVLD would exceed their Performance IQ (PIQ) by at least 10 points. This is true when the authors read the psycho-educational assessment reports of the five children. In

addition, according to Stewart (2007), children with NVLD would score highest on the following two or three verbal scale subtests – Vocabulary (Vocab), Similarities (Sim), and/or Comprehension (Comp) – while lowest scores would be on two or three performance scale subtests – Block Design (BD), Object Assembly (OA), and/or Coding (Cd). Mamen (2002) states that children with NVLD are relatively weak on the Object Assembly (OA) and Picture Arrangement (PA) subtests. In addition, Mamen (2002) also notes that the Block Design (BD) subtest is not usually affected to the same degree; she explains this difference as due to the added pragmatic communication demands inherent in the socially-oriented themes of the Object Assembly (OA) and Picture Arrangement (PA) subtests.

The Autistic Disorder and Asperger Syndrome Groups: From the 12 children diagnosed with autistic disorder, five of them were identified as having high-functioning autistic disorder (HFAD) with pro-rated FSIQs between 78-85, and the remaining seven displayed low FSIQs (i.e., less than 70). This finding is consistent with the similar result that McLaughlin-Cheng (1998) found in her meta-analytical study of children with autistic spectrum disorder (commonly known as ASD, for short). On the whole, all 12 of them did very badly in the verbal scale subtests, i.e., Information (Info), Similarities (Sim), Vocabulary (Vocab), and Comprehension (Comp). Their scaled score for the Digit Span (DS) subtest was higher than scaled scores of the other verbal scale subtests, with four of the children with HFAD scored within the average range of scaled scores 8-12 and the fifth one with HFAD even obtained a scaled score of 14. Overall, they scored significantly better in the following two performance scale subtests: Block Design (BD) and Object Assembly (OA).

From the 15 children diagnosed with Asperger Syndrome, all of them showed the totally reverse results in terms of the following subtests – the scaled scores of Similarities (Sim), Vocabulary (Vocab) and Comprehension (Comp) subtests were better, but the scaled scores of Block Design (BD), and Object Assembly (OA) were worse – when comparing with the results of the Autistic Disorder Group. Besides, their pro-rated FSIQs were between 90 and 115, and their VIQ (in the range between 100 and 117) was significantly higher than their pro-rated PIQ (in the range between 70 and 85). In other words, these children obtained better scaled scores in the verbal scale subtests (i.e., Similarities/Sim, Vocabulary/Vocab, and Comprehension/Comp) than in the performance scale subtests (i.e., Block Design/BD and Object Assembly/OA). As for the verbal scale subtest Information (Info), nine of them scored within the average range of scaled scores 8-12, while the remaining six scored in the borderline and low average range of scaled scores 4-7.

The present findings agreed with what had been previously discovered in a review study by Sigman, Ungerer, Mundy, and Sherman (1987) that children with ASD generally performed worse on the verbal than the performance scale. Their best verbal subtest was Digit Span (DS), which measures the verbal short-term memory. This result could explain why the delayed echolalia is often observed in many children with ASD. Their worst performance was on Comprehension (Comp) subtest, which measures knowledge of social conventions, among other things. Even relative to children with developmental

language disorders, children with ASD have been found to perform worse on Comprehension (Comp), Similarities (Sim), and Vocabulary (Vocab) subtests (Bartak, Rutter, & Cox, 1975). Pennington (1991) noted that children with ASD performed better on language tests such as the Peabody Vocabulary Test or the Boston Naming Test, which require less social interaction than they did on the WISC-III verbal scale subtests, Vocabulary (Vocab) and Similarities (Sim) that require explaining a verbal concept to the examiner.

On the performance scale subtests of the WISC-III (Wechsler, 1991), the children in the Autistic Disorder Group performed best on Block Design (BD) and Object Assembly (OA), both of which measure spatial cognition. In fact, Sigman et al (1987) found children with ASD generally outperform either retarded or dysphasic children similar in mental and/or language age on Block Design (BD). In contrast, Wing (1981) reported cases of children with Asperger Syndrome tend to perform worse on the Performance IQ (PIQ).

Summaries of Findings and Conclusion

Children with hyperlexia per se are excellent readers and they can decode words with ease (i.e., higher mean reading accuracy age equivalent), but are rather poor performers in both reading and listening comprehension (i.e., lower mean reading and listening comprehension age equivalents) (Aaron, 1989, 1997). However, from the findings in this study, the authors did not find any child with this type of hyperlexia, which they have termed as the Type-I Hyperlexia, in their sample of subjects. Children with Type-I Hyperlexia have a language pattern that is a total opposite of those with dyslexia.

