A Dialogic Reading Intervention Incorporating AAC Modelling and Increased Communication Partner Responsiveness During Shared Storybook Reading with Children with Complex Physical, Cognitive, and Sensory Needs Who Use Partner Assisted Scanning.

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Abstract

Children with complex physical, cognitive and sensory needs (CPCSN) who use augmentative and alternative communication (AAC) may use partner assisted scanning (PAS) as their access method. This access method is not well understood and rarely features in existing literature. Children with CPCSN also seldom appear in the literature on aided language. Children who use AAC require significant intervention to build their receptive and expressive language skills and develop communicative competence.

This research examined an evidence based dialogic shared reading strategy which incorporated aided language modelling and increased communication partner responsiveness with two children with CPCSN who use PAS to access a Pragmatic Organised Dynamic Display (PODD; Porter, 2012) communication book. The dialogic reading strategy prompted the communication partner to comment on the story, invite a communication turn, and respond contingently to the child. Aided language modelling and increased responsiveness are widely recognised as strategies which support language development in children who use AAC.

Data were collected via communication frequency measures, field notes, and observations throughout the intervention process and an interview with the children's teacher was conducted after the intervention was complete. The quantitative data were analysed using descriptive statistics and graphs, while the qualitative data were analysed using a general inductive approach. In an effort to integrate all of the data sources, the quantitative communication frequency measures were treated as deductive codes and embedded within the qualitative analysis.

Two major themes emerged from the data. One theme described the practical challenges associated with the health and physical needs of the children that required consideration when providing intervention, as well as the changes to the clinical protocol that became necessary in response. In addition, the second theme outlined the effects of the intervention on the children's communication skills. This included positive outcomes in skill areas such as turn taking, efficiency

and conveying meaning. Recommendations for further research and clinical practice as a result of the research are presented.

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AAC Conventions

When describing or transcribing interactions which include spoken language, aided language and gestures or body movements, the following conventions are used:

- Spoken language: plain text, quotation marks, e.g., “I have something to say”.
- Aided language accompanied by spoken language: plain text, underlined, / between symbols, quotation marks, e.g., “<u>want/help/that is all I have to say</u>”.
- Aided language with no accompanying spoken language: plain text, underlined, / between symbols, no quotations marks, e.g., <u>more to say/I think it’s/gross/that’s all I have to say</u>.
- Gestures or body movements: italicised, no quotation marks, e.g., *head shake.*

Chapter One: Introduction

Communication, the shared act of giving and receiving information in an agreed and mutual language, is a basic human right and a foundation for learning and connecting with others (National Joint Committee [NJC] for the Communication Needs of Persons with Severe Disabilities, 2016). It is an ability that most of us take for granted as it is effortless and automatic. There are many modes that we use to communicate including speech, body language, gestures, signs, eye gaze, intonation, facial expression and writing (Beukelman & Mirenda, 2013).

Communication is a complex process. It begins with a communicator's intent and relies on the coordination of their physical, cognitive, and sensory skills to move and send a message to a listener (Beukelman and Mirenda, 2013; Burkhart and Porter, 2006; Light, Beukelman & Reichle, 2003). Each skill-set contributes to the process of communication and difficulties in any of them can have adverse effects.

Complex Communication Needs

People who are unable to meet their daily communication needs with speech alone are considered to have complex communication needs (CCN; Beukelman & Mirenda, 2013; Iacono, 2014). They have difficulty using speech to successfully obtain what they want, reject what they don't want, interact socially, and gain or share information in a way that is understood by others (Light, 1988). They come from a variety of socio-economic backgrounds, age groups, genders, ethnicities and cultures (Beukelman & Mirenda, 2013). People with CCN may have either acquired (e.g., stroke, traumatic brain injury) or developmental disorders (e.g., autism spectrum disorder) which cause difficulty with communication.

Children with Complex Physical, Cognitive and Sensory Needs

Some people with CCN have a multiplicity of impairments which put them at high risk for developing little or no spoken language. The children in the study reported in this thesis have complex physical, cognitive or sensory needs (CPCSN) which result in CCN. Each impairment contributes to the complexity of their communication needs in different ways.

Physical impairments may disrupt gross or fine motor strength, balance and posture, breath support and motor planning, as well as the coordination needed for verbal communication. Cerebral palsy is the most common cause of physical impairments in children and the impact may be mild to severe (Cerebral Palsy Society of NZ, 2017). Children with CPCSN tend to have significant disruptions to the physical structures and functions for voice and speech and experience severe restrictions to participation in many activities of daily life.

Cognitive or intellectual disorders can have an impact on speech and language development. Language is essentially a cognitive skill, but there is much that is not known about the relationship between language and cognitive development (Rowland & Schweigert, 2003). The literature suggests that there is a dynamic and reciprocal interaction between language, cognition and motor development (Notari, Cole & Mills, 1992).

Children with sensory needs may have vision, hearing, or other sensory processing impairments. Dual sensory impairment refers to combined impairments of vision and hearing (Huo, Burden, Hoyt, & Good, 1999). Vision impairment may be ocular or neurological. Ocular impairments occur when there is abnormality of the anterior eye structures, whereas neurological visual impairment (NVI) which is also known as cortical or cerebral visual impairment (CVI), occurs when there is impaired visual functioning or processing in the absence of structural abnormality of the anterior visual pathways or optic disease (Huo et al., 1999).

One in 10 children with cerebral palsy have a severe vision impairment, either neurological or ocular, and CVI has been identified as the leading cause of low vision in developed countries (Cerebral Palsy Society of NZ, 2017; Huo et al., 1999). The literature suggests that children with vision loss and no other physical, sensory or neurological disabilities, develop language skills that are comparable to sighted children. However, when combined with other impairments, the development of language is negatively impacted (Hennessy, 2011). Hearing loss affects language development in children who are otherwise developing typically and adds another layer of complexity for those with co-existing physical impairments (Ching et al., 2010).

Sensory processing is the ability of the nervous system to organise sensory information (e.g., vestibular, proprioceptive, auditory, visual, and/or tactile) from one's own body or the environment in order to respond appropriately. People with sensory processing impairments may be over- or under-sensitive to internal or external sensory information which leads to difficulties regulating their responses and learning from their environment. Research suggests that sensory processing impairments may affect children's cognitive, language and sensorimotor skills (Taal, Reitman, Muelen, Schipper, & Dejonckere, 2013).

Augmentative and Alternative Communication

People with CCN may use an augmentative and alternative communication (AAC) system to share their needs, wants, feelings and ideas in a way that is understood by others (Beukelman & Mirenda, 2013; Light, 1988). An AAC system may be an alternative when speech is non-existent, or it may be supplemental when speech is unclear (American Speech-Language-Hearing Association [ASHA], n.d.).

In spoken language, words are symbolic representations of conventional concepts. In AAC systems, symbolic representations fall into two categories: unaided and aided. Unaided AAC refers to forms of communication that utilise a person's body, but no external aids, such as sign language, gesture, or vocalisations. Aided AAC involves external, tangible assistance. This can be low-tech (e.g., communication boards or books with visual graphic symbols, alphabet boards) or high-tech (e.g., voice output communication devices such as a tablet with a communication app) (Beukelman & Mirenda, 2013). The two children in this study use low-tech communication books as part of their communicative repertoire.

People who use aided AAC indicate specific items from the collection of symbolic representations provided in their AAC system to transmit their message. They may do this via direct selection or scanning. Direct selection involves touching or pointing at the desired item and is the simplest and most 'direct' method for making a selection (Treviranus & Roberts, 2003). Direct selection is often the first choice for access to an AAC system, as it is operationally simple. However, for some people with significant motor impairments, a direct selection is inhibited or

compromised, and, scanning (switch or partner assisted) is a viable option (Dropik and Reichle, 2008; Horn and Jones, 1996; White, Carney & Reichle, 2010).

Scanning requires vocabulary items to be presented in a consistent sequence, while the communicator waits until the desired item has been presented, and then signals in some way to select it. In aided AAC systems, items or symbols are often selected by activating a switch, particularly when the selection set is presented electronically (Beukelman and Mirenda, 2013).

Partner Assisted Scanning

Partner assisted scanning (PAS) with AAC is a strategy where a skilled communication partner assists by presenting vocabulary options, and then observes and responds to a signal from the communicator to co-construct the message. Vocabulary may be presented visually, with the communication partner pointing to, or highlighting, each item; auditorily, with the communication partner speaking aloud each vocabulary item; or a combination of the two. The children in this study use PAS to access AAC and require items to be presented in an auditory-visual manner during a scan.

During PAS, the communication partner needs to be attentive and responsive to the often subtle and idiosyncratic movements of the communicator who signals their acceptance or rejection of each vocabulary option. People who use PAS may vocalise, use body movement including eye gaze, facial expression or change in effect to indicate that they accept or reject a presented item (Bayldon & Clendon, 2017).

PAS may be used with physical objects, spoken words, or an aided AAC system to support engagement and participation in activities or message construction. In this study, Pragmatic Organised Dynamic Display (PODD; Porter 2012) communication books were used to support the aided communication needs of the children who participated in the intervention.

Pragmatic Organisation Dynamic Display (PODD; Porter, 2012)

PODD communication books are considered a robust AAC language system and include aspects that support motor planning, vocabulary expansion, grammar

use, spelling, the use of pre-programmed phrases or messages, and the use of core words (Ahern, 2016). PODD books use a grid display with vocabulary organised to promote communication for a range of functions and efficiency. Activity page displays include predictably associated vocabulary, while taxonomic category pages support more generative message creation. Each page includes navigation and operational commands to support the communicator to create an autonomous message (Beukelman & Mirenda, 2013; Porter, 2012). Figure 1 shows the first page of a PODD book which has been designed for partner assisted visual scanning.

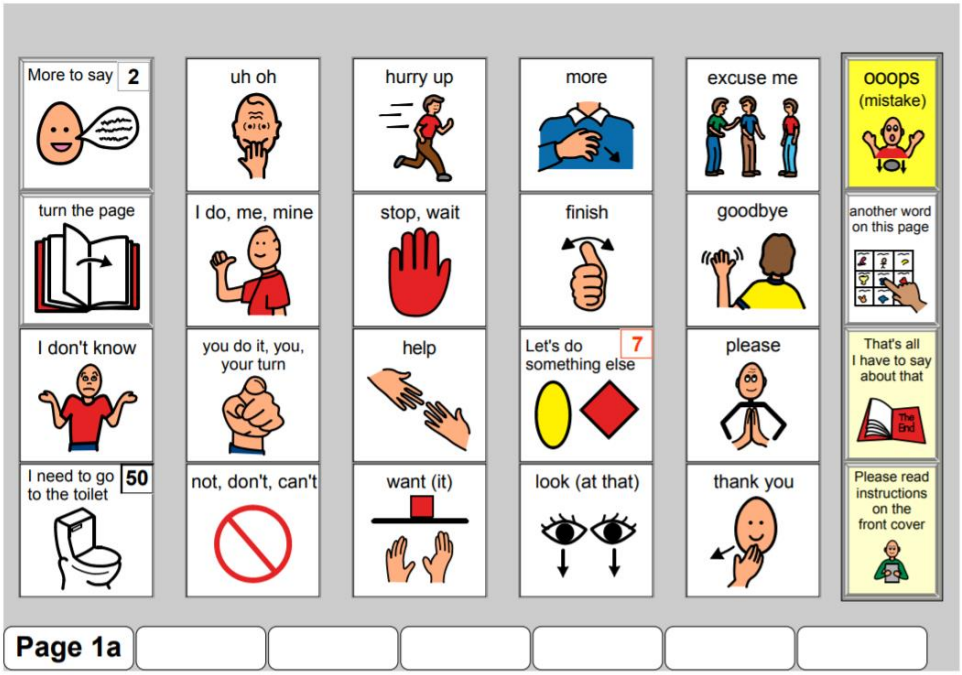

Figure 1. Page 1a 20 PAVS PODD expanded functions.

Note. Reprinted from Pragmatic Organisation Dynamic Display Communication Books, Alternative Access Templates, 20 PAVS Expanded Functions (p.1a) by Gayle Porter, 2017, Glen Waverley, VIC. Cerebral Palsy Education Centre. Copyright (2017) by Gayle Porter. Reprinted with permission. See Appendix A for permission.

PODD page-sets which are organised specifically for partner assisted scanning include an efficient scanning layout and message completion commands. The navigation column on the right-hand side of the page includes symbols for the communicator to add another word to the message if desired, and when ready, to complete the message.

New Zealand Context

Children with CPCSN comprise a relatively small proportion of those needing speech-language therapy in New Zealand. As at 1 July 2017, approximately 1.1% of the total school population received Ongoing Resource Scheme (ORS) funding, which provides the highest level of support for students with learning support needs (New Zealand Ministry of Education [MoE], 2018a). Of those 9,049 students, approximately 1% received Extension category funding for Moderate to High needs, 75% received funding at High Need, and nearly a quarter (24%) received Very High Need funding (New Zealand MoE, 2018b). It is these students, those with Very High Need funding, who often have CPCSN and are the focus of this study.

Rationale for the Present Study

In the past few years PAS has become more widely used as an access method, however, it is not very well understood by speech-language therapists (SLTs) or others who support individuals with CPCSN (Nevers, 2016). There is very little in the literature to describe it and nothing the researcher could find that discusses the efficacy of PAS as an access method. However, several clinical experts (see Burkhart, 2016; Farrall, 2015; Porter, 2012; Zangari, 2016) have suggested that when combined with a robust AAC system, PAS is a strategy that supports language learning and communication in children with CPCSN.

PODD communication books are gaining in popularity in New Zealand, Australia, and many parts of North America and Europe (Beukelman & Mirenda, 2013). However, research is still required as to the effectiveness of the system in supporting the language development of people who use AAC.

It is accepted that adults scaffold and support early language development of infants and children (Bedrosian, 1997; Calculator, 1997; Light 1997; Romski, Sevcik & Adamson, 1997). There is much in the literature which suggests that more skilled communication partners may change their language and interaction style to promote language learning with children who have language delays or use AAC (Drager et al., 2006; Harris & Reichle, 2004; Kent-Walsh, Murza, Malani, & Binger 2015; Romski & Sevcik, 2003). Aided language modelling and an increase in communication partner responsiveness are two strategies which are widely

accepted as beneficial for the language development of people who use AAC. However, there is no literature investigating these strategies with children with CPCSN who use PAS.

Shared storybook reading is a routine activity in the lives of many children and is generally recognised to be a context that provides rich language learning opportunities (Clendon, Erickson, van Rensburg and Amm, 2014). There are both theoretical (e.g., the emphasis on naturalistic contexts for intervention and the growing understanding of the importance of early literacy experience for beginning communicators who use AAC) and practical (e.g., books are cost-effective and portable) reasons to provide language intervention during shared storybook reading (Clendon et al., 2014; Kaderavek and Justice, 2002). There are a number of evidence-based approaches to shared storybook reading which scaffold interactions and support language development for children who use AAC (Kent-Walsh, Binger & Hasham, 2010; Notari-Syverson, Maddox, & Cole, 2002). One such strategy is CAR, which stands for Comment and wait, Ask questions and wait, and Respond (Notari-Syverson et al., 2002). The existing literature investigates shared storybook reading interventions with children who use direct access to AAC, with no evidence base for this intervention strategy with children with CPCSN who use PAS.

Research Aim

The study aimed to explore and describe the outcomes of implementing a dialogic reading strategy with aided language modelling and an increase in communication partner responsiveness in a shared reading context with children with CPCSN who use PAS to access PODD communication books. It is hoped that this study will expand the existing knowledge about how best to support language learning for AAC users with CPCSN and fill a gap in the knowledge base about those who use PAS as an access method.

Researcher's Perspective

I have worked as an SLT with children with CPCSN for more than 10 years and have a special interest in literacy learning. My experience using PODD and PAS with children with complex needs has prompted this research project. My observations and experience have shaped the research aim and propelled me to

discover more effective ways to support language and literacy development for children with CPCSN. I will refer to myself as the researcher throughout the thesis. When acknowledging my position in the study however, I will refer to myself using the first person.

Thesis Structure

This introductory chapter has introduced some key terminology which will be used throughout the thesis including children with complex physical, cognitive and sensory needs (CPCSN); augmentative and alternative communication (AAC); partner assisted scanning (PAS), and; Pragmatic Organisation Dynamic Display (PODD) communication books. The chapter has presented the context and rationale for the present study along with the research aim.

The second chapter provides a summary of the transactional theory of typical language development along with some of the challenges associated with this process for children who require AAC. This chapter also reviews some of the existing literature on the intervention strategies used in this study, discusses storybook reading as an authentic context for providing intervention, and provides the theoretical justification for the research aim.

Chapter Three outlines the methodology used to undertake the research, including the original plan for an experimental design study and the reasons for changing to a case study approach. Next, a detailed explanation of the intervention used in the study, the data collection methods and data analysis undertaken is provided. This chapter also discusses ethical considerations and positionality. Chapter Four presents the results from the study. A discussion of the key findings and results as they relate to the literature follow in Chapter Five. The sixth and final chapter concludes the study with a description of the trustworthiness and limitations of the study with suggestions for future research. Then the clinical implications for SLTs or teachers working with children with CPCSN who use PAS are explored.

Chapter Two: Literature Review

This chapter will begin with a brief overview of the transactional theory of language acquisition. It will then discuss differences and barriers affecting language development for children with complex communication needs (CCN). Following this, the key features of two language interventions, aided language modelling and increased responsiveness, that have been used successfully with children with CCN will be reviewed. Lastly, research on dialogic reading practices for supporting language development during shared storybook reading will be examined, with attention to adaptations for children with CCN. Overall, this review will provide a theoretical justification and rationale for the current research, which aims to examine the outcomes of a dialogic reading intervention which incorporates aided language modelling and increased communication partner responsiveness with children with complex physical, cognitive and sensory needs (CPCSN) who access augmentative and alternative communication (AAC) with partner assisted scanning (PAS).

Theory of Language Development

Language acquisition may be viewed as a transactional process that happens in the context of social interaction (Light, Collier and Parnes, 1985; Romski & Sevcik, 2003; Smith & Murray, 2016). Speech and other communication skills are developed through an active process of listening and speaking (Reichle, Beukelman, & Light, 2002). Children who are developing language typically participate in rich interactions with supportive adults and are surrounded by speech; hearing as many as 26 million words by the time they are 4 years old (Hart and Risley, 1995).

The transactional theory of language development is based on the work of Vygotsky (1978) who developed the concept of the zone of proximal development (ZPD). The ZPD is the difference between what a learner can do alone and what a learner can do with the support of a more skilled person. The ZPD allows for individual variation in the acquisition of language as the skilled partner scaffolds or supports the child to participate while the child internalises the rules, skills and abilities, and begins to exert autonomous control (Bedrosian, 1997).

Communication and interaction start from the moment a child is born. During typical language development children transition through three stages of complex behaviour. First, the perlocutionary stage, in which there is a single focus of attention on an object or person. During this stage, children move from being spontaneous and reactive, to intentional and proactive. A communication exchange occurs as a result of the communication partner perceiving intent or meaning from the child's behaviour (Cress, 2002). Behaviours in the early stage of development that are interpreted as 'language' include crying, eye-gaze, laughing, smiling, cooing, grimacing, and body movements. Later behaviour in the first stage includes reaching and reaching while looking (Rowland, 2018; Romski & Sevcik, 1995).

The second stage is illocutionary, in which the child continues to rely on the communication partner to 'read' the behaviour, assign intent and respond contingently. However, in this stage, the child's actions are easier to interpret as they become more conventional. They alternate their focus between a referent object and the partner, known as joint attention, and behaviour is persistent and directed. Communicative intent becomes obvious (Joginder Singh, Iacono, & Gray, 2014).

The third and last stage is locutionary. As children who are developing typically move into this stage of language acquisition, they begin to use symbolic forms of communication to represent conventional concepts. Typical symbolic language includes speech, signs, orthographic and graphic symbols which the partner decodes and then responds to contingently (Cress, 2002; Siegel & Cress, 2002).

Children move through these stages from spontaneous behaviour to speech in the early years of life gaining a wide vocabulary and complex syntax as well as social skills (Sennott, Light and McNaughton, 2016). Several research studies (e.g., Fernald & Weisleder, 2015; Hart & Risley, 1985) have demonstrated that the differences in quality and quantity of interaction between parents and their children have a significant impact on children's cognitive and language development.

Language Development and AAC

For children with CCN who cannot meet their communication requirements with speech alone, augmentative or alternative methods of language acquisition and communication are necessary. The focus of this research is on children who are beginning communicators and have CPCSN affecting their speech and language development, access to AAC, and development of symbolic communication.

Beginning communicators.

