SIGHT WORD READING IN CHILDREN WITH DEVELOPMENTAL DISABILITIES

USING PICTURE COMMUNICATION SYMBOLS:

A COMPARATIVE STUDY

by

BRENDA FOSSETT

B.Ed., University of British Columbia, 1992
Dip.Ed. (Deaf and Hard of Hearing), University of British Columbia, 1993

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Department of Educational & Counseling Psychology & Special Education
The University of British Columbia
Vancouver, Canada

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Abstract

Historically, children with developmental disabilities were often excluded from literacy instruction, particularly if they were non-verbal. A growing body of research suggests this population can develop sight word reading skills. Numerous methods have been investigated; paired associate research recommends that pictures be removed from reading instruction while stimulus fading and picture-to-text matching research advocates the use of pictures in reading instruction.

The present study used an adapted alternating treatments design (Sindelar, Rosenberg, & Wilson, 1985) to examine the use of Picture Communication Symbols (PCS) to develop a small sight word reading vocabulary in three non-reading individuals with developmental disabilities. The study compared two instructional conditions, paired associate learning and picture-to-text matching, and measured changes in participants’ ability to match PCS to corresponding text. In the paired associate condition, PCS were always presented alongside text. In the picture-to-text matching condition, PCS were always presented separate from text.

Results indicated that, for two participants, the picture-to-text matching condition was more effective than the paired associate condition for developing a small sight word vocabulary. The third participant was unable to complete the study due to difficulties in her personal life and did not demonstrate learning in either condition. Follow-up data for one participant showed that skills developed using the picture-to-text matching strategy were maintained up to 4 months after intervention.

The results contribute to the existing research on sight word reading instruction and extend previous findings in a variety of ways. First, the study investigated the effectiveness
of two different sight word instructional approaches, both of which used pictures. This was to clarify the role of pictures in sight word reading instruction. In addition, the study investigated two sight word instructional strategies that can be used to teach individuals who are unable to speak and are often excluded from literacy instruction. Finally, the study examined retention of sight word vocabulary over several months and suggested that the picture-to-text matching intervention can achieve long-lasting sight word reading skills. Further research is necessary to extend these findings, particularly in terms of the development of larger sight word vocabularies and the transition from sight word reading to more conventional reading skills.
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CHAPTER 1
Introduction and Review of the Literature

Literacy is an essential skill for inclusion in today’s society. The ability to read and write supports communication, provides access to information, and allows individuals to conduct personal and work-related business. For persons with disabilities, literacy is increasingly recognized as a critical skill. Koppenhaver, Coleman, Kalman, and Yoder (1991) discussed the importance of literacy as it relates to improved communication and control over communication-related technology. Ryndak, Morrison, and Sommerstein (1999) noted that improved literacy skills result in enhanced interpersonal interactions related to the expression of needs, wants, information, feelings and ideas. Others have recognized that the development of literacy skills in persons with developmental disabilities may result in increased access to employment (Koppenhaver et al. 1991; Singh & Singh, 1986), leisure (Singh & Singh, 1986), and educational opportunities (Browder & Xin, 1998; Koppenhaver et al., 1991), as well as increased independence with regard to both domestic and daily living skills (Singh & Singh, 1986). Despite all of this, children with developmental disabilities have often been excluded from literacy learning opportunities, with attention placed instead on the development of functional skills for daily living (Kliewer & Biklen, 2001; Singh & Singh, 1986).

Beginning in the late 1960s, attention was drawn to methods for teaching sight word reading skills to persons with developmental disabilities. Research focused on the teaching of functional sight word vocabularies to enable independence within the community. Since then, numerous methods for teaching sight word reading have been investigated, including stimulus fading, trial and error, symbol accentuation, and tactile-kinesthetic approaches.
(Singh & Singh, 1986). With a plethora of information currently available regarding potentially successful sight word instructional methodologies, the need for selecting appropriate instructional techniques based on individual student characteristics has emerged (Browder & Xin, 1998). In addition, educators are faced with the challenges of implementing effective literacy instruction in the context of inclusive classroom settings.

**Models of Literacy Instruction**

Numerous theories and models of literacy instruction for typically developing children have guided the development of techniques for teaching reading and writing to students with developmental disabilities. As our understanding of literacy development has evolved, we have moved away from theories supporting literacy learning from a “readiness” model to theories that view literacy as a wholistic process and support literacy instruction through a “balanced” approach to learning.

*The Readiness Model of Literacy Instruction*

Although current theories support the inclusion of students with developmental disabilities in literacy learning activities, this has not always been the case. Prior to 1980, a rather narrow view of literacy development emphasized primarily the deficits of students with developmental disabilities and provided “proof” that literacy instruction was wasted on this population. This “readiness approach” to reading resulted in the exclusion of students with developmental disabilities from literacy learning opportunities, as it “…serv[ed] to highlight students’ disabilities and emphasize[d] differences in each student’s performance from that of the mainstream population” (Ryndak et al., 1999, p. 5). Within the readiness model of literacy instruction, students were expected to develop prerequisite skills in a lock-step manner. This regimen of literacy learning required students with developmental
disabilities to spend considerable instructional time attempting to master phonics skills, considered at the time to be essential prerequisites for the development of reading. Phonics skills were usually taught in isolation without being linked to meaningful or motivating activities, and often failed to build on students' strengths or interests. Due to the decontextualized nature of instruction, students with developmental disabilities often found it impossible to develop and demonstrate mastery of these prerequisite skills; thus, they were often excluded from further literacy instruction. One teacher, interviewed regarding her thoughts on literacy instruction and one of her students with Down syndrome, recalled her experience during this time:

We just assumed he couldn't read because [emphasis added] he was Down’s. There was this assumption—always for the kids with severe disabilities—they're not going to be able to read; they're not going to be able to write. I bought into that (Kliewer, 1998, p. 89).

Regardless of their verbal ability, students who were unable to demonstrate the “necessary” prerequisite skills were considered ineligible for further literacy instruction. Clearly, such attitudes “severely delimit[ed] recognizable literacy opportunities and the resources made available to children” (Kliewer, 1998, p. 89). Students without spoken language skills were at especially high risk for failure in reading readiness programs, because it was often assumed that reading was impossible in the absence of the ability to sound out words phonetically. Thus, students with developmental disabilities who were not able to demonstrate an understanding of sound-symbol relationships through speech were deemed to be failures before instruction even began.
A Balanced Approach to Literacy

In the late 1980s and throughout the 1990s, a broadening of the definition of literacy in regular education helped to shift attitudes related to literacy development and persons with developmental disabilities. The more recent conceptualization of literacy as reading, writing, listening, and speaking in daily living contexts (Cunningham, Hall, & Defee, 1991, 1998; Teale & Sulzby, 1986) has helped to open the doors of literacy classrooms to students with significant developmental disabilities (Hedrick, 1999; Katims, 1991, 1996; Ryndak et al., 1999). Literacy is no longer viewed in terms of isolated skills that relate primarily to academic development; instead, literacy is viewed as a means to support connections between students and the broader communities in which they live (Kliewer, 1998). In addition, “[t]he notion that children are too physically, too cognitively, or too communicatevatively disabled to benefit from experiences with written language are not supported by current emergent literacy research” (Koppenhaver et al., 1991, p. 38). Rather than viewing literacy learning as a progression up a rigid ladder, with each rung representing a specific literacy-related skill, literacy is increasingly viewed as a web of skills that interrelate and support one another (Kliewer & Biklen, 2001). Such a view encourages a perception of learners with developmental disabilities as possessing both strengths and weaknesses, and challenges educators to accomplish two tasks simultaneously: strengthening the existing “threads” of the literacy skills web as well as encouraging the creation of new “threads.”

Current views of literacy instruction as multimodal (Cunningham & Allington, 1999; Hedrick, 1999; Katims, 1991, 1996), along with philosophies regarding inclusive education, set the stage for inclusive literacy instruction. The pendulum has swung from a bottom-up,
skills-based model of instruction, to a top-down, whole-language model of instruction and is now moving to a balanced literacy model, comprised of features of both skills-based and whole language models (Adams, 2000; Cunningham et al., 1991, 1998; Cunningham & Allington, 1999; Teale and Sulzby, 1996; Zakaluk, 1996). The balanced model of literacy instruction embraces the notion that literacy learners of varied backgrounds and abilities benefit from multilevel literacy instruction. Cunningham et al. (1991, 1998) and Cunningham and Allington (1999) have discussed the components of a balanced literacy program in terms of “Four Blocks” of literacy instruction: (1) working with words, in which teachers guide students to acquire a wide range of word analysis, decoding, and spelling skills; (2) guided reading, in which teachers model and guide students to practice the skills that are necessary for effective reading and comprehension; (3) shared reading, in which students engage in reading activities with each another while teachers meet with individual students and focus on individual needs; and (4) writing, in which teachers model and guide students to utilize numerous skills for creating written language. In the Four Blocks approach to balanced literacy, students are not grouped on the basis of ability. Rather, instruction is provided in a multilevel fashion, based on the understanding that all students learn and receive support from both teachers and peers. This understanding serves to welcome students of differing ability levels into the literacy classroom.

Sight Word Learning

It is important to recognize that literacy is not defined simply in terms of word recognition. Reading is seen as a complex interactive process involving attention, memory, metacognition, motivation, and strategic action. As Marilyn Jagger Adams (2000) succinctly stated:
Skillful reading is not a unitary skill. It is a whole complex system of skills and knowledge. Within this system, the knowledge and activities involved in visually recognizing individual printed words are useless in and of themselves. They are valuable and, in a strong sense, possible only as they are guided and received by complementary knowledge and activities of language comprehension. On the other hand, unless the processes involved in individual word recognition operate properly, nothing else in the system can either (p. 3).

It is clear from Adams' description that sight word reading is but one literacy-related skill; however, additional literacy skills such as reading comprehension are dependent on it. There are two predominate instructional approaches for developing sight word reading skills: phonics-based and whole word. While phonics-based approaches rely on the development of phonemic awareness skills and sound-symbol relationships, whole word approaches focus on the development of sight word reading skills in the absence of word analysis skills, at least in the early stages of learning.

There is considerable debate about the best practices for teaching word learning. On one side of the argument are those who believe that in order to “crack the code” of an alphabetic system, one must be taught to read using phonics-based methods. Supporters of this philosophy stress that in order for children to become independent readers who are able to decode unfamiliar and untaught words encountered during the reading process, they must be able to pronounce the individual sounds of letters as well as the sounds of blends, onsets, rhymes, and so on. However, the belief that it is impossible to encode text to meaning directly, without first changing text to its spoken form, has been refuted in a number of
contexts. For example, Deaf persons, who are unable to hear the sounds of speech, are able to learn to read via whole word methods without engaging in phonetic decoding of text. In the case of Deaf students who use sign language, text is associated with manual signs. One study in particular investigated the establishment of stimulus equivalence between pictures, manual signs, and printed text (Osborne & Gatch, 1989). Two young, profoundly Deaf students learned to match text to both manual signs and pictures following instruction that was focused on these skills. The children learned to mediate text using a non-vocal language, American Sign Language, in absence of the ability to recognize sound-symbol relationships through verbal means.

Researchers have also considered the experiences of Chinese children who are learning to read. Regan, Kequ, Wei-Jiang, and Chang-Qing (1995) wrote about their process of inquiry related to word learning in both English- and Chinese-speaking children. At a reading conference, some Chinese educators overheard American educators discussing “reading problems.” Puzzled, the Chinese educators asked what was meant by the term “reading problems” and added:

But it is not a problem, is it?...Perhaps it is just a lot of hard work to learn to read, and I think by Grade 6 everyone can read but only after careful, disciplined repetitions and hard work. There are no problems, really. I don’t understand why you say there are reading problems (p. 119).

This exchange resulted in a series of lengthy discussions on the issue of “reading problems” and some important insights from the Chinese. To be literate, Chinese children need to recognize approximately 5,000 different shape clusters produced from the system of 40,000 to 50,000 characters. Chinese characters and shapes do not spell words in the phonetic sense;
rather, they display whole words, and Chinese readers must memorize the characters and shapes visually rather than encoding them based on grapho-phonetic principles. It is clear from the Chinese example that people can learn to read solely by memorizing configurations of characters and associating those configurations with spoken words.

Finally, research investigating the development of reading skills in very young, non-speaking children with Down syndrome further supports the notion that whole word reading instruction can support reading development even in the absence of the ability to sub-vocalize and/or understand sound-symbol relationships (Buckley, 1985; Buckley & Bird, 1993; deGraaf, 1993; Hill, 1995; Laws, Buckley, Bird, MacDonald, & Broadley, 1995). Buckley’s (1985) study is representative of the research in this area. Using parents as teachers, she developed an ongoing home intervention to explore the hypothesis that teaching reading to very young children with Down syndrome would facilitate their language development. Participants were 10 children with Down syndrome between the ages of 5:1 and 7:0. The age at which the children first spoke ranged from 1:10 to 3:2, and their language development at the time of the study ranged from one child who spoke only 20 single words to others who spoke in 7 to 8 word sentences. The participants received individualized sight word instruction in which they were taught by their parents to match, select, name, and communicate the meaning of pictures and related words. Buckley observed that, while the participants often made semantic errors such as reading closed for shut, they never made phonological errors. Based on her results, she hypothesized that the children with Down syndrome were able to access meaning directly from the visual form and concluded that mastering print-to-sound relationships is not essential for young children with Down syndrome to learn to read. Buckley and Bird (1993) argued that “the brain could go straight
from print to meaning, without changing the visual image of the word to its spoken form first and then accessing the meaning” (p. 35).

Clearly, strong arguments exist both for and against the importance of phonics instruction for word learning. Fortunately, it is becoming increasingly common to see the merging of these two perspectives on sight word learning during literacy instruction. Zakaluk (1996) commented on this issue, noting that “In global terms, the interactive model of reading implies an eclectic approach to teaching. That is neither a completely phonic nor a completely holistic approach is correct in teaching beginning reading” (p. 18). Duffy and Hoffman (1999) echoed Zakaluk and also commented on the problems encountered when educators search for the single “right” way to teach reading. They warned that an inordinate focus on a single good idea or method “easily leads to theoretical distortions and undesirable practices. One costly distortion is that teachers develop loyalty to the method and do not switch to other methods even when students need it” (p. 13).

Changes in philosophies regarding literacy development have resulted in theories of sight word learning that take into account the varied and complex processes involved in the acquisition of sight word vocabularies. Developmental theories of sight word learning take into account both the role of visual memory and word analysis skills in the development of effective and efficient readers, and view literacy learning as a series of developmental stages. *Stages of Literacy Development*

The stages of literacy development, particularly those related to the development of word recognition skills, have been defined and researched extensively. Ehri and McCormick (1998) noted that information about these stages is important to help teachers “understand and interpret the word reading behaviors they see in delayed or disabled readers. Behaviors
that might be regarded as bizarre, atypical reactions to print are in most cases just behaviors that typify less mature readers who are at an earlier phase of development” (p. 136). They described four ways by which words can be read by skilled readers: (a) decoding, which involves identifying the sounds of individual letters and then blending them into pronunciations of words; (b) analogy, which involves recognizing how the spelling of an unfamiliar word is similar to that of a familiar word and then adjusting the pronunciation accordingly; (c) prediction, which involves guessing new words using initial letters and context cues such as pictures and/or nearby text; and (d) sight, which involves using memory to read words that have been encountered in print before. Quality literacy instruction encourages students to use all four of these strategies for reading new words as they progress across five phases of reading development. These phases (Ehri, 1992, 1995) are described briefly in the sections that follow.