Table 9: A Summary of Results based on NARA-III and OWLS:LC&OE

Disorder Groups (N)	Gender (N)	Mean Chronological Age (CA) (Years:Months)	Mean Reading Accuracy Age Equivalent (Years:Months)	Mean Reading Comprehension Age Equivalent (Years:Months)	Mean Listening Comprehension Age Equivalent (Years:Months)
Hyperlexia	-	-	Above CA (Excellent)	below CA (Poor)	below CA (Poor)
Dyslexia (N = 21)	Male (N = 17)	11:01	2:05 b (Poor)	0:08 b (Poor)	1:06 a (Excellent)
	Female (N = 4)	12:06	3:02 b (Poor)	2:09 b (Poor)	0:08 a (Excellent)

NVLD (N = 5)	Male (N = 3)	12:03	0:06 a (Excellent)	1:10 b (Poor)	2:08 b (Poor)
	Female (N = 2)	11:07	0:06 a (Excellent)	1:00 b (Poor)	2:05 b (Poor)
Autistic Disorder (N = 12)	Male (N = 10)	11:06	1:05 a * (Excellent)	Couldn't do (Poor)	Couldn't do (Poor)
	Female (N = 2)	12:02	Couldn't do (Poor)	Couldn't do (Poor)	Couldn't do (Poor)
Asperger Syndrome (N = 15)	Male (N = 12)	13:04	abt 0:05 (Average)	4:05 b (Poor)	4:00 b (Poor)
	Female (N = 3)	10:10	2:01 a (Excellent)	2:08 b (Poor)	1:07 b (Poor)

Note: b = below chronological age a = above chronological age
* based on children with HFAD abt = about the same as chronological age

Table 9 shows that children in the Dyslexia Group performed poorly in the reading accuracy task (word recognition) and hence, in turn, affected their performance in reading comprehension. However, their performance in listening comprehension was excellent with a mean age equivalent of 12 years 7 months for the boys (1 year 6 months above their mean CA) and 13 years 2 months for the girls (8 months above their mean CA). This finding is consistent with the findings of previous studies (e.g., Aaron, 1997; Ng, 1996; Stanovich, 1991) that despite having to struggle with their reading comprehension, children with dyslexia do not have problems in their listening comprehension. This can be explained in a recent study done by Chia (2006), who showed that reading comprehension operates on the visual-oral (see-say) pathway that decodes printed words to make sense of what is read, while listening comprehension operates on the aural-visual (hear-see) pathway that decodes spoken words to make sense of what is heard. Both decoding-comprehension pathways are independent of each other but interact and integrate within the short-term memory where the process of schema-matching of what has been decoded from reading/listening with what is already known and retrieved from the long-term memory, to establish reading/listening comprehension. Hence, although it appears that "reading and listening involve identical comprehension skills" (Kintsch & Kozminsky, 1977, p.498), their underlying process consists of two different decoding-comprehension pathways that lead to reading/listening comprehension.

From their findings based on NARA-III (Neale, 1999) and OWLS:LC&OE (Carrow-Woolfolk, 1995) results in this study, children in the NVLD Group and the Asperger Syndrome Group as well as a small number of them (five boys to be exact) with HFAD in the Autistic Disorder Group displayed a hyperlexic language pattern that could match the hyperlexia profile (see Table 9). The remaining children with autistic disorder and moderate-to-severe speech delay failed to meet the criteria of the hyperlexia profile. Kupperman, Bligh and Barouski (n.d.) have argued that hyperlexic children with autistic behavioural patterns when they were younger tend to lose those autistic traits when their language skills begin to improve as they mature.

However, when the WISC-III subtest results were examined and compared, the authors noticed that there were obvious cognitive differences in the WISC-III subtest patterns (see Table 10) of these children with NVLD, Asperger Syndrome and HFAD despite having a similar hyperlexic language pattern. This finding suggests the possibility of other hyperlexic subtypes in existence. Circled arrows and are indicative of hyperlexic traits based on six WISC-III subtest results as shown in Table 10.