The term beginning communicator encompasses a broad range of profiles including people of any age who: depend on mainly non-symbolic modes of communication (e.g., gestures, facial expression, body language) which are interpreted as intentional or non-intentional behaviours and assigned meaning by communication partners; are learning to use aided or unaided symbols to represent basic messages for a range of simple functions; and/or use or are learning to use assistive technology, electronic or non-electronic AAC to participate in early communication exchanges (Beukelman and Mirenda, 2014). Romski, Sevcik, Hyatt, & Cheslock (2002) suggest that beginning communicators express less than 50 words or symbols. They propose this boundary because when children reach this point in typical language development, they tend to experience a vocabulary growth spurt, start to combine words, and the complexity of their utterances increases.

Children with CPCSN have multiple challenges which disrupt the language acquisition process at all points on the continuum between spontaneous behaviour, and complex, competent symbolic communication. As beginning communicators, non-symbolic modes (e.g., facial expression, vocalisations, body language) are a vital part of their communication repertoire. They are often used concurrently with symbolic modes and may be an important part of these children's expressive communication over the course of their lives. For children with CPCSN, communication must be multi-modal (Bedrosian, 1997).

AAC competence.

The AAC competency model provides a framework for understanding and describing the language acquisition process for children with CPCSN. In 1989, Light

posited that competent AAC use needs to be functional and adequate to meet the communication needs of the user, and is predicated on sufficient knowledge, judgement and skills in four interrelated domains: linguistic, operational, social and strategic. Later, she expanded her definition to recognise that other factors also influence communicative competence including psychosocial factors, such as motivation, attitude, confidence and resilience; and limitations and supports in the environment (see Light & McNaughton, 2014).

Linguistic competence.

Linguistic competence provides depth and breadth to communication exchanges and pertains to knowledge, judgement and skill in the native language(s) spoken by the individual's family and broader social communities, as well as the linguistic codes of the AAC systems used. Linguistic skills require understanding and expression of the form, content and use of the spoken language(s), as well as the AAC system, to express concepts and meaningful messages (Light & McNaughton, 2014).

When acquiring language through AAC, the linguistic form is often atypical, with differences in syntax and morphology. For example, even when a child has a repertoire of more than 50 words, messages may be telegraphic in nature or missing word endings. This may be due to constraints within the AAC system, such as the layout or vocabulary available, or because of environmental influences such as reduced language input and modelling (Beukelman & Mirenda, 2013; Binger & Light, 2007; Binger, Macguire-Marshall & Kent-Walsh, 2011; Bruno & Trembath, 2006; Gerber & Kraat, 1992; Kent-Walsh, Binger, & Buchanan, 2015). It is also common for children developing symbolic communication to use incorrect word order and have difficulty constructing multi-symbol messages which follow the rules of spoken language (Smith & Grove, 2003).

Children with CPCSN who are learning to use AAC may have differences in the acquisition of new vocabulary or content. Children following patterns of typical language development learn vocabulary slowly over the first 12-18 months of life, as adults around them repeat and label new words or concepts in naturally occurring routines and activities (Beukelman & Mirenda, 2013). Joint attention and

coordinated joint attention – where children shift their attention between a targeted object and a communication partner, is a critical skill for learning associations between words and their referents (Bakeman & Adamson, 1984). Children with CPCSN often have significant difficulty in initiating and maintaining joint attention due to physical or sensory limitations. They also have difficulty exploring and manipulating objects and their environment which affects vocabulary development (Cress, 2002).

Operational competence.

Physical, cognitive and sensory skills are needed to access AAC to both select symbols and navigate and operate the system. These technical skills need to be effective, efficient and minimally fatiguing for the user, to support successful communication and development of operational competence (Light & McNaughton, 2014). People with significant physical and visual and/or auditory challenges may take a long time to develop reliable and automatic control of body movements, and while this develops even simple intentional movements can require cognitive energy to perform (Burkhart, 2016; Treviranus & Roberts, 2003). Children with CPCSN may have significant difficulty learning and using operational skills due to the complexity of their needs (Bayldon & Clendon, 2017).

Social competence.

Proficiency in the *social* domain requires sociolinguistic skills, such as pragmatics (e.g., turn taking, initiation, and maintaining topics), as well as understanding and using a range of communicative functions (e.g., greetings, questions, comments etc). A competent social communicator must also develop socio-relational skills to actively participate in conversations, demonstrate an interest in the conversation partner(s), and project a positive self-image (Light, 2003; Light, Arnold & Clark, 2003; Light & McNaughton, 2014).

Children with CPCSN face challenges with the development of social skills from the beginning. In the perlocutionary and illocutionary stages of language development, these children are at risk for experiencing limited interaction with their surroundings and may not develop an understanding of the effect of their behaviour on others (Cress, 2002; Dunst & Lowe, 1986; Schweigert & Rowland

1992). During these early stages when the child is refining actions and behaviours that are intentional and directed towards a communication partner, children with CPCSN tend to exhibit different and fewer movements that can be discriminated and understood as socially communicative. They may demonstrate atypical body movements, lack of eye contact, less recognisable facial expression, and undifferentiated affective cueing (Dunst & Lowe, 1986; Joginder Singh, et al., 2014). They often have difficulty demonstrating instances of joint attention, probably due to their physical impairments, which is a feature of intentional communication and encourages the communication partner to recognize and respond. Attempts at joint attention or other intentionally communicative behaviours by children with complex physical disabilities may be subtle and ambiguous and may result in parents and caregivers becoming less responsive, as they do not always recognise when their child is initiating or turn-taking in a 'conversation' (Joginder Singh et al., 2014). Some researchers have suggested that the child with CPCSN often takes on the role of responder rather than initiating communication acts and many develop 'learned helplessness' or become passive during interactions (Broberg, Fern, & Thurnberg, 2012; Cress, 2002; Light et al., 1985; Schweigert & Rowland, 1992).

Children who are developing conventional or idiosyncratic movements to communicate rely on responsive communication partners. The partners attend and respond to the child's unintentional behaviours on multiple opportunities in a constrained context to increase the contingency or specificity of their response and scaffold the child to learning new skills (Iacono, 2003). The complex interaction between the child's behaviour and a communication partner's responsivity plays an important role in the development of intentional and symbolic communication, with the success of communicative interactions depending greatly on the communication partner's skills (Kent-Walsh & McNaughton, 2005).

As the child moves to the locutionary stage of development and begins to use symbolic modes, the literature suggests that individuals who use AAC often do not actively take part in conversations. They have difficulty initiating turns or topics and the pattern of interaction is asymmetrical. Communication partners tend to provide reduced opportunities to participate, they dominate the conversation topics and turns, and reduce the role of the person who uses AAC to responder

rather than active conversationalist (Kent-Walsh and McNaughton, 2005; Light & Binger, 1998; Light, Binger, & Agate, 1999; Light, Binger, & Kelford Smith, 1994; Light, Datillo, English, Gutierrez, & Hartz, 1992; Light & McNaughton, 2014).

Strategic competence.

The fourth domain of communicative competence in AAC use is strategic. Compensatory strategies used to bypass the limitations in the AAC system itself such as linguistic (e.g., incomplete vocabulary set), operational (e.g., slow rate of speech) and social (e.g., lack of prosody) domains are strategic skills. For example, when an AAC user uses an alternative word for one that is not in their lexicon (e.g., sports "ball" for dance "ball") they are being strategic. Strategic competence is also needed to overcome the challenges of communicating with partners who are unfamiliar with AAC use. Personality, preferences and priorities play a role in influencing the choice of strategy used to make up for the limitations imposed by AAC use. Early communicators who use AAC, like most children who use speech, have limited meta-cognitive skills, or the ability to plan, evaluate and problem solve as well as understand and regulate the learning of others. They may not understand that they need to use a compensatory strategy to repair or prevent a communication breakdown, and they may not know what strategies are available to them (Mirenda & Bopp, 2003).

Rationale for using PAS.

There are several advantages to using PAS for children with CPCSN. An attentive communication partner responds to subtle and idiosyncratic movements and scaffolds the communicator to participate in the creation of messages while reducing the demand for precise gestures. The reduction of sensory and/or motor demand while actively engaging in language construction supports linguistic knowledge and skills to become more familiar and automatic. Later, these language skills can become the context for developing other skills, for example, vision processing or shaping of idiosyncratic movements to more conventional gestures (Bayldon & Clendon, 2017; Burkhart, 2016).

PAS has advantages over electronic access for people who uses AAC. During PAS, the communication partner becomes a virtual computer, who "can observe

and problem solve… in ways a computer operating system cannot" (Burkhart and Porter, 2006, p 3). The skilled and experienced or 'smart' partner can interpret movement and recognise intent by interpreting the child's body language, facial expression and context, to co-construct the message. A smart partner can adjust the speed of presentation within a single communication turn if necessary, as well as read the subtle cues sent from the individual with CCN. This allows the focus to remain on the development of language and communication skills and supports the communicator to be as successful as possible (Porter, 2012).

PAS provides opportunities for the communicator to practice and repeat movements which result in meaningful outcomes. As intentional, idiosyncratic movements become more automatic and therefore take less cognitive energy to perform, they may be shaped towards more conventional movements (Burkhart, 2016).

For those who have intact vision, visual, or auditory plus visual presentation of the vocabulary items during PAS may enhance the pattern of the visual information provided in the AAC system and support the learner to become more familiar with the arrangement. PAS may also encourage visual interaction between the communication partners (Burkhart, 2016; Kovach and Kenyon, 2003).

Barriers to Language Development in AAC

There are two main external barriers that impede the development of competent AAC use for children with CPCSN. As well as the physical, cognitive and sensory difficulties that make language learning a challenge, there are extrinsic factors such as early learning experiences, and attitudes and beliefs of others, which also have an impact.

Experience barriers.

The early experiences of children who are learning to use AAC differ from those of their typically developing peers in two significant ways. Firstly, there is asymmetry of their input and output modalities. Put simply, children who are learning to use AAC are not usually brought up in an 'AAC speaking' world with competent models of their expressive communication system. Secondly, the

interaction style of many adults does not support turn taking and the expressive communication attempts of children who use AAC (Sennott et al., 2016).

Asymmetry of input and output.

Language comprehension is a vital skill in the development of communication and influences the way that children acquire expressive language skills, either spoken or aided (Gerber & Kraat, 1992; Romski et al., 2002; Sevcik & Romski, 2002). AAC input supports receptive language in two ways: (a) by enhancing comprehension of spoken language in the environment; and (b) demonstrating how an AAC system may be used (Romski & Sevcik, 2003).

Children are immersed in a language learning environment with models, or input, from parents, caregivers, siblings, friends, and other competent users of their native language. The quantity and quality of this child-directed speech have a direct effect on their vocabulary and language learning (Hart & Risley, 1995). Children who use AAC often do not experience the same level of immersion in the modality they use for expression. There may be many reasons for this (Smith & Grove, 2003).

One reason may be the amount of time needed to care for a child with CPCSN, which has an impact on the availability of carers and communication partners to spend time engaging in play and leisure with their child (Rassafiani, Kahjoogh, Hosseini, & Sahaf, 2012; Sawyer et al., 2011). An investigation into the time spent on instructional programming, or 'teaching', in classes with children with multiple disabilities suggests that time spent on non-instructional tasks (such as toileting, meal preparation and changing position, etc.) comprises a significant proportion of the school day (Snart & Hillyard, 1985). These caring tasks reduce the amount of time available for children and carers to be involved in experiences that provide rich language learning opportunities.

Another reason that children with CCN do not receive the same amount of input in the modality they are learning to use is to do with the proficiency in AAC use of the adults and peers around them. Kent-Walsh and McNaughton (2005) have explained that communication partners need to learn to use AAC and support children who use it to develop language, as this does not necessarily come naturally to them. The literature is clear that aided language modelling has a positive impact

on language outcomes for children who use AAC, but that communication partners rarely provide this input (Binger & Light, 2007; Binger et al., 2011; Bruno & Trembath, 2006; Drager et al., 2006; Harris & Reichle, 2004; Kent-Walsh et al., 2015; Light et al., 1985).

Interaction styles.

Interactive behaviours of adults and others often do not scaffold or support the expressive communication of children who use AAC. Instead, the interactions are more likely to be characterised by a high number of yes/no questions instead of open-ended questions, interruptions during the child's turn, a focus on the device or technology, and provision of fewer opportunities for participation as the adults take more of the conversational turns (Kent-Walsh, Binger, & Hasham, 2010; Light et al., 1994; Light & Kelford-Smith, 1993). Research that focusses on improving parent responsiveness to children's communication attempts shows that this has an impact on the child's development of intentional communication (Yoder & Warren, 1998).

Attitude barriers.

In 2005, Cheryl Jorgenson stated that the current prevailing paradigm, or shared worldview, about disability and competence, could be defined by several ideas including that intelligence can be reliably measured; and, when "we aren't sure that students, know, understand or have anything to say, we presume that they don't, can't and probably never will" (p. 5). This paradigm contributes to an attitude of low expectations for learning and achievement for children with disabilities. She suggests that a new paradigm is needed, based on the 'least dangerous assumption' (Donellan, 1984), which presumes competence and holds high expectations that students will succeed in learning. From this view, any failure of children to perform and learn requires educators to examine the adequacy of their own instructional techniques, rather than assume it is due to student deficits.

The role of the partner and language learning environment in the development of language for children with CPCSN cannot be stressed enough. The assistance and scaffolding provided by the communication partner, the provision of a robust AAC system with a wide range of vocabulary, and the opportunity to learn

language in naturally occurring and meaningful contexts are all factors in supporting children with CPCSN to learn and develop language and communication skills (ASHA, n.d.; Light & McNaughton 2014; Ogletree & Pierce, 2010).

Intervention Context

It is generally agreed that early language learning can be facilitated best by increasing participation of beginning communicators in natural contexts (Bedrosian, 1997; Calculator, 1997; Light 1997; Romski et al., 1997). Shared storybook reading is a regular and commonly occurring activity both at home and in early childhood settings (Bedrosian, 1997; Clendon et al., 2014; Whitehurst & Lonigan, 1998). This context provides rich opportunities to learn and use many language skills such as vocabulary, grammar, and basic conceptual knowledge, and provides examples of how stories are structured and concepts about print (e.g., which way up a book goes, the difference between words and pictures, and familiarity with the alphabet) (Clendon et al., 2014; Justice, Kaderavek, Fan, Sofka, Hunt, 2009).

A storybook provides a concrete support to facilitate joint attention and gives a context to encourage conversation on a shared topic. It is the 'extratextual' language, or the discussion that occurs outside of the written words, that is important for enhancing communication development, and books that are simply read verbatim do not provide the same communication support (Skotko, Koppenhaver and Erickson, 2004; Zucker Justice, Pentimoni, Cabell, & Kadaravek, 2013). Dale, Crain-Thoreson, Notari-Syverson, and Cole (1996) explain the effect of shared storybook reading on language development may be due to systematic changes that can occur in parent language during reading activities. Parents' language can become more sophisticated and informational, and they may engage in vocabulary teaching during shared storybook reading.

In alignment with previous studies, recent research (Zucker et al., 2013) has examined the role of frequency and features of shared reading experiences as they relate longitudinally to language and literacy skill development. Evidence supports the premise that the number of shared reading experiences in early years classrooms may predict the expressive vocabulary growth of children in the short term, but it is the quality of the shared reading experience that affects vocabulary

and language development across time. Further results from this study demonstrate that many teachers read the printed text and do not engage in interactive reading strategies, but instead focus on the literal aspects of the story or illustrations. Training and support for teachers to go beyond the literal reading of texts and engage in extra-textual talk and interactive styles of shared reading is important for supporting and scaffolding young children's language and literacy development.

There is some evidence in the literature to suggest that familiar storybooks encourage and support language development more than new storybooks (Edmister & Wegner, 2015; Hindman, Connor, Jewkes, & Morrison, 2008; Kadaravek & Justice, 2002; Liboiron & Soto, 2006; Martinez & Roser, 1985), however this is inconclusive (Koppenhaver et al., 2001; Koppenhaver, Erickson & Skotko, 2001; Light et al., 1994) and requires further investigation.

Intervention Strategies

Aided language modelling, encouraging communication through providing enough wait time, and increasing responsivity to the child's communication attempts are all intervention strategies that have been proven to be successful in increasing the language outcomes of children who use AAC (Sennott et al., 2016; Skotko et al., 2004). Dialogic reading strategies are used during shared reading activities and incorporate elements of the language interventions mentioned. They are used with a range of children with and without language disorders or delays to support language development and literacy skills. These interventions will be examined below with an outline of their key features, why they are important to a discussion on intervention with children with CPCSN, and the research that supports their inclusion in this current line of study.

Aided language modelling.

Modelling aided language involves a communication partner highlighting a communication aid – an object, symbol or text, while simultaneously saying the word to which that object, symbol or text relates. The research reviewed for this chapter focuses on symbolic communication aids, such as communication boards, books or high-tech devices. Intervention strategies which include aided language

modelling seek to address the imbalance between input and output modes for children who are learning to use AAC.

For best outcomes, aided language modelling should occur in environments that provide natural and meaningful contexts for communication (Bedrosian, 1997; Romski et al., 1997). Much of the current research uses shared storybook reading as a natural context, but some studies have included play activities, arts and crafts, and snack time (see Sennott et al., 2016 for a systematic review).

AAC intervention which involves aided language modelling has been shown to have positive outcomes for people of all ages and developmental stages (Sennott et al., 2016). And several authors advocate for the importance of early intervention debunking the myth that children must be a certain age to benefit from AAC (Light et al., 2003; Romski & Sevcik, 2005; Romski, Sevcik, Barton-Hulsey, & Whitmore, 2015). There is a wide body of evidence to support aided language modelling as an AAC intervention which enhances expressive production and receptive language and allows the AAC user to participate in interactions as both listener and speaker (Romski & Sevcik, 2005).

Intervention, which incorporates aided language modelling, has been shown to have positive effects on a range of language skills. These include: pragmatic skills such as turn taking (Kent-Walsh et al., 2010; Rosa-Lugo & Kent-Walsh, 2008); semantics including expressive vocabulary (Koppenhaver et al., 2001; Romski et al., 2010; Rosa-Lugo & Kent-Walsh, 2008) and receptive vocabulary (Dada & Alant, 2009; Drager et al., 2006; Harris & Reichle, 2004); syntactic skills such as multi-symbol message production (Binger et al., 2008; Binger, Kent-Walsh, Ewing, & Taylor, 2010), and morphology (Binger et al., 2011).

Expectant pause/wait time.

Pause, or wait time describes the strategy of providing extra time for a person who uses AAC to understand what has been said, and formulate, as well as compose, a preferred message to take a communicative turn (Binger, Kent-Walsh, Berens, del Capo, & Rivera, 2008; Mathis, Sunderland, & McAuliffe, 2011). It is a responsive behaviour that may be taught to communication partners, to increase initiations and turn-taking with children who use AAC. Pausing with an expectant

look, or an open body posture can provide an extra cue to person who uses AAC that it is their turn and creates an expectation that they need to respond (Binger et al., 2008).

Several studies have investigated the impact of increased wait time on turn taking and initiation with children who use AAC (Koppenhaver et al., 2001; Light et al., 1992; Mathis et al., 2011) with positive results. This is a strategy that does not come naturally to communication partners. Most communication partners of children who use AAC do not provide adequate wait time between communicative turns (Light, Binger, & Kelford Smith, 1994; Light et al., 1992). A pause in conversation of more than 2-3 seconds results in feelings of unease and discomfort, and communication partners may need specific training on the duration and timing of wait time (Mathis et al., 2011).

Very little research has been undertaken to discover the optimal wait time for beginning communicators who use AAC. Many studies that include wait time as a strategy suggest at least a 5-second expectant pause (Binger et al., 2010; Kent-Walsh et al., 2010), although investigations with children who have complex physical needs suggest between 10-30 seconds may be needed to encourage a communicative turn (Koppenhaver et al., 2001). Mathis and colleagues (2011) explored the effect of variations of 2, 10, and 45 seconds wait time on the expressive communication of young people who use AAC and concluded that a longer pause time was more likely to encourage a response.

Increasing responsivity.

Communication partner responsivity is linked to awareness and readiness to respond to a child's communicative initiations or behaviours (Broberg, Fern, & Thurnberg, 2012). Responsive behaviours may include strategies such as:

- attributing meaning to potentially communicative behaviours, even when the intention is unclear. For example, if a child vocalises, the parent may notice this and encourage the child to take a turn;
- asking for clarification of non-verbal communicative behaviours;
- asking open-ended or wh-questions to maintain the conversation topic;
- labelling the object, activity or event to which the child is attending;

- providing opportunities for and expectations that children will participate in conversations, by increasing wait time and/or using an expectant facial expression or body language;
- focusing on the child and the message, rather than the AAC tool;
- following the child's lead; and,
- using AAC modelling to provide contingent responses to the intention communicated.

These strategies focus on changing communication partner behaviour and do not involve prompting the child to produce certain language targets (Binger & Light, 2007; Binger et al., 2011; Broberg et al., 2012; Harwood, Warren, & Yoder, 2002; Romski et al., 2002; Rowland & Schweigert, 1993).