**Pre-alphabetic phase.** In this first phase of reading development, students have very limited knowledge of letters and do not understand sound-symbol relationships. Thus, they make connections between the visual images of words and their pronunciations or meanings and are able to read only by relying on memory or context cues. Readers attend to the length and shape of words (rather than letters or sounds) in order to identify them. Young children demonstrate evidence of sight word reading when they recognize familiar words such as McDonald’s, Coca-Cola, STOP, and so forth. Children with developmental disabilities, particularly autism, are often highly skilled at reading these environmental words, especially when pictures or logos (such as the “golden arches”) accompany text. Even those whose speech has not developed may demonstrate their understanding of print and/or logos in unusual ways, as in the case of a child who tantrums whenever he is driven past a
McDonald’s restaurant. Despite the fact that children at this stage are unable to make sense of the phonetic code, their early sight word recognition skills must be acknowledged, since they lay the foundation for the development of more complex, analytic word reading skills.

Partial alphabetic phase. In this phase, students begin to develop skills for decoding and reading by analogy. Mason (1980) referred to this as a “visual recognition” stage because children begin to detect letters in words and utilize context cues in order to guess the meanings of unknown words. During this phase, children typically recognize basic, initial consonants (e.g., d, f, p, m, etc.) but have difficulty with graphemes containing more than one letter (e.g., sh, ch, th) or consonants whose names are not directly related to their sounds (e.g., h, w, y). Students begin to apply their growing phonemic awareness to reading and begin to use their knowledge of simple consonant sounds to decode unknown words. For example, when seeing the word book, a student in this phase is likely to recognize the letters b and k as having the sounds /b/ and /k/ and to use that knowledge to guess the word. However, it is also common for students in this phase to make errors, since their knowledge of sound-symbol relationships is just emerging.

Full alphabetic phase. By this phase, children have acquired the “foundations for attaining mature reading skill in an alphabetic writing system” (Ehri & McCormick, 1998, p. 143). While the process of decoding unknown words may continue to be somewhat laborious, children are becoming more competent in this realm. Students begin to use analogy while decoding unfamiliar words and are able to combine higher-level decoding skills with the ability to check for comprehension while reading, ensuring that what they are reading makes sense in context. At this stage, students understand the major grapheme-phoneme correspondences and possess phonemic awareness, allowing them to decode
unfamiliar words, perform grapho-phonetic analyses, and read unknown words by analogy. This supports students to increase their sight word vocabularies, as they are able to store words in memory based on their understanding of the alphabetic system.

*Consolidated alphabetic phase.* This stage begins during the full alphabetic stage as students become skilled in more complex decoding skills. Students learn to recognize chunks of frequently-recurring letters such as affixes, root words, onsets, rhymes, and syllables. They also learn to apply their knowledge of letter chunks to unknown words, thus facilitating word decoding accuracy and speed. An additional result is an increase in sight word vocabulary, particularly for longer words, as students memorize chunks of letters.

*Automatic phase.* In this phase, students become proficient at reading both familiar and unfamiliar words with automaticity. Thus, most words are sight words by this phase, although readers also have an arsenal of skills at their disposal to decode unfamiliar words with ease. It is at this stage that readers are able to focus entirely on text meaning, since word recognition skills are highly developed and occur unconsciously.

While students with developmental disabilities may possess within-child factors that interfere with their progression through these stages of reading acquisition, there is a significant body of literature that suggests such students can and do benefit from instruction in sight word reading. Given that many students with developmental disabilities possess strengths in visual matching and visual memory and demonstrate weaknesses in phonics-related skills such as sequential auditory processing, the literature on sight word instruction for students with developmental disabilities focuses on whole word methods. Numerous strategies have been explored, many with positive results.
Sight Word Learning and Students with Developmental Disabilities

General support for the whole word method of instruction for students without disabilities dates back to the 17th century. In his book, *The Psychology of Reading: An Introduction*, Crowder (1982) displayed a page from an educational book published in 1657. In it, text is annotated with numerals that correspond to various parts of an illustration, demonstrating the use of whole word approaches utilizing pictures to teach reading. Crowder also quoted a defense of the whole word approach that appeared in the 1828 Worcester primer:

> It is not very important, perhaps, that a child should know the letters before it begins to read. It may learn first to read words by seeing them, hearing them pronounced, and having their meanings illustrated; and afterward it may learn to analyse them or name the letters of which they are composed (p. 198).

While scant research has examined sight word reading using phonics-based approaches with persons with developmental disabilities (Singh & Singh, 1986), extensive research has investigated whole word approaches. This is due to the belief that students with developmental disabilities are more likely to benefit from whole word approaches to instruction, at least in the initial stages of word reading development (Buckley & Bird, 1993). Studies that have compared phonics-based approaches with whole word approaches tend to support this belief. For example, Vandever, Maggart, and Nesser (1976) compared a phonics-based approach to reading instruction with the whole word-based Edmark Reading Program in children with significant developmental disabilities. Their results clearly favoured the Edmark Reading Program. In contrast, Foorman, Francis, and Winikates (1997) compared three reading interventions for children with reading disabilities but no additional
developmental delays: synthetic phonics (the teaching of individual letter sounds), analytic phonics (the teaching of onsets and rhymes), and the Edmark Reading Program. They demonstrated that students in the synthetic phonics group outperformed those in the other two groups on several reading measures. These contrasting results highlight the apparent discrepancy between students with and without developmental disabilities in this area.

Other researchers have also voiced their support of a whole word approach for initial reading instruction with learners with developmental disabilities. Van Etten (1977) suggested that teaching whole-word reading to such students may lay the groundwork for future instruction in sound-based approaches:

The pool of words developed through the sight-word method can...serve as a basis for analytic phonics instruction and other analysis techniques. Once the student can identify some number of words fluently, more sophisticated word recognition skills can be developed. Beginning with sight-word instruction, rather than another approach, simply provides a starting place. Instruction in basic sight-word procedures can often be profitably followed by more involved word analysis techniques (p. 126).

Van Etten’s suggestion was later supported by Ehri’s (1992, 1995) extensive research regarding word learning processes during the pre-alphabetic phase of reading. As noted previously, she found that typical children begin to learn words as whole chunks, and often learn to read logos and whole words first. As they mature, they become able to understand increasingly complex sound-symbol relationships that strengthen their web of literacy skills. As both Van Etten (1977) and Buckley & Bird (1993) have suggested, learners with developmental disabilities may follow the same learning progression.
There is a large body of literature related to the use of whole word methods for teaching sight word reading to persons with developmental disabilities. However, in the majority of these studies, sight word reading is conceptualized as the ability to verbalize words presented on flash cards or in word books. These studies have investigated a variety of instructional methods, including (a) antecedent stimulus control or errorless procedures such as paired associate teaching (both with and without stimulus fading) and discrimination approaches; (b) trial-and-error methods; (c) a variety of behavioural approaches, including comparisons of different forms of time delay and prompting strategies; (d) symbol accentuation approaches; (e) tactile-kinesthetic approaches (Browder & Lalli, 1991; Singh & Singh, 1986; Walsh & Lamberts, 1979); and (f) incidental, immersion, or communication-based approaches (Collins, Branson, & Hall, 1995; Eikeseth & Jahr, 2001; McGee, Krantz, & McClannahan, 1986; Raver & Dwyer, 1986). Research regarding these instructional techniques will be summarized in the section that follows.

**Sight Word Instructional Techniques**

*Picture-Based Techniques*

*Paired associate learning.* A number of studies have investigated the use of paired associate learning techniques that incorporate pictures to develop sight word reading skills in persons both with and without developmental disabilities. The authors of numerous paired associate learning studies have invariably concluded that the use of pictures "blocks" (i.e., interferes with) sight word learning (Didden, Prinsen, & Sigafoos, 2000; Harzem, Lee, & Miles, 1976; Lang & Solman, 1979; Montare, Elman, & Cohen, 1977; Newton, 1995; Samuels, 1967; 1970; Saunders & Solman, 1984; Singer, Samuels, & Spiroff, 1974; Singh & Solman, 1990; Solman & Singh, 1992; Wu & Solman, 1993). This "blocking effect" is
typically explained in relation to stimulus control. In these studies, learners are typically taught to respond verbally to the presentation of text + picture cards and the request to “read.” Although, hypothetically, familiar pictures should enhance the ability to recognize unfamiliar words by sight, they instead appear to interfere with learners’ attention to unknown print stimuli. In other words, the previously established association between the picture and its name appears to impede the acquisition of a new association between the text and its name. Thus, when learners are later presented with text-only stimuli, they are unable to respond to the request to “read.”

**Stimulus fading procedures.** In attempts to ameliorate the blocking effect seen in paired associate learning, some researchers have investigated the use of fading procedures to enhance the learning of sight words (Dorry, 1976; Dorry & Zeaman, 1973, 1975; Lalli & Browder, 1993; McDowell, 1982; Rincover, 1978; Tabe & Jackson, 1989; Walsh & Lamberts, 1979). Stimulus fading “involves the gradual shifting of control from some dominant stimulus element to a different and criterion stimulus” (Wolery, Bailey, & Sugai, 1988, p. 273). When using stimulus fading techniques to teach word recognition, text is first paired with a picture that the student is able to identify. When instructed to “read,” the student uses his or her knowledge of the picture cue to respond correctly. Over time, the picture cue is faded using one of several techniques. One technique simply involves making the picture increasingly smaller or making its outline lighter. Alternatively, fading may be accomplished using a slide viewer or light box to display the picture + text and then gradually dimming the light behind the picture so it is increasingly difficult to see. Additional fading techniques have included fading in a word by making the text increasingly darker, while simultaneously fading out the associated picture by making the picture increasingly
lighter (Dorry, 1976). Overall, fading procedures that are designed to gradually and systematically draw the learner’s attention away from the picture and toward the text stimulus do indeed result in improved text-alone reading, especially when compared to standard paired associate techniques (Dorry, 1976; Dorry & Zeaman, 1973, 1975; McDowell, 1982; Rincover, 1978; Tabe & Jackson, 1989; Walsh & Lamberts, 1979).

**Discrimination Techniques**

The most well-known reading program utilizing a discrimination procedure is the afore-mentioned Edmark Reading Program (1972). In this program, which is currently available in both print and software versions, a target word first appears alone, and the student is directed to “Point to the word ________.” The pointing response is gradually shaped over a series of exposures in which additional words or word-like letter configurations appear with the target word (Walsh & Lamberts, 1979). The final trial asks the student to “Read this word,” and requires a verbalization of the target word.

Walsh and Lamberts (1979) compared stimulus fading and errorless discrimination techniques for teaching sight word vocabulary to students labeled “trainable mentally retarded.” They followed Dorry and Zeaman’s (1975) procedures for the stimulus fading condition and used the Edmark Reading Program for the errorless discrimination condition. Students were assessed on word identification (saying the word presented), word recognition (pointing to a word), and picture-word matching (placing a word card next to the appropriate picture). Their results favoured the errorless discrimination approach (i.e, the Edmark Reading Program) for all three reading tasks. Walsh and Lamberts attributed their results to the use of errorless discrimination that involved an auditory-to-visual match-to-sample
procedure that maintained students’ attention on word-text equivalencies without the use of pictures.

Other studies have also focused on the Edmark Reading Program. One such study (Vandever, Maggart, & Nasser, 1976), which was discussed briefly in a previous section, compared the Edmark Reading Program to the Merrill Linguistic Series (Fries, Wilson, & Rudolph, 1966), a program that emphasizes the teaching of simple word families; and to the Sullivan series (Buchanan, 1968), which teaches sound-symbol relationships. The study involved three groups of primary-aged students labeled as “educable mentally retarded.” Students were pre-tested on their ability to read the first 150 words from the reading program to which they were randomly assigned and were then taught to read the words in the program at their own pace. Finally, they were post-tested on their ability to read the original 150 words. Students who received instruction via the Edmark Reading Program achieved higher scores on the post-test than those either of the other groups. Despite these favourable results, Vandever et al. cautioned that the words taught in the Edmark Reading Program were highly discernable and would likely foster “rapid initial learning at the expense of transfer” (p. 32).

Matching Techniques

A major dilemma with paired associate, stimulus fading, and discrimination techniques for reading instruction is the necessity for verbal skills. In almost all of the studies involving these techniques, reading has been defined as the ability to articulate words out loud when presented with text stimuli. However, many individuals with developmental disabilities experience expressive language difficulties that prevent them from being able to read out loud. In addition, unlike Deaf individuals, non-verbal persons with developmental disabilities may not have a viable language system such as American Sign Language through
which they can communicate. Thus, these individuals may possess literacy skills that go unnoticed. Consider the case of Sharisa Kochmeister, an individual once labeled as having an IQ in the "profound" range of mental retardation. In 1997, she wrote:

I spent in excess of 11 years (ages 1 to 13+) with no way to communicate because I was and still am, almost completely non-verbal...Although I readily understand spoken and written language...I couldn't speak, or use sign language effectively....People fully believed I was "hopelessly retarded" since I couldn't express myself or respond well. When I started to type, I needed my hand held and index finger supported. Over time, I moved to wrist support, elbow support, a hand on my shoulder, and just having someone's hand "shadowing" mine. All these kinds of "facilitation" made it easier to overcome my inertia; but they also caused people to question whether it was my hand or that of my "facilitator" actually typing. I finally became an independent typist because of those doubts that become the ultimate motivator...(para. 4).

Others have echoed Kochmeister's experience. Lucy Blackman (1999) described her early reading development, prior to beginning school:

A picture of a ball and the four letters that were below it came together in a completely synchronized way, but I know that until I was a lot older I never connected those symbols with the huggable plastic sphere I could hold in my hands. I never developed the urge to follow a written or symbolic instruction, and I never became automatic at speaking a written word. So no one knew I could read. At that stage I would not have seen any point in showing that I could (p. 46).
These two individuals, both of whom were assumed to have severe cognitive deficits, challenge us to re-evaluate our biases regarding literacy instruction and persons labeled with significant cognitive disabilities. Such a re-evaluation challenges us to consider unconventional and creative strategies to support individuals who are unable to demonstrate literacy-related skills in traditional ways. In addition to considering whether or not word recognition and other reading skills can be acquired and demonstrated by persons with developmental disabilities, researchers need to consider how such reading skills can be demonstrated. Some researchers who have focused on this issue have found that many students can demonstrate reading ability by matching words to either pictures or real objects, or by engaging in activities or completing tasks as dictated by text.

*Picture-to-text matching interventions.* Two early studies investigated the use of matching as both an instructional intervention and a method for demonstrating word recognition skills. Hewett (1964) taught an institutionalized 13-year-old boy with autism who was unable to speak to use writing for communication. Over a 1.5 year period, the student first learned to match objects to pictures, and then to match pictures to words. Words were selected based on the student’s interests; he was involved in selecting pictures from books and mounting them on cards for instruction. Eventually, he learned the alphabet and was taught to write simple phrases for communicating wants and needs. Similarly, LaVigna (1977) used an errorless, discrete trial approach to teach three adolescents with autism from a state hospital unit to match text labels to three types of candy. All three students developed the ability to select the correct label when presented with a single candy as well as to select the correct candy when presented with a single label. Both of these studies demonstrate the potential of using a matching paradigm to teach either picture-to-text or object-to-text
discrimination to students who are unable to demonstrate reading ability via verbal expression.

A recent study also investigated the use of picture-to-text matching as a demonstration of reading, and text-to-picture matching as a demonstration of writing. Eikeseth and Jahr (2001) compared the effectiveness of the UCLA Reading and Writing Program with a behaviorally based program for teaching receptive and expressive sign language use in children with autism who displayed extreme difficulty in acquiring verbal language skills via behaviourally based intervention. In the reading portion of the program, students were taught to respond to printed instructions rather than to verbal or signed instructions. Target skills included “identifying objects, verbs, colors, shapes, gender, etc.” (p. 291) as well as collecting specific toys, completing specific tasks, and following printed activity schedules. As the program was designed specifically for students who experienced difficulty in acquiring spoken and/or signed language, verbal reading was not required to demonstrate reading ability. The results clearly demonstrated that an errorless approach to teaching picture-to-text matching resulted in the children’s ability to discriminate between three words in the picture-to-text condition and three different words in the text-to-picture condition. Had these same children been involved in interventions requiring verbal output as a demonstration of ability, they would have been unsuccessful and likely viewed as non-readers.