Table 10: A Summary of Results based on WISC-III Subtests

Disorder Group	Info	Sim	Arith	Vocab	Comp	DS	PC	Cd	PA	BD	OA	SS	Mz
Hyperlexia												X	X
Dyslexia													X
NVLD	A						A					X	X
Autistic Disorder			X				X	X	X			X	X
Asperger Syndrome	A		X			X	X	X	X			X	X

Richman (1997) has identified two types of hyperlexia: one has a visuo-spatial-motor disorder; the other, a language learning disorder. The authors of this present study have termed the former as Type-II Hyperlexia, and the latter, Type-III Hyperlexia. According to Richman (1997), Type-II Hyperlexia, also known as Hyperlexic Visuo-Spatial Disorder, manifests visuo-spatial problems and/or motor developmental delay. Children with this type of hyperlexia also display "language pragmatic deficit in expressing and interpreting experiential aspects of language and environment" (Richman, 1997, p.1-2). Children with Type-II Hyperlexia may also exhibit symptoms resembling Asperger Syndrome or NVLD.

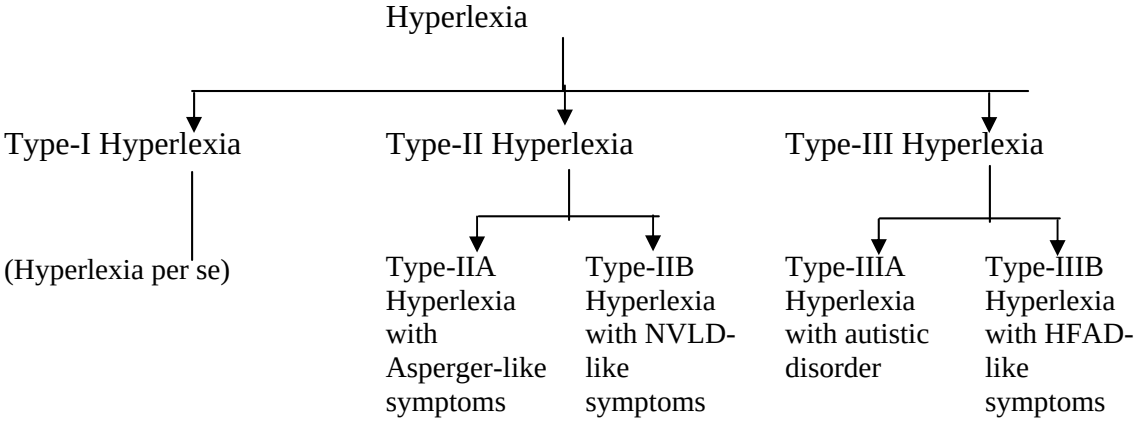
There are differences between children with Asperger Syndrome and those with NVLD. The former is primarily notable for typically appearing uninterested in forming human bonds. The latter, though, does typically seem interested in human bonds – "even though they may be clueless how to actually achieve them successfully" (Kutscher, 2005, p.99). In addition, children with Asperger Syndrome typically have more diminished symbolic play than in NVLD.
As a result, the authors of this study believed that the Type-II Hyperlexia can be further categorized into two subtypes: Type-IIA Hyperlexia with Asperger-like symptoms and Type-IIB Hyperlexia with NVLD-like symptoms.

The Type-III Hyperlexia is also known as Hyperlexia language Disorder (Richman, 1997). It is defined as an "expressive language deficit despite good rote memory skills. Language is delayed, echolalic and perseverative" (Richman, 1997, p.1). A child with Type-III Hyperlexia also manifests problems in understanding the overall meaning beyond rote recall and in addition, may exhibit autistic-like symptoms. Like Type-II Hyperlexia, the authors of this study also believed that Type-III Hyperlexia can be further categorized into two subtypes: Type-IIIA Hyperlexia with autistic disorder and Type-IIIB Hyperlexia with HFAD-like symptoms. According to Chia (2008) and Rimland (1990), children with HFAD are different from those with autistic disorder in that unlike the latter, the former possesses savant skills that are hidden and unknown to all around them because of their poor ability to communicate. These children with HFAD are sometimes known as autistic crypto-savants (Chia, 2008; Rimland, 1990).

To differentiate Type-IIA Hyperlexia with Asperger-like symptoms, Type-IIB Hyperlexia with NVLD-like symptoms, and Type-IIIB Hyperlexia with HFAD-like symptoms from one another, the authors highlighted that Type-IIIB Hyperlexia with HFAD-like symptoms differs from the two Type-II Hyperlexia subtypes in two aspects noted in their psycho-educational assessment reports: first, there is a language delay or unusual development by age three; and second, language is used to get needs met. Unlike Type-IIIB Hyperlexia with HFAD-like symptoms, children with either of the two Type-II Hyperlexia subtypes have normal language development by age three, and they use language to interact with others (Stewart, 2007).