Harwood et al., (2002) report that contingent responsivity has the potential to scaffold and support the language development of children with CCN at any stage of development. An increase in recognising and responding to children's communication attempts has been shown to have a positive impact on the development of intentional communication behaviours (Harwood et al., 2002; Koppenhaver et al., 2001; Ogletree & Pierce, 2010; Seigel and Cress, 2002; Skotko et al., 2004; Yoder & Warren, 1998).

Early studies which investigated language interventions with children who were late talkers, taught responsive strategies to communication partners and showed an immediate effect on adult responsivity, with an increase in such behaviours during interactions (Tannock and Girolametto, 1992). Later research which included frequent models of targeted language skills as well as strategies to increase parent's responsive interaction skills were effective in increasing vocabulary use of children with expressive language delays and supported both intentional communication and word use in children with developmental delays (Giromaletto, Pearce, & Weitzman, 1995; Wilcox, Shannon, & Bacon 1992, 1996 in Harwood et al., 2002). More recently, studies focusing on increasing communication partner responsiveness towards children with CCN have shown positive outcomes for language skills (Binger & Light, 2007; Binger et al., 2011; Harwood et al., 2002; Romski et al., 2002).

Intervention that facilitates language development with children who use AAC has often included strategies to increase adult responsivity. Kent-Walsh et al. (2010) instructed communication partners to ask open-ended and wh- questions and provide a contingent response with an AAC model after each of their child's communicative turns as part of an intervention during storybook reading. Likewise, the use of open-ended questions and increased responsiveness to communicative turns were taught to communication partners in a study by Rosa-Lugo and Kent-Walsh (2008). Koppenhaver and colleagues (2001) taught parents to attribute meaning to their child's attempts to communicate, even when the meaning was unclear, and Sennott and Mason (2016) encouraged communication through providing contingent responses in the form of an AAC model and recast of the child's utterance during shared storybook reading. Results across each of these studies indicate that increasing responsivity to children's communicative behaviours, even when they are unclear, increases the number of communication turns that the child will take.

Dialogic reading.

Adults using a dialogic reading style take on the role of the active listener during shared storybook reading and support the child to tell the story. The adult makes comments, asks questions, adds information, explains vocabulary and encourages the child to respond and engage in the story. A number of studies exploring the effectiveness of dialogic reading practices on oral language development have been reviewed (for extensive meta-analysis reviews, see Mol, Bus, & de Jong, 2009; Institute of Educational Sciences, 2007). Results indicate that the quality of book reading affects the oral language and print knowledge of young children. Around 6-8% of growth in vocabulary and oral language skills in young children in educational settings can be explained by dialogic reading interventions (Mol et al., 2009).

There are several evidence-based approaches to teach adults to interact more effectively with children during shared storybook reading to enhance communication and literacy skills. These approaches differ in the way they structure interactions between adults and children. One such approach is the CAR (Cole, Maddox, Lim, & Notari-Syverson, 2002), or *comment* and wait, *ask* questions and

wait, *respond* and add a little more. The authors suggest a waiting time of 5 seconds to give the child time to think of and code a response and elicit language by letting the child know that the adult is interested in what they have to say. However, research with children with CCN suggests they may need significantly longer time to respond (see Mathis et al., 2011; Skotko et al., 2004).

Dialogic reading to support language acquisition of children with CPCSN who use AAC and PAS.

According to Bedrosian (1996), shared storybook reading is an authentic and important context for the development of early literacy and language skills for children who use AAC. Literacy, for people who use AAC, is widely recognised as an important life skill. Literacy skills are fundamental to the use of more complex and refined communication systems; they are important for participation in educational and vocational opportunities; a means to bypass the limitations of face to face communication with AAC; and, a way to engage with the traditional tasks of literacy (Bedrosian, 1997; Light et al., 1994).

The findings of early studies on the experiences of children who use AAC during shared reading interactions was somewhat discouraging (see Light, Binger & Kelford-Smith, 1994; Light & Kelford-Smith, 1993; Bedrosian, 1999). Often, children with CPCSN do not have frequent access to storybooks. This may be due to their physical or sensory impairments limiting their ability to hold, point, turn pages, or reach for books. Communication partners do not always make use of communication opportunities during shared reading for children who use AAC (Sigafoos, 1999). When stories are read, the children may take on a passive role, as parents or others tend to choose the book, set the pace, dominate the conversation, ask predominantly yes/no questions, and do not usually provide access to the child's AAC system (Bedrosian, 1999; Koppenhaver et al., 2001).

Shared storybook reading using structured interactions provides opportunities for modelling aided language and increasing responsive behaviours by communication partners (Binger et al., 2008; Binger et al., 2010; Clendon et al., 2014; Kent-Walsh et al., 2010; Liboiron & Soto, 2006; Rosa-Lugo & Kent-Walsh, 2008). The literature (Edmister & Wegner, 2015; Kent-Walsh et al., 2010; Liboiron & Soto, 2006; Sennott & Mason, 2016; Skotko et al., 2004) suggests that a dialogic

reading approach which incorporates AAC can enhance interaction and scaffold participation in shared storybook reading and support language development with children who use AAC. Positive language outcomes include an increase in turn-taking, vocabulary expression, message length and complexity.

Limitations of Current Research

Data from most current research has been collected from a restricted population in terms of age range, disability and language ability. Many studies include participants who use direct access to AAC and have vision and hearing that are within normal limits. Except for one study that included girls with Rett syndrome (Koppenhaver et al., 2001), there is a lack of evidence from studies conducted with children with complex motor needs. Where there is research on individuals with cognitive impairment, the participants do not have confounding motor or sensory impairments (Drager et al., 2006; Harris and Reichle, 2004).

Children with CPCSN, or those who use alternative access methods, are rarely the subject of experimental research, and often have additional health needs that preclude them from investigations into language interventions. The complexity of these children means that changes in communication behaviour are often slow and difficult to measure. Despite this, limited research and clinical and anecdotal evidence (e.g., Koppenhaver et al., 2001; We Speak PODD; Zangari, 2015; 2016) suggests that children with CPCSN who use alternative access methods are capable of learning and developing language skills.

Many children with CPCSN use PODD communication books. There has been no research published on aided language modelling or shared storybook reading interventions that includes children who use this AAC system.

Theoretical Justification for the Current Study

Communication is a fundamental human right for all individuals including those with CPCSN (National Joint Committee [NJC] for the Communication Needs of Persons with Severe Disabilities, 2016; Brady et al., 2016). Language acquisition and communication are enhanced during interactions between skilled communication partners and children, where the partner uses a range of strategies to scaffold the child to participate and become more independent in the interaction. Interactions

that are rich in vocabulary and opportunities for the child to engage and participate have been proven to support language development. Storybook reading that utilises dialogic reading strategies, such as CAR, to structure exchanges, provides a natural and rich language learning context and opportunities to enhance interactions between partners and children.

Aided language modelling has been well documented in the literature as having a positive effect on the language and communication skills of children who use AAC. Aided language modelling supports the development of receptive (e.g., Drager et al., 2006) and expressive language skills (e.g., Harris & Reichle, 2004; Kent-Walsh et al., 2010; Rosa-Lugo & Kent-Walsh, 2008).

AAC interventions which promote increased responsivity by the communication partner have contributed to positive language outcomes for children who use AAC (Koppenhaver et al., 2004; Sennott & Mason, 2016). Response behaviours include attributing meaning to child's attempts to communicate and providing contingent responses.

This research will seek to address some of the limitations of the current research. The thesis will describe the outcomes of implementing a shared storybook reading intervention that incorporates a dialogic reading strategy, aided language modelling and increased communication partner responsivity with children with CPCSN who are beginning communicators and use PAS to access their AAC systems.

Summary

In summary, the literature supports the use of dialogic reading practices, aided language modelling and increasing responsivity to scaffold children who use AAC to develop language and early literacy skills. Dialogic reading strategies encourage the communication partner to talk about the story, provide extra pause time to allow children to formulate and produce their responses, and increase their responsivity to the child's communicative acts. For communication partners of children who are learning to use AAC, aided language modelling is also an important feature of their interactions. Much of the focus of the current literature has been on a population that does not include children with CPCSN who use PAS. This study will

investigate the outcomes of a dialogic reading strategy incorporating aided language modelling and increased communication partner responsiveness for two children with CPCSN who use PAS to access ACC.

Chapter Three: Methodology

The purpose of this study was to describe the outcomes of a shared reading intervention which included aided language modelling and increased communication partner responsiveness for two children with complex physical, cognitive and sensory needs (CPCSN) who use partner assisted scanning (PAS) to access augmentative and alternative communication (AAC). This chapter details the methodology used in the study. It begins with a description of the decision-making process to determine the appropriate methodological approach and the rationale for employing a case study design. The chapter continues with an introduction to the children who participated in the study and a description of the protocols for conducting the intervention. Next, the communication frequency measures and other data collection methods including field notes, observations and a semi-structured interview will be outlined. The data analysis undertaken to determine the findings will be explained, along with the procedures for examining the inter-observer agreement. Lastly, ethical considerations and the measures taken to mitigate these concerns will be discussed.

Research Design

This research was initially designed as a single subject multiple-baseline study to examine the effects of implementing a dialogic shared reading intervention with aided language modelling and increased communication partner responsiveness on the language and communication skills of children with CPCSN who use PAS. Due to the complexity of the children's needs, it became clear early in the quantitative data collection that there would need to be changes made to the clinical protocol to accommodate for the children's fatigue, health and physical needs. It was also apparent that some of the dependent variables were going to be difficult to quantify, particularly the intent of the children's unaided communication behaviours, as they required interpretation by the researcher and could be manipulated by the researcher's responsiveness. A case study design was then chosen to allow for a fuller exploration of the process of undertaking this research and to provide a richer description of the outcomes of the intervention. The research aim then broadened to become a description of the outcomes of implementing a dialogic shared reading intervention incorporating aided language

modelling and increased communication partner responsiveness for two children with CPCSN who use PAS to access AAC.

The benefits of a case study approach are many and varied. A case study can make a valuable contribution to the field, particularly when the present knowledge is incomplete or non-existent (Yin, 2014). There is currently very limited research conducted with children with CPCSN who use PAS to communicate and one reason for this may be because their needs are so complex. Comprehensive case studies may provide knowledge and learning that are worthwhile and contribute to an understanding of certain aspects of complex social behaviours. And, case study research, when combined with other methodological approaches, can provide a far broader understanding of a phenomenon than quantitative approaches alone (Punch and Oancea, 2014; Yin 2014; Zainal, 2007).

Some of the main criticisms of case study research are the perceived difficulty with generalising between the sample and population; the unwieldy amounts of data involved; and a lack of rigour. To counter these arguments, the purpose and procedures of a case study must be clear and focused. When the reason for the research is to examine a case for its own sake, and according to Yin (2014) the goal is to "expand and generalize [*sic*] theories (analytic generalizations) and not to extrapolate probabilities" then generalisability is not an issue (p. 21). When the researcher follows systematic procedures and records findings and conclusions following unequivocal evidence, the question of rigour or quantity of data is no less an issue than in other methodological approaches (Punch and Oancea, 2014; Yin 2014). This chapter lays out the specific procedures and data analysis used in this study to allay these concerns.

Case study design has several defining features including: identification of a specific case or cases with certain parameters or boundaries to define it; an intentional focus for procedures; the collection of data from multiple sources; differential data analysis; a description of themes or issues that have emerged from the case study; and a conclusion about the overall meaning (Creswell & Poth, 2018). This research project examined the interactions that occurred within, and the process of conducting, a dialogic shared reading strategy with aided language modelling and increased researcher responsiveness with two children with CPCSN

who use PAS (as the case to be examined). The intervention comprised of up to three storybook reading sessions per week and ran for more than two months from start to finish. There were four data collection sources: communication frequency measures, field notes, observations and a teacher interview. Differential data analysis was necessary to reveal the the complexity of this case and provide information about the overall meaning.

Participants

Following ethics approval from the Massey University Human Ethics Committee, two children with CPCSN were recruited from a special school in Auckland, New Zealand. The deputy principal of the school approached parents of potential children with an Information Sheet (Appendix B) outlining the study and inviting them to consider giving consent for their child to take part. Once consent was given, the parents were asked to provide information on the child's age, primary diagnosis, ethnicity, and AAC system. The researcher read the children's school reports and administered the Peabody Picture Vocabulary Test – fourth edition (PPVT-IV) (Dunn & Dunn, 2007) to gather information about their receptive vocabulary and an understanding of their current expressive language skills.

Eligibility.

To be eligible for participation in this study, children were required to meet the following criteria:

a) present with complex physical, cognitive or sensory disabilities that impact on all aspects of daily living;
b) between 5 and 10 years old;
c) beginning communicators who use symbolic and/or non-symbolic communication. See literature review chapter for a full definition.
d) have a reliable movement to select or reject (indicate yes or no);
e) have been supplied with an AAC system and use PAS as their access method.

Characteristics.

The two children in this study, one male (DS) and one female (KT), were 8 years; 2 months and 8 years; 11 months at the beginning of the intervention (see Table 1). DS presents with dystonic spastic quadriplegia cerebral palsy, while KT has spastic quadriplegia cerebral palsy. KT's family speak English at home. DS's family speak Gujarati as their first language at home, although his parents understand English and his father speaks fluent English.

Both children have been provided with a personalised PODD which is adapted for PAS. DS has a 12 per page book, while KT has a 20 per page book. The children are from the same class where a 20 per page group PODD communication book is frequently used for modelling and scanning expressively with all the students.

Table 1

Participant Characteristics

	Age	**Ethnicity**	**Diagnosis**	**AAC system**	**PPVT - 4**	
DS	8 years 2 months	Indian	Cerebral palsy – dystonic spastic quadriplegia	12 per page PODD adapted for PAS	Raw Score: Standard Score: Percentile: Stanine:	*11* *20* <0.1 *1*
KT	8 years 11 months	Maori/ European	Cerebral palsy – Spastic quadriplegia	20 per page PODD adapted for PAS	Raw Score: Standard Score: Percentile: Stanine:	*9* *20* *<0.1* *1*

Note: PPVT-4: Peabody Picture Vocabulary Test (4th ed.) (Dunn & Dunn, 1997).

Setting.

The children in this study are from the same class in a special school. Special schools provide specialist services and support for students from 5 to 21 years of age, who have the very highest learning, physical, sensory and/or communication needs (Education Counts, 2018). Students at special schools spend their school day in special education classrooms with specialist teaching staff and therapy support. In this study, each child was withdrawn individually from their regular classroom to attend the reading session. The researcher conducted each session.

Positionality.

All qualitative research is influenced by the researcher's biases due to their own cultural and social politics that they bring to the study (Cresswell & Poth, 2018). To be a responsible researcher, one needs to make explicit one's position in the writing and be clear about how one's beliefs, values and experiences influence the data collection and interpretation, the analysis and outcomes of the study (Cresswell & Poth, 2018; Gibbs, 2007).

It is important that I explain my position in relation to this study. I currently work in the school from which the children who participated in this study were recruited, and both children are on my caseload. I have known them and their families for 5-6 years and work closely with their teacher. My beliefs and experiences of working with children with CPCSN have undoubtedly provided the impetus to pursue this study and have influenced my interpretation of the data.

My position as both researcher and therapist were made explicit to the families from the beginning of the research via the Parent Information Sheet (see Appendix B) as well as during informal meetings throughout the course of the study. I checked in regularly with my supervisors regarding the coding and analysis of the data and made a particular effort to be self-aware of my position in the study and the effect this may have on the outcomes.

Storybook Reading Protocol

There were two phases in this study, a baseline and intervention phase. Each phase was expected to comprise three reading sessions per week, with either two new, or one new and one familiar, storybook read per session. The baseline phase was staggered for each child and involved three or six reading sessions, for a total of six or 12 storybooks.

The intervention sessions were originally intended to follow the same pattern, with three sessions per week and two storybooks read in each session, for 15 sessions in total over five weeks (30 storybooks). Due to a number of practical considerations, which will be discussed in further chapters, the number of storybooks read in each session was reduced to a single book and the number of weeks to complete the study was extended.

Materials.

The following is a list of materials used in each storybook reading session for the course of the study.

- Children's picture storybooks.
- Personalised or generic Group PODD.
- Yes and no symbols.
- Pre-prepared comments for selected pages.
- Sony Handycam video recorder and stand for the recording of sessions.

Criteria for selection of each storybook focused on the simplicity of language and vocabulary, story schema and content. The storybooks were similar in length, had a narrative story structure, and were on topics of interest to age-matched peers (see Appendix C for a list of all storybooks used). Storybooks were read either once or three times during the study to determine if there was a difference in the effect on communication skills between new and familiar storybooks.

Clinical procedures.

The storybook reading sessions were conducted up to three times a week for approximately 40 mins. Each session was video-recorded. The storybook reading sessions all took place in one of three small rooms outside of the children's main classroom. The procedures for both phases are explained below.

Baseline phase.

During the baseline phase, two storybooks were read by the researcher with no comments or conversation extra to the text. The child's PODD communication book was placed in sight of the child but out of reach. If the child interacted using unaided communication behaviours, the researcher acknowledged these, by looking, smiling or verbally acknowledging (e.g., 'yeah'), and continued to read the storybook. If the child clearly and obviously signalled they had something to say, the researcher checked with "do you have something to say?" If the answer was yes, the researcher began PAS with the child's AAC system. When the child's message was completed, the researcher then verbally responded and continued to read the storybook. See Appendix D for a complete baseline lesson plan.

The baseline conditions were informed by the literature on shared reading with children who use AAC, which suggests that adults rarely provide the means or opportunity for the child to communicate using aided communication. In typical shared storybook reading scenarios, adults tend to dominate the conversation space, almost never pausing quietly or expectantly, and often simply read the text while the child listens. In general, adults seldom obligate their child's involvement in conversation during shared storybook reading (Kent-Walsh, Binger & Hasham, 2010; Light & Kelford-Smith, 1993; Light, Binger & Kelford Smith, 1994).

Intervention phase.

There were three key adaptations embedded within the shared storybook reading experience during the intervention phase. Firstly, the implementation of the CAR strategy (CAR stands for Comment and wait, Ask or invite a turn, and Respond; Cole, Maddox, Lim, & Notari-Syverson, 2002) which was used to structure the interactions throughout the reading; second, the use of aided language stimulation, also known as modelling, with the child's AAC system; and third the increased responsiveness of the researcher to the child's unaided communication behaviour.

Each of the components of the CAR strategy including details of types of aided language modelling used and a description of increased researcher responsiveness are described below. As part of the intervention, the researcher pre-prepared comments for each storybook and wrote these on small sticky notes. These were attached to selected pages of each storybook, to prompt the researcher to make a comment on that page. The sticky notes ensured that the comments were consistent in each book for each child. The researcher also prepared additional comments to be made if the child did not take an aided turn during a CAR prompt. These were printed on a sheet of paper and available for use during the session if needed. A PODD was placed within view and reach of both the child and researcher throughout every intervention phase storybook.

Comment.

The researcher modelled and verbally referenced an unaided initiation signal each time she began a comment. Comments were short and simple sentences,

which emphasised one or two core vocabulary words, chosen from a list based on the work of van Tatenhove (2016). “They **want help**” is an example of a comment with the core vocabulary in bold. Comments were made about the title page and each subsequent 3rd or 4th page of the book. Care was taken to ensure that each comment would involve only short and simple PODD pathways with a minimum number of pages turns to express the core vocabulary in the message.

Ask.

After each scheduled comment, the researcher provided a silent pause to ask for, or invite, a communication turn from the child. During this pause, the researcher ensured she had an open body posture and an encouraging facial expression with as little movement as possible. The initial protocol required a pause of 10 seconds to invite an aided turn.

The researcher silently observed the child throughout this time and acknowledged potential initiation signals by verbally referencing the behaviour she observed and checking if the child had “something to say?” If the child signalled (yes) they had something to say, the researcher scanned the PODD to assist the child to create an aided message, then moved to the Respond component of the strategy. If the child signalled they did not have something to say, the researcher moved straight to the Respond component of the strategy.

Respond.

For the Respond component of the strategy, the researcher made further comments using AAC modelling contingent on the child’s actions. If the child had not taken an aided communication turn, the researcher made an additional pre-prepared comment with AAC modelling related to the page just read. When the child took an aided turn, the researcher responded to this message using AAC models to:

- repeat the child’s message;
- recast or reformulate the child’s incomplete or ungrammatical message;
- expand the child’s message by repeating the message and adding one more word;

- answer with a new message, particularly if the child's message was a question.

See Appendix E for an example of an intervention lesson plan.

Aided language simulation.

Aided language stimulation, also known as modelling, involved pointing to symbols in the PODD that represented keywords or phrases from the comment, and the navigation commands necessary to express the message. In the example above ("they **want help**"), 'want' and 'help' were the keywords highlighted during the comment and 'another word on this page', and 'that is all I have to say about that' are the navigation commands that were used.