Functional Sight Word Instruction

Some researchers have focused on the use of various instructional procedures to teach the sight words necessary for engaging in daily living skills such as cooking, doing laundry, and making telephone calls (e.g., Browder, Hines, McCarthy, & Fees, 1984; Collins et al.,
Browder et al. (1984) used small group instruction to introduce words in instructional booklets that were then used as supports for cooking, doing laundry, and making telephone calls. Collins et al. (1995) employed peer tutors to teach sight words to students with developmental disabilities. Students were taught to look at words printed on flashcards and then find the target words on cooking product labels. Generalization was assessed during cooking activities with the teacher.

Others have taught safety-related words with the intention of increasing independence within the community (e.g., Ault, Gast, & Wolery, 1988; Schloss et al., 1995). Ault et al. (1988) taught safety sign words in a classroom setting, although they did not assess generalization in the community. Schloss et al. (1995) used modeling and guided practice within the community to teach sight words commonly seen in recreation settings. Teachers pointed out words, verbalized them, and asked students to repeat them. Scavenger hunt games required students to locate, read and define words in order to receive arcade tokens. This strategy was found to be more effective than teachers simply reading passages from signs during recreational activities.

The use of sight word reading skills for the purpose of interpersonal communication has also been investigated (Eikeseth & Jahr, 2001; McGee et al., 1986; Raver & Dwyer, 1986). Eikeseth and Jahr (2001) alluded to the potential of their program for developing receptive and expressive communication skills, although their study did not address this issue specifically. McGee et al. (1986) incorporated motivating toys into their teaching program. Students learned to select a corresponding text card in order to obtain preferred play items. Similarly, Raver and Dwyer (1986) used a naturalistic method whereby teachers modeled the use of text cards to access play items in the classroom. All of the children in this study
learned 24 words and one phrase over a 48 day period. Overall, this body of research extends previous sight word research by investigating efficient and effective instructional strategies that support sight word reading for functional tasks. Results have generally demonstrated that students can and do develop sight word recognition skills when instruction is embedded in functional, motivating, and/or meaningful activities, provided that effective instructional procedures are implemented.

**Efficacy and Efficiency of Instructional Techniques**

Given that a wide variety of instructional approaches may result in successful word reading in persons with developmental disabilities, it is important to consider both efficiency and efficacy when choosing an approach to use with a specific student. Accuracy and rate of acquisition are not the only factors to consider; the amount of time spent teaching sight words, the number of errors made using a particular intervention, and the complexity of an intervention are also important features to consider. For example, research has compared the efficiency of various time delay and prompting procedures, and has found that some strategies are more efficient than others. Constant time delay has been found to be more efficient than progressive time delay or the system of least prompts in terms of the number of trials required to reach criterion performance, the number of errors that occur during learning, and the amount of instructional time required, although the procedures were similar with regard to generalization (Ault et al., 1988; Gast et al., 1988). In one study, simultaneous prompting resulted in better maintenance and generalization than antecedent prompt and test procedures (Singleton et al., 1999). In another study, Schuster, Griffen, and Wolery (1992) demonstrated that, while simultaneous prompting was more effective than constant time
delay in terms of acquisition, the differences between the two methods were not as clear with regard to maintenance.

Despite the relative success of time delay and prompting procedures, it is also important to consider how such methods fit within the context of inclusive classroom settings. Of eight studies investigating the use of time delay and prompting procedures (Ault et al., 1988; Browder & D'Huyvetters, 1988; Browder et al., 1984; Collins et al., 1995, Gast et al., 1988; Lalli & Browder, 1993; Singleton et al., 1999; Winterling, 1990), none were implemented in either integrated or inclusive settings. Time delay and prompting procedures require careful monitoring to ensure that prompts are delivered at precisely the correct moment and in the correct manner. In frequently hectic and noisy inclusive educational settings, where adult attention is often divided among 30+ students, it is unlikely that such precision could be implemented. Furthermore, such instructional methods are unlikely to facilitate peer interaction. Of the eight studies listed above, only one incorporated peer tutors, who were trained by university level instructors (Collins et al., 1995). In inclusive settings, instructional methods such as time delay and prompting procedures that require careful training and a high degree of precision may separate students with developmental disabilities from their peers and may be impossible for peers to implement accurately.

*Visually Supported Instruction for Persons with Developmental Disabilities*

Browder and Xin (1998) suggested that research should investigate the use of instructional strategies for sight word learning that are matched with individual student learning characteristics. Although, as with typical learners, persons with developmental disabilities comprise a heterogeneous group, there is a growing body of literature suggesting that these individuals often learn better through the use of visual support strategies (Grandin,
“Visual support strategies” is a term that refers to the use of photographs and line drawings to assist individuals to access information, understand the communication of others, and express themselves. The success of visual support strategies for persons with developmental disabilities is most likely related to the visual processing strengths and auditory processing weaknesses common in this population (Prizant & Schuler, 1987). For these individuals, the processing of transient information may be quite difficult because of neurological limitations related to the ability to process rapidly changing stimuli auditorially (Schuler, 1995). When an individual with a developmental disability does not respond immediately to a spoken request or message, the speaker typically repeats or rephrases the message, further taxing the auditory processing system, which becomes increasingly “overloaded.” The stress experienced during this process by the individual with a developmental disability may further exacerbate the problem. Temple Grandin, an adult with autism, noted that nonverbal persons with autism likely experience difficulties with spoken language “because not enough speech gets through their dysfunctional auditory system” (p. 72). It is for this reason that she advocates the use of visual support strategies for both communication and learning.

Visual support strategies are increasingly being applied in situations where auditory processing difficulties interfere with the quality of life of persons with developmental disabilities. Visual supports for communication have been implemented in various forms, including picture communication books, boards, and wallets (Bondy and Frost, 1994; Hamilton & Snell, 1993; Rotholz & Berkowitz, 1989). Numerous research articles have also described the benefits of visual schedule systems for children and adults who exhibit problem behaviour (e.g., Clarke, Dunlap, & Vaughn, 1999; Dalrymple, 1995; Dettmer, Simpson,
Myles & Ganz, 2000; Dunlap & Fox, 1999; Hodgdon, 1995; Krantz, MacDuff, &
McClannahan, 1993; MacDuff, Krantz, & McClannahan, 1993; Pierce & Schreibman, 1994;
Savner & Myles, 2000). Visual schedule systems have been used to support children and
adults with developmental disabilities to understand what tasks are expected of them and
when preferred activities will occur.

Given the demonstrated success of visual support strategies for alleviating the
communication and behavioural difficulties experienced by many persons with
developmental disabilities, it would seem logical to extend the use of pictures to the teaching
of literacy skills, including word reading. Carroll (2000) suggested that “…the teaching of
the mechanics of speech reconstruction (techniques of word recognition) is best done with
materials which are maximally meaningful to the learner…” (p. 5). For an individual using
pictorial and other visual supports to express himself, understand information from others,
and access his world with ease and efficiency, what could be more meaningful for teaching
word recognition skills than those same picture symbols? Temple Grandin (1995)
commented on the use of visual supports for teaching reading to children with autism:

Autistics have problems learning things that cannot be thought about in pictures. The
easiest words for an autistic child to learn are nouns, because they directly relate to
pictures. Highly verbal autistic children like I was can sometimes learn how to read
with phonics...Lower-functioning children often learn better by association, with the
aid of word labels attached to objects in their environment. (p. 29-30).

Of course, the use of pictures to develop reading skills in children with developmental
disabilities is not a novel concept. With the increased use of pictures for communication,
behaviour support, and other learning-related tasks over the past decade in particular, educators and publishers have leapt at the opportunity use pictures in academic arenas as well, particularly with regard to literacy instruction. However, despite numerous studies that caution against the use of pictures for teaching word reading skills to both typical children and children with developmental disabilities because of the blocking effect that was described previously, most formalized reading programs utilize paired-associate strategies for instruction. For example, the Bridge Reading program (Dewsbury, 1983) pairs all of the target words to pictures and engages children in a variety of reading and writing activities with picture-supported text. Text in the student workbooks is entirely supported by pictures, as is text in the 50 readers that accompany the program. In the handbook for the program is a section titled “Changing the focus from picture to word alone” (p.7). In this section, it is recommended that the teacher use “delay strategies” as one method for shifting attention from pictures to text. Unfortunately, only three general points regarding the implementation of delay strategies are provided, and there is no mention of either the various types of delay strategies or their comparative efficacy or efficiency. Another suggested strategy for shifting stimulus control from pictures to text is match-to-sample; however, it is described in a way that does not follow from the established research. Rather than teaching children to match text-alone to picture-alone stimuli, students are taught to select text-alone stimuli that match text + picture stimuli. Thus, students can succeed by simply matching text to text; however, this is unlikely to result in their ability to read text in the absence of the picture, based on paired associate research. Figure 1 shows an example of two match-to-sample exercises from the Bridge Reading program.
Another example of the erroneous application of research to reading instructional products can be found in The Early Learning Site (http://aba-materials.com/), an online store selling picture software for children with autism spectrum disorders. A section of the site provides information about the benefits of their software for teaching sight word reading:

Reading is of course a vital skill without which a child cannot get very far in school or society. A common mistake is to teach reading using just words without pictures or any other media. The child could learn to sight-read by memorizing the sequence of letters but may not understand much of what he is reading. A much better approach is to begin by using pictures with the text underneath. The child will then associate the words with the pictures. Do not teach your child to read words he would not know the meaning of.

While it is commendable that this company stresses the importance of reading for meaning, they unfortunately advocate the use of pictures to develop sight word reading skills without any discussion of the issues related to transferring stimulus control from pictures to the text. In fact, they state that it is a “mistake” to teach sight words without the use of pictures, when a large body of literature shows that, compared to the paired associate method they promote, it is more beneficial to teach sight words without picture prompts.

Another popular special education software program that pairs pictures to text adds to the confusion regarding sight word reading development. Writing with Symbols 2000
(Mayer-Johnson, Figure 2) is a symbolized word processing program that can be used to support the inclusion of students with a variety of disabilities in classroom activities.

*Figure 2. Screen Shot for Writing with Symbols Software*

This software can be used to adapt text so that symbols appear above each word, thus supporting students to “read” the same material as their peers. On-screen word-symbol grids can also be constructed to support students to “write” by pointing and clicking on picture symbols to construct sentences. While a number of important language and literacy skills can be developed through the use of this software, its use is unlikely to result in the development of sight word reading skills in non-readers. Unfortunately, despite the large body of research regarding the blocking effect typically found with paired associate learning, Writing with Symbols 2000 is marketed as a tool to teach reading (see, for example, www.donjohnston.com, which describes this program as one that helps “students learn to read using symbols”).

These examples of improper picture use in reading and literacy-related instructional and support products for children with developmental disabilities highlight the need for (a) a clearer understanding of the role of pictures in reading instruction and (b) accurate
dissemination of research information to parents, educators, and publishers. It is vital that reading instructional programs attend to issues regarding stimulus transfer from pictures to text in order to avoid problems related to the blocking effect. Although much of the paired associate research simply advises against using pictures in reading instruction at all, to do so would equate to "throwing the baby out with the bath water." For students who already use pictures to understand and interact with the world around them, the extension of picture use to reading instruction makes both practical and theoretical sense (Sheehy & Howe, 2001). While the use of pictures certainly appears to inhibit the development of sight word reading skills when presented alongside the text, as in paired associate techniques, pictures seem to facilitate sight word learning when a) attention is gradually diverted from the picture cues to the text or b) students are taught the equivalence between pictures and text through engagement in picture-to-text matching activities.

Statement of Problem

Historically, children with developmental disabilities have historically been excluded from literacy instruction, based on the supposition that they are unlikely to benefit from such instruction due to their limited communication, language, and cognitive skills. As the definition of literacy has expanded to include listening and speaking in addition to reading and writing, attitudes regarding the potential of persons with developmental disabilities in terms of literacy learning have started to shift. Researchers have started to focus on instructional methodologies to develop sight word reading skills in persons with developmental disabilities using a number of strategies, including stimulus fading, trial and error, behavioural approaches, symbol accentuation, and tactile-kinesthetic methods.
While these methods have generally proved effective, most require participants to possess sufficient verbal skills to demonstrate learning, particularly those using standard paired associate and stimulus fading procedures. In addition, these strategies are rarely used to teach sight word reading in functional contexts or for functional purposes. On the other hand, methods that are typically used in functional contexts require teachers to possess a high degree of training and skill with regard to the application of time delay and prompting procedures and are thus generally used only in segregated settings. It is unlikely that these methods will fit within the context of inclusive classroom settings; furthermore, it may not be feasible for school systems to provide the level of staff training and intensive one-on-one instruction required for their effective use.

Currently, acknowledgement of the need to support the development of literacy skills in students with developmental disabilities has prompted the production of new materials for teaching. However, despite a significant body of evidence establishing the fact that standard picture-to-text paired associate techniques result in a blocking effect and inhibit sight word learning, current print and software programs designed to develop literacy skills in persons with developmental disabilities encourage the use of standard paired associate teaching. On the other hand, given our current understanding that many persons with developmental disabilities, particularly autism, possess relative strengths in visual processing skills, interventions that incorporate the use of pictures for literacy instruction are likely to be effective if such use is situated firmly within the research regarding how pictures can be used to maximum advantage. This is especially important for students who are unable to speak, and who must acquire reading skills through nonverbal means. Thus, it is critical to develop instructional strategies that (a) take advantage of the visual processing strengths of this
population, (b) draw upon prior knowledge about successful instructional procedures related to the use of pictures, (c) teach functional skills, (d) include students with limited verbal capabilities, and (e) fit within the context of inclusive classroom settings. The goal of this study is to investigate the use of one such strategy, picture-to-text matching, and compare it to paired associate instruction.

Research Questions

Research Question 1

Does a picture-to-text matching intervention result in increased accuracy of sight word recognition in students with developmental disabilities, compared to a paired-associate intervention?

Research Question 2

Does a picture-to-text matching intervention result in better generalization of sight word recognition to novel and functional activities, compared to a paired-associate intervention?
CHAPTER 2
Method

Participant Selection

A Request for Ethical Review was submitted to the University of British Columbia Office of Research Service, Behavioural Research Ethics Board. Upon receiving a Certificate of Approval from the Behavioural Research Ethics Board (Appendix A), recruitment of participants began. The Autism Society of British Columbia (ASBC) assisted in the recruitment of participants. ASBC is a parent directed society whose members include both parents of children with autism spectrum disorders and professionals in the field of autism and related developmental disabilities. ASBC agreed to distribute recruitment notices (Appendix B) at their Annual General Meeting on June 1, 2002. They also agreed to include a recruitment notice in their June 2002 newsletter.

Several conditions had to be met in order to qualify for inclusion. To ensure that participants demonstrated a history of a significant difficulty in acquiring sight word reading skills, participants had to be a minimum 7 years of age and unable to read any sight words. Because the intervention required participants to engage in one-on-one instruction for one-hour sessions with breaks, participants needed to have a demonstrated ability to do so without presenting problem behaviour. Because the intervention was to include the use of Picture Communication Symbols, participants needed to demonstrate an ability to understand these symbols. Finally, because instruction centered on reading English words, participants were required to be from homes where English is the primary language.

As parents contacted the investigator regarding the project, they were asked general questions regarding their child's age, diagnosis, and educational program. After it was
determined that a child met basic qualification criteria, an appointment was set up to meet the
child and conduct initial assessments, which included a symbol assessment and
administration of the Peabody Picture Vocabulary Test (Dunn & Dunn, 1997). After a child
was determined eligible for the study, based on initial assessment outcomes, parents were
provided with an Informed Consent Form (Appendix C) and a Permission to Videotape form
(Appendix D) to complete.