Figure 3 below shows the diagrammatic summary of hyperlexia and its subtypes:

Figure 3: Hyperlexia and its Subtypes



It is the authors' hope that with a better understanding of hyperlexia as well as an efficient procedure in identifying and differentiating its reading and/or listening comprehension-related anomalous subtypes, more effective and innovative intervention strategies can be developed to cater to the challenging needs of such children learning to understand what they read and/or listen.

References

Aaron, P.G. (1989). *Dyslexia and hyperlexia: Diagnosis and management of developmental reading disabilities*. Dordrecht, the Netherlands: Kluwer Academic.

Aaron, P.G. (1997). Hyperlexia: Reading without meaning in young children. *Topics in Language Disorders, 17*(3), 1-33.

American Hyperlexia Association (2005). *Semantic pragmatic disorder*. Retrieved June 10, 2005, from http://www.hyperlexia.org/spl.html.

American Psychiatric Association (2000). DSM-IV-TR: *The diagnostic and statistical manual of mental disorders (Fourth Edition) text revision*. Washington, D.C.: The Author.

Aram, D.M., Ekelman, B.L., and Healy, J.M. (1984). *Reading profiles of hyperlexic children*. A paper presented at the meeting of the International Neuropsychology Society, Acchen, West Germany.

Aram, D.M., and Healy, J.M. (1987). Hyperlexia: *A review of extraordinary word recognition*. In L.K. Obler and D. Fein (Eds.), Neuropscyhology of talent and special abilities. New York, NY: Guilford Press.

Autism Support Network (2002). *Hyperlexia*. Retrieved April 1, 2006, from http://www.bbbautism.com/other_conditions.htm.

Baron-Cohen, S. (1999). Mindblindness: *An essay on autism and theory of mind*. London, U.K.: MIT Press.

Bartak, L., Rutter, M., and Cox, A.A. (1975). A comparative study of infantile autism and specific developmental receptive disorder. *British Journal of Psychiatry, 126*, 127-145.

Bronner, A.F. (1917). *The psychology of special abilities and disabilities*. Boston, MA: Little, Brown and Company.

Burd, L., Kerbeshiian, J., and Fisher, W. (1985). Inquiry into the incidence of hyperlexia in a state-wide population of children with pervasive developmental disorder. *Psychological Reports, 57*, 236-238.

Carrow-Woolfolk, E. (1995). *Oral and written language scales: Listening comprehension and oral expression*. Circle Pines, MN: American Guidance Service.

Chi, F.M. (1995). EFL readers and a focus on inter-textuality. *Journal of Reading, 38*(8), 638-644.

Chia, K.H. (1995). *A survey of parents' and professionals' knowledge and understanding of hyperlexia in Singapore*. Unpublished study presented at the Association of Educational Therapists-Singapore Study Group meeting on December 5.

Chia, K.H. (1996a). Hyperlexia: A deficit of inter-textuality in reading comprehension. *Education Today, 46*(2), 66-71.

Chia, K.H. (2000). The four theoretical concepts of hyperlexia. *Health Digest, 12*(6), 30-37.

Chia, K.H. (2006). *Evaluating the efficacy of the Orton-Gillingham intensive reading intervention program: Phonological performance and differential patterns of reading errors made by Singaporean children with dyslexia*. Unpublished Doctor of Education dissertation, University of Western Australia, Perth, Australia.