The aided language models were either direct (used for approximately 80% of the CAR prompts), partial (used for approximately 10% of the CAR prompts) or full (used for the remaining 10% of scheduled partner turns). Direct models involve pointing only to the symbols needed to construct a message while speaking. Partial models involve a direct model for the initial navigation until the desired page is reached, then each column and then item is scanned out loud until the message is completed. Full models involve scanning all columns, then items, as well as providing the yes/no responses required, to construct the message.

The following example shows the construction of the message "they want help" using a direct model:

Researcher: "I have something to say".

E*xaggerated look at child, then at PODD, then back at child*.

"I look at you, I look at my PODD, I look at you. I have something to say."

"They… want" (*points to 'want' symbol on first page)*

"Help" *(points to 'help' symbol on first page)*

"Oops, a mistake" *(points to 'oops' symbol)*

"No" *(shakes head to indicate no, positions and wiggles 'no' symbol)*

"Another word" (*points to 'another word' symbol)*

"No" *(shakes head to indicate no, positions and wiggles 'no' symbol)*

"That's all I have to say" *(points to 'that's all I have to say' symbol)*

"Yes" *(nods head to indicate yes, positions and wiggles 'yes' symbol)*

"They want help!"

The transcription in Appendix F shows an example of a full model given during Storybook 9 with DS.

Researcher responsiveness.

Unaided communication behaviours included eye pointing, vocalisations, upper limb movements, or smiling, giggling or laughing. Behaviours were interpreted as an intentional communication act if the child used two or more behaviours in a short time and directed them towards the communication partner. For students with complex physical challenges, intentionality can be difficult to interpret (Dunst & Lowe, 1986; Joginder Singh et al., 2014). The researcher was required to respond to the unaided communication acts made by the child at any time during the storybook reading, as if they were an initiation of an aided turn. When the researcher noticed these potential initiations, she stopped, verbally referenced the behaviours, and asked if the child had "something to say". The researcher did not respond in this way when she, or the child, was in the process of using AAC to construct a message.

Data Collection Methods

At the beginning of the project, the purpose of the study was to measure three communication skills within the storybook interactions: the number of aided turns taken within a CAR-prompted opportunity; the number of aided symbols communicated in each message; and the number of unaided communication acts which initiated an aided turn. The addition of field notes, observations and a semi-structured interview with the children's teacher, broadened the scope of the study to include measures of other communication skills and descriptions of the challenges and considerations needed to implement the intervention. Each data collection type will be described below.

Communication frequency measures.

For children with CPCSN who use PAS, communication is multi-modal, meaning they use both aided and unaided modes to express themselves. Features of these communication skills were measured throughout both phases of the study to determine the effect of the intervention.

Aided communication.

Aided communication behaviours were defined as any symbolic communication expressed using the child's AAC system and PAS. The clinical protocols were designed to allow measurement of two aided communication behaviours:

- the number of symbols communicated (NSC) per aided turn by each child per storybook; and
- the number of aided turns taken per CAR prompted opportunity, by each child per storybook.

Words or phrases were included in the NSC whether they were relevant to the storybook text or conversation or not. Symbols which represented a phrase (such as more to say or hurry up) were counted as a single meaning unit as they required a single signal to select. Navigation commands, whilst not adding to the meaning of the utterance, were an integral part of the construction of the message and were also counted in the NSC.

Unaided communication.

The study protocol required the researcher to respond only to clearly obvious unaided communication acts during the baseline phase. However, during the intervention phase, the researcher was required to respond to as many unaided communication acts as possible, even if they were not clear and obvious, and presume that they were a potential initiation of aided communication. Because the children's unaided communication acts were difficult to interpret in the moment, particularly during baseline, many were missed. These were easier to detect during repeated viewings of the videos.

There were two measures of the children's unaided communication acts:

- the number of unaided communication acts made by each child, per storybook; and,
- the number of unaided communication acts which converted to an aided turn, for each child per storybook.

Each measure of unaided communication was analysed for both phases of the study.

Communication partner responsiveness

Along with measures of the child's unaided communication, the study included a measure of the researcher's responsiveness across both phases:

- the number of responses made by the researcher to the child's unaided communication acts, per storybook.

Field notes and observations.

Field notes and observations are an additional source of evidence when conducting case study research and can contribute useful information (Yin, 2014). In this study, field notes were taken after each storybook session and included self-reflection and notable aspects of the children's behaviour during the sessions. Field notes also recorded observations or information from the children's teacher gained from informal discussions before or after the sessions and any complications with carrying out a session were also noted. These records were kept as a single document and added to as soon as possible after each session.

Further observations were made and recorded on the transcripts both during and after review of the videos of each session. These observations pertained to aspects of the interaction or procedures that were missed during the session and were added to the field notes.

Interview.

Semi-structured interviews are used in case study research to provide explanations and/or explore another observer's or participant's personal view of a phenomenon (Yin, 2014). The children's teacher participated in a semi-structured interview after the intervention was complete to gain a different perspective and a fuller understanding of the effect of the intervention on the children's

communication outside of the storybook reading sessions. The interview was conducted after a school day and resembled a guided conversation rather than a structured inquiry (Yin, 2014). The researcher asked the teacher to reflect on her observations of the children's communication in class before, during and after the intervention process. The conversation was recorded, transcribed and then sent to the teacher for verification of accuracy and her final approval.

Data Analysis

Case study research may be undertaken in a variety of ways, however, there are becoming more well-established processes for the analysis of qualitative and quantitative data that contribute to the overall picture of a case (DeCuir-Gunby, Marshall & McCulloch, 2011; Punch & Oancea, 2014; Thomas 2006). The procedures for collating, organising, and analysing each type of data are explained here.

Quantitative data.

To analyse the data relating to the communication frequency measures, all video material was transcribed to document the communication behaviours and exchanges of the child and the researcher. The researcher used a transcription template (see Appendix G) to record the child's communication behaviours as vocalisation, gaze towards the researcher, smile/giggle/laugh, etc. with any aided language recorded (including yes, and no, and symbols selected during creating a message with PAS). When the child's communicative behaviour was unclear on the video, the researcher used the context (including comments made during the storybook session) to determine or interpret the child's action.

The results for the communication frequency measures were presented in graphs (column, line, or combination). Visual inspection of the graphs was the primary analysis undertaken to determine the effects of the intervention. The pattern of data within each phase was inspected for level, trend, and variability, and where appropriate, the pattern of data between phases (baseline and intervention) was also analysed (Kratchowill et al., 2010).

Inter-observer agreement.

Approximately 30% of each of the baseline and intervention sessions were randomly selected to examine inter-observer agreement. A research assistant

(qualified SLT) observed video recordings of the storybook reading sessions and reviewed and checked transcriptions of the aided turns taken by each child. She then recorded the scores for all communication frequency measures for each session. This was compared to the transcription and scoring undertaken by the researcher. The inter-observer agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements plus omissions in the transcription and scoring.

Qualitative data.

The approach used to analyse the qualitative data followed a general inductive approach which uses repeated and in-depth readings of the text to derive themes from interpretations of the raw data (Attride Stirling, 2001; Thomas 2006). This is a commonly used approach in health and social sciences (Punch & Oancea, 2011; Thomas, 2006). It reduces a large amount of raw data into a concise format, develops a structure to describe or display the main themes that arise from the data, and establishes links between the research question and the summary of findings (Attride Stirling, 2001; Thomas, 2006).

There are several steps involved in the process of undertaking an inductive analysis of raw data. The first step is to reduce the text to manageable and meaningful units (Attride Stirling, 2001; DeCuir-Gunby et al., 2011; Thomas, 2006). In the current study, field notes, additional observations from the review of the videos, and the transcribed teacher's interview were reviewed multiple times to identify meaningful units from the text.

The meaningful units of text were then assigned codes. Figure 2 shows an example of initial coding and analysis of the field notes. Through an iterative process, the codes were reviewed and refined. A codebook was developed which included code labels, definitions and examples (see Appendix H).

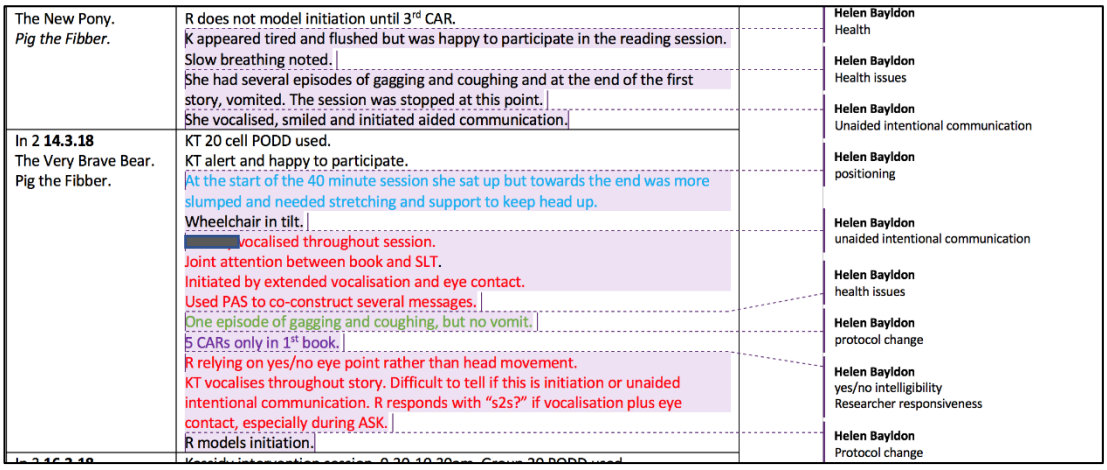

Figure 2. Example of initial coding process for inductive data analysis.

The next step in the process was to categorise the codes into themes. Significant and common patterns among the codes were identified and then grouped together to create organising themes. These organising themes were reviewed to confirm that they were discrete, yet broad enough to adequately and appropriately describe the theme (Attride Stirling, 2001; DeCuir-Gunby et al., 2011).

The organising themes were then summarised, arranged and collapsed into global themes. The process undertaken to arrive at global themes involved systematic reduction and sense-making of the raw data in relation to the research aim. The global themes were then reviewed again, to make sure that they were an accurate reflection and correct interpretation of the text data (Attride Stirling, 2001; DeCuir-Gunby et al., 2011).

Trustworthiness.

Confirmability is one aspect that contributes to the trustworthiness of qualitative research. It is enhanced through the reflexivity of the researcher (Mills, 2014). The process of analysis, the decision to include or discard codes, define codes and interpret themes is shaped by the researcher's beliefs, values, assumptions and experience (Gibbs, 2007; Punch & Oancea, 2014). In order to minimise the risks inherent in this bias, it is helpful to have input into the process from others who can offer a different view. My thesis supervisors were involved in discussions regarding the analysis at all levels. They reviewed and made suggestions

about the labels and definitions of the codes, the arrangement of the organising themes and global themes, and the relation of the data to the research question.

Data integration.

In an effort to integrate all of the data sources, the quantitative communication frequency measures were treated as codes and embedded within the qualitative analysis. This made sense as much of the qualitative data informed and expanded the quantitative results. The expanded codebook including these deductive codes is provided in Appendix I.

Ethical Considerations

This project involved children from a vulnerable population and there were several ethical issues that were considered carefully over the course of the study. Approval for the study was given by the Massey University Human Ethics Committee before the study began (Application number NOR 17_49; see Appendix J for Approval letter). Later approval was given to amend the initial single-subject, multiple-baseline design to a case study, with further permission given to collect data from additional sources (see Appendix K).

Conflict of interest.

There was a potential for a conflict of interest as the researcher worked at the school where the children were students and they were on her caseload. The families may have felt a potential power imbalance and pressure to participate. To alleviate this, the school principal considered the research proposal and gave permission to conduct the study (see Appendix L for the Principal Information Letter) and the approach to the parents for recruitment of the children was made by the deputy principal. There was a clear statement in the information sheet (see Appendix B for the Parent Information Sheet) that non-participation in the study would in no way affect their child's regular SLT support at school.

Informed consent.

Information was provided to each potential family in the form of a Parent Information Sheet (see with an invitation to discuss the study in person. Consent to participate was sought from the parents of each child (see Appendix M for Parent Consent Form). Shortly after the intervention began consent was requested from

the parents to allow the researcher to collect field notes and observations (see Appendix N). Ongoing consent was obtained during each session with the researcher observing for behaviour that indicated the children were comfortable to continue.

Tikanga Māori.

This research took place in New Zealand and, as such, is of interest to Māori. In order to ensure that the research was culturally and socially responsible, the researcher consulted the Te Ara Tika, guidelines for Māori research ethics (Hudson, Milne, Reynolds, Russell, & Smith, 2010) when planning the study. She met with the school's kaumatua to discuss the intervention procedures and ensure that the information shared with participants was culturally and socially appropriate (see Appendix O).

Privacy.

Pseudonyms are used to protect the identity of the children, both within the thesis, as well as in any resulting published articles or presentations. No identifying information is available to persons outside of the school, and the research assistant signed a confidentiality agreement (See Appendix P for Research Assistant Confidentiality Agreement).

There was a potential risk that the school from which the children were recruited might be identified, although no names or identifying features are listed in this thesis. No identifying information will be used in subsequent publications or presentations. The school's principal was made aware of this in a letter introducing the study before giving permission for the research to go ahead (See Appendix L for Principal Letter).

Potential for harm.

There was a minimal risk of harm to the children in the form of fatigue. If the researcher noted the child seemed fatigued, she asked the child if they wanted to stop the session or if they felt comfortable to continue. In an event where the child requested to stop, or the researcher determined they were unable to continue, the session was stopped. The study was adjusted from reading two storybooks per session to reading a single storybook to alleviate potential fatigue issues.

Summary

This chapter has outlined the case study approach used in this research to describe the outcomes of a dialogic shared storybook reading intervention which incorporated AAC modelling and increased communication partner responsiveness for children who have CPCSN and use PAS to access ACC. The chapter introduced the children who participated, along with the eligibility criteria, and the context for the study. Next, the intervention, including materials and clinical procedures, were detailed. Then followed an explanation of the data collection methods used, with a description of the data analysis undertaken with the different types of raw data and measures taken to increase validity. Lastly ethical issues that may have been a concern during the research were considered. The next chapter will describe the results of the study.

Chapter Four: Results

The purpose of this case study was to describe the outcomes of a shared storybook reading intervention which included aided language modelling and increased communication partner responsiveness for two children with complex physical, cognitive and sensory needs (CPCSN) who use partner assisted scanning (PAS) to access augmentative and alternative communication (AAC). This chapter presents the results.

The research was initially designed to collect quantitative data to examine the effect of the interventions on specific communication frequency measures for the children. However, due to the complexity of the children's needs, it became clear early in the data collection that changes to the clinical protocol would be necessary, and that qualitative data collection, in the form of field notes, observations and an interview with the children's teacher, would provide valuable information and contribute to a richer description of the communication outcomes.

The quantitative data pertaining to communication frequency measures were treated as codes and integrated into the qualitative analysis in an effort to combine the findings from each data type. Table 2 displays the codes and contributing data type.

As a result of the inductive analysis, two global themes emerged: Practical Considerations when Implementing Intervention; and, Effects on Communication Skills. Table 3 displays the global themes, organising themes and codes which combined findings from the deductive and inductive analysis. An Expanded Code Book (see Appendix I) was created to represent the inductive coding from the qualitative analysis combined with the deductive communication frequency measures from the quantitative analysis.

Table 2

The Data Type for Each Code

Codes	Data types	
	Quantitative	**Qualitative**
Aided communication measures	✓	✓
Unaided communication measures	✓	✓
Researcher responsiveness measures	✓	✓
Intelligibility of yes/no response		✓
Scan speed	✓	✓
Functions/intents		✓
Imitation		✓
Word order		✓
Seizures		✓
Medications		✓
Other		✓
Equipment, positioning and comfort		✓
Personal care		✓
Length of session		✓
Wait time		✓

To avoid repetition and duplication of the discussion of the outcomes, the global themes are used as a framework to present these combined quantitative and qualitative results. The first part of this chapter presents the findings related to the Practical Considerations theme and describes some of the practical challenges associated with conducting research with these two children, including their health and physical needs, and changes made to the intervention protocol in response. This provides the reader with a picture of the intervention context and explains some of the variability in the communication skills results. The second part of the chapter outlines findings related to the Effects on Communication Skills theme, including an examination of the children's aided turn taking, spontaneous initiations, the efficiency of communication and how they conveyed meaning.

Table 3

Global Themes, Organising Themes and Codes

Global theme	Organising theme	Codes
Practical Considerations when Implementing Intervention	Health	Seizures
		Medications
		Other
	Physical needs	Equipment, positioning and comfort
		Personal care
	Session protocols	Length of session
		Wait time
Effect on Communication Skills	Aided turn taking	Aided communication measures
	Spontaneous Initiations	Unaided communication measures
		Researcher responsiveness measures
	Efficiency	Intelligibility of yes/no response
		Scan speed
	Conveying meaning	Functions/Intents
		Imitation
		Word order

Intervention Context

A total of 25 storybook reading interactions with KT and 28 storybook reading interactions with DS were conducted for the intervention. This was less than originally intended as the number of storybooks read in each session was reduced owing to some practical challenges which will be described below. The duration of the intervention also took longer overall than the intended six or seven weeks (depending on the baseline).

Both children read two storybooks during each session in the baseline phase of this study. These storybooks were either two new storybooks or one new storybook and one familiar storybook. New storybooks were read a single time and familiar storybooks were read three times in total. The familiar storybooks were

considered new the first time they were read, and familiar during the subsequent two readings.

KT read six storybooks in total across three sessions to complete her baseline phase in the first week of the study. Four of these storybooks were new, and one of these was repeated twice more. DS read eight new storybooks, two of which were repeated twice, for a total of 12 storybooks across six baseline sessions. DS's baseline phase took four weeks and one day to complete.

In the intervention phase, KT participated in five sessions with two storybooks following the same pattern as her baseline phase. She also participated in nine sessions during which just one storybook was read, resulting in a total of 19 storybook readings overall in the intervention phase. The first session stopped after the first storybook when KT became unwell, and the final eight sessions used a single storybook. Of the 19 storybooks read to KT, 13 were new storybooks, with three of them read three times in total, yielding six familiar storybooks. The number of storybooks read in each session, and the order of new and familiar storybooks, changed over the course of the study due to fatigue, health and other issues for the children, which will be discussed in more detail below.

In the intervention phase, DS participated in one session with two storybooks, and 14 sessions with one storybook, for a total of 16 storybook reading interactions. During this phase, DS read nine new storybooks and four that were read once or twice more after the initial read through. Figure 3 displays the number and type (new or familiar) of storybooks read by each child within each session. See Appendix C for the revised Book List detailing the title and author of each book read in each session.

The figures used in this chapter will present data for each storybook, using a B to denote storybooks read during the baseline phase, and an I for storybooks read in the intervention phase. Individual storybooks will be referred to as BSB or ISB (baseline storybook and intervention storybook respectively) in the text.

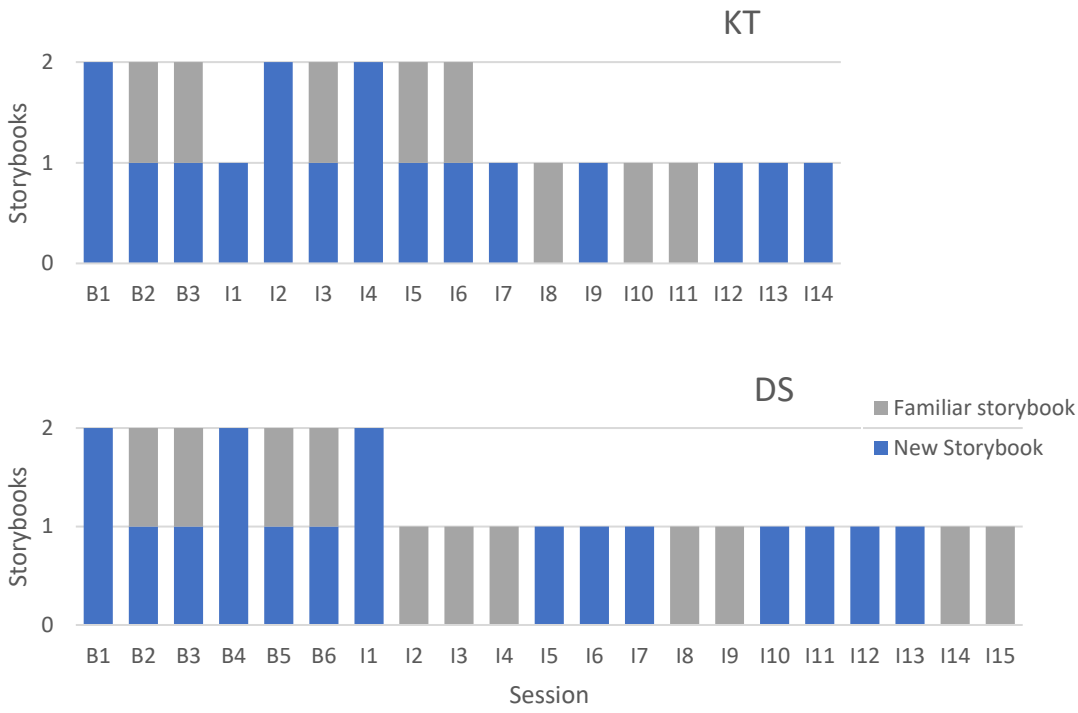

Figure 3. The number of storybooks read in each session by type (new or familiar) for each child.