Participants

Five individuals completed the initial assessment process. Of those individuals, three
met criteria for inclusion in the project: Jason, Sam, and Andrea (pseudonyms).

Jason. When the study commenced, Jason was 10 years and 7 months old. He was
diagnosed with “autistic features” at 4 years of age. He is the youngest child in a Chinese-
Canadian family, and lives with his mother, father, and older brother and sister. Jason has
received numerous supports and interventions over the years. When he was 4 and 5 years of
age, he and his family received consultative services from an agency in their city. The
consultant provided support at both home and school. During this time, Jason became toilet
trained, learned to respond to his name, and began to understand some simple instructions
and engage in play and daily living activities. His receptive communication skills were poor
and he did not use speech expressively. At age 6, Jason began a home-based, behavioural
therapy program under the direction of various consultants from agencies in the United
States. Jason received 25 to 30 hours per week of home-based instruction, in addition to
attending his neighborhood school. During this time, he acquired a basic receptive
vocabulary of approximately 200 words and developed the ability to engage in educational
and play-based activities, with support. At age 8, Jason began attending Giant Steps, an
alternative school program for children with autism spectrum disorders. For 3 days per week at Giant Steps, Jason received occupational and speech therapy in addition to educational therapy to support him in developing communication, social, and early academic skills. Jason attended his neighbourhood school for 2 days per week while attending Giant Steps. In 2002, Giant Steps closed and Jason returned to his neighbourhood school on a full time basis. During the study, Jason was on summer holidays from school and was enrolled in an inclusive day camp program and did not receive additional home-based therapies. Jason demonstrated minimal expressive speech skills and used approximately 10 words to express his wants and needs.

_Sam._ At the time of the study, Sam was 11 years and 9 months old. Diagnosed with Soto Syndrome, Sam lives with his father and paternal grandmother and visits with his mother regularly. Soto Syndrome is characterized by high birth length, rapid bone growth, and possible verbal or motor delays. Persons with Soto Syndrome may also have developmental deficits, specific learning problems, and/or speech and language delays. Sam attends a neighbourhood school and, at the time of the study, received support from a special education resource room program. Sam is a highly verbal child who enjoys asking questions, sharing information, and interacting with others. Despite his high verbal ability, Sam was unable to read, was very much aware of his inability, and was highly motivated to learn. Throughout the study, Sam was involved in a variety of activities, including a daytime recreational program for children with disabilities, going on weekend holidays with his mother, and spending time with friends.

_Andrea._ At the time of the study, Andrea was 20 years and 5 months old. Andrea has a significant cognitive disability as a result of birth trauma, is unable to communicate
effectively through speech, and has a seizure disorder. When the study began, Andrea was living with her parents, spending 2 weeks at the home of her father followed by 2 weeks at the home of her mother. Andrea has two younger brothers who also moved regularly between their parents’ homes. During the day, Andrea was supported by an individual hired privately by the family. Andrea’s weekly schedule included activities such as volunteering at the SPCA; doing housework; meeting friends for social activities; and taking classes for persons with developmental disabilities such as yoga, cooking, and art. During the study, Andrea’s parents made the decision for her to live full time with her mother. After a few weeks, this situation became problematic and Andrea moved to her father’s home on a full-time basis and visited with her mother regularly. Also during the course of the study, Andrea’s primary support staff went away on a holiday and Andrea’s daily schedule became somewhat less predictable. These changes, along with an increase in seizure activity during the course of the study, resulted in Andrea experiencing a great deal of stress and confusion during the study. Table 1 summarizes the participants’ characteristics.
### Table 1

**Characteristics of Participants Included in the Study**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Jason</th>
<th>Sam</th>
<th>Andrea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>10 years, 7 months</td>
<td>11 years, 9 months</td>
<td>20 years, 5 months</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>Autism</td>
<td>Soto Syndrome</td>
<td>Significant cognitive disability resulting from birth trauma</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Chinese-Canadian</td>
<td>Caucasian</td>
<td>Caucasian</td>
</tr>
<tr>
<td>Family</td>
<td>Middle class, 2 parents, 2 siblings</td>
<td>Upper class, 2 parents, (divorced), no siblings</td>
<td>Middle class, 2 parents (divorced), 2 siblings</td>
</tr>
<tr>
<td>Schooling at time of study</td>
<td>Attended neighbourhood school</td>
<td>Attended neighbourhood school</td>
<td>Completed high school</td>
</tr>
<tr>
<td></td>
<td>full time with support of educational assistant</td>
<td>in resource room program</td>
<td></td>
</tr>
</tbody>
</table>

**Symbol Set and Target Printed Words**

Picture Communication Symbols (PCSs) (Mayer-Johnson, 2001) were selected as the graphic representational system (GRS) for this study. PCSs were chosen because they have been found to be one of the easiest GRSs to learn (Mirenda & Locke, 1989). As well, PCSs are frequently used in communication and behaviour supports for persons with developmental disabilities (Bondy & Frost, 2002; Cafiero, 2001; Hodgdon, 1995; Peterson,
Prior to data collection, ten typically developing children ages 7 to 9 were surveyed regarding the meanings of 20 potential PCSs. For any PCSs without 80% agreement, the corresponding words were replaced. Replacement words were evaluated by the same group of typically developing children and received a minimum 80% agreement. See Appendix E for the PCSs used for symbol assessment.

Printed words were selected based on word composition features; potential words were selected because of a high degree of visual differentiation between them. As well, potential words were selected because of a high degree of iconicity of corresponding PCSs. Words were also related to motivating play and snack items. The potential target words were divided into two equal sets; each word began with a different letter and sets were balanced in terms of word length. The words in Set 1 were: egg, dice, keys, light, felts, stamp, whale, muffin, orange, and bubbles. The words in Set 2 were: car, glue, horn, train, video, juice, robot, puzzle, insect, and animals. Each set contained one 3-letter word, two 4-letter words, four 5-letter words, two 6-letter words, and one 7-letter word. During the initial assessments, 10 target words and their corresponding PCSs (5 from each set) were selected for each participant, based on his or her ability to identify the PCSs and inability to read the target words.

Initial Assessments

Peabody Picture Vocabulary Test

The Peabody Picture Vocabulary Test (PPVT)-Form IIIB (Dunn & Dunn, 1997) was used to obtain information regarding participants' receptive language levels. The PPVT is an individually administered measure of listening comprehension for spoken words in Standard
English, norm-referenced for ages 2.5 to 90+ years. Test items are divided into sets of progressive difficulty. The basal set is the lowest set with one or no errors, while the ceiling set is the highest set with eight or more errors. Administration averages 11 to 12 minutes. As well as providing information regarding receptive language levels of potential participants, administration of the PPVT assisted in determining which children possessed the necessary learning and attending behaviours to participate in the intervention activities.

Internal reliability of the PPVT has been reported as alpha = .92 to .98, with a median of .95 for Form IIIB. Standard score correlations for three separate age groups range from \( \alpha = 83 \) to \( .89 \). Correlations between the PPVT-III and the Expressive Vocabulary Test (Williams, 1997) have been measured at \( r = .77 \). Correlations have also been calculated between the PPVT-IIIB and measures of cognitive ability: WISC-III Verbal IQ: \( r = .92 \), WISC-III Performance IQ: \( r = .84 \), and WISC-III Full Scale IQ: \( r = .80 \) (American Guidance Service, 2002). Therefore, the PPVT has been shown to be a reliable measure of receptive vocabulary, with standard scores well correlated to chronological age, the Expressive Vocabulary Test (Williams, 1997), and measures of cognitive ability.

In addition to being a reliable and valid instrument, the PPVT was also chosen for its ease of administration; respondents needed only to point to pictures to indicate a response. The interventionist, who has completed graduate-level coursework on measurement and received training from a BC-certified Speech Language Pathologist, administered the PPVT. Administration of the PPVT occurred prior to baseline data collection.

*Symbol Assessment*

Potential participants were pre-tested on the ability to identify the PCSs for target words. Two activities assisted in determining their understanding of PCSs. Participants were
first shown four sets of five PCSs at a time and asked “Give me the point to the ______.” This procedure was conducted three times for all 20 potential PCS/target word combinations. They were also shown four sets of five PCSs at a time along with related toys or snack items and asked to match the PCSs to the items. This procedure was conducted three times for all 20 potential PCS/target word combinations. Data were collected on the number of correct responses for each potential PCS/target word combination. Individual target words were selected based on results of the symbol assessment. Five words from each target word set (PTM and PA) with 100% correct responding in the verbal and/or visual matching task were used. Words were selected such that mean word length was equal across sets.

Results of Initial Assessments

PPVT. Jason, Sam, and Andrea were all able to complete the PPVT. All participants received age equivalent scores well below their chronological age. Table 2 summarizes the PPVT scores for each participant.

Table 2

Results from the PPVT for each Participant

<table>
<thead>
<tr>
<th>PPVT Results</th>
<th>Jason</th>
<th>Sam</th>
<th>Andrea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Score</td>
<td>36</td>
<td>47</td>
<td>36</td>
</tr>
<tr>
<td>Standard score equivalent</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Age equivalent</td>
<td>3:03</td>
<td>3:09</td>
<td>2:11</td>
</tr>
<tr>
<td>Chronological age</td>
<td>10:5</td>
<td>11:7</td>
<td>20:4</td>
</tr>
</tbody>
</table>
**Symbol Assessment.** Jason, Sam, and Andrea all demonstrated an ability to understand PCSs. Jason and Andrea had prior experience with PCSs for communication support. Of the 20 potential PCS/target word combinations, 10 PCS/target words were selected based on a demonstrated understanding of the PCSs. During the baseline phase of the study, Sam demonstrated that he possessed emerging phonemic awareness skills and the ability to identify words based on their initial letters. Therefore a new set of target words was generated for both conditions, with all words beginning with the same initial consonant. Sam was assessed on his ability to understand the new PCSs following the same symbol assessment procedures used previously, prior to beginning the baseline phase. Table 3 lists target words for each of the participants.

Table 3

**Target Words**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Jason</th>
<th>Sam</th>
<th>Andrea</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTM</td>
<td>Egg</td>
<td>Witch</td>
<td>Egg</td>
</tr>
<tr>
<td></td>
<td>Dice</td>
<td>Water</td>
<td>Dice</td>
</tr>
<tr>
<td></td>
<td>Light</td>
<td>Wagon</td>
<td>Light</td>
</tr>
<tr>
<td></td>
<td>Whale</td>
<td>World</td>
<td>Whale</td>
</tr>
<tr>
<td></td>
<td>Bubbles</td>
<td>Walkman</td>
<td>Bubbles</td>
</tr>
<tr>
<td>PA</td>
<td>Car</td>
<td>Watch</td>
<td>Car</td>
</tr>
<tr>
<td></td>
<td>Glue</td>
<td>Whisk</td>
<td>Glue</td>
</tr>
<tr>
<td></td>
<td>Train</td>
<td>Wheel</td>
<td>Train</td>
</tr>
<tr>
<td></td>
<td>Robot</td>
<td>Woman</td>
<td>Robot</td>
</tr>
<tr>
<td></td>
<td>Animals</td>
<td>Whistle</td>
<td>Animals</td>
</tr>
</tbody>
</table>
Setting

All instructional and probe sessions took place at the Sunny Hill Health Centre for Children in Vancouver, BC. Sunnyhill was chosen due to its central location in the Lower Mainland of British Columbia. Many families are familiar with the location as Sunnyhill provides diagnostic services. The teaching room contained a child-sized table and chairs, a file cabinet and bookshelf. A video camera and tripod were set up in the teaching room prior to each session and all probe and intervention sessions were videotaped.
Research Design

Research Question # 1

The first research question to be addressed was: Does picture-to-text matching instruction result in increased accuracy in sight word recognition in students with developmental disabilities, compared to a paired-associate intervention? The independent variables for this question were: 1) a picture-to-text matching intervention (PTM), whereby participants matched printed words to Picture Communication Symbols (PCSs); and 2) a paired-associate learning intervention (PA), whereby participants matched printed text + PCSs to identical stimuli. The dependent variable was the number of sight words from each condition read correctly during daily probes. An adapted alternating treatments design (Sindelar, Rosenberg, & Wilson, 1985) was used to answer this question. This design allowed for comparison of teaching methods where “differences are demonstrated when acquisition of one [set] is more rapid than acquisition of the other, and the effect is consistent across subjects, or behavior” (p. 70).

Research Question # 2

The second question addressed was: Does the use of a picture-to-text matching strategy result in improved generalization of sight word recognition to novel and functional activities, compared to that of a paired-associate teaching strategy? The independent variables for this question were: 1) a picture-to-text matching intervention (PTM), whereby participants matched printed text to PCSs; and 2) a paired-associate learning intervention (PA), whereby participants matched printed text + PCSs to identical stimuli. The dependent variable was the number of words read correctly from each condition during generalization
probes. An adapted alternating treatments design (Sindelar, Rosenberg, & Wilson, 1985) was used to answer this question.

Activities and Materials

Materials

Interventionist-made materials were used for all probe and intervention sessions. Black and white PCSs were created using version 5.0 of the Boardmaker software program (Mayer-Johnson, 2001). PCSs were presented in a 5" x 5" cell for all baseline and daily probe activities. PCSs were presented in 1.75" x 1.75" cells on all flashcards and worksheets. All text was presented in bold AbcPrint font. Font size was 48 point on all flashcards and 20 point on all worksheets.

Baseline, daily probes, and maintenance. Two 3-ring binders, each containing five pages, displayed one PCS per laminated page. Loop Velcro® was attached to the page below the PCS. Laminated text cards (3" x 5") attached to the pages via hook Velcro®. Using a 3-ring binder to house the pages of the book allowed for daily randomization of presentation. See Appendix F for sample pages from the 3-ring binders used for probe sessions, adjusted to fit the page size.

Intervention. A variety of materials were used for the daily intervention activities. Text-only, PCS-only, and text + PCS flashcards (3" x 5") were used. See Appendix G for examples of all forms of flashcards, adjusted to fit the page size.

Matching worksheets were developed for use in each condition. For the PTM condition, text appeared on the left side of the page and PCSs appeared on the right side of the page. For the PA condition, text + PCSs appeared on both sides of the page. A variety of matching worksheets were produced so that PCSs and text appeared in different locations to
prevent participants from memorizing the locations of matching stimuli. See Appendix H for matching worksheet examples, adjusted to fit the page size.

Pasting worksheets were also used during intervention activities. For the PTM condition, PCSs were placed on the left side of the page with empty 2” x 4” cells to the right. Pre-cut text labels (2” x 4”) were provided for matching. For the PA condition, text + PCSs appeared along the left side of the page with empty 2” x 4” cells to the right. Pre-cut text + PCS labels (2” x 4”) were provided for matching. See Appendix I for pasting worksheet examples, adjusted to fit the page size.