Chia, K.H. (2008). Autistic savant: A need to re-define autism spectrum disorder. *Special Educational Needs Monograph Series #1*. Singapore: Cobee Publishing House.
Cobrinik, L. (1974). Unusual reading ability in severely disturbed children. *Journal of Autism and Childhood Schizophrenia, 4*, 163-175.
De Beaugrande, R. (1980). *Text, discourse and process*. Norwood, NJ: Ablex.
Elliott, D.E., and Needleman, R.M. (1976). *The syndrome of hyperlexia*. Brain and Language, 3, 339-349.
Fontenelle, S., and Alarcon, M. (1982). Hyperlexia: precocious word recognition in developmentally delayed children. *Perceptual and Motor Skills, 55*, 247-252.
Goldberg, T.E., and Rothermel, R.D. (1984). Hyperlexic children reading. *Brain. 107*, 759-785.
Gough, P.B., and Tunmer, W. (1986). Decoding, reading, and reading disability. *Remedial and Special Education, 7*(1), 6-10.
Healy, J. (1982). The enigma of hyperlexia. Reading Research Quarterly, 17, 319-338.
Healy, J.M., Aram, D.M., Horwitz, S.J., and Kessler, J.W. (1982). *A study of hyperlexia. Brain and Language, 17*, 1-23.
Huelsman, C.B., Jr. (1970). The WISC subtest syndrome for disabled readers. *Perceptual and Motor Skills, 30*, 535-330.
Johnson, D., and Myklebust, H.R. (1967). Nonverbal disorders of learning. In D. Johnson and H.R. Myklebust (Eds.), *Learning disabilities: Educational principles and practices*. New York, NY: Grune and Stratton.
Kaufman, A.S. (1994). *Intelligent testing with the WISC-III*. New York, NY: John Wiley.
Kintsch, W., and Kozminsky, E. (1997). Summarizing stories after reading and listening. *Journal of Educational Psychology, 69*, 491-499.
Kline, P. (2000). *Handbook of psychological testing* (Second Edition). New York, NY: Routledge.
Kristeva, J. (1980). *Desire in language: A semiotic approach to literature and art*. New York, NY: Columbia University Press.
Kupperman, P., Bligh, S., and Barouski, K. (n.d.). *The syndrome of hyperlexia vs. high functioning autism and Asperger's syndrome*. Retrieved May 16, 2008, from http://www.hyperlexia.org/gordy001.html.
Kutscher, M.L. (2005). *Kids in the syndrome mix of ADHD, LD, Asperger's, Tourette's, bipolar, and more: the one stop guide for parents, teachers, and other professionals*. London: Jessica Kingsley.
Leavell, C. (1998). Identifying and managing a child with a nonverbal learning disability. Part 1: Diagnosis and assessment of the nonverbal learning disabled child. *Learning Disabilities Journal, 8*(6), 4-7.
Lord, C., Rutter, M., DiLavore, P.C., and Risi, S. (2001). *Autism diagnostic observation schedule (*ADOS). Los Angeles, CA: Western Psychological Services.
Mamen, M. (2002). *Understanding nonverbal learning disabilities: A commonsense guide for parents and professionals; Commonsense approaches to understanding and management*. London, U.K.: Jessica Kingsley.
Manzo, A.V., and Manzo, U.C. (1994). *Literacy disorders: Holistic diagnosis and remediation*. Orlando, FL: Holt, Rinehart and Winston.

McLaughlin-Cheng, E. (1998). Asperger syndrome and autism: A literature review and meta-analysis. *Focus on Autism and Other Developmental Disabilities, 13*, 234-245.
Mehegan, C.C., and Dreifus, R.E. (1972). Hyperlexia – exceptional reading ability in brain-damaged children. *Neurology, 22*, 1105-1111.
Miles, T.R. (1997). *Bangor dyslexia test-revised*. Cambs, U.K.: Learning and Development Aids.
Myklebust, H.R. (1975). Nonverbal learning disabilities: Assessment and intervention. In H.R. Myklebust (Ed.), *Progress in learning disabilities: Vol.*3. New York, NY: Grune and Stratton.
Neale,M.D. (1982). *Neale analysis of reading ability: The manual*. Berkshire, U.K.: NFER-Nelson.
Neale, M.D. (1990). *Neale analysis of reading ability* (Second Edition): The manual. Berkshire, U.K.: NFER-Nelson.
Neale, M.D. (1999). *Neale analysis of reading ability* (Third Edition). Berkshire, U.K.: NFER-Nelson.
Ng, G.T. (1996). Dyslexia: what is it really? *Education Today, 46*(2), 54-56.
Niensted, S.M. (1968). Hyperlexia: An educational disease? *Exceptional Children, 35(*2), 162-163.
Parker, S.W. (1917). Pseudo-talent for words. *Psychology Clinics, 11*, 1-7.
Pennington, B.F. (1991). *Diagnosis of learning disorders: A neuropsychological framework*. New York, NY: The Guilford Press.
Pennington, B., Johnson, C., and Welsh, M. (1987). Unexpected reading precocity in normal preschoolers: Implications for hyperlexia. *Brain and Language, 30*, 165-180.
Philips, A. (1930). Talented imbeciles. *Psychology Clinics, 18*, 246-265.
Phua, L.P. (1999, April 30). More can be done for these children. *The Straits Times, 24*.
Pierangelo, R. (2003). *The special educator's book of lists* (Second Edition). San Francisco, CA: Jossey-Bass.
Pierangelo, R., and Giuliani, G. (2007). *EDM: The educator's diagnostic manual of disabilities and disorders*. San Francisco, CA: John Wiley and Sons.
Richman, L. (1997). *Peaceful co-existence: Autism, Asperger', Hyperlexia*. Retrieved September 26, 2008, from http://www.hyperlexia.org/aha_winter9697.html.
Rimland, B. (1990). Autistic crypto-savants. *Autism Research Review International, 4*(1), 3.
Rourke, B. (1989). *Nonverbal learning disabilities: The syndrome and the model*. New York, NY: Guilford Press.
Rourke, B. (Ed.) (1995). *Syndrome of nonverbal learning disabilities: Neurodevelopmental manifestations*. New York, NY: Guilford Press.
Schonell, F.J., and Schonell, F.E. (1950). *Schonell graded reading tests*. London, U.K.: Oliver and Boyd.
Searls, E.F. (1972). *WISC and WPPSI IQs and subtest patterns related to first grade reading achievement*. Unpublished Doctor of Philosophy dissertation, University of Miami, Florida, USA.
Searls, E.F. (1997). *How to detect reading/learning disabilities using the WISC-III*. Newark, DE: International Reading Association.