The total time of baseline interactions analysed was 96.48 mins (approximately 1 hr 37 mins), while the total time of intervention interactions analysed was 980.57 mins (approximately 16 hrs and 20 mins). See Table 4 for total time analysed in each phase per child. KT's baseline sessions took an average of approximately 9 minutes each (4 minutes and 25 seconds each storybook). DS's average baseline session time was longer, taking approximately 11 minutes and 40 seconds to read two storybooks (average 5 minutes and 50 seconds), because of the aided message he expressed in the first session.

Table 4

Total Time Analysed, by Phase, and Child (hrs:mins)

Total time	**KT**	**DS**
Baseline	0:27	1:10
Intervention	8:40	7:40

Each storybook read to KT in the intervention phase required approximately 27 minutes and 22 seconds to complete, while for DS each storybook took an average of 28 minutes and 47 seconds. There was no pattern to the period between reading sessions for either child. The intervention phase took KT 10 weeks to complete 14 separate reading sessions and took DS six weeks to carry out 15 reading sessions. This included a break of 2 weeks and 3 days for school holidays and time during which the school was closed due to a power cut.

Practical Challenges

The first key theme that emerged from the data was the number of practical challenges associated with completing a study with children CPCSN. These include challenges relating to health and physical needs, as well as necessary changes to clinical protocols as a result.

Health.

Both children selected for this study have complex health needs which have an impact on their daily functioning. Both experience seizures regularly, take daily medications and are susceptible to stomach upsets and coughs and colds. These will be examined further, below.

Seizures.

Both children experience regular seizures which have an impact on their concentration and fatigue levels. The effect was particularly notable during the storybooks immediately following major seizure episodes. For example, during the week of ISB:12, ISB:13, and ISB:14, DS had several major seizures which reduced his energy and participation levels across the school day. His teacher reported that he usually does not attend school for several days following a big seizure but stays home sleeping and recovering. The storybooks were continued during this week as DS appeared to be attentive, although he did not initiate any aided turns during the sessions. The following week DS took three then four aided turns during ISB:15 and ISB:16 respectively.

During ISB:16, KT quickly initiated an aided turn three times out of four CAR prompts, before she experienced several seizures, at which point she became more

distracted and less engaged. She looked away more often and did not initiate another aided turn (given two further CAR prompts). Lots of seizure activity was also noted throughout ISB:18, and although she smiled and seemed engaged while the storybook was being read, she took only one aided turn within a CAR prompt. This contrasted with the previous five sessions during which she usually took 3-5 CAR- and non-CAR-prompted aided turns.

Medications.

Both children take several medications to treat seizures and combat the effects of high muscle tone resulting from their cerebral palsy. These medications reduce muscle tone and increase fatigue, which affects their ability to concentrate on communication and move their bodies to select or signal. Medications are given at different times of day, and at times this interrupted sessions. Interruptions extended the length of the sessions, as well as requiring both the researcher and the child to return their attention to the storybook or interaction. DS took time off school to attend medical appointments to receive medication (e.g., Botox injections).

Other health issues.

Two storybooks were abandoned with KT due to ill health (ISB:2 and ISB:19) as the researcher determined that she was unable to complete the sessions. KT experienced coughing and gagging during many of the sessions which interrupted the flow of the reading. Both KT and DS vomited during the reading of storybooks, requiring the session to finish prematurely or be interrupted while they were cleaned up. Both children had time off school for sickness while the study was in progress.

Physical needs.

The children in this study have complex physical needs which require ongoing monitoring of equipment to ensure that they are positioned well and comfortably throughout the day. Their physical needs also mean that they require full support for all tasks related to personal cares. Accessing AAC using PAS takes longer than direct access methods, not just to select a symbol, but to co-construct a

message with navigation between pages. These requirements had an effect on the delivery of both baseline and intervention sessions and will be examined in detail.

Equipment, positioning and comfort.

Both KT and DS need supportive seating. DS also has adaptive equipment for standing and walking. Both use ankle-foot orthoses (AFOs) and for KT, hand splints, to maintain joint extension and help prevent contractures. DS wears a Second Skin suit to help maintain postural support. Both use neck collars at times to provide head and neck stability. Both children require hoisting in a sling for transfers between equipment.

The significant time spent transferring the children into or out of their equipment meant that the time available to schedule sessions to complete this study within the school day or over a week was reduced. Both children had time off school to attend appointments to do with their equipment, such as wheelchair review clinics or orthotics appointments. These appointments had an effect on the children's availability to attend sessions.

Pain and discomfort were noted as affecting performance for both children throughout the study and this was often associated with positioning and equipment. Both children needed re-positioning in their chairs within sessions as they became fatigued and slumped forward or to the side.

DS postured more than usual and grunted when in his standing frame and wearing a neck collar (e.g., BSB:7, BSB:8; ISB:1, ISB:2). He appeared uncomfortable which reduced his concentration and attention. Once the neck collar was removed, he was more relaxed and engaged with the storybook reading, but this affected his head control making his yes/no responses less clear. When KT wore hand-splints (BSB:1, BSB:2, BSB:5, BSB:6; ISB:13), she made continuous soft grunting sounds and mouthed them often. The observation notes reflected that she was not very responsive and seemed distracted and fatigued during sessions when she was wearing hand-splints. KT is building up her tolerance for wearing hand-splints and is encouraged to wear these for longer periods each day.

The nature of her physical needs means that KT's supportive seating requires frequent adjustment to allow her to be comfortable and promote optimal

positioning. Towards the end of the study, KT was provided with a new seating system in her wheelchair. During sessions with the new seating (ISB:16, ISB:17, ISB:18) the field notes recorded that KT seemed “pale and lethargic” and “not her usual self”. She also was noted to close her eyes a lot and appeared to rest. During one of these sessions (ISB:17), KT also experienced more than the usual number of seizures. It is difficult to determine whether these factors are correlated or causal, however, they both had an impact on KT’s overall responsiveness during the sessions.

Personal care.

The schedule and time involved to complete personal cares affected the timing and length of sessions during this study. Both children require full assistance with personal cares such as eating and going to the bathroom. KT does not eat orally but requires enteral feeding and medications which are scheduled throughout the school day. Several of KT’s sessions were interrupted by staff to provide medication and enteral feeds. DS is assisted to eat morning tea and lunch orally and requires extra time to eat a modified diet. Sessions with DS needed to be carefully scheduled around meal times. Interruptions and limitations on session length to manage personal care needs were frustrating for both the researcher and the children.

Protocol changes.

There were several adaptations made by the researcher to the intervention protocol due to a combination of the challenges noted above. These included: a reduction in the length of each session; and change in researcher response.

Length of sessions.

Each baseline session took on average 9 mins to read two storybooks from start to finish, excluding the baseline session in which DS took nearly 15 mins to construct an incomplete message. Table 5 presents the average time taken to read a storybook during the baseline phase (with no CAR prompts), as well as the average time taken to read a storybook during the intervention phase with CAR prompts and partner scans included.

Table 5

Average Time to Read a Storybook per Session (in mins: sec) by Child

Book		**KT**	**DS**
Baseline	New	04:50	06:58
	Familiar	03:59	04:42
Intervention	New	25:52	25:26
	Familiar	29:03	31:23

During the intervention phase, a new storybook took on average four and a half times longer to read than in the baseline phase. A familiar storybook read during the intervention phase took on average seven times longer compared to the baseline phase. This calculation does not consider the differing number of CAR prompts provided during a storybook in the intervention phase, however, it does reveal that reading a storybook with the CAR intervention strategy took significantly longer than reading a story without it. Most of the storybooks used were of a similar length and most had a total of five CAR prompts plus a title comment using AAC modelling (KT had 14/19 storybooks with five CAR prompts, DS had 10/16 storybooks with five CAR prompts).

The average time taken to read two storybooks during each of the first six intervention phase sessions with KT was 60 mins, excluding setup and interruptions (range 40-68 mins). Due to the difference in length of baseline phases and availability for sessions, DS had participated in one intervention phase session (taking 51 mins) by the time KT had completed six. These initial intervention phase sessions were longer than originally anticipated.

Sessions of this length appeared to have a negative impact on KT's posture, attention and concentration with the researcher observing that she “became more slumped towards the end”, as well as becoming more tired and less responsive. KT also had reduced head control, with slower yes/no responses and required more breaks for re-positioning.

After discussion with her supervisor, the researcher decided to reduce the number of storybooks to one storybook per session instead of two. A revised book

list (see Appendix C) was created to ensure that a mix of new and familiar storybooks was included for the remainder of the study. At the same time, adaptions were made to reduce the number of CAR prompts provided during each book.

CAR prompts were originally provided every 3-4 pages regardless of the number of pages in each book. Books differed in length and therefore the number of CAR prompts provided. For example, *The Gruffalo* (MacMillan Publishers Ltd, 1999) had nine CAR prompts, while *The New Pony* (Usborne Publishing Ltd, 2000) had five. More CAR prompts usually resulted in a long reading session. The decision was made to reduce the number of CAR prompts to five per book, plus an aided language comment to introduce the title. This became standard for the remainder of the books read during the study.

Wait time.

As the study progressed, the researcher documented that she became more comfortable providing wait time, recording that "wait time seems more natural". The researcher increased the amount of wait time given, up to 45 seconds, when the child appeared to need it and provided more pauses to respond with a yes/no. Pauses were longer, and the researcher asked for clarification more frequently when the child displayed signs of fatigue, had seizures, or was poorly positioned, as noted after reading *The Gruffalo* with KT "occasionally gets stuck or uses both head movement signals. She will try a different signal when asked for clarification".

Observations during repeated viewings of the videos revealed that pauses while reading the storybooks were more frequent than required by the CAR prompts. The longer and more frequent pause time potentially influenced the increase in the number of non-CAR-prompted initiations from the child.

As both the children developed an intelligible head nod or shake to signal yes or no, the researcher began accepting the head movements as signals, rather than requiring eye-pointing to yes/no symbols. This contributed to faster scan speeds as both children needed longer to make two movements (head and eye) than one.

Joint attention (looking between an object or person and their communication partner) to signal an intent increased for both children as well as a concurrent increase in response by the researcher to their unaided communication turns. For example, during the first intervention phase session (ISB:2), KT appeared to 'Request Action' (by looking repeatedly at the researcher and the door) before becoming physically ill. The researcher did not respond to this unaided turn, possibly because she did not notice, or because she could not interpret it. By storybook ISB:14, KTs 'Request Recurrence' at the end of the story by looking repeatedly between the researcher and the book, resulted in a further reading of the storybook. Likewise, DS's shift in gaze between the researcher and a door during storybook ISB:15 was taken as a 'Request for Information' about who was making noise behind the door. The researcher responded verbally and then with an AAC model (more to say/I'm asking a question/who) which was then repeated by DS using AAC during his next aided communication turn. The researcher documented that she became more 'tuned in' or responsive to the movements of each child over the course of the intervention and more skilled at interpreting their behaviours.

Effect on Communication Skills

The dependent variables that were the initial focus for this study included aided and unaided communication frequency measures: the number of aided turns taken during CAR prompts, the average number of symbols communicated during these aided turns, and the number of unaided communication acts which initiated an aided turn. These variables provided a starting point, however, effects on other communication skills emerged from the inductive analysis of the qualitative data including changes related to intelligibility, scan speed and message content for the children, and a change in response for the researcher.

Aided turn taking.

Aided turn taking describes turns taken by the children when they used their aided communication system (PODD) to express a message. The children use PAS to access their PODD communication books, signalling yes or no to select aided symbols and co-construct a message with the communication partner.

Aided communication measures.

There were two aided communication skills measured. These were the number of aided turns taken per CAR prompted opportunity, by each child per storybook; and, the number of symbols communicated (NSC) per aided turn by each child per storybook. Reliability was calculated on the aided communication measures for 30% of the intervention phase storybooks. The inter-observer agreement for the number of aided turns taken per CAR prompted opportunity across both children was 93% (KT: 86%, DS: 100%). The inter-observer agreement for the number of symbols communicated during aided turns across both children was 84% (KT: 90%, DS: 78%).

CAR-prompted aided turns.

Data were collected on the number of aided turns taken per opportunity provided by a CAR prompt for each storybook for each child (see Figure 4). Neither child took a CAR-prompted aided turn during the baseline phase of this study as there were no CAR prompts given and therefore no opportunity for this to occur. Both children took CAR-prompted aided turns during most storybooks read during the intervention phase. KT took 1-4 CAR-prompted aided turns per storybook, while DS took 0-4.

In the intervention phase, KT took CAR-prompted aided turns during every storybook while DS took CAR-prompted aided turns during every storybook except those read in ISB:1, ISB:11, ISB:12, and ISB:13. In the later three sessions, DS experienced health issues that may have inhibited his focus or energy for taking an aided communication turn as discussed above.

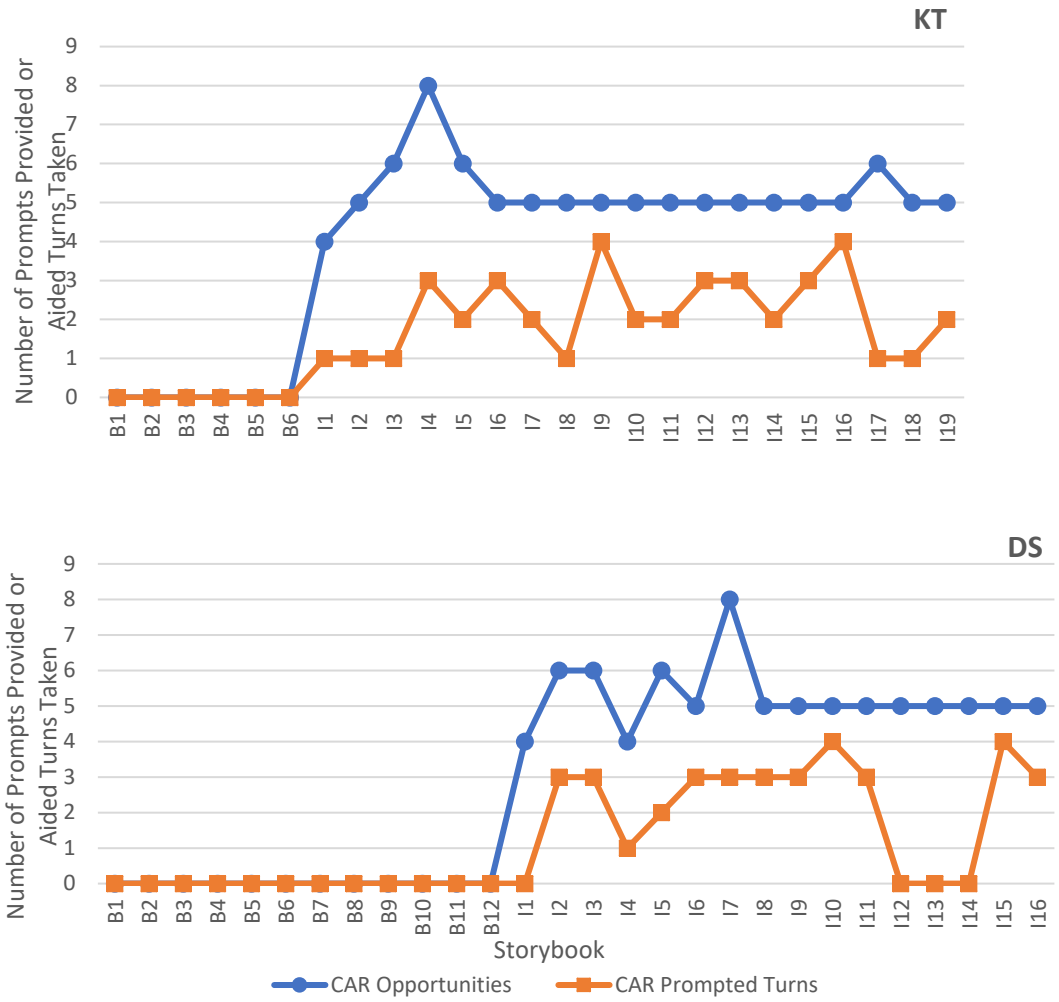

Figure 4. The number of CAR opportunities and CAR-prompted aided turns, per storybook, by child.

There was a difference noted in the effect on communication skills between new and familiar storybooks. For both KT and DS, there was an increase in the average number of aided turns taken during familiar storybooks read in the intervention phase compared with new storybooks. Figure 5 shows the number of aided turns (CAR-prompted and non-CAR-prompted) taken by each child during the intervention phase with new and familiar storybooks, as well as the average number of aided turns under each condition. Both children took an average of 1.9 aided turns when they were read a new storybook. During familiar storybooks both KT and DS increased this to an average of 3.2 and 3.6 aided turns respectively. The increase in the total number of aided turns taken during familiar storybooks

compared with new storybooks suggest that the familiar storybooks elicited more aided turns than new storybooks.

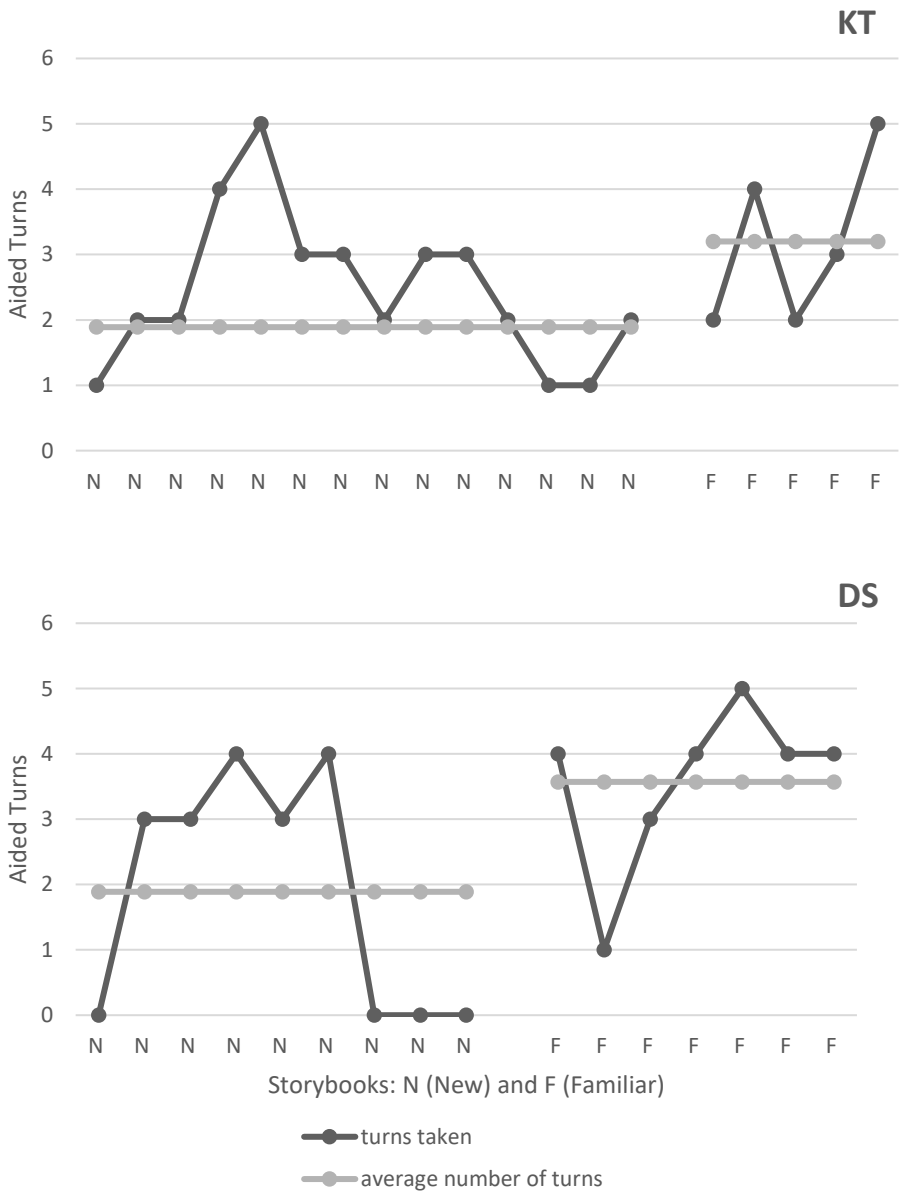

Figure 5. The number and average number of aided turns taken per new and familiar storybook during the intervention phase, per child.

Number of symbols communicated.

Data were collected on the number of symbols communicated (NSC) during each aided turn taken by each child per storybook. Figure 6 displays the average number of symbols communicated during aided turns for each storybook, as well as the total number of aided turns taken.