Generalization. For generalization sessions, toys and items related to target words were placed in opaque containers and stored on a shelf in the teaching room. Each container was labeled with a 3” x 5” text card identical to those used for intervention activities. PCS cards (3” x 5”) identical to those used for intervention activities were used for matching purposes. Table 4 lists target words and their associated items for Jason and Andrea. Table 5 lists target words and their associated items for Sam.
### Table 4

**Target Words and Associated Items for Jason and Andrea During Generalization**

<table>
<thead>
<tr>
<th>Target Word</th>
<th>Associated Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egg</td>
<td>A plastic toy egg with a surprise toy inside</td>
</tr>
<tr>
<td>Dice</td>
<td>A large dice used to play a counting game</td>
</tr>
<tr>
<td>Light</td>
<td>A View-Master Super-Show™ Projector, shaped like a flashlight, that projected View-Master™ slides onto the wall</td>
</tr>
<tr>
<td>Whale</td>
<td>A plush orca whale that made noises when manipulated</td>
</tr>
<tr>
<td>Bubbles</td>
<td>A battery operated bubble gun that blew bubbles</td>
</tr>
<tr>
<td>Car</td>
<td>A battery operated, remote control toy car that moved and made noise</td>
</tr>
<tr>
<td>Glue</td>
<td>Glitter glue used to make designs on paper</td>
</tr>
<tr>
<td>Train</td>
<td>A toy train set with tracks</td>
</tr>
<tr>
<td>Robot</td>
<td>Transformer toy</td>
</tr>
<tr>
<td>Animals</td>
<td>Plastic toy farm animals</td>
</tr>
</tbody>
</table>
Table 5

*Target Words and Associated Items for Sam During Generalization*

<table>
<thead>
<tr>
<th>Target Word</th>
<th>Associated Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Witch</td>
<td>Colouring pages featuring witches</td>
</tr>
<tr>
<td>Water</td>
<td>A toy bucket with a water fountain</td>
</tr>
<tr>
<td>Wagon</td>
<td>A Playmobil® toy set featuring a wagon</td>
</tr>
<tr>
<td>World</td>
<td>An inflatable globe</td>
</tr>
<tr>
<td>Walkman</td>
<td>A personal walkman-type tape player with audio tapes</td>
</tr>
<tr>
<td>Watch</td>
<td>An electronic, digital watch that had games built into it</td>
</tr>
<tr>
<td>Whisk</td>
<td>A whisk and other cooking items for pretend play</td>
</tr>
<tr>
<td>Wheel</td>
<td>A Lego™ truck with large wheels</td>
</tr>
<tr>
<td>Woman</td>
<td>A Barbie-type doll</td>
</tr>
<tr>
<td>Whistle</td>
<td>A plastic whistle</td>
</tr>
</tbody>
</table>

*Procedures*

**Phase I: Baseline**

Baseline measurements were conducted for 5 days for all participants. First, participants were provided with a 3-ring binder and the corresponding text cards for one condition. Text cards were randomly placed on the table top above the binder. The interventionist opened the binder and drew the participant’s attention to the PCS on the first
page by pointing and saying “look.” By pointing to the piece of loop Velcro below the PCS while saying “read,” the interventionist prompted the participant to select a text card to place under the PCS. All responses resulted in non-specific verbal praise from the interventionist (e.g. “thank you,” “let’s turn the page,” etc.) This procedure was repeated until all five text cards were placed on a page. Next, the procedure was repeated for the second condition. Conditions were counterbalanced across sessions to control for an order effect. When both binders were completed, they were set aside for data collection at the end of the session. Correct responses were defined as correct text-to-PCS matching. Incorrect responses were defined as incorrect text-to-PCS matching. For the remainder of the 1-hour session, the participant and interventionist played with the toy items to establish rapport.

After the session was concluded and the participants left the room, the interventionist referred to the 3-ring binders and, using the data sheet (Appendix J), marked responses as correct (+) or incorrect (-). It was during this phase that Sam demonstrated the ability to select the correct printed word for PCSs, based on his emerging understanding of consonant sounds and initial letters in words. As a result, an alternate set of target words was developed, with all words beginning with the letter W.

Phase II: Intervention

Multi-element intervention sessions were conducted, with each intervention session lasting 1 hour. Participants were given opportunities to have short play-breaks during each session, between intervention activities. On occasions when a participant demonstrated unwillingness to participate, the session was concluded immediately.

Five levels of instruction were used to ensure systematic presentation of target words. Table 6 depicts the levels and how the words were presented. Movement between levels was
based on each participant’s performance during daily probes. Daily probes followed the procedures outlined in Phase I: Baseline, with the exception that text cards were placed on a Velcloth® covered slant board in order to increase visibility. The text cards attached to the Velcloth® covered slant board with Velcro®. Due to apparent difficulties in understanding the directive “read,” both Jason and Andrea were provided with the verbal label of each PCS in the probe binder to prompt a response, beginning on the 14th intervention session. Correct reading of all previously taught words resulted in moving to the next level of instruction, while incorrect reading of any previously known words resulted in moving to the previous level of instruction.

Table 6

Instructional Levels and Presentation of Target Words

<table>
<thead>
<tr>
<th>Level</th>
<th>Presentation of Target Words during Initial Word Learning Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>Target words #1 and #2 were taught individually for the three initial trials each, followed by four discrimination trials per word.</td>
</tr>
<tr>
<td>Level 2</td>
<td>Target words #1 and #2 were presented together for seven discrimination trials each. Target word #3 was presented individually for three initial presentations, then added to words #1 and #2 for four discrimination trials.</td>
</tr>
<tr>
<td>Level 3</td>
<td>Target words #1, #2, and #3 were presented together for seven discrimination trials each. Target word #4 was presented individually for three initial presentations, then added to words #1, #2 and #3 for four discrimination trials.</td>
</tr>
<tr>
<td>Level 4</td>
<td>Target words #1, #2, #3, and #4 were presented together for seven discrimination trials each. Target word #5 was presented individually for three initial presentations, was added to words #1, #2, #3 and #4 for four discrimination trials.</td>
</tr>
<tr>
<td>Level 5</td>
<td>All five target words were presented together for seven discrimination trials per word.</td>
</tr>
</tbody>
</table>
Teaching individual words. Upon presentation of each new PCS or text + PCS card by the interventionist, participants were required to select the corresponding text or text + PCS card from an array on a slant board. An errorless instructional approach was implemented to maximize learning. Initially, there were seven errorless presentations of each word per instructional setting (i.e. previously untaught/unlearned words were presented in a non-discrimination format only). Based on apparent difficulties with discrimination in subsequent instructional activities, the decision was made to follow three errorless presentations of a target word with four discrimination presentations, beginning on the 5th day of intervention. This provided participants with increased practice in discriminating between target words. Once a participant demonstrated his or her ability to read previously taught words during probe sessions, those words were presented in a discrimination-only format. The directive “read” was initially used to prompt responding. For Sam, this directive was used throughout the study. For Jason and Andrea, who seemed to have difficulty understanding the direction and appeared confused by the variety of verbal information used (i.e., a directive, a label for the word, and verbal praise), the directive “read” was replaced with the label of the target word, beginning on the 14th day of intervention. When the interventionist showed a PCS or text + PCS card to either Jason or Andrea, she simply stated the label of the target word while pointing to the card. After the participant selected a text or text + PCS card from the slant board and placed it in the interventionist’s hand, the interventionist replied “yes” and, while holding both cards up, side by side, for the participant to see, moved the text or text + PCS card closer to the participant to highlight the selection he or she made, while again stating the label. Social reinforcement (verbal praise, high-fives, etc.) was used to reward correct responding. For Jason, edible reinforcers (Mini
Sight Word Reading 51

M&Ms® and sensory-based toys (flashing light balls, hand held fans, etc.) were used in addition to social praise in order to motivate him to attend to the task and respond correctly. Incorrect responses or failures to respond were followed by positional and physical prompts to elicit correct responding. Figures 3 and 4 depict the instructional procedures for presenting a single target word (Figure 3) and teaching discrimination between target words (Figure 4).
Figure 3. Teaching Single Target Words – No Discrimination

Interventionist placed text + PCS (PA condition) or text-only (PTM condition) card on the slant board, facing the participant

Interventionist held the corresponding text + PCS (PA condition) or PCS-only (PTM condition) card in one hand, facing the participant

Interventionist drew the participant’s attention to the held card by pointing to it and saying “read” (for Sam) or the label of the target word (for Jason and Andrea)

Interventionist held one hand open, palm up, as a prompt for the participant to place the text + PCS or text card into it

Correct Response: Participant placed the text + PCS or text only card into the open hand of the interventionist

Interventionist said “yes” and named the text/PCS while moving the text or text + PCS card closer to the participant. Social Feedback: verbal praise, high-fives, etc. Edible reinforcement for Jason

Repeated for a total of three trials

Incorrect/No Response: Interventionist moved hand next to card on table and said “read”

Incorrect/No Response: Interventionist provided hand-over-hand prompt to elicit correct responding.
Figure 4. Teaching Single Words - Discrimination

Interventionist placed one or more text + PCS (PA condition) or text-only (PTM condition) cards on the slant board, facing the participant.

Interventionist held a corresponding text + PCS (PA condition) or PCS-only (PTM condition) card in one hand, facing the participant.

Interventionist drew the participant's attention to the held card by pointing to it and saying "read" (for Sam) or the label of the target word (for Jason and Andrea).

Interventionist held one hand open, palm up, as a prompt for the participant to place the text + PCS or text card into it.

Correct Response: Participant placed the correct text + PCS or text only card into the open hand of the interventionist.

Interventionist said "yes" and named the text/PCS while moving the text or text + PCS card closer to the participant.

Social Feedback: verbal praise, high-fives, etc. Edible reinforcement for Jason.

Repeated for a total of four trials per target word (untaught/unlearned) or seven trials per target word (learned).

Incorrect/No Response: Interventionist moved hand next to correct card on table and said "read".

Incorrect/No Response: Interventionist provided hand-over-hand prompt to elicit correct responding.
Find it. In this activity, text (PTM condition) or text + PCS (PA condition) cards were attached to Velcloth® hung on the wall of the teaching room, which allowed the cards to be hung with Velcro®. Participants were shown a PCS or text + PCS card and asked to “read.” As in the individual word activity, both Jason and Andrea demonstrated difficulty understanding this direction and, thus, the interventionist simply stated the label for the PCS or text + PCS card she was holding. This change took place on the 14th day of intervention. A correct response consisted of the participant removing the corresponding text or text + PCS card from the wall and placing it in the hand of the interventionist. In the occasion of a non-response, the interventionist led the participant to the correct card and held an open hand against the wall next to the card. A hand-over-hand prompt was used, if necessary, to teach the task. There was one trial per word, per session, with all trials requiring discrimination between target words. See Appendix K for a diagram of the Find It activity. After a correct match was made, the interventionist held both cards facing the participant and, while moving the text or text + PCS card closer to the participant, said “yes” and stated the label of the word. Social praise and edible reinforcement in the form of Teddy Grahams, Gummy Bears, and Mini M&Ms® were provided for correct responding, defined as independent retrieval of the corresponding card from the wall.

Pencil and paper matching. Participants were presented with a worksheet (see Appendix H) and required to draw a line from each word to PCS (PTM) or each word + PCS to word + PCS (PA). Before beginning the matching activity, the interventionist directed the participants to point and look at all stimuli on the page. Then, the interventionist pointed to each PCS or text + PCS in turn to begin a trial. The directive “read” was given to Sam and, as in the previous activities, the label of the PCS or text + PCS was stated by the interventionist
to elicit responding from Jason and Andrea. This change in directive for Jason and Andrea was introduced on the 14th day of intervention. In cases of no response, the interventionist provided hand-over-hand prompting. Incorrect responses were erased and corrected through hand-over-hand prompting. There was one trial per word, per session. After a correct match, the interventionist directed the participant’s visual attention to the page, pointed from the PCS or text + PCS to the corresponding text or text + PCS, stated “yes” and labeled the target word. Social reinforcement and stickers were provided for correct responding, defined as independent matching. For Jason, edible reinforcers were also provided to increase motivation.

*Cut and paste matching.* In this activity, participants were presented with a worksheet (see Appendix I). Participants were given pre-cut text (PTM) or text + PCS (PA) labels and a glue stick. Before beginning the matching activity, the interventionist directed the participants to point to and look at all stimuli on the worksheet and held up each label before placing it on the table, to ensure the participants saw all of the stimuli. The participants were then instructed to paste the labels next to the appropriate PCS (PTM) or text + PCS (PA) with the directive “read” used to elicit responding. The label for the PCS or text + PCS was stated by the interventionist for Jason and Andrea, instead of the directive “read.” This change in directive began on the 14th day of intervention. The interventionist assisted by applying glue to the page after participants had made their selections. Hand-over-hand prompts were provided in cases of no response. Incorrect responses were anticipated by the interventionist, who interrupted the incorrect responding and facilitated correct responding using physical prompts. There was one trial per word, per session. Correct matches were followed by the interventionist stating “yes” and verbally labeling the target word while
directing the participant’s visual attention to the match. Social reinforcement and stickers were provided for correct responding, defined as independent matching. For Jason, edible reinforcers were also provided to increase motivation.

*Phase III: Generalization*

Generalization was not assessed for the PA condition, as none of the participants demonstrated learning of all five PA words. Generalization was not assessed for Andrea in the PTM condition because she was unable to complete the project due to an increased incidence of problem behaviours related to upheaval in her personal life. Both Jason and Sam completed generalization probes for the PTM condition after they demonstrated learning of all five PTM words taught.

During generalization probes, participants were presented with the PCSs for the five target words from the PTM condition and asked which one they wanted to play with. After making a selection, the participants were guided to a shelf of text-labeled, identical, opaque containers. Sam was directed to “read,” while Jason was provided with a verbal label for the PCS card he selected. Participants selected the container with the matching text card and brought the container to the table. The interventionist held the PCS card next to the text label and provided feedback. A correct response, defined as correctly matching the PCS card to the corresponding text card, resulted in the interventionist saying “yes,” stating the label of the text, and allowing access to the toy item in the container. The interventionist and participant then played with the item. An incorrect match resulted in the participant being told “no” and the beginning of a new trial. New trials occurred approximately every 5 minutes to allow for assessment of generalization for all target words. All five containers remained on the shelf for all five trials, and their position on the shelf was randomized between each trial. All
generalization sessions were videotaped to support data collection. Data were collected in terms of correct (+) and incorrect (-) text-to-PCS matches.

Phase IV: Maintenance

Only one participant was available for follow up data collection. Jason completed two maintenance assessments: the first, 9 days after his final session and the second, 123 days after his final session. Procedures followed those outlined in Phase I: Baseline.

Data Collection

Intervention data were collected via probe sessions at the beginning of each session, whereby participants matched laminated text cards to laminated PCS illustrations in a 3-ring binder. See Appendix J for the probe data collection form. Sessions were videotaped during probe and intervention trials to allow for inter-rater and procedural reliability data to be collected. Initially, all five words for a particular condition were presented in the probe binder. For Jason and Andrea, however, this appeared to be confusing. Despite performance during instructional activities that demonstrated successful text-to-picture matching, the participants would select a text label for a previously demonstrated “known” word, place it below an incorrect PCS, and then appear puzzled when encountering the corresponding PCS on a subsequent page. It seemed that these participants were unable to anticipate that the correct PCS for a particular text label would appear on a subsequent page in the binder. As a result, for both Jason and Andrea, only previously taught words appeared in the probe binder, beginning on the 19th intervention session.

Data Analysis

Probe data for each participant was plotted daily and graphs were visually inspected to assess learning in general and compare learning between the two conditions. Daily plotting
assisted the interventionist to make procedural changes for Jason and Andrea to enhance their understanding of instructional activities as well as their learning. From baseline through generalization, 33 data points were analyzed for Jason, 28 data points were analyzed for Sam, and 29 data points were analyzed for Andrea. Data were analyzed in terms of magnitude of change (i.e., changes in the mean number of words read correctly from baseline, through intervention, and to generalization).

Reliability

Each day, one videotape was selected at random for analysis related to probe procedural reliability and intervention procedural reliability. Thirty-three percent of reviewed tapes came from sessions with Sam, 36% came from sessions with Jason, and 31% came from sessions with Andrea. Altogether, the interventionist and an independent rater reviewed 39% of all probe videotapes and 37% of all intervention videotapes to ensure adherence to the probe and intervention protocols. See Appendices L and M for checklists for procedural reliability data collection for probe and intervention sessions. Procedural reliability scores were determined by the formula: number of correct steps divided by number of correct plus incorrect steps, multiplied by 100. The interventionist reviewed feedback related to procedural reliability daily and errors were corrected through additional practice.