Sigman, M., Ungerer, J.A., Mundy, P., and Sherman, T. (1987). Cognition in autistic children. In D.J. Cohen, A.M. Donnellan, and R. Paul (Eds.), *Handbook of autism and pervasive developmental disorders*. New York, NY: John Wiley.

Silberberg, N., and Silberberg, M. (1967). Hyperlexia: Specific word recognition skills in young children. *Exceptional Children, 34*, 41-42.

Silberberg, N., and Silberberg, M. (1971). Hyperlexia: The other end of the continuum. *Journal of Special Education, 5*(3), 233-242.

Snowling, M., and Frith, U. (1986). Comprehension in hyperlexic readers. *Journal of Experimental Child Psychology, 42*, 392-415.

Sparrow, S.S., Cichetti, D.V., and Balls, D.A. (2005). *Vineland adaptive behaviour scales-second edition* (VABS-II). Circle Pines, MN: American Guidance Service.

Stanovich, K.E. (1991). Discrepancy definitions of reading disability: Has intelligence led us astray? *Reading Research Quarterly, 26*, 7-29.

Stewart, K. (2007). *Helping a child with nonverbal learning disorder or Asperger's disorder* (Second Edition). Oakland, CA: New Harbinger Publications.

Swartz, G.A. (1974). *The language-learning system*. New York, NY: Simon and Schuster.

Tan-Niam, C. (2003). The false belief paradigm and theories of development. In C. Tan-Niam, S. Degotardi, and S. Dockett (Eds.), *MINDS@PLAY: Inter-subjectivity, theory of mind and social competence in children's interaction*. Singapore: National Institute of Education/Nanyang Technological University.

Thomson, M.E. (2003). Monitoring dyslexics' intelligence and attainments: A follow-up study. *Dyslexia: An International Journal of Research and Practice, 9*(1), 3-17.

Trevarthen, C. (1980). Instincts for human understanding and for cultural cooperation: Their development in infancy. In M. von Cranach, K. Fopps, K. Lepenies, and D. Ploog (Eds.), *Human ethnology: Claims and limits of a new discipline.* Cambridge, U.K.: Cambridge University Press.

Turkeltaub, Peter.E., Flowers, D., Lynn, Verbalis, Alyssa, Miranda, M., Gareau, Lynn & Eden, Guinevere, F (2004). *The neural basis of hyperlexic reading: an fMRI case study. Neuron, 41*, pp 1-20.

Tyre, C., and Young, P. (1994). *Specific learning difficulties*. Staffordshire, U.K.: Q.Ed.

Watkins, M.W., Kush, J.C., and Glutting, J.J. (1997a). Discriminant and predictive *validity of the WISC-III ACID profile among children with learning disabilities. Psychology in the Schools, 34,* 309-319.

Watkins, M.W., Kush, J.C., and Glutting, J.J. (1997b). Prevalence and diagnostic utility of the WISC-III SCAD profile among children with disabilities. School *Psychology Quarterly, 12*, 235-248.

Wechsler, D. (1974). *Wechsler intelligence scale for children-revised: WISC-R manual.* New York, NY: Harcourt Brace Jovanovitch/Psychological Corporation.

Wechsler, D. (1991). *Wechsler intelligence scale for children* (Third Edition): *WISC-III manual*. New York, NY: Harcourt Brace Jovanovitch/Psychological Corporation.

Whitehouse, D., and Harris, J. (1984). Hyperlexia in infantile autism. *Journal of Autism and Developmental Disorders, 14*, 281-289.

Wing, L. (1981). Asperger's syndrome: A clinical account. *Psychological Medicine, 11*, 115-129.

Wong, Y.L. (2003). *Teaching text types in the Singapore primary classroom* (Second Edition). Singapore: Pearson/Prentice Hall.