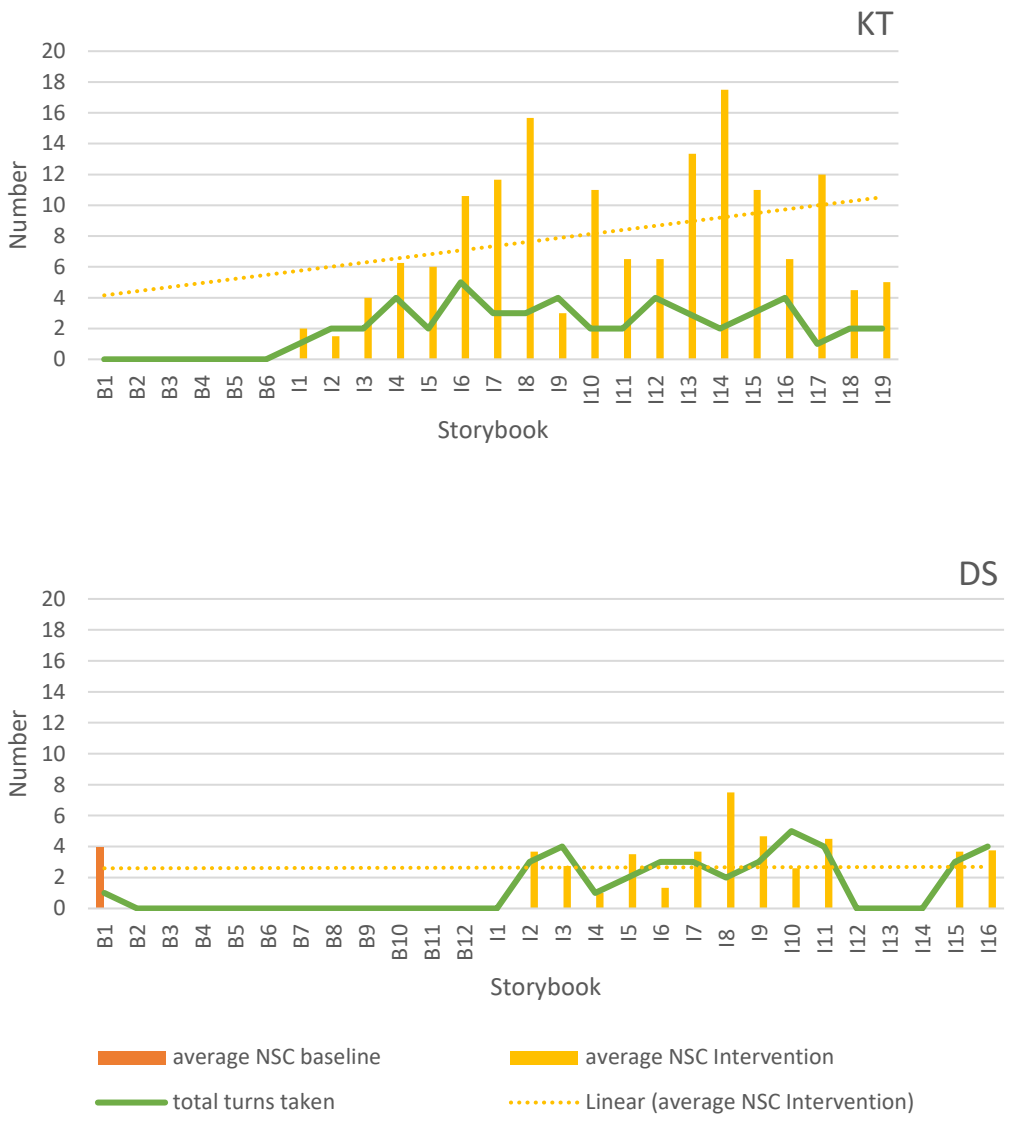

Figure 6. The average number of symbols communicated (NSC) per aided turn with the total number of aided turns taken per storybook.

KT did not take any aided turns during the baseline phase and therefore did not communicate any aided symbols. DS took one aided turn in the first baseline session and selected four symbols in total during this turn.

The average number of symbols communicated per aided turn per storybook by KT ranged between 1.5-17.5 (range 1-27. See Table 6 for detail) throughout the intervention phase. The trendline, which was created using intervention phase data only, indicates an increase in the number of symbols communicated per aided turn by KT as the study progressed. DS communicated on

average between 1-7.5 (1-12) symbols per aided turn per storybook during the intervention phase, with the trendline for intervention phase data remaining static.

KT expressed two single symbol messages out of a total of 52 aided messages and DS expressed five single symbol messages from a total of 38. Of the single symbol messages communicated by the children, one consisted of the completion symbol that is all I have to say about that, expressed by DS after he initiated an aided turn but did not select any content words. When using a PODD communication book that is designed for PAS access, the symbol that is all I have to say about that usually signals the end of a communicator's turn and adds a symbol to the count of aided symbols. The majority of the single symbol turns were terminated when the child had not made a signal after an extended period of time (more than 60 seconds), or they had signalled 'no' to that is all I have to say about that but when asked if they had something else to say, also signalled 'no'. Nearly all two symbol messages, (8/52 in total for KT and 13/38 in total for DS) consisted of a single content word and the turn completion symbol.

Table 6

The Number of Single and Multi-Symbol Messages Expressed by Each Child

Number of symbols per aided turn	**KT**	**DS**
1	2	5
2	9	13
3-5	14	13
6-10	12	6
11-15	7	1
16-20	5	-
21-25	2	-
26-30	1	-
Total aided turns	52	38

Both children expressed a number of multi-symbol messages of three or more symbols. Table 6 displays how many messages each child expressed using

multiple symbols. For a person to select more than one content word using a PODD communication book that is designed for PAS access, the communicator needs to signal that they want to select another word (on the current page, or from the categories page, or back on the first page of the section), and there are other navigation commands which may be selected to create a message. These navigation command symbols were counted in the data for the total number of symbols communicated.

Spontaneous initiations.

Unaided turn taking describes unaided communication acts which allowed the child to participate in a communication exchange with no aided message or served to initiate an aided turn. Unaided turn-taking was influenced by the researcher's response to these communication acts.

Unaided communication measures.

There were two unaided communication measures. These were the number of unaided communication acts made by each child, per storybook; and, the number of unaided communication acts which converted to an aided turn, for each child, per storybook. Reliability was calculated for unaided communication measures for approximately 30% of both the baseline and intervention phases. The inter-observer agreement for the number of unaided communication acts made during the baseline phase was 33% across both children (KT: 28%, DS: 38%). This indicates a significant difference in interpretation of unaided communication acts between the researcher and the second observer. The inter-observer agreement for scoring unaided communication acts during the intervention phase was 89% (KT: 88%, DS: 90%).

Total number of unaided communication acts.

An unaided communication act was determined to have taken place when the child directed communicative behaviour towards the researcher. Both children used eye contact, vocalisation, smiling or laughing, and/or joint attention between the researcher and their communication book (PODD) or other objects to direct unaided communication towards the researcher during both phases of the study. In addition, DS reached out towards or touched his PODD in the intervention phase.

Because of the nature of the children's physical impairments, it was difficult for the researcher to know for certain if these behaviours signalled an unaided turn, an initiation of an aided turn, or were simply unintentional movements. An interpretation was needed based on context throughout the study, and if in doubt, the researcher made a response. When the researcher noted this behaviour, she verbally referenced what she saw and asked the child if they had something to say to confirm their intent, as seen in the following example.

DS: *Looks at Researcher, looks at book, looks at PODD.*

Has been resting arm against PODD. Now moves it across PODD.

Looks up at Researcher.

Researcher: "Touching your PODD."

"Looking at me."

"Something to say?"

DS: *Smiles. Looks down at PODD.*

Looks up at Researcher. Nods head.

The baseline phase protocol required the researcher to respond to the children's unaided communication acts as potential initiations of an aided turn only when they were obvious. The intervention phase protocol required the researcher to 'presume competence' and respond to all unaided communication acts, both obvious and subtle, as potential initiations of aided turns during the storybook reading.

Results for DS revealed that he made 0-2 potential initiations per storybook during the baseline phase and 2-13 potential initiations per storybook during the intervention phase. DS made 11 potential initiations overall during the baseline phase, but only one of these was obvious to the researcher at the time. When the researcher verbally referenced his behaviour and asked if he had something to say, DS signalled that he wanted to communicate an aided message. He took approximately 15 minutes to express four symbols and this message was incomplete.

On review of the videos, KT appeared to interact intentionally with 7-20 potential initiations per storybook during the baseline phase. The researcher responded to two of these as intentional communication initiations, although each time KT signalled that she did not want to express an aided message. The video transcripts also revealed that KT made eye contact and smiled or vocalized frequently during the baseline storybooks. She turned or looked towards the researcher often, particularly when the researcher made eye-contact or looked towards KT, however, it was difficult to interpret the behaviour as it was not obvious to the researcher whether it was an intentional initiation or not. She made generally fewer (4-15) potential initiations during the intervention phase when the researcher was more responsive to her communicative behaviours.

Number of unaided communication acts which converted to an aided turn.

Data were also collected on the number of unaided communication acts which converted to an aided turn both within the CAR prompt and extra to the prompt within a storybook. KT took 52 aided turns in total across all storybooks in the study. DS took 38 aided turns within the intervention phase. The proportion of unaided communication acts, which were recognized as intentionally communicative by the researcher and subsequently converted to an aided turn are presented in Figure 7 below.

The percentage of converted potential initiations fell below 20% in ISB:14 and ISB:17 for KT. Field notes recorded that she had been away from school all week before participating in ISB:14 and the video transcription showed that she had several seizures in the second half of the storybook. None of her unaided communication behaviours converted to an aided turn after the seizures. The field notes and video transcription documented that KT experienced many seizures (13 in 30 minutes) during ISB:17. Although she was happy to participate in this reading session, evidenced by smiles and eye-contact with the researcher, she expressed only a single aided message to ask a question.

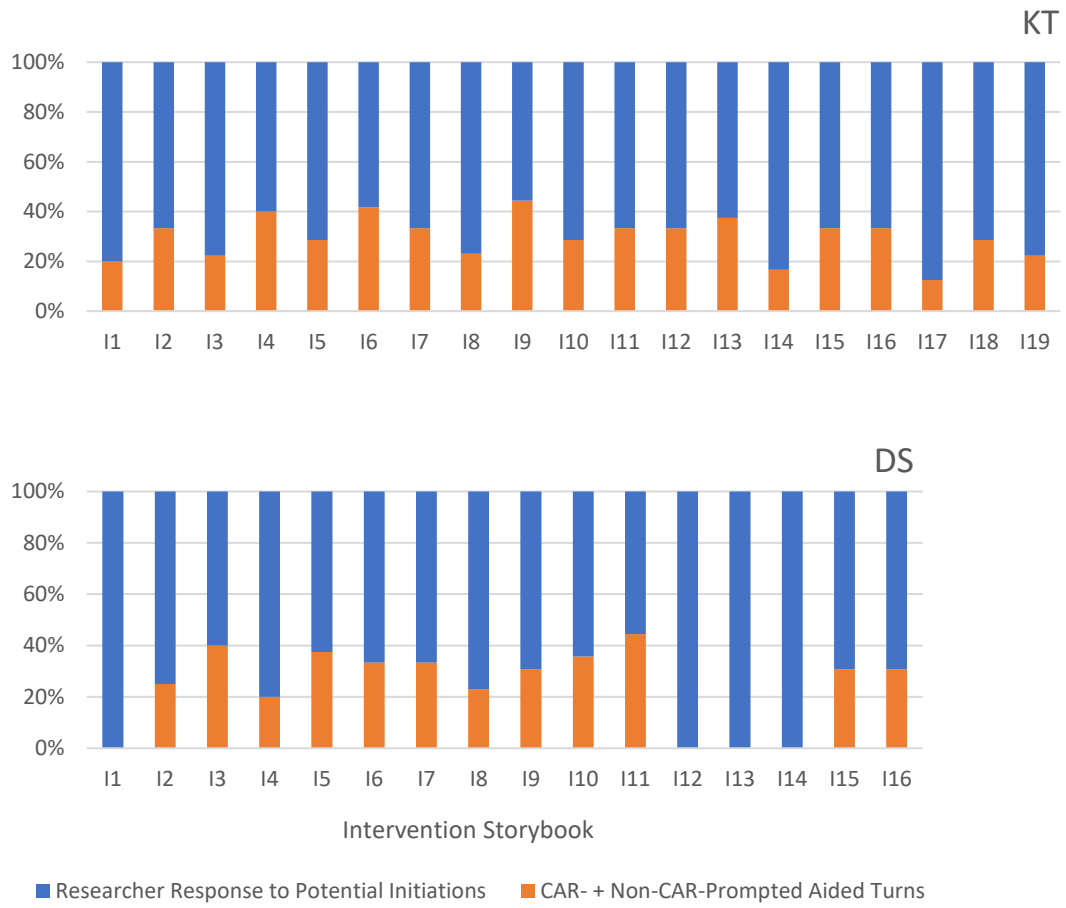

Figure 7. The percentage of potential initiations made by the child and were recognized by the researcher, that converted to an aided turn during intervention storybooks.

Both children made potential initiations in both phases of the study. KT did not convert any potential initiations to an aided turn during the baseline phase, while DS converted one initiation to an aided turn. Both children spontaneously initiated aided communication turns before, during or after the storybook reading during the intervention phase. They did not rely on the CAR prompt to initiate an aided turn in almost half of the storybooks read. DS initiated an aided turn during his first baseline storybook, and he initiated a non-CAR-prompted aided turn during 7 of the 16 storybooks in the intervention phase. KT took no aided turns during the baseline phase, and 1-2 non-CAR-prompted aided turns during 8 of 19 intervention phase storybooks.

The increase in initiations and conversion to an aided turn was reflected in the classroom, with the children's teacher observing that they "both became more interactive during class". She noted that they "They always had something to say and they were shouting out or staring at the PODD, you know, "I've got something to say, stop and listen to me".

Researcher responsiveness.

The researcher significantly increased her responsiveness during the intervention phase (see Figure 8). The researcher did not respond to every unaided communication act in a storybook, however, as she did not always notice when the child looked at or reached for the PODD and smiled when there was no vocalisation or eye contact. At times, the researcher responded as if the child had made an initiation when the review of the video suggested they had not. Field notes documented that the researcher became more confident interpreting the children's communication acts as initiations, e.g., "easier to interpret body language."

KT exhibited more unaided communication behaviours on average (13.7 acts) during baseline storybooks, when there was relatively little researcher response, than during the intervention phase. During the intervention storybooks, KT performed fewer unaided communication behaviours on average (8.7 acts) than the previous phase. When the researcher acknowledged and responded to these acts, KT took at least one opportunity during every storybook to express an aided message. In contrast, DS made an average of 0.9 unaided communication acts during baseline storybooks and an average of 8 unaided communication acts in the intervention phase storybooks.

Reliability was calculated on the number of researcher responses in approximately 30% of storybook sessions over both phases. The inter-observer agreement between the scoring of the researcher and the second observer for researcher response was 91.5% (KT: 96%, DS: 87%) across children.

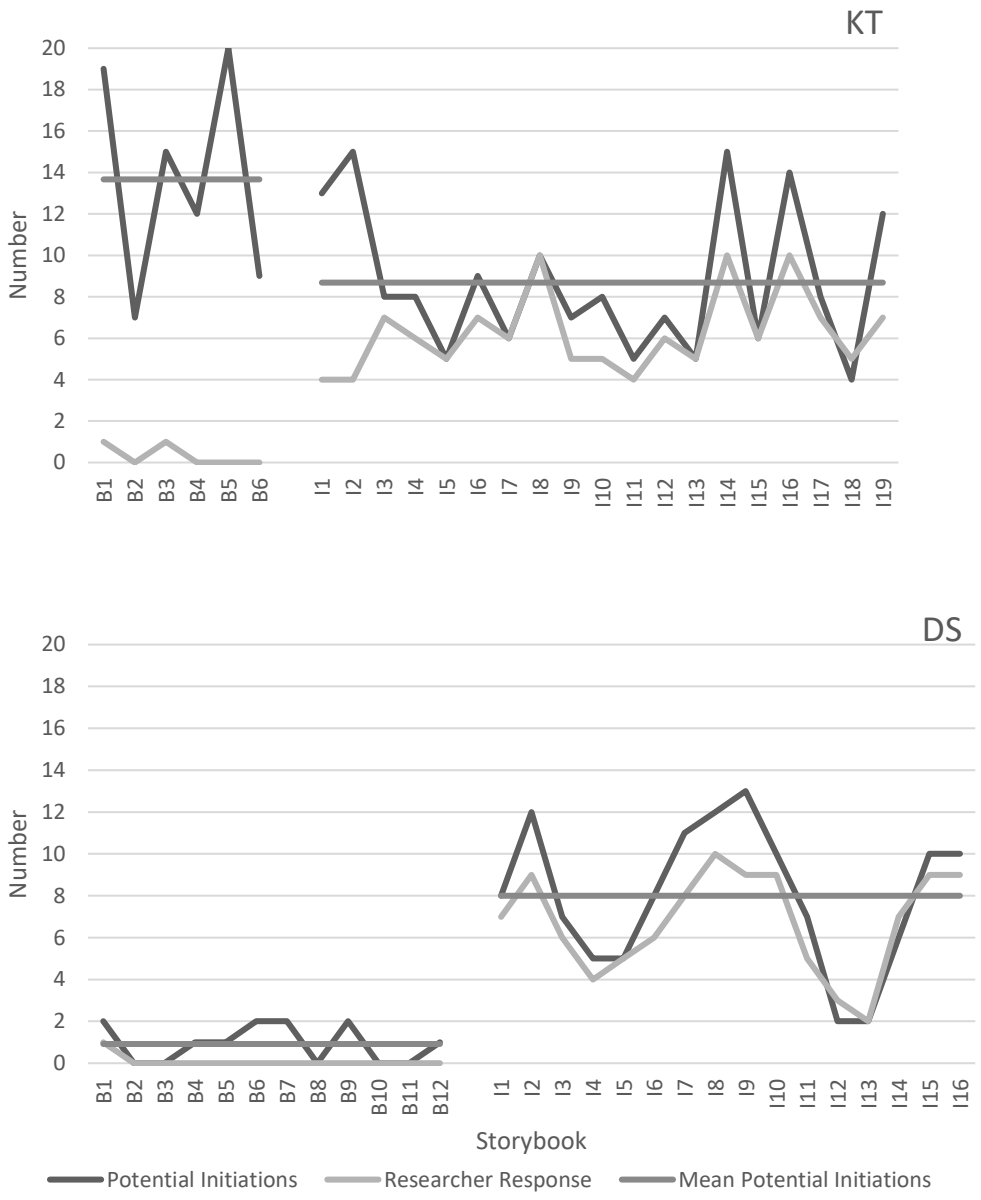

Figure 8. The number of potential initiations made by each child and the number of responses made by the researcher per storybook, along with the mean for potential initiations per phase.

Efficiency.

Over the course of the study, the researcher and the teacher noted that PAS seemed to become more efficient and quicker for the children. The children's teacher reported that their signals became more intelligible and faster, and field notes documented that the researcher improved her ability to read the signals from each child.

Intelligibility of yes/no responses.

At the beginning of the study, the children eye-pointed to yes/no symbols to make a response. The symbols were held in such a position to encourage a head nod movement for 'yes', and a head shake movement for 'no'. By the end of the study, both children were more often using only a head nod or shake to signal their intentions during scanning. The researcher stopped relying on eye-pointing to the symbol if the child had already signalled with a head movement.

This skill transferred to the classroom, as the teacher noted "we don't really use the cards anymore as I don't need them. The kids just nod or shake". The teacher also reported that after a long break between sessions (due to school holidays and absence) that both children did not signal yes or no as clearly. KT's movements had become difficult to 'read' due to a decrease in size and unclear direction of the head nod or shake. After a single intervention session, during which KT was prompted to make her signals clear, a marked improvement was noted by her teacher, who said: "she was much clearer after she came back from your session".

Both children needed extra time to clarify their yes/no response if it was initially missed by the researcher. Both children made either the same ('yes' then 'yes') or a different ('yes' then 'no') response when asked for clarification, with no perceivable pattern to this behaviour.

Scan speed.

Both the researcher and teacher noted that the time taken to express a single symbol appeared to become faster over the course of the study. The field notes documented that DS seemed "faster at scanning, even with poor head control" and KT's "yes/no responses [were] clearer and faster". The teacher reported that "their 'yeses' and 'nos' are so much faster". To determine if this was accurate, a calculation was made using data available in the interaction transcripts.

The calculation noted the time code from the moment the child signalled they had 'something to say' to the moment they signalled 'that's all I have to say' for each aided turn taken during two early and two later storybooks of the intervention phase. The duration of each aided turn was divided by the number of

symbols communicated during that turn, to calculate an average time taken to express a single symbol per turn. The average times taken to express a symbol for each turn in a storybook were added together, then divided by the number of turns taken during the storybook to give an average scan speed.