Procedural reliability. Thirty-five probe sessions were evaluated for procedural reliability. The probe procedural reliability mean equaled 97.6% (range = 80 to 100%). Twenty-six intervention sessions were evaluated for procedural reliability for the PTM condition. The intervention procedural reliability mean for the PTM condition equaled 98.6% (range = 88.9 to 100%). Twenty-three intervention sessions were evaluated for procedural
reliability for the PA condition. The intervention procedural reliability mean for the PA condition equaled 98.9% (range = 83.3 to 100%).

Inter-rater reliability. Thirty-one percent of all probe videotapes and 37% of all intervention tapes were re-scored by an independent rater to check for correct and incorrect responses by participants. Comparisons were made between the original scoring by the interventionist and the re-scoring by the independent rater. An inter-rater reliability score was calculated using the formula: number of agreements divided by the number of agreements plus disagreements, multiplied by 100. Thirty-five probe sessions were evaluated for inter-rater reliability. The mean inter-rater reliability was 98.8% (range = 90 to 100%). Twenty-six intervention sessions were evaluated for inter-rater reliability for the PTM condition. The mean inter-rater reliability for the PTM condition equaled 98.9% (range = 88.1 - 100%). Twenty-three intervention sessions were evaluated for inter-rater reliability for the PA condition. The mean inter-rater reliability for the PA condition equaled 99.1% (range = 96.9 - 100%). Table 7 summarizes the procedural and inter-rater reliability data.

Table 7

<table>
<thead>
<tr>
<th>Type of Trial</th>
<th>Procedural Reliability</th>
<th>Inter-rater reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probe</td>
<td>97.6% (range = 80 – 100%)</td>
<td>98.8% (range = 90 to 100%)</td>
</tr>
<tr>
<td>PTM Condition</td>
<td>98.6% (range = 88.9 – 100%)</td>
<td>98.9% (range = 88.1 – 100%)</td>
</tr>
<tr>
<td>PA Condition</td>
<td>98.9% (range = 83.3 – 100%)</td>
<td>99.1% (range = 96.9 – 100%)</td>
</tr>
</tbody>
</table>
Similarity of Reinforcement between conditions. In addition to rating the video-taped sessions for procedural reliability, both the interventionist and the second rater rated the sessions in terms of level of reinforcement. For each condition, the interventionist and the second rater rated the level of reinforcement as low (little or no reinforcement; reinforcement was “bland”), medium (average amount of reinforcement; moderate degree of enthusiasm), or high (lots of reinforcement for correct responding; high degree of enthusiasm). In addition, they both provided a yes/no reply to the statement: “The level of reinforcement was similar across conditions.” Interrater reliability regarding level of reinforcement was calculated by dividing the number of agreements by the number of agreements plus disagreements, multiplied by 100.

The interrater reliability regarding similarity of reinforcement between conditions was 89.6% (range = 50 to 100%). Of 24 total sessions evaluated, 20 showed 100% agreement on level of reinforcement. Three sessions showed 50% agreement on level of reinforcement demonstrating that the two raters agreed on two of the four questions related to reinforcement. One session showed 0% agreement on level of reinforcement; for this particular session, only the PA condition received a rating on reinforcement during instruction as the participant was engaged in generalization activities for the PTM condition and instruction was no longer occurring for the PTM target words. This left only one question to be assessed for interrater reliability: the question regarding level of reinforcement. The question regarding similarity of reinforcement could not be answered given that only the PA intervention was being delivered while the PTM condition was being assessed for generalization. Therefore, the raters could either agree (100%) or disagree (0%).
Whenever the raters disagreed on level of reinforcement, they discussed the reasons for answering the reinforcement rating questions as they did, determined if the difference in rating was due to different understandings of the meanings of the rating scale or less than adequate reinforcement on the part of the interventionist. In cases where there was confusion regarding the meanings of the rating scale, discussions and examples of reinforcement at various levels was provided to the second rater by the first rater/interventionist. In cases where the second rater brought less than optimal reinforcement levels to the attention of the first rater/interventionist, the interventionist practiced delivering the interventions with more appropriate levels of reinforcement and paid particular attention to level of reinforcement during the next intervention session.
CHAPTER 3

Results

Overview

The goals of this study were to compare a picture-to-text matching intervention with a paired-associate intervention used to teach sight words to non-readers with developmental disabilities, with the intention of clarifying the role of pictures in sight word instruction. In addition, this study was designed to examine the potential for generalization of each approach. The data were analyzed using visual analysis for each participant. From these analyses, it appears that the picture-to-text matching intervention resulted in improved learning for two of the three participants, over the paired-associate intervention, once experimental control was achieved. Sight word reading skills developed using the picture-to-text instructional strategy also resulted in successful generalized reading to a novel activity. One participant was unable to complete the study, due to behavioural difficulties.

In the sections that follow, the results will be presented for each of the participants in relation to the two research questions posed by the study.

Jason

Figure 5 displays the probe results for Jason.
Figure 5. Jason’s acquisition of sight words in the PTM and PA conditions
Table 8

*Average percentage of correct responding during probe session: Jason*

<table>
<thead>
<tr>
<th></th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline (Sessions 1-5)</td>
</tr>
<tr>
<td>PA</td>
<td>8%</td>
</tr>
<tr>
<td>PTM</td>
<td>4%</td>
</tr>
</tbody>
</table>

Note: sessions 11-19: increased discrimination practice; sessions 20-25: change of stimulus to target word label; sessions 26-33: removal of untaught target words from probe activity
Question #1

Does picture-to-text matching instruction result in increased accuracy in sight word recognition in students with developmental disabilities, compared to a paired-associate intervention?

Baseline. During baseline, it was clear that Jason was unable to read any of the sight words reliably in either the PTM or the PA condition. On two occasions, Jason correctly matched one PTM target word and one PA target word to their corresponding PCSs. Stability was reached after five days of baseline data collection and Jason moved to the intervention phase of the study.

Intervention. After four days of intervention, Jason was not demonstrating learning in either condition. The decision was made to alter the individual word activity to provide him with more opportunities to learn and practice discriminating between the target words. Thus, beginning on the fifth day of intervention (session 10), three errorless presentations of a target word were followed by four trials requiring discrimination between target words. This resulted in occasional correct responses during the probe sessions for both the PTM and PA conditions. However, after 13 intervention sessions, Jason was still not reliably demonstrating sight word reading skills in either condition. During intervention sessions, he appeared to be confused by the variety of verbal directives and comments presented, which included (a) “look” to direct his attention to the stimuli; (b) “read” to elicit responding in all probe and intervention activities; (c) “yes” followed by the target word label after a correct response; and (d) various types of verbal praise, including “yeah,” “good job,” “good boy,” and “way to go!” In addition to appearing confused, Jason also covered his ears when a large amount of verbal information was given, particularly when verbal praise was delivered. It
was thus decided to reduce the variety of verbal directives and comments with the intention of reducing Jason's confusion. Beginning on the 14th day of intervention (session 19), the use of the word “look” was no longer used to obtain attention. Instead, Jason’s name was used to direct his attention to the stimuli. The use of the word “read” was dropped from the procedures and the decision was made to verbally label the PCS (PTM condition) or the text + PCS (PA condition) card. When Jason made a correct response, only the label for the target word was stated and verbal praise was delivered quietly and gently, as Jason often put his hands over his ears or his fingers in his ears if loud and exuberant verbal praise was delivered.

Six sessions later (session 25), with Jason continuing to demonstrate an inability to read words from either condition, a change to the probe procedures was also made. Jason regularly selected a text card for a taught word and placed it on a page with a yet-to-be taught PCS. When turning the page in the probe binder and seeing the PCS for the previously taught word, whose text card he had already placed with an incorrect PCS, Jason appeared confused. It seemed as though Jason was looking for the correct text card, but did not see it on the slant board and did not remember placing it with an incorrect PCS. He made no attempts to turn back and self-correct. Therefore, it was decided to place only PCSs for taught target words in the probe book and only text cards for taught target words on the slant board. Immediately, Jason began to demonstrate learning in the PTM condition, acquiring a new word each session, until he learned all five PTM target words. During this time, he occasionally demonstrated correct reading of PA target words but never demonstrated learning sufficient to move past Level 2 of instruction in the PA condition.
After three days of 100% correct responding for the PTM condition during the probe activity, Jason began the generalization portion of the study for the PTM condition. Throughout the generalization portion, Jason continued to demonstrate 100% accuracy in the PTM condition in the daily probes. During the generalization period, Jason began to demonstrate increased learning of words in the PA condition, although not sufficient enough to move beyond Level 3 of instruction.

**Maintenance.** Jason completed two probes for long-term maintenance of sight word reading acquisition for the target words from the PTM condition. The first assessment of sight word maintenance occurred nine days after Jason’s final day in the research project. He demonstrated the ability to read all five of the PTM target words and three of the PA target words. Approximately four months (123 days) later, Jason was again assessed for maintenance of sight word reading skills. He successfully read 60% (three) of the PTM target words but was unable to read any of the PA target words.

**Question #2**

Does the use of a picture-to-text matching strategy result in improved generalization of sight word recognition to novel and functional activities, compared to that of a paired-associate teaching strategy?

**Generalization.** Visual inspection of the data for Jason’s generalization trials shows that he was able to successfully transfer sight word reading skills acquired using the PTM intervention to a novel activity, demonstrating a relationship between sight word acquisition via a PTM intervention and generalization of word recognition skills. On the first day of generalization, Jason correctly read 80% of the target words. On the second day, Jason only read 40% of the target words correctly; however it was noted that he had a cold on that day
and was not feeling well. On the final day of generalization, Jason correctly read 100% of the target words, demonstrating complete transfer of sight word reading skills to a novel activity. Data were not collected regarding generalization for the PA condition.

Sam

Figure 6 displays the probe results for Sam.
Figure 6. Sam’s acquisition of sight words in the PTM and PA conditions
Table 9

Average percentage of correct responding during probe sessions: Sam

<table>
<thead>
<tr>
<th></th>
<th>Intervention</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Sessions 6-10</td>
<td>Sessions 11-28</td>
<td>Overall</td>
</tr>
<tr>
<td></td>
<td>(Sessions 1-5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA</td>
<td>20%</td>
<td>27%</td>
<td>20%</td>
<td>23.5%</td>
</tr>
<tr>
<td>PTM</td>
<td>16%</td>
<td>45%</td>
<td>93%</td>
<td>69%</td>
</tr>
</tbody>
</table>

Note: sessions 11-28: increased discrimination practice

Question #1

Does picture-to-text matching instruction result in increased accuracy in sight word recognition in students with developmental disabilities, compared to a paired-associate intervention?

Baseline. During baseline, Sam’s original word sets were identical to Jason and Andrea’s. However, Sam demonstrated an ability to read the sight words in both the PTM and PA conditions when the words began with different letters. Due to his emerging phonological and phonemic awareness skills, which assisted him in correctly matching PCSs to text in both conditions based on initial consonants and their sounds, the interventionist devised alternate word sets, with all words beginning with the letter W. PCSs were produced and Sam successfully completed a symbol assessment. Over five sessions of baseline data collection, it was clear that Sam was unable to consistently demonstrate successful sight word reading of the new sets of target words in either condition.
Intervention. It is clear, viewing the data regarding Sam’s acquisition of sight words for both the PTM and PA conditions that the PTM condition resulted in rapid and successful sight word learning for Sam, while the PA condition did not. As with Jason, an increased number of discrimination trials were introduced during the individual words activity during the 5th intervention session (session 10). Following this change, whereby Sam had increased practice in discrimination during intervention activities, Sam began to demonstrate increased learning of PTM target words. By the 9th intervention session (session 14), Sam had acquired four of the PTM target words, yet had not reliably acquired even two of the PA target words. By the 12th day of intervention (session 17), Sam had acquired all five of the PTM target words, while still not having acquired two of the PA target words. Sam maintained his ability to read all five of the PTM target words for the remaining 10 days he was involved in the project. During that time, his ability to read the PA target words did not improve.

Question #2

Does the use of a picture-to-text matching strategy result in improved generalization of sight word recognition to novel and functional activities, compared to that of a paired-associate teaching strategy?

Generalization. Again, it is clear after viewing the graph for Sam’s generalization results for the PTM condition that the PTM strategy did result in successful generalization of word reading skills to a novel activity, demonstrating a relationship between sight word acquisition via a PTM intervention and generalization of word recognition skills. Sam demonstrated 100% correct sight word reading during generalization for seven out of eight generalization sessions (87.5%). During one generalization session, Sam read only four of the five target PTM words correctly; however, it was noted that this session followed a late
night for Sam and he was observed to be tired and moody during that particular session. Data were not collected regarding generalization for the PA condition.

Andrea

Figure 7 displays the results for Andrea.
Figure 7. Andrea’s acquisition of sight words in the PTM and PA conditions.
Table 10

Average percentage of correct responding during probe session: Andrea

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Sessions 1-5)</td>
<td>6-10</td>
</tr>
<tr>
<td>PA</td>
<td>8%</td>
<td>0%</td>
</tr>
<tr>
<td>PTM</td>
<td>20%</td>
<td>20%</td>
</tr>
</tbody>
</table>

Note: sessions 11-19: increased discrimination practice; sessions 20-25: change of Stimulus to target word label; sessions 26-33: removal of untaught target words from probe activity

Question #1

Does picture-to-text matching instruction result in increased accuracy in sight word recognition in students with developmental disabilities, compared to a paired-associate intervention?

Baseline and Intervention. Over five sessions of baseline data collection, it was apparent that Andrea was unable to consistently read the target words in either the PTM or the PA condition. Also, as seen in the above graph, Andrea did not demonstrate learning in either the PTM or the PA condition. Throughout the intervention period, Andrea did not respond to the interventions, despite procedural changes designed to enhance her learning. On the fifth day of intervention (session 10), discrimination was introduced into the individual words activity, whereby the initial three trials were presented in an errorless fashion and the remaining four trials were presented in a discrimination fashion. This change was made in order to provide additional instruction and practice in discriminating between target words. On the 14th day of intervention (session 19), the interventionist began stating
the label for all PCS (PTM condition) and PCS + text (PA condition) cards during intervention activities, as well as for all PCS in the probe binder. This was to deal with possible confusion resulting from a high degree of verbal directives and comments. On the 20th day of intervention (session 25), only previously taught words appeared in the probe binder, to lessen potential difficulties in dealing with words that had not been taught. Although these procedural changes were sufficient to result in improved learning in Jason, this was not the case for Andrea.

During the intervention phase of the project, several conflicting events that could not be controlled by the interventionist occurred in Andrea’s life. First, Andrea’s family and support team made the decision to change Andrea’s living arrangements. After several years of moving between the homes of her two parents, spending two weeks with each in an alternating fashion, a decision was made that Andrea would feel more secure and stable if she were to live in just one home and have regular visitations with the non-custodial parent. Thus, a decision was made for Andrea to move full time with her mother. After a few weeks, however, it became apparent that this was not successful, and Andrea moved to her father’s home full time. Second, in addition to the confusion of moving between her parents’ homes, Andrea’s full time support worker went away on holidays for two weeks. This proved to be extremely upsetting and stressful for her. Finally, Andrea began to experience an increase in seizure activity during the intervention phase of the project. All of these issues resulted in Andrea displaying increasingly problematic behaviour, including an unwillingness to engage in intervention activities as evidenced by crying, yelling, laying her head on the table, and occasional self injurious behaviour. After 24 intervention sessions, during four of which Andrea refused partial or full participation, a decision was made by the interventionist to end
Andrea's participation in the project. As a result, data showing evidence of word learning and generalization to a novel activity are not available.