World Health Organization (1994). *ICD-10-CR: International classification of diseases and health related problems (Second Edition) tenth clinical revision*. Geneva, Switzerland: The Author.

Due Process: A Primer for Special Education Teachers

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Abstract

The threat of special education due process has set the tone for the way IEP meetings are conducted and IEP decisions are made. This threat has eroded relationships and trust between families and district personnel. This article reviews the background, history and current status of special education due process and offers suggestions to teachers about how their work can help restore the much needed trust that is the bedrock for all the primary relationships assisting students in need of special services.

Due Process: A Primer for Special Education Teachers

The effects of litigation in special education cases are too often destructive, affecting students, parents and teachers with long-lasting negative consequences. According to a pilot study conducted by Public Agenda in 2003, superintendents and principals report that special education issues are the most frequent cause for educational litigation. Special education administrators choose either to stand up to these due process challenges and litigate, which results in expense in money and time, or they choose to take the easier and initially less expensive alternative of settlement.

When PL 94-142 became part of the fabric of public school education in 1975, it was expected that IEP team decisions occasionally would be challenged. Disputes would arise over issues about classification and placement. Today, however, we see an entirely new use of special education due process litigation. Procedural mistakes often lead to large settlements that have little to do with appropriate educational programs. Parents find private schools promising special programs and treatment and remove their children from the public school. After a unilateral placement in a special private school, parents expect to be reimbursed for tuition by the public school for their legal action. This new wave of litigation activity has changed the way IEP teams make decisions; it dictates the way they document information and it lurks in the shadows of every IEP meeting. Too frequently litigation interferes with or impedes the process of educating a child. When did IEP teams move away from putting their efforts into child-centered decisions to thinking about avoiding being sued? The Public Agenda (2003) survey documents the reality that educators perceive parents having a sense of educational entitlement based on special education law which increases the likelihood of litigation.

What are the implications for today's teachers? The bond between families and teachers working with students with disabilities is still the key to achieving the goal of providing a free appropriate public education. Now is the time for all responsible parties to realize that no one wins in a special education due process hearing and that the best way to win for children is to avoid disagreement, resolve differences and find solutions.

The design of a child's educational program is a collaborative process. Collaboration begins at the IEP meeting with unanimous commitment to respect each participant as a sincere, honest and dedicated member working towards designing an appropriate education. If we agree to establish safeguards, to follow the same rules and guidelines, to stop looking for fault and personal gain, then we can avoid frivolous litigation and increase the effectiveness of services for children.

Recent changes in IDEA (IDEIA'04, P.L.108-446) require parents to state their complaints and provide an opportunity for the district to resolve issues at a new IEP meeting. It is recommended that the district initiate a pre-meeting with the parents to discuss issues and possible solutions to bring to a new IEP meeting. Teachers can assist in this step by providing concrete information about what works or does not work for this student. They should include work samples of success and areas of need.

Mediation is still not required as a step preceding litigation in the reauthorized IDEIA, but when mediation is used both parties should agree that it will be "legally binding". Mediation is less contentious than due process and is a way to work through differences and arrive at a compromise with less expense in time and money. Every effort should be made, therefore, to consider mediation seriously as a step that could well avoid litigation.

Trust and meaningful communication with parents are the foundation of change in this due process cycle. When teachers and administrators avoid contact with parents who have initiated due process, they only exacerbate negative feelings and mistrust. A strong line of communication must remain open with equal access for parents and teachers. Teachers should make every effort to remain focused on the education of the student and work on maintaining a good working relationship with the parents. Teachers can and should be the educational ambassadors who open a healthy dialogue between school and home.

All educators involved with the child need to understand the issues in dispute and be consistent among themselves in their approach and communication with parents. Team members need to attend all meetings, be prepared and informed with updates on the student's status, and be able to suggest possible changes. It is important that teachers understand how their role relates to other professionals on the team. Any differences of opinion that may exist within the team should be discussed and resolved before the meeting so that all sides can feel comfortable with suggested recommendations.

All team members must take the remarks and information from parents seriously without appearing defensive. When reviewing reports presented by parents, team members need

to articulate their own expert opinion using specific information that will either support or dispute the parents' position.

When parents bring an outside expert to the IEP meeting it is important for the educational staff to engage that person in a comprehensive discussion. It is helpful to have the experts inform the committee of their findings and recommendations. Having the opportunity to hear and discuss the perceptions from outside professionals will help school professionals gain important insight into the parent perspective. The teachers in attendance should never feel intimidated by the outside expert. Teachers need to be honest with their remarks and support their comments with specifics.