The scan speed result for KT used data collected during ISB:2, ISB:3, ISB:13 and ISB:14. Communicative responsiveness, attention and participation during the first and last intervention sessions were affected by illness and were excluded from this analysis as they were not a fair representation. The calculation for scan speed for DS used data from ISB:1, ISB:2, ISB:14, and ISB:15. DS took nearly 14 mins to express an incomplete message of four symbols during his first baseline storybook, however this turn was excluded from the calculation as it did not occur within the intervention phase. Table 7 displays the results of this calculation and shows that both children significantly decreased the average time taken to express a single symbol over the course of the intervention.

Table 7

Average Time Taken by Each Child to Express a Single Symbol During Early and Later Intervention Sessions (Mins:Secs)

Child	Early sessions	Later sessions
KT	01:31	00:28
DS	02:01	01:16

Caution should be taken when considering these results as although they confirm the perception of the researcher during the study, they do not reflect the length of the scan (i.e., the total number of columns and items scanned to construct the message) or the complexity of the language expressed. For both children, a change in signal or pattern of signals (e.g., yes, yes, yes, no) when scanning often required extra time to perform.

Conveying Meaning.

The children used aided language for multiple purposes during interactions. They used imitation and word order to express themselves.

Functions/Intents.

Interaction transcripts revealed that both children used AAC to express a range of intents including: commenting (e.g., I don't know), requesting action (e.g., hurry up), requesting recurrence (e.g., more), requesting cessation (e.g., stop), giving an opinion (e.g., I think it's nice) greeting (e.g., hello), asking a question (e.g., what's his name?), sharing information (e.g., baby), describing (e.g., lots), interjecting (e.g., uh oh), and protesting (e.g., don't). Both usually selected one or more keyword symbols in context to take a communication turn, although, occasionally both children selected only navigation commands (e.g., oops, or another word, or turn the page, or that's all I have to say) during their message.

Imitation.

During sessions in the intervention phase, DS repeated a total of five comments previously made by the researcher as part of the CAR prompts. All of these were at appropriate moments during the storybook. For example, during the second read-through of *Edward the Emu*, DS expressed more to say/I'm telling a story/descriptions/numbers/lots to take a turn within the CAR prompt given. This comment had been modelled by the researcher the day before. See Appendix F for a full transcription of the co-construction of this message, including the complete scan.

Likewise, during the third read-through of *Thelma the Unicorn*, KT seemed to attempt to describe the colour of Thelma (pink), as the researcher had done when using an AAC model to introduce the book each time. She selected the column containing the symbol 'pink' three times, signaling oops/another word each time she missed the word "pink". Strategically, she expressed not/green before going on to complete her message on another page. While KT did not repeat any previous comments made by the researcher, her messages tended to be longer overall. The field notes documented that her aided turns seemed "conversational" at times as she responded to the comments made by the researcher in the CAR prompt. The following interaction provides an example of a conversational turn between the researcher and KT:

Researcher: more to say/I think it's/don't like/yucky/that's all I have to say about that.

KT: more to say/I think it's/not, don't, can't/that's all I have to say about that.

Researcher: "you think it's not/yucky!"

KT: *smiles*

Word order.

Both children expressed messages using correct word order some of the time. For example, DS expressed uh oh/I think it's/gross, while KT expressed uh oh/ don't touch.

Analysis of the qualitative data revealed that from the beginning of the study, KT engaged and interacted less with serious books compared to more humorous books. The field notes documented she often "had lots to say" during humorous books. Overall DS became more interactive as the study progressed, and used more joint attention between the storybook, the researcher and the PODD in intervention sessions compared with baseline.

Summary

This chapter has detailed and described the two main themes that have emerged through analysis and synthesis of both qualitative and quantitative data in response to the research objective to describe the outcomes of a shared reading intervention which incorporates AAC modelling and increased communication partner responsiveness for two children with CPCSN who use PAS to access AAC. The themes that emerged detailed overall positive effects on the children's communication skills, in spite of a number of practical challenges associated with implementing intervention and research with these children. The next chapter will discuss these findings in terms of the literature and implications for clinical practice, as well as the limitations of the study and future research directions.

Chapter Five: Discussion

The aim of this study was to describe the outcomes of a shared reading intervention which included aided language modelling and increased communication partner responsiveness for two children with complex physical, cognitive and sensory needs (CPCSN) who use partner assisted scanning (PAS) to access augmentative and alternative communication (AAC). Although shared reading and aided language modelling interventions have been the focus of earlier investigations with children with complex communication needs (CCN), the present study contributes to the knowledge base in several ways. First, this study explored the effect on the communication skills of children who have CPCSN and use PAS; these children are rarely included in investigations. Second, this study included the use of the PODD communication tool, which is gaining in popularity, particularly in New Zealand and Australia, and has not been used in research as yet.

The study revealed findings relating to the children participating in the intervention, and, the researcher. These were categorized into two global themes: Practical Considerations in Implementing Intervention with these children, which necessitated changes in clinical protocols; and, Effects on Communication Skills, both aided and unaided. While the communication skills of the children with CPCSN who use PAS were the main focus for the study, a change in the researcher's interaction style was also noted. The results will be discussed with reference to existing literature. The two global themes will structure the discussion.

Practical Considerations

Access to communication and education is a human right and care and attention are needed to enable all children to reach their fullest potential (United Nations, 2006). However, there are multiple challenges associated with working with children with CPCSN and consideration is needed to ensure that their learning is maximised.

Health.

Seizures, medications and other health issues are commonly associated with children with complex physical disabilities such as cerebral palsy (Duangdech, Patoomwan, Pookboonmee, Orathai, & Rhem, 2017; Meehan et al., 2017). These

children tend to have a lower health related quality of life (Lai, Chen, Chen, Chan, Shen & Wu, 2017) and spend more than average time in hospitals and attending medical appointments (Meehan et al., 2017). Each of the health-related factors noted in the results had an impact on the children's responsiveness within the storybook reading sessions, with seizures documented repeatedly as having a detrimental effect. Health factors also affected the children's availability to participate in a session on any given day. Both children were absent from school for appointments that were directly related to their medical needs (e.g., Botox appointments) and sessions were often interrupted for medications. Disruptions to reading sessions and reduction in instructional time has been shown to be directly related to reduced performance gains in children with multiple disabilities (Snart & Hillyard, 1985).

Physical needs.

Other factors pertaining to the physical needs of the children, such as the time taken to get into and out of equipment and personal cares, affected the scheduling, availability for, and length of sessions. These factors are often associated with a reduced proportion of the school day available for instruction (Snart & Hillyard, 1985). Discomfort, related to structural and functional physical needs, also had an impact on attention and concentration within sessions for both children. It is very common for children with severe physical impairments to experience significant pain. This may be related to their spasticity and because they are unable to move position easily or relieve pressure or stiffness in their body (Adolfsson, Johnson, & Nilsson, 2018). Pain affects fatigue levels and causes children to be distracted and reduce their participation in school activities (Adolfsson et al., 2018). Communication exchanges, particularly for children who require alternative access to AAC take time, and cognitive and physical effort, and may be easily disrupted by pain or discomfort. These physical complications combined with health factors contributed to some of the protocol changes that became necessary as the study progressed.

Protocol changes.

The amount of time needed by the children to initiate a turn, complete a scan and construct a message was longer than expected at the outset of the study and these were factors that affected session protocols, especially the length of the sessions. Some of these changes were an attempt to simplify and facilitate the research itself. Reducing the length of each session, by halving the number of storybooks read and standardising the number of CAR prompts to five per storybook, mitigated some of the scheduling conflicts and supported the children to have quality interactions.

The increase in the wait time given by the researcher when she determined that the children needed it resulted in changes to the clinical protocol at times. This was as a result of the researcher becoming more responsive to the needs and communication behaviours of the children. Increased responsivity has been shown to have a positive effect on intentional communication behaviour and aided communication measures (Harwood et al., 2002; Koppenhaver et al., 2001; Ogletree & Pierce, 2010; Seigel and Cress, 2002; Skotko et al., 2004; Yoder & Warren, 1998).

There are multiple challenges when working with children with disabilities, whether in the school environment or at home, but the complexity of children with severe physical needs must be taken into consideration when planning and implementing AAC intervention (Rassafiani et al., 2012; Sawyer et al., 2011; Snart & Hillyard, 1985). Children with CPCSN will benefit from instructional time that is scheduled to minimise disruptions and distractions, that considers the length of the activity and utilises evidence-based AAC intervention.

Communication Skills

Overall, there was a positive effect on the children's communication skills, both communication frequency measures and other communication skills which emerged from the data. However, these results must be interpreted tentatively and with caution. The implementation of the intervention strategies (the CAR [Comment, Ask, and Respond] prompts, aided language modelling and increased responsiveness), along with the presumption of competence and consequent attributing meaning to the children's behaviours, left no room for them to fail at

becoming more communicative in this context. The effect of the intervention on communication skills will be discussed below.

Aided turn taking.

Although both children made potential initiations during the baseline phase of the study and the researcher responded to several of these for each child, only DS expressed an aided turn (one only). The conditions for the baseline phase were informed by the literature, which shows that children who use augmentative and alternative communication (AAC) are rarely provided with opportunities to engage in shared storybook reading experiences, with adults tending to dominate the conversation space and children having very limited opportunity to participate in extra-textual talk (Kent-Walsh et al., 2010; Light & Kelford-Smith, 1993; Light et al., 1994).

As there were no CAR prompts given during the baseline phase a between-phase comparison of aided turns taken per CAR prompt was not useful. However, once the intervention strategies were implemented both children took at least one aided turn during most of the storybook readings. Previous studies on AAC intervention in storybook reading contexts show similar results, with an increase in turn taking after the intervention was implemented (e.g., Binger et al., 2008; Koppenhaver et al., 2001; Rosa-Lugo & Kent-Walsh, 2008; Sennott & Mason, 2016). This may have been due to the extra wait time provided by the researcher, the use of aided language modelling during the CAR interaction, the researcher's increased responsiveness to all attempts at directing communication towards the children, or a combination of these intervention strategies.

The immediate response to the intervention strategies by both children from the first session (ISB:1 for KT, ISB:2 for DS) suggested that either both children were already developing symbolic turn taking, or that the strategies used promoted the development of this skill (Kent-Walsh et al., 2010). These opportunities and expectations to take a turn not only increased the results for number of aided turns taken and number of symbols communicated, but gave the children opportunities to practice constructing symbolic messages and use aided language expressively regardless of their stage of symbolic development.

Wait time and assigning meaning to atypical and subtle communication behaviours were scaffolds that supported the children to initiate aided turns and co-construct messages. They were given more opportunities to initiate aided language and were positively reinforced for most attempts. The increase in the children's turn taking due to increased communication partner responsiveness aligns with findings in previous research (Bedrosian, 1994; Joginder Singh et al., 2014; Brady et al., 2004;).

The difference in the mean number of aided turns (CAR- plus non-CAR-prompted) taken during new and familiar storybooks suggest that familiar storybooks stimulated more aided language than new storybooks in this study. This is consistent with some existing studies (e.g., Edmister & Wegner, 2015; Liboiron & Soto, 2006) which showed that using familiar storybooks had a larger effect on improving language skills than unfamiliar texts, although contradicts other research (e.g., Koppenhaver et al., 2001; Light et al., 1994) which showed no effect between the two conditions.

There was a wide range in the number of aided symbols used to express messages for both children. KT selected 1-27, and DS 1-12 symbols to create aided messages during their turns, with the numbers including content words or phrases as well as navigation commands (e.g., turn the page, another word, etc.) The findings showed that there was an increase in the average number of symbols communicated (NSC) over the course of the intervention for KT, while, for DS, the average remained stable. The range of NSC was much wider for KT than DS. Both children expressed messages using either only content words (e.g., uh oh, more, etc.), only navigation commands (see above), or a combination of the two (e.g., turn the page/what's his name?).

Both children expressed relatively few messages using a single symbol which contrasts significantly with existing literature (Binger & Light, 2008). Binger and Light (2008) discuss the predominance of single-symbol message productions as one of the more robust findings in nine studies examined for a systematic review on morphology and syntax. Several other studies discuss the difficulties shifting from a single- to multi-symbol message stage in AAC language development (Binger et al., 2008; Binger & Light, 2007; Smith & Grove, 2003). However, these studies generally

include children who are at a symbolic stage of language development. Various reasons are discussed in the literature for the preponderance of single-symbol utterances. These include: efficiency factors - AAC output is slow and the use of short messages and/or reliance on a communication partner to infer meaning from the context are both ways to increase efficiency; a single symbol may represent multiple concepts for the AAC user who may not see the need to use multiple symbols to express a message; communication partners often do not provide opportunities for people who use AAC to use multi-symbol messages. They often ask questions which require a single word answer, such as yes/no questions; there may be something fundamental to the AAC system itself, that affects multi-symbol message production. Even typically developing young children have difficulty creating multi-symbol messages using AAC; and finally, the asymmetry between input and output modes for people who use AAC mean that they do not experience nearly enough linguistic input in the expressive mode they are expected to use (Binger & Light, 2007; Trudeau, Sutton & Morford, 2014).

It is difficult to explain the findings of this study in light of what is known about typical AAC use. Possibly the children in this study were afforded an opportunity to babble expressively while they developed an understanding of the navigational commands and operational skills needed to construct a message and terminate a turn. Or they may have been at a later stage of expressive symbolic language development and simply required the opportunity to access AAC. Given the number of messages that consisted of only navigation commands and the description of their receptive language afforded by the PPVT scores at the beginning of the study, the former explanation seems more likely.

PAS as an access method requires the communicator and partner to co-construct messages. For the communicator to develop autonomy, they must have control over which symbols to select, in which order and on what page. To do this, they must have a way to indicate they want to say another word, a way to navigate to the page they want, and a way to signal that they have finished their message. These operational or navigational commands are extra to the content but vital to the construction of a complete and autonomous message. The features of a PODD communication book that has been designed for PAS mean that there will usually

be more than one symbol selected to construct a message. The final symbol in a message is usually that is all I have to say about that to indicate to the communication partner that the communicator has finished their turn. In this study the children sometimes did not select this symbol, but it was clear from the context that they had finished their message (e.g., they signalled 'no' to that is all I have to say and then also signalled 'no' when asked if they had something else to say). In almost every message constructed with two symbols that is all I have to say about that was the final symbol selected.

Spontaneous initiations.

Spontaneous initiation by the children, or unaided communication behaviours which were interpreted by the researcher as potential initiation signals for an aided turn, occurred at any time during the storybook reading sessions. The number of unaided communication behaviours which elicited a response from the researcher and converted to an aided turn were measured, with patterns between phases differing for each child. KT performed more unaided communication behaviours in the baseline phase compared to the intervention phase. In contrast, DS used very few unaided communication behaviours during baseline and significantly more during the intervention phase.

The data on KT's use of idiosyncratic unaided communication behaviours contrasts with much of the literature which describes patterns of interaction between children with physical disabilities and their caregivers (Light, et al., 1994; Light, Collier, & Parnes, 1985a). These studies suggest that children with physical disabilities tend to be passive communicators and take relatively few unaided turns, which did not seem to be the case with KT.

KT's unaided communication behaviours during baseline could be manipulated by the researcher, with a brief pause or eye-contact eliciting a vocalisation, turn to look at, or a smile or giggle from KT. During the intervention phase the data show that KT made fewer unaided communication turns as her aided turns increased. Possibly she could not (maybe due to fatigue), or did not see the need to, take as many unaided communication turns once she was given the opportunity to take aided language turns.

DS's behaviours in the baseline phase were more aligned with findings from studies examining communication behaviour patterns between children with physical disabilities and their caregivers (Light et al., 1994; Light, Collier, & Parnes, 1985). He tended to be passive, took very few unaided turns and exhibited difficulties with joint attention. Instead, he focused on the storybook in quiet concentration. In contrast to this, DS made, on average, more than eight times as many unaided communication behaviours during the intervention phase when he was provided with structured interaction prompts, wait time and aided language modelling. DS appeared to need the extra time to organize his body to change focus for joint attention. The importance of providing wait time for children with physical disabilities has been well documented (Joginder Singh et al., 2014; Koppenhaver et al., 2001; Mathis et al., 2011; Skotko et al., 2004).

Increased responsiveness was a key component of the intervention strategy, both generally and as part of the CAR prompt, along with the use of aided language modeling. The Response component of the CAR prompt focused on adding an extra aided language model and repeating and expanding the child's message. The increase in general responsiveness targeted responses to the children's unaided communication behaviours. This was an intentional component of the intervention strategy as previous research suggests it is an effective way to scaffold and support language development at any developmental stage (Binger & Light, 2007; Binger et al., 2011; Harwood et al., 2002; Romski et al., 2002). The quantitative results showed that the researcher became more responsive to the children's potential initiations of aided language and at the same time the qualitative analysis revealed that she became more attuned to their unaided communication turns.

There were several ways the researcher changed her responses to the children which supported their communicative expression. She increased the wait time given in the Ask component of the CAR strategy beyond what was originally planned; responded to different yes/no signals from the children as they used them more; and, increased her responsiveness to unaided intentional communication turns.

Efficiency.

As described in previous research, children with complex physical needs require a lot of wait time or expectant pausing (up to 45 seconds) to move their bodies to access AAC and communicate (Koppenhaver et al., 2001; Mathis et al., 2011). This wait time provides them opportunities to practice the motor skills they require for access and this allows them to develop automaticity. Several authors (Burkhart, 2016; Porter, 2012; Treviranus & Roberts, 2003) discuss the need to invest large amounts of time to practice, but it is unclear exactly how much time an individual with physical impairments needs to develop intelligible and reliable signals to access AAC using PAS. Both children in this study became more adept at their signaling behaviour within several weeks of up to three times weekly intervention sessions. As KT and DS became more proficient at signalling their accept and reject responses using the yes/no symbol cards they both developed the more conventional gestures of a head nod and shake. The symbols had been positioned to encourage the conventional gestures and the children began relying on these movements after several weeks. PAS provided them with a context to develop and practice this skill (Burkhart, 2016; Treviranus & Roberts, 2003).

Along with the development of intelligible signaling behaviours, both children developed a much faster scan speed over the course of the intervention. KT reduced the average time taken to select a single symbol at the end of the study to a third of the time she took at the start, while DS almost halved his average time. There may be a relationship between the speed of symbol selection and the average number of symbols selected during an aided turn, particularly for KT, although both children did not necessarily select more symbols when they were scanning faster on any given turn. With the development of effective, efficient and minimally fatiguing motor skills to operate AAC, children can concentrate on the linguistic or social aspect of their message (Burkhart, 2016; Light and McNaughton, 2014).

Conveying meaning.

It is possible that the use of the PODD communication book supported the language expression of the two beginning communicators in this study. As the children developed operational skills to access the PODD via PAS they displayed the

use of a range of communicative functions to comment, interject, share opinions, ask questions, greet, describe, protest, etc. The 'one-page opening PODD' layout is designed to scaffold language expression with predictably associated core and fringe vocabulary on each page. It has pragmatic branch starters which provide pathways to pages of vocabulary commonly required to express a range of functions and which compensate for the reduced use of supports, such as gesture or intonation, which are not readily available to children with physical disabilities (Porter, 2012).

The use of the pragmatic branch starters by both children gave the researcher context for the message as well as content. Both children chose to share information that was not necessarily storybook related or context specific within the sessions and a pragmatic branch scaffold helped the researcher respond contingently. The inclusion of navigation commands within the PODD supported the children to control movement between the pages, and develop autonomy when constructing their messages (Porter, 2012).

Although neither child constructed messages using correct word order all the time, the use of the pragmatic branch starters allowed the researcher to make a 'best guess' as to the meaning and intent of their messages and respond contingently. Contingent responsiveness to symbolic language has been associated with more effective facilitation of both typical and atypical language development (Dunst & Lowe, 1986; Deveney et al., 2016, Madeiros & Cress, 2016).

Summary

This chapter has discussed the global themes that emerged from the data with reference to existing literature. The findings suggest that an AAC intervention within a shared reading context had overall positive effects on several aided and unaided language skills for the two children who participated, but that there were several challenges to take into consideration during implementation. The next and final chapter concludes this study with a discussion of the limitations, directions for further research, and clinical implications for practitioners who work with children with CPCSN who use PAS to access AAC.

Chapter Six: Conclusion

This chapter summarises the purpose, rationale and findings for this research which aimed to describe the outcomes of a shared storybook reading intervention incorporating aided language modelling and increased communication partner responsiveness with two children with complex physical, cognitive and sensory needs (CPCSN) who use partner assisted scanning (PAS) to access augmentative and alternative communication (AAC). The trustworthiness and limitations of the study will be discussed. Thoughts on future research and implications for clinical practice will also be explored.

Purpose, Design and Rationale

For children with CPCSN who are beginning communicators, access to quality learning opportunities and communication is difficult, time-consuming and reliant on the beliefs and practices of others. A review of the existing literature on effective AAC intervention reveals a paucity of research which includes these children, however it does suggest that there are strategies and techniques that have the potential to be beneficial.