Summary of Results

Visual inspection of the data indicated that, for two of the three participants, the PTM condition resulted in successful sight word learning as defined by the ability to match text cards to PCSs as measured in the probe activity. In addition, two of the three participants demonstrated an ability to generalize their newly acquired skills to a novel activity, as defined by the ability to match PCSs to text cards labeling opaque boxes containing toy items.

The first research question examined the effectiveness of two interventions for teaching sight word reading to persons with developmental disabilities. The PTM intervention proved to be the most successful intervention for the two participants who acquired sight word reading skills. Neither of the two participants who completed the study demonstrated successful sight word acquisition via the PA intervention. The third participant was unable to complete the study and demonstrated learning in neither condition.

The second research question examined the generalizability of sight word reading skills acquired via PTM and PA interventions. Because neither of the participants who completed the study acquired sight word reading skills via the PA method, generalization of skills acquired using this method could not be assessed. However, for the two participants who completed the study, sight word reading skills acquired via the PTM strategy did transfer to a novel activity during the generalization phase, suggesting a relationship between the acquisition of sight word reading skills via a PTM intervention and transfer of reading.
skills to a novel and functional activity. The third participant was unable to complete the study and, thus, did not participate in the generalization phase.
CHAPTER 4
Discussion

Historically, students with developmental disabilities have been excluded from literacy learning instruction (Kliwer & Biklen, 2001; Singh & Singh, 1986). Over the past several decades, there has been an increased interest in developing literacy skills in persons with developmental disabilities due to the belief that such skills will result in improved communication; control over communication-related technology (Koppenhaver et al., 1991); enhanced interpersonal interactions and improved expression of needs, wants, information, feelings, and ideas (Ryndak et al., 1999); increased access to both employment-related (Koppenhaver et al., 1991; Singh & Singh, 1986) and educational opportunities (Browder & Xin, 1998; Koppenhaver et al., 1991); and increased independence (Singh & Singh, 1986).

In particular, there has been a high degree of interest in strategies to develop word recognition skills in persons with developmental disabilities (Browder & Xin, 1998; Lalli & Browder, 1993; Singh & Singh, 1986). A wide variety of approaches have been investigated, including stimulus fading, trial and error, symbol accentuation, and tactile-kinesthetic approaches (Singh & Singh, 1986). One area of sight word instructional research has investigated the use of pictures to develop sight word reading skills in persons with developmental disabilities. Research into paired associate techniques resulted in the conclusion that pictures blocked the learning of sight words (Didden, Prinsen, & Sigafoos, 2000; Harzem, Lee & Miles, 1976; Lang & Solman, 1979; Montare, Elman, & Cohen, 1977; Newton, 1995; Samuels, 1967, 1970; Saunders & Solman, 1984; Singer, Samuels, & Spiroff, 1974; Singh & Solman, 1990; Solman & Singh, 1992; Wu & Solman, 1993). Research on sight word instruction using stimulus fading procedures demonstrated that pictures could
facilitate the acquisition of a sight word vocabulary (Dorry, 1976; Dorry & Zeaman, 1973, 1975; Lalli & Browder, 1993; McDowell, 1982; Rincover, 1978; Tabe & Jackson, 1989; Walsh & Lamberts, 1979). Research into the use of matching procedures has also resulted in successful use of pictures to develop sight word reading skills (Eikeseth & Jahr, 2001; Hewett, 1964; LaVigna, 1977).

The present study was designed to examine the effectiveness of using Picture Communication Symbols to develop a small sight word reading vocabulary in non-reading persons with developmental disabilities. The study compared two instructional conditions and measured changes in the participants' ability to read sight words, defined as matching Picture Communication Symbols to corresponding text. In the paired associate condition, Picture Communication Symbols were always presented alongside text. In the picture-to-text matching condition, Picture Communication Symbols were always presented separate from text. The instructional procedures for the two conditions were identical; the only difference was the way in which pictures and text were presented. It was expected that a comparison of these two conditions would determine whether changes in sight word reading skill were the result of differences in presentation of picture cues. In the sections that follow, the results for each of the three participants will be discussed separately.

Results for Each Participant

Jason

Initially, Jason demonstrated difficulties acquiring a sight word vocabulary in both the PTM and the PA conditions. He appeared to have difficulty making discriminations during intervention activities; thus, changes in instructional procedures were made so that he received increased practice in making discriminations, beginning on the fifth intervention
session. In addition, Jason appeared to be overwhelmed and confused by the amount of verbal information presented in order to direct his attention to the stimuli, prompt him to make a response, provide feedback regarding incorrect responses, and reward him for correct responding. Changes were made to the instructional procedures to reduce extraneous verbal input and make necessary verbal input more direct and clear. These changes occurred on the 14th intervention session. Despite these changes, Jason did not demonstrate learning in either condition during the daily probe activity. While Jason regularly made correct discriminations during instructional activities, he seemed to have difficulty matching text to PCS when stimuli for untaught words were present in the binder and on the slant board. To deal with this difficulty, untaught PCS were removed from the probe binder and their corresponding text cards were not placed on the slant board during probe activities. The removal of untaught words appeared to simplify the tasks sufficiently, because it resulted in an increased in correct responding at the rate of one word per day in the PTM condition. However, Jason continued to demonstrate difficulty acquiring words in the PA condition. Therefore, despite changes that made the probe activity easier and increased the likelihood of Jason responding correctly, successful acquisition of sight words occurred only the in PTM condition.

After Jason maintained his ability to read the PTM target words for three days, a generalization activity was introduced. In this activity, Jason was presented with all five PCSs from the PTM condition. He was asked which he wanted to play with and an open hand prompt was given by the interventionist to encourage him to remove a PCS card from the slant board. Jason was then directed to a shelf where five identical, opaque boxes held the corresponding toy items, labeled with the text only cards. Jason was to select the box labeled with the text that corresponded to the PCS he had selected. If correct, Jason and the
interventionist played with the toy for approximately five minutes, before returning to the slant board and beginning another generalization trial. Jason readily demonstrated an ability to transfer his ability to read words from the PTM condition to this novel activity. He completed three generalization sessions and performed with 80% accuracy during the first session, 40% accuracy during the second session, and 100% accuracy during the final session. During this time, Jason was experiencing a cold and was feeling somewhat unwell. This may explain his less-than-perfect performance during two of the generalization sessions.

While engaging in generalization activities for the PTM condition, Jason continued to engage in intervention activities for the PA condition. Jason continued to demonstrate erratic learning of the PA words, although he did move up to the second level of instruction. During the probe activity, Jason demonstrated correct reading of three PA words on two occasions but, after moving to the third level of instruction, was unable to correctly read four PA words during the probe activity.

Nine days after completing the final generalization session, the interventionist visited Jason in his home to conduct a follow-up probe. Jason had not been exposed to the PTM or PA target words during this time. For this follow up, Jason demonstrated successful reading of all five PTM target words and three PA target words. Approximately four months later, the interventionist again visited Jason in his home to conduct a follow-up probe. Again, Jason had not been exposed to any of the PTM or PA target words during the interim. At this time, Jason demonstrated successful reading of three of the five PTM target words but was unable to demonstrate successful reading of any of the PA target words.

It is interesting that, after Jason acquired the five PTM target words and demonstrated successful sight word reading of those words, he began to demonstrate some improvement in
his ability to read some of the PA target words. In fact, he correctly read three PA target words at the nine-day follow up. Perhaps, the PTM intervention taught Jason to focus his attention on text and to shift it from pictures to text when the two forms of stimuli were presented together. This might have resulted in his acquisition of sight words presented in a paired associate format.

Sam

Sam began the study with the same PTM and PA target words as Jason and Andrea. These target words all began with different initial letters and were highly discernable. Almost immediately, Sam demonstrated an ability to read all of these words during the probe sessions. It appeared that he was using a rudimentary understanding of sound-symbol relationships to discriminate between the target words. Therefore, a second set of PTM and PA target words were compiled each beginning with the letter W. This prevented Sam from utilizing his emerging understanding of sound-symbol relationships to discriminate between target words and allowed for a comparison of his learning between the two conditions.

Sam did not experience the same difficulties as Jason, likely due to differences in their verbal abilities. Unlike Jason, Sam possessed a solid expressive vocabulary and was able to express himself quite easily. He also seemed to possess more learning behaviours than Jason. He understood what was expected of him and, in fact, understood enough about the nature of the project to know that he was there to learn to read, something that he very much wanted to learn to do. As such, Sam demonstrated no difficulties following directions and he was highly motivated to engage in all activities. Only one change was made in terms of instructional procedure for Sam. During the individual words activity, the number of discrimination trials was increased to provide additional practice in discrimination.
Sam presented few problems in terms of completing the requirements of each session. His desire to socialize with the investigator required the investigator to indicate that chatting could happen between instructional activities. Once this was clear to Sam, he was more able to focus on instructional activities. The other issue for Sam related to sessions following nights during which he had been exceptionally busy and had gone to bed late. Sam’s father was extremely supportive of the project and made every effort to ensure that Sam went to bed early so that he would be in a cooperative mood during the session the next day. When it was anticipated that Sam would have a late night or on days when Sam had been up late the night before, his father phoned the investigator prior to the session and arranged to reschedule for later in the day or on a weekend. This reduced problems related to Sam being tired and irritable during his sessions.

Once the intervention began, Sam demonstrated rapid growth in his ability to read the PTM target words. For a few days, there was a reduction in Sam’s ability to read the PTM target words, likely due to a few busy days and late nights. However, Sam rapidly re-gained momentum and quickly acquired all five of the PTM target words. Throughout the study, Sam continued to demonstrate difficulty in acquiring the PA target words, generally reading no more than two PA target words successfully during the daily probe activity.

After maintaining 100% correct reading of PTM target words for 3 days, Sam began the generalization phase of the study. For eight sessions, Sam continued to demonstrate 100% reading of PTM target words and 0% to 20% correct reading of PA target words during daily probe sessions. During the generalization sessions, Sam was presented with the five PCSs for the PTM target words and asked to select one for play. After Sam removed the PCS of his choice and stated the label verbally, he was asked to locate the correct box by
finding the matching text label. After selecting a box, Sam would bring it to the table where
the interventionist would provide feedback. Sam demonstrated consistently successful
generalization of his sight word reading vocabulary to this novel activity over eight days of
generalization sessions. For seven of the eight sessions, he responded 100% correctly; during
one session he made one error.

Unfortunately, Sam was not available for follow-up after the study. While it was
planned that follow-up would occur 10 days after the final generalization session, Sam’s
family had a trip planned, and Sam was out of town at that time.

The PTM intervention was the most successful intervention strategy for Sam. For
Sam, who already possessed some emerging understandings about sound-symbol
relationships yet continued to experience difficulty dealing with text, the PTM condition
resulted in a rapid acquisition of sight words and appeared to result in an increase in self-
esteeem for Sam. Sam appeared very pleased with his ability to read the PTM target words
and would confidently select cards to make matches.

Andrea

Andrea did not demonstrate the same level of learning that Jason and Sam. While she
demonstrated many of the same difficulties as Jason, the procedural changes implemented
successfully for Jason did not produce improved learning in Andrea. An increased number of
discrimination trials during the individual word activity, beginning during the fifth
intervention session (session 10) did not help Andrea learn to successfully discriminate
between target words. A reduction in verbal directives and the use of the target word label
instead of the directive “read” was implemented for Andrea on the 14th day of intervention
(session 19), yet her learning continued to be poor. When the probe activity was changed so
that only previously taught words appeared in the binder, the change that produced dramatic results for Jason, Andrea did not show improved learning.

Throughout this time, Andrea experienced a number of significant changes in her personal life. After many years of residing for two weeks at each of her parents' homes, she moved full time to her mother's home. This was done to provide her with increased stability and security. After a few weeks, however, Andrea was displaying significant problem behaviours at home and her mother lacked the additional support necessary to deal with these issues. During the move to her mother's house, Andrea's full time support worker went on holidays. Andrea spent much of her time perseverating over the absence of her support worker and would engage in tantrums, believed to be motivated by Andrea's desire to have her support worker return. After three weeks at her mother's house, Andrea moved to her father's house on a full time basis.

In addition to the changes in Andrea's life that occurred during the study, Andrea began experiencing an increase in seizure activity. All of these issues resulted in increased problem behaviour on the part of Andrea, as she tried to deal with the confusion in her life. Andrea began to demonstrate an increase in whining and crying behaviours. Sometimes she would lay her head on the table and refuse to interact with the interventionist. On a few occasions, Andrea exhibited self-injurious behaviour, in the form of head hitting. On the 15th, 17th, 22nd, and 23rd sessions (sessions 20, 22, 27, and 28) Andrea refused to participate in some or all of the probe and/or intervention activities. After the 24th day of intervention (session 29) the decision was made by the interventionist to end Andrea's participation in the study. As a result of the turmoil that occurred in Andrea's life during the intervention portion
of the study, the results of daily probe sessions are not valid. Due to her early removal from the study, data regarding generalization and maintenance are not available.
Summary

Results for two of the participants supported the hypothesis that a PTM intervention would result in improved sight word learning, compared to a PA intervention, while results for one of the participants neither supported nor refuted this hypothesis, given her withdrawal from the study.

Results for two of the participants supported the hypothesis that a PTM intervention would support generalization of sight word reading skills to a novel and functional activity. Results for the third participant neither supported nor refuted this hypothesis, given her withdrawal from the study. Sam demonstrated strong generalization of his reading skills to the generalization activity, with 100% correct responding for 80% of the generalization sessions in the PTM condition. Jason’s less than perfect performance during two of the generalization sessions may be attributed to his feeling unwell on those days, as he had a cold.

Comparison with Previous Research

As discussed in Chapter 1, previous studies of paired associate intervention techniques to develop sight word reading skills in persons with developmental disabilities proved unsuccessful. Many authors concluded that pictures should not be used to teach sight word reading skills, given the blocking effect that interferes with learning when paired associate techniques are implemented (Samuels, 1967; Saunders & Solman, 1984; Singer, Samuels, & Sprioff, 1974; Singh & Solman, 1990; Wu & Solman, 1993). At the same time, other bodies of research have demonstrated the effective use of pictures to teach sight word vocabularies to persons with developmental disabilities, including those considered significantly developmentally disabled and/or classified as nonverbal. The present study
sought to clarify the role of pictures in developing sight word reading skills in persons with developmental disabilities by comparing an intervention that used paired associate stimuli to an intervention that involved participants in learning to match PCSs to text.

The demonstration of successful sight word acquisition when engaging in picture-to-text matching activities by the two participants who completed the study helps to clarify the role of pictures in sight word instruction. The instructional procedures for the two conditions were identical, as were the instructional activities. The only difference between the two conditions related to how the pictures were presented. In the PA condition, pictures were always presented alongside text during all instructional activities. In the PTM condition, pictures were never presented alongside text. This allowed for a comparison of the two conditions in terms of the effects of differing picture presentation techniques. When participants were engaged in learning activities that required them to match pictures to text, stimulus equivalencies were developed. When pictures were consistently presented alongside target words, stimulus equivalencies did not develop, due to the blocking effect. This is not surprising, given the plethora of previous research on paired associate learning, sight word development, and the blocking effect. This demonstrates that the issue is not whether or not to use pictures when teaching sight word reading skill, as the paired associate literature would lead one to believe. Rather than removing pictures from sight word instruction altogether, as paired associate research suggests, pictures should be used in a manner to encourage the development of stimulus equivalencies. The issue, then, is not whether or not to use pictures for sight word instruction, but how to effectively use pictures to develop a sight word vocabulary.
Another issue that was apparent in the literature related to the instruction of persons labeled nonverbal. The majority of sight word instructional research focuses on individuals with verbal abilities and defines reading as the ability to verbalize words on the page. For those who are nonverbal and may never acquire verbal abilities, this definition of sight word reading excludes them from sight word instruction. Unable to demonstrate reading in the defined manner, they are simply judged incapable of the act of reading. This study addressed this issue by suggesting that a picture-to-text matching intervention can be used successfully to teach sight word reading skills to nonverbal individuals. Jason possessed limited verbal skills and rarely used speech to express himself. However, he was able to demonstrate successful learning of all of the PTM target words.