Teachers and related service providers will need to be prepared to present a comprehensive current educational status report. This report is most effective when it includes work samples with teacher comments and recent anecdotes from classroom activities. At least one current observation conducted by a team member should be included to support important anecdotal information from the current placement. When reporting this information the staff will need to be honest and straightforward with clear comments about educational gains or the lack of progress. Staff should always support their recommendations with scientifically based methods of instruction. The wealth of supportive information should be shared generously with the parents.

The student's special education file is very important and, of course, confidential. It needs to be up-to-date, well organized, and accessible to the parents and staff upon request. This requires ongoing attention regarding professional notes, assessments, classroom tests and reports.

Occasionally a meeting is in progress and parents comment that they are in serious disagreement and try to stall the process. It is important for the IEP team to consider such comments with respect and make every effort to complete writing an appropriate IEP or make clear that the meeting will be rescheduled.

When surprised by the unannounced presence of an attorney representing the child, the IEP team should proceed with caution. School district representatives have a right to reschedule a meeting to include their own legal representative. Under no circumstance should teachers begin to discuss the child before the official opening of the meeting by the designated chairperson.

Current changes in IDEA (IDEIA'04, P.L.108-446) have made a mild attempt to alter procedural safeguards. These changes require that either party seeking due process must submit a formal complaint that includes a description of the problem, the facts relating to the problem and a proposed resolution. It is expected that a meeting will be convened to resolve the dispute unless both parties agree to waive the meeting.

Additional IDEIA changes help prevent procedural mistakes from clouding programming issues and decisions. Hearing officers must decide the cases on substantive grounds related to the child's receiving a free appropriate public education (FAPE).

It can no longer be expected that school districts have deep pockets and that they will be held hostage to an imperfect ability to cope with attorneys trying to seize a financial opportunity for their clients and themselves. A free appropriate public education for all students with disabilities is obtainable when the special education staff and parents work together to find solutions instead of litigating differences.

References

Blau, M. (2003, June 9). Learning curve. *New York Magazine.* 31-35&79.

Getty, L.A. & Summy, S.E. (2004). The course of due process. *Teaching Exceptional Children.* 36(3). 40-44.

Goldberg,S.S. (1986). Reimbursing parents for unilateral placements in private Special education schools. *Exceptional Children.* 52, 390-394.

Groeschel, R.L. (2002, March). Bulletproof your IEPs: How to overcome common roadblocks in the process. *The Special Educator.* 17, 8-9.

Keith, J.A. (2002). *The attorney's guide to due process: Preparation equals success.* Horsham, PA: LRP Publications.

Kelman, M. (2001). The moral foundation of special education law. In Finn,E.,Rotherham, A.J., & Hokanson, C.R. (Eds.) *Rethinking special education for a new century.* Thomas B. Fordham Foundation and the Progressive Policy Institute.

Lake, S.E. (2002). *The top 10 IEP errors: How to avoid then, how to fix them*. Horsham, PA: LRP Publications.

Lanigan, K.J., Audette, R.M., Dreier, A.E., & Kobersy, M.R. (2001). Nasty, brutish…and often not very short: The attorney perspective on due process. In Finn,E.,Rotherham, A.J., & Hokanson, C.R. (Eds.) *Rethinking special education for a new century.* Thomas B. Fordham Foundation and the Progressive Policy Institute.

Martin, J.L. (2001). *10 effective stategies to resolve special education disputes without due process.* Horsham, PA: LRP Publications.

McGroarty, D. (2001). The little-known case of America's largest school choice program. In Finn,E.,Rotherham, A.J., & Hokanson, C.R. (Eds.) *Rethinking special education for a new century.* Thomas B. Fordham Foundation and the Progressive Policy Institute.

Katsiyannis, A. & Herbst, M. (2003).Legal and policy trends in special education. *National Association of Secondary School Principals, A Legal Memorandum.*

Richards, D.M. (2002), *Settlement agreements and special education: The essentials for successful dispute resolution*. Horsham, PA: LRP Publications.

Rotter. K. (2001, Nov.). Coordinate staff communication with parents during due process cases. *The Special Educator.* 17, 8.

Weatherly, J.L. (2003, July). Eight promising practices to keep schools out of "Deep Due" process. *In CASE.* 6-7.

Weintraub, F. (2005, February). IDEA amended. *In CASE*, p. 1-2.

Zurko, L.G. (2002). *Preparing your staff for due process: An administrator's guide*. Horsham, PA: LRP Publications

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