Limitations of the Study

One limitation of this study relates to the participants. Few participants responded to the advertisements for inclusion in the project. Of five potential participants, two did not meet inclusion criteria, leaving only three participants for inclusion. The removal of Andrea from the study further decreased the sample size. As well, each of the participants possessed characteristics which complicated the study. Jason experienced difficulty with verbal instruction and was difficult to motivate. Sam possessed an emerging sound-symbol awareness that was not apparent during the initial assessment activities. Andrea, like Jason, demonstrated difficulty understanding verbal instructions and also experienced environmentally and medically-related issues that influenced the occurrence of problem behaviour.
Experimental Control

As noted previously, within-participant characteristics necessitated a divergence from the procedures as initially designed. For Sam, this involved an increase in discrimination practice, beginning on session 10. For Jason and Andrea, changes involved an increase in discrimination practice, beginning on session 10, a change in stimulus, beginning on session 19, and the removal of untaught target words from the probe activity, beginning on session 25. Until adjustments were made for Jason and Sam, there was no separation in the data as expected in an Adapted Alternating Treatments Design. In other words, experimental control was not demonstrated for Jason and Sam until procedural adjustments were made. For Andrea, experimental control was not demonstrated, despite procedural adjustments.

Generalization Procedures

Participants’ ability to generalize the reading of PA target words to a novel, functional activity was not assessed. As a result, it is impossible to make a comparison regarding generalization of reading skills developed by the PTM and the PA interventions. There was a relationship between the PTM intervention and successful generalization of learned words to a novel, functional activity. However, without direct assessment of generalization in the PA condition, it was not possible to compare the two conditions. Thus, it is not possible to confirm the hypothesis for question #2.

External Validity

Another limitation is related to the small sample size. With only two participants successfully completing the study, it is difficult to extend the results to a wider population. Also, because the two participants were quite different in terms of their learning styles, verbal abilities, and learning behaviours and skills, it is even more difficult to extend the
results to a larger group of similar learners. At the same time, the fact that the two participants were so different in profile suggests that the PTM instructional method might be successful for students of varying learning styles and abilities.

Finally, the small target word set makes it difficult to extend the results to the learning of a larger sight word vocabulary. Both Jason and Sam successfully acquired five words from the PTM condition. It is difficult to determine whether they would have been able to acquire a significantly larger sight word vocabulary, given that the study covered a short period of time. Therefore, results from this study cannot be generalized to the teaching of larger sight word vocabularies.

Future Research

Diversity of Population

One area to which this research can be extended relates to the diversity of the population for whom a PTM intervention strategy would be successful. Jason represented a nonverbal child with an autism spectrum disorder and Sam represented a more verbally capable child with Soto Syndrome. Neither of the participants had a significant physical disability. Future research should investigate the efficacy of a PTM intervention strategy for children with a wide range of disabilities, including autism spectrum disorders, Down syndrome, cerebral palsy, sensory impairments, and other significant disabilities. Children with a wide range of communication styles should also be included in future research, including those who use computer-based augmentative communication devices. Extending the research to a greater diversity of children with disabilities will allow us to understand if there are profiles of students more suited to this type of intervention and will perhaps identify profiles of students for whom this intervention will not be successful. Such information
would assist educators in matching this intervention to suitable students while avoiding the
use of this intervention for students likely not to benefit.

*Vocabulary Size*

A second area requiring increased research is related to the size of target vocabulary.
It is possible that the PTM intervention will only support students in acquiring a sight word
vocabulary to a maximum level. Such research would assist educators in understanding the
limitations of using a whole-word PTM approach. As well, it would help them to select a
sight word vocabulary judiciously and use the PTM approach to effect the development of a
useful and meaningful set of sight words.

*Ease of Use and Effectiveness in Inclusive Settings*

As students with developmental disabilities are generally schooled in inclusive
classroom settings, it is important to ascertain the ease with which a PTM intervention can be
implemented in such settings. It is important to determine how such an intervention can be
programmed into a student’s day, as well as the degree of support for material development
and program implementation either by teachers, support staff, volunteers, or peer tutors. It is
important to determine if the procedures are straightforward enough for paraprofessionals,
volunteers, or peer tutors to deliver, as well as to establish how a PTM intervention would fit
within the context of an inclusive classroom environment.

*Transfer of Sight Word Recognition Skills to Conventional Reading Activities*

It is important that students learn to use sight word recognition skills for meaningful,
purposeful activities such as communicating and acquiring information. Simply teaching
students to memorize sight words is not sufficient for them to become skilled readers and
writers. Given that students with developmental disabilities often experience difficulty
transferring skills to novel or more challenging activities, it is important to research how a PTM intervention can be part of a larger literacy program, where conventional reading and writing are encouraged.

*Educational Implications*

The results of the present study provide some support for the use of a picture-to-text matching strategy to teach sight word reading skills to children with developmental disabilities. Both of the participants who completed the study and acquired a small sight word vocabulary received low chronological age scores on the PPVT, suggesting that the PTM intervention strategy would be beneficial for cognitively young children. This supports research showing that children with Down syndrome under five years of age can successfully acquire quite significant sight word vocabularies (Buckley, 1985; Buckley & Bird, 1993; deGraaf, 1993; Hill, 1995; Laws, Buckley, Bird, MacDonald, & Broadley, 1995).

The results also suggest that the procedures can be applied somewhat flexibly, as long as students are involved in activities that require matching pictures to text. For students who are more verbally capable, a high degree of verbal input and instruction can be provided. For students who find auditory input overwhelming, verbal input can be reduced significantly and learning can still occur. As well, although only four kinds of matching activities were used for this study, it is likely that a greater variety of matching activities could be developed based on students' interests and learning styles. This allows for a greater degree of flexibility when presenting instruction, allows the instructor to be creative in selecting matching activities, allows for a rotation of various kinds of matching activities, and satisfies individual activity preferences of students, thereby increasing motivation.
Summary

This study examined two questions: (a) Does picture-to-text matching instruction result in increased accuracy in sight word recognition in students with developmental disabilities, compared to a paired-associate intervention? and (b) Does the use of a picture-to-text matching strategy result in improved generalization of sight word recognition to novel and functional activities, compared to that of a paired-associate teaching strategy? The results indicate that, for two of three participants, picture-to-text matching instruction resulted in increased accuracy in sight word recognition, compared to a paired-associate intervention. As well, results indicate that, for two of three participants, sight words acquired using a picture-to-text matching intervention generalizes to a novel activity. Generalization could not be assessed for the paired-associate condition, given that none of the participants demonstrated sufficient learning to warrant investigation of generalization. Jason and Sam both acquired the target words from the picture-to-text matching condition. Andrea did not demonstrate learning in either condition and her participation in the study ended early, due to behavioural problems related to changes in her personal life.

The study contributes to the existing empirical data on sight word instructional strategies in a number of ways. First, it clarifies the role of pictures in sight word instruction and suggests that the problem with using pictures to teach sight word reading skills lies not with the pictures themselves but rather the techniques by which pictures are used to teach sight words. Given that the two instructional conditions were identical except for the way in which pictures were presented, the results of this study provide such clarification. The use of pictures paired with text inhibited the acquisition of sight word learning. This supports the large body of paired associate/sight word learning literature. However, while that body of
literature recommends that pictures not be used in sight word instructional programs, the results of this research demonstrate that pictures can facilitate the development of a small sight word vocabulary in students with developmental disabilities who have previously failed in acquiring sight word reading skills. The results of this study clearly demonstrate that the issue is not whether or not to use pictures when teaching sight words but how to use pictures effectively and efficiently to develop stimulus equivalencies between pictures and print. Second, the study demonstrates that both nonverbal and verbal students can benefit from a picture-to-text matching intervention to acquire a sight word vocabulary. Third, generalization data suggest that a picture-to-text matching intervention results in successful generalization of sight word reading skills to novel activities. Finally, follow up data for one participant suggests that sight word reading skills can be maintained, without additional instruction or practice, for up to four months.

For educators and parents, the findings of the present study should be viewed as promising. Picture-to-text matching instructional strategies appear to be beneficial in developing sight word vocabularies in non-reading students with developmental disabilities, both verbal and nonverbal. Further research is necessary to extend these findings to a more diverse population, explore the potential of this strategy for teaching larger vocabularies, investigate the contextual fit of this strategy within inclusive classroom settings, and consider ways in which this strategy can support literacy programs in general.
References


Mayer-Johnson Co. (2001). *Boardmaker 5.0* [Software Program]. Solana Beach, CA.


Appendix D

Permission to Videotape Form

THE UNIVERSITY OF BRITISH COLUMBIA

Program Areas
Special Education
School Psychology
Measurement, Evaluation & Research Methodology
Human Learning, Development, & Instruction
Counselling Psychology

Department of Educational and Counselling Psychology, and Special Education
Faculty of Education
2125 Main Mall
Vancouver, B.C. Canada V6T 1Z4

Permission to Videotape

I, ______________________ (parent/guardian’s name)
give permission to Brenda Fossett, a graduate student in the Dept. of
Educational and Counselling Psychology and Special Education at the
University of British Columbia, to videotape ______________________
(child’s name) as part of her research project on literacy instruction
of students with disabilities. I understand that the videotape will be used for
the purpose of data collection and transcription by Brenda Fossett and a
graduate assistant only.

Signed,

______________________________
Parent/Guardian

______________________________
Date

In addition to the above, I give permission to Brenda Fossett and her research
supervisor, Dr. Pat Mirenda, to use excerpts of the videotapes of my child that
were recorded during Brenda’s research project in courses or workshops
related to literacy instruction of children with disabilities. I understand that
the videotape will not be used outside of such courses or workshops without
my express permission.

Signed,

______________________________
Parent/Guardian

______________________________
Date
Appendix E

PCSs for Word Sets 1 and 2

Word Set 1: PTM Condition, Jason and Andrea

<table>
<thead>
<tr>
<th>Egg</th>
<th>Dice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keys</td>
<td>Light</td>
</tr>
<tr>
<td>Felts</td>
<td>Stamp</td>
</tr>
<tr>
<td>Whale</td>
<td>Muffin</td>
</tr>
<tr>
<td>Orange</td>
<td>Bubbles</td>
</tr>
</tbody>
</table>
Word Set 2: PA Condition, Jason and Andrea

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Car</td>
<td>Glue</td>
</tr>
<tr>
<td>Horn</td>
<td>Train</td>
</tr>
<tr>
<td>Video</td>
<td>Juice</td>
</tr>
<tr>
<td>Robot</td>
<td>Puzzle</td>
</tr>
<tr>
<td>Insect</td>
<td>Animals</td>
</tr>
</tbody>
</table>
### Word Set 1: PTM Condition, Sam

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Witch</td>
<td>Water</td>
</tr>
<tr>
<td>Wagon</td>
<td>World</td>
</tr>
<tr>
<td>Walkman</td>
<td></td>
</tr>
</tbody>
</table>

### Word Set 2: PA Condition, Sam

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Watch</td>
<td>Whisk</td>
</tr>
<tr>
<td>Wheel</td>
<td>Woman</td>
</tr>
<tr>
<td></td>
<td>Whistle</td>
</tr>
</tbody>
</table>
Appendix F

Sample Page from 3-ring Binder

PTM Condition

egg
PA Condition

\[ \text{car} \]
Appendix G

*Sample Flashcards*

*PTM Condition*

PCS only flashcard

![Egg illustration]

Text only flashcard

*egg*
PA Condition

Text + PCS flashcard
Appendix H

Sample Matching Worksheet

PTM Condition

egg

dice

keys

light

felts
PA Condition

car

video

horn

car

train

glue

horn

video

train
PA Matching Worksheet Example for Sam

Watch

Whisk

Wheel

July 24/02
Appendix I

Sample Completed Pasting Worksheet

PTM Condition

dice
felts
light
egg
keys
PA Condition

car

video tape

glue

horn

train

video
## Appendix J

*Probe Data Collection Form*

<table>
<thead>
<tr>
<th>Session</th>
<th>Target Words</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>12</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>19</td>
<td></td>
<td>20</td>
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<tr>
<td>21</td>
<td></td>
<td>22</td>
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<tr>
<td>23</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td>26</td>
</tr>
<tr>
<td>27</td>
<td></td>
<td>28</td>
</tr>
<tr>
<td>29</td>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>
Appendix K

*Diagram of Find It Activity: PTM Condition*

Interventionist

Participant

dice
egg
keys
Appendix L

_Procedural Reliability Checklist for Probe Trials_

_Date:_ ____________________________

<table>
<thead>
<tr>
<th>Interventionist Behaviour</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stated that pages had been randomized before giving book to participant.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Five text labels removed from book prior to presentation to participant.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Text cards randomly placed in front of participant.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absence of corrective feedback (interventionist did not say 'no', shake her head, gesture, or give other verbal or physical cues to the participant in relation to an incorrect response).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-specific verbal praise after each trial (e.g.: “thank you,” “way to go,” etc.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal praise for completion of the task after the last card had been attached to a page (“good work,” “all done,” etc.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix M

*Procedural Reliability Checklist: Intervention Sessions*

**Date:** __________________________

**Words Targeted:**

**Level:** 1 2 3 4 5 (Circle one)

**Teaching Individual Words**

<table>
<thead>
<tr>
<th>Interventionist Behaviour</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct number of text or PCS/text cards on board, based on level of instruction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Held PCS or text/PCS card facing participant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Directed participant’s attention to the hand-held card by pointing and saying “read”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Held one hand out, palm up, as physical prompt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interventionist said word and highlighted participant response by moving card closer to him/her</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provided correct reinforcement, based on participant response (social feedback/praise for correct responding, positional and physical prompts for incorrect/no response)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Each ‘teaching’ word received 3 individual presentations and 4 discrimination presentations; each ‘maintenance’ word received 7 discrimination presentations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cards on table re-randomized after each trial</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Find It Activity**

<table>
<thead>
<tr>
<th>Interventionist Behaviour</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text or PCS/text cards affixed to wall in random order using Fun-Tak</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interventionist showed the PCS or PCS/text card to the participant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interventionist said “read”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interventionist provided positional and hand-over-hand prompts in presence of no response from participant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In cases of incorrect response, provided hand-over-hand prompting to erase incorrect response and elicit correct responding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interventionist highlighted each match by saying the word and moving the selected card closer to the participant.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edible reinforcement offered for each correct response.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Pencil and Paper Matching Activity

<table>
<thead>
<tr>
<th>Interventionist Behaviour</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper and pencil given to participant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interventionist pointed to all words/PCS on paper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participant directed to “read”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand-over-hand support to erase incorrect response and correct mistake</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand-over-hand assistance provided in case of no response</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social feedback (praise) provided after each correct response</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interventionist highlighted each match by saying the word and pointing to the matching items</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sticker provided for correct responding on all target words</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Pasting Activity**

<table>
<thead>
<tr>
<th>Interventionist Behaviour</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper and pre-cut labels presented to participant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All words/PCS pointed to by interventionist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participant directed to “read”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand-over-hand assistance provided in case of no response</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incorrect responses anticipated by interventionist and corrected via hand-over-hand assistance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social feedback (praise) provided after each correct response</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interventionist highlighted each match by saying the word and pointing to the matching items</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sticker provided for correct responding on all target words</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Overall level of reinforcement**

- **Low** (little or no reinforcement; reinforcement was ‘bland’)
- **Medium** (average amount of reinforcement; moderate degree of enthusiasm)
- **High** (lots of reinforcement for correct responding; high degree of enthusiasm)

**AFTER CODING BOTH CONDITIONS FOR THE SAME DAY, RESPOND TO THE FOLLOWING:** The level of reinforcement was similar across conditions. **Yes** **No**