This research study has filled a gap in the literature by describing the outcomes of a shared reading intervention which incorporated aided language modelling and increased communication partner responsiveness for two children with CPCSN who use PAS to access AAC. Quantitative and qualitative data were collected to provide a rich description of the process and outcomes of the intervention. The results of the study suggest that there were many positive effects on the communication skills of the children and several practical issues that needed consideration when working to provide intervention and learning opportunities.

The two children in this study increased the number of aided turns, the number and intelligibility of their unaided behaviours and reduced the time taken to select symbols. Both children used aided turns to express a range of communicative intents. They used a varying number of symbols in each turn and chose many different symbols to construct messages. The researcher also noted changes in her behaviour which had a positive effect on the communication opportunities provided to the children.

The children made progress in their communication skills within a relatively short period of intervention and these improved skills transferred to the classroom. The teacher reported that she noticed a difference in the children's engagement and participation in class, with an increase in initiation of aided language and efficiency of scanning as their intelligibility of unaided behaviours and speed improved.

However, in the process of providing the intervention there were several practical challenges to overcome. The health and physical needs of the children meant that their availability for sessions was limited and the length and complexity of the intervention needed to be reduced as a result. Their levels of comfort and fatigue affected their responsiveness and capacity to participate.

Quality of Research

There are several strategies available to the researcher to enhance the quality of both quantitative and qualitative research. Inter-observer agreement scores examine agreement and discrepancies between the scoring of quantitative data by two observers. Trustworthiness measures are undertaken to ensure qualitative research is credible, transferrable and confirmable (Mills, 2014).

Inter-observer agreement.

A research assistant (trained SLT) viewed approximately 30% of the baseline and intervention sessions to check transcriptions of aided communication turns and score unaided communication acts and researcher responses. Inter-observer agreement was calculated on all communication frequency measures: the number of aided turns; NSC; frequency of unaided communicative acts; number of unaided communication acts that initiated aided language; and the number of researcher responses.

Inter-observer agreement was low for the children's unaided communication acts during baseline. Measures were reliable during the intervention phase. The issues with interpreting and scoring the children's unaided communication intents and acts during baseline was one of the reasons the project changed from a single-subject, experimental design to a case study soon after it started.

Trustworthiness.

Mills (2014) identifies three aspects of trustworthiness that enhance the quality of qualitative research: credibility, transferability, and confirmability. Credibility refers to how the researcher considers the complexities of the study and establishes that the findings are plausible (Mills, 2014). Triangulation of data sources are used to establish credibility (Mills, 2014). In this research triangulation was used across data sources (interview, observations, field notes, communication frequency measures) and analysis methods (deductive and inductive analysis). Findings from the teacher's interview supported the results from the communication frequency measures and the analysis of the observations and field notes, for example, "their communication was way faster than it (was) and more easily understood than it ever had been".

Transferability refers to the belief that the goal of qualitative research is not to develop a single 'truth' that allows generalization to a larger group or population, but to study a phenomenon in a bounded context (Mills, 2014, Yin, 2014). This is especially true of case study research which seeks to describe a specific case defined within boundaries (Yin, 2014). The aim of this research was to describe the outcomes of a dialogic shared reading intervention which incorporated aided language modelling and included increased communication partner responsiveness with two children with CPCSN who use PAS to access AAC and not to generalize the findings to all children with CPCSN who use PAS. The descriptive detail provided in this case study will provide the reader with enough information to identify with the context and make comparisons with other potential contexts (Mills, 2014). The participants and practical issues were described in some detail to allow readers to fully understand the context and make possible comparisons where and when appropriate.

Qualitative research displays confirmability when the data that is collected is objective or neutral (Mills, 2014). The two main strategies for increasing confirmability are triangulation of the data and reflexivity of the researcher. Triangulation of data sources has been discussed above. Reflexivity, whereby the researcher acknowledges and reflects on his or her own biases and partiality towards the research process, was undertaken throughout the study.

I had a relationship with both children and their teacher as they attended the school where I was employed. This relationship undoubtedly influenced the genesis of the study and may have affected both the communication outcomes and the findings relating to the practical challenges associated with implementing the intervention. I undertook several practices to display reflexivity. I clearly and explicitly positioned myself to the participants' families from the start and throughout the study. I also had ongoing discussions with, and input from, my supervisors to ensure that the findings resulted from the data and not my own bias.

Limitations/Challenges

Despite the quality of the research there were inevitably some limitations/challenges which must be considered. These related to the social validity of the intervention; some aspects of the methodology of the research design including changes to the clinical protocol, reliability issues and lack of maintenance data; and presuming competence during interpretation of unaided communication behaviours.

Social validity.

The intervention was carried out by the researcher who withdrew the children from their regular classroom for the storybook reading sessions. Kadaravek and Justice (2002) advocate for the need to provide intervention in naturalistic environments as much as possible, to support interactions in real life contexts and create optimal meaning making situations for language development. While shared storybook reading is considered a natural and authentic context for intervention, to withdraw children from their regular classroom and assess their interactions with an irregular communication partner is not. The decision to carry out the research under these conditions however, was deliberate. The research was exploratory and the researcher knew it was likely to be complex, and therefore the decision was made to remain as close to the intervention as possible.

The application of these intervention strategies in groups or in class settings, and with other adults, such as teachers, teacher aides and parents, as the 'agent' of the intervention warrants further investigation. There are a number of studies that have successfully targeted coaching and instructional interventions delivered by

teachers and caregivers (see Douglas, 2012 for a review), which may be implemented with this dialogic reading strategy. Furthermore, research utilising other contexts for intervention, such as dressing, mealtimes and play, would also provide useful information for the field.

Methods and design.

As the study progressed it became clear that there was a need to change several clinical protocols including a reduction in the number of storybooks read and the number of CAR prompts given within storybooks. The issues which contributed to these necessary adjustments emerged as findings from the study and added to the understanding of the case. They would however, need to be taken into consideration by researchers wanting to undertake purely quantitative research with this population.

One of the significant challenges in this study was reliably measuring the children's unaided communication behaviours during the baseline phase. This contributed to the decision to change the study design from single-subject experimental design to a case study. There were several contributing factors to the low inter-observer reliability for this measure. Firstly, the children's behaviours were more difficult to interpret during baseline storybooks. As noted in the results, joint attention, which helps signal intent and the direction of communication acts, increased during the intervention phase for both children. Secondly, reliability was possibly easier to attain during intervention because the researcher presumed that the children were making unaided communication acts and responded accordingly. This marking of their behaviour may have made it easier for a second observer to also notice the behaviour. Thirdly, the researcher only provided a single training session along with written instructions for how to interpret and score each measure. The second observer may not have had a clear understanding of the definitions of an unaided communication act. Follow up instructional time with the second observer may have mitigated some of these issues.

Another factor to consider is the order in which new and familiar storybooks were read. For this study, they were assigned in random order rather than following a strict sequence. Although the results suggested a positive effect on language skills

with familiar storybooks, the sequence would need to be controlled more systematically in a future quantitative study.

The length of time between ISB:9 and ISB:10 for KT was longer than originally planned. KT had a four week break between storybook reading sessions due to school holidays, illness and a family event. The decision was made to continue the final storybook readings with her due to the near completion of intervention and the unexpected length of time to complete data collection overall.

Maintenance data.

One of the major limitations of this study is the lack of maintenance data and limited generalisation data. The limited scope of the study meant that this information was not collected as part of this project. Existing literature, reviewed in chapter two, often includes information on maintenance and generalisation and suggests that there are wide and ongoing benefits for children who participate in AAC intervention. It is unknown whether the improved communication skills of the children who participated in this study generalized to other settings to the same degree and/or if they are long-term outcomes. Further research on the long-term outcomes for children with CPCSN receiving AAC intervention is warranted.

Competence.

A further challenge related to presuming competence during interpretation of unaided communication behaviours. This was part of the intervention strategy of responsiveness but made it difficult to 'score' or quantify unaided communication for research purposes. The researcher noted that she could manipulate the number of unaided communication behaviours, particularly with KT in the baseline phase.

Directions for Future Research

While some of the limitations of the present study lead directly to recommendations for future research, several other suggestions will be presented. The presence or extent of auditory or visual processing difficulties experienced by the children in this study is unknown. Given the high correlation between complex physical impairment and other sensory processing needs, it is likely that both children experience some form of visual or auditory processing difficulty. Although they seemed to look and listen with relative ease, it is difficult to objectively assess

their abilities due to the complexity of their needs. Further research including participants who have diagnosed visual and/or auditory impairment would further inform the field about best practice when providing intervention with this population.

The use of a PODD communication tool has not yet been included in peer-reviewed published research. This tool differs from other core-word based systems or voice output dynamic displays in the way it is laid out and its focus on pragmatic scaffolds, particularly in the one-page opening books recommended for use with beginning communicators. The intervention in this research sought to include models of simple sentences using 1-2 core words and basic navigation to reduce the number of page turns as this was presumed to be a variable in maintaining attention and engagement for these children. The proportion of aided language models that were direct, partial or full models attempted to optimise operational and linguistic skill development with no specific recommendations coming from the literature. Further research targeting the amount of navigation between pages, the effect of the pragmatic branch starters on expressive language, the expansion of children's language using PODD, and, the optimal number of direct, partial or full models is warranted.

Clinical Implications

This study compliments the existing body of research which makes recommendations for intervention with children who require AAC to meet their communication needs. There are however, several implications for clinicians practicing with children with CPCSN that have emerged from the findings of this research.

Context.

The use of familiar storybooks elicited more language from the two children in this study and may be beneficial for others who are beginning communicators and require PAS access. Also, the use of storybooks with humour and those with a strong rhythm and rhyme appeared to capture the attention of both children even when they did not appear to have the energy to take aided turns. Shared

storybooks should be repeated, fun and engaging to promote attention and receptive and expressive communication skills development.

Communication partner actions.

The CAR strategy, which prompts the communication partner to Comment and wait, Ask or invite a turn, and Respond contingently during shared storybook reading, along with aided language modelling supports children with CPCSN to develop communication skills. The integration of these strategies into classroom storybook reading provides a structure for interactions and ensures that communication partners are providing opportunities and expectations for children with CPCSN to initiate and take aided turns. Communication partners also need to ensure that they provide enough wait time and pause expectantly.

The use of more conventional gestures to signal yes or no, i.e., a head nod or shake, during PAS improved the efficiency of the child's scan and the construction of aided messages. Where possible, the communication partner should encourage conventional gestures for accept/reject, or yes/no signaling.

Working with children with complex needs is challenging and progress is often slow. Persistence and patience despite the challenges is needed to provide these children with ongoing support to learn and develop communication skills.

Team approach.

A team approach is necessary when working with children with CPCSN to ensure they are as comfortable as possible and ready to learn, attend and concentrate. The expertise, knowledge and support of the physiotherapist and occupational therapist to the physical and sensory comfort and well-being of children with CPCSN cannot be underestimated.

Final Thoughts

Children with CPCSN who use PAS to access AAC face many obstacles to developing receptive and expressive language to meet their daily communication requirements. Such children rely on the support of a skilled team of communication partners to facilitate their skills across the social, linguistic, operational and strategic domains of AAC use. Storybook reading provides a natural context for AAC intervention and communication partner strategies including a dialogic reading CAR

prompt, aided language modelling and increased responsiveness have been shown in this research to increase the expectation and opportunities provided for children with CPCSN and to support them to learn and develop important communication skills.

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Appendices

Appendix A: PODD Image Permission

PODD images Inbox ×

Helen Bayldon <[redacted]> 28 Nov 2018, 11:22 (7 days ago)
to Gayle, info, Sally

Hi Gayle,

My name is Helen Bayldon, and I am currently completing my Masters in SLT under the supervision of Sally Clendon at Massey University in Auckland. I have been undertaking research with two children who use PODD and partner assisted scanning in a shared reading context to look at the outcomes of AAC intervention with children with complex needs

Please could I have your permission to use several images of PODD pages in my thesis? I believe the images will help the reader unfamiliar with PODD, understand the process of partner assisted scanning.

If you have any questions or concerns, please contact me or Sally,

Thanks and kind regards,
Helen

Helen Bayldon <[redacted]> 28 Nov 2018, 21:15 (7 days ago)
to Gayle, info, Sally

Hi again Gayle,

Sally has asked me to get in touch again to let you know that I'd only like to use page 1a of the 20 PAVS expanded functions at this stage. We're talking through the images I want to use tonight.

Thanks,
Helen

•••

Gayle Porter 30 Nov 2018, 17:55 (5 days ago)
to me

Hi Helen,

Sorry for the delay responding I am currently in Scandanavia doing lots of PODD trainings and the emails can get a bit out of control while I am traveling. You have my permission to use the images.

Best wishes

•••

Appendix B: Parent Information Sheet

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

THE IMPACT OF DIALOGIC READING STRATEGIES ON THE EARLY COMMUNICATION SKILLS OF CHILDREN WITH COMPLEX PHYSICAL, COGNITIVE AND SENSORY NEEDS

Tena koe whanau whanui,

Tihei mauri ora!

E ngā mana, e ngā reo, e ngā hapu, e ngā iwi, e ngā iwi, e ngā hau e wha, e rau rangatira mā

Tēnā koutou, tēnā koutou, tēnā koutou katoa

The researcher: I am carrying out a research project, as part of my Masters of Speech Language Therapy at Massey University under the supervision of Dr Sally Clendon and Dr Elizabeth Doell. I am currently employed as a Speech-Language Therapist at [redacted] School.

Background: My project will explore the effect of a shared story-reading intervention on the early language skills of children with complex needs. Shared story-reading interventions have been shown to be effective in supporting the language development of children who speak, as well as with children who use Augmentative and Alternative Communication (AAC). The study will examine the impact of the reading intervention on early language skills, such as turn taking and message length, with children who use partner assisted scanning to access their AAC.

I want to study three children who use AAC, and have approached the school principal of [redacted] School to ask permission to recruit from within the school. This approval has been granted, therefore this Information Sheet and Consent Forms have been sent to you from the school. If you give consent for your child to participate, I will need to read their school reports and conduct a formal speech-language therapy assessment, to describe their receptive language level.

Please would you would consider your child participating in this study.

Benefits: If multiple parents give their consent, then the children who participate will be randomly selected. There will be two benefits to you or your child as a result of participating in the study. Firstly, you will receive a brief report on your child's performance during the study, and a summary of the final outcome of the project. Also, your child will be involved in a positive intervention that may support their early language development.

The Project: The project will start in Term 1, and may continue in Term 2 if necessary. It will involve 2 stages.

- Stage 1: Reading sessions without intervention. Your child will be read to 3 times a week for approximately 15 minutes with no intervention strategies. This stage will take 1, 2 or 3 weeks, with the number of weeks being assigned to your child randomly. The reading sessions will take place in a quiet room, during the school day.
- Stage 2: Reading sessions with intervention. During these sessions your child will be read to by the researcher, who will use the intervention strategies each time. These sessions will take between 20 and 40 minutes each. The sessions will occur 3 times a week, during the school day. This stage will take 5 weeks, for a total of 15 sessions.

All sessions in both stages will be taken by the researcher. All sessions in both stages will be videotaped.

If your child becomes tired, or upset, or indicates that they do not want to participate at any time during the study, the session will be stopped. If your child is absent from school the study will continue on their return. If they are absent for more than three weeks, they will be withdrawn from the study.

The Results: When the project is finished, findings from the study may be presented to staff at school, at international conferences, and/or published in journal articles. The information shared will not include names or any identifying features of any of the children.

Please would you consider giving permission to use video of your child for training purposes, either within the school, and/or at external conferences.

A summary of the research findings will be sent to you and [redacted] School. The data collected will be kept for 5 years following the completion of the final publication. When disposed of, the Massey University confidential waste service will be used for printed materials, and film will be wiped.

Your rights: You are under no obligation to accept this invitation. If you chose for your child not to participate, there will be no impact on their regular speech-language therapy provision at school. If you decide to participate, you have the right to:

- Withdraw from the study up to the time of data analysis and have any data pertaining to your child destroyed.
- Ask any questions about the study at any time during participation to the researcher (Helen Bayldon), and/or her supervisor (Dr. Sally Clendon).
- Provide information on the understanding that your or your child's name will not be used unless you give permission to the researcher.
- Be given access to a summary of the project findings when it is concluded.

If you think you might be interested in being part of this project, please complete the attached consent forms and demographic information form, and return it to school by Monday, 19 Feb, 2018.

Project Contacts: This study is under the supervision of Massey University, not [redacted] School. If you have any questions about this project, you may contact the school principal ([redacted], ph: (09) [redacted]).

If you have any questions relating to the project, please call Helen Bayldon on 027 613 0550 or Dr. Sally Clendon on (09) 414 0800 Ext. 43537.

Committee Approval Statement

This project has been reviewed and approved by the Massey University Human Ethics Committee: Northern, Application NOR 17/49. If you have any concerns about the conduct of this research, please contact Dr Ralph Bathurst, Acting Chair, Massey University Human Ethics Committee: Northern, telephone 09 414 0800 x 43404, email humanethicsnorth@massey.ac.nz.

Thank you for considering this project.
This information sheet is for you to keep

He aha te mea nui o te ao,
What is the most important thing in the world?
He tangata, he tangata, he tangata
It is people, it is people, it is people.
He tamariki mō apōpō.
The children of the future

Helen Bayldon
Masters Student
Speech and Language Therapy
Massey University

Appendix C: Revised Book List.

KT: Baseline and Intervention.

Session	New	Author	Familiar	Author
B1	Busting	Aaron Blabey	The Way Back Home.	Oliver Jeffers
B2	Saturday Night at the Dinosaur Stomp	Carol Diggory Shields	The Way Back Home.	Oliver Jeffers
B3	A Squash and a Squeeze.	Julia Donaldson	The Way Back Home.	Oliver Jeffers
I1	The New Pony.	Heather Amery & Stephen Cartwright	Pig the Fibber.	Aaron Blabey
I2	The Very Brave Bear.	Nick Bland	Pig the Fibber.	Aaron Blabey
I3	The Gruffalo.	Julia Donaldson	Pig the Fibber.	Aaron Blabey
I4	Spider.	Jackie Robb & Berny Stringle	Edward the Emu.	
I5	The Cloudspotter.	Tom McLaughlin	Edward the Emu.	
I6	What Do They Do With All the Poo, from All the Animals at the Zoo?	Anh Do	Edward the Emu.	
I7	Hold on Tight.	Sara Acton		
I8	The Father who had 10 Children.	Bénédicte Guettier		
I9	Mrs Wishy Washy's Farm.	Joy Cowley		
I10			Thelma the Unicorn.	Aaron Blabey
I11			Thelma the Unicorn.	Aaron Blabey
I12			Thelma the Unicorn.	Aaron Blabey
I13	Piranha's Don't Eat Bananas.	Aaron Blabey		
I14	How to Catch a Star.	Oliver Jeffers		
I15	Baa Baa Smart Sheep.	Mark and Rowan Sommerset		

DS: Baseline and Intervention.

Session	New	Author	Familiar	Author
B1	Busting	Aaron Blabey	The Way Back Home.	Oliver Jeffers
B2	Saturday Night at the Dinosaur Stomp	Carol Diggory Shields	The Way Back Home.	Oliver Jeffers
B3	A Squash and a Squeeze.	Julia Donaldson	The Way Back Home.	Oliver Jeffers
B4	The Baby BeeBee Bird.	Diane Redfield Massie	When the Dragons Came.	Naomi Kefford & Lynne Moore
B5	When a Dad Says "I love you".	Douglas Wood	When the Dragons Came.	Naomi Kefford & Lynne Moore
B6	Penguin	Polly Dunbar	When the Dragons Came.	Naomi Kefford & Lynne Moore
I1	The New Pony.	Heather Amery & Stephen Cartwright	Pig the Fibber	Aaron Blabey
I2			Pig the Fibber	Aaron Blabey
I3			Pig the Fibber	Aaron Blabey
I4			The New Pony.	Heather Amery & Stephen Cartwright
I5	The Very Brave Bear.	Nick Bland		
I6	The Gruffalo.	Julia Donaldson		
I7			Edward the Emu.	Sheena Knowles
I8			Edward the Emu.	Sheena Knowles
I9			Edward the Emu.	Sheena Knowles
I10	Spider.	Jackie Robb & Berny Stringle		
I11	The Cloudspotter.	Tom McLaughlin		
I12	What Do They Do With All the Poo, from All the Animals at the Zoo?	Anh Do		
I13			Thelma the Unicorn.	Aaron Blabey
I14			Thelma the Unicorn.	Aaron Blabey
I15			Thelma the Unicorn.	Aaron Blabey

Appendix D: Lesson Plan Baseline

BASELINE Name: **Date:** **Text:**	
	Teaching sequence
Before reading	"We're going to read a story". Show the storybook to the participant. Read the title. "This book is called … Let's read it."
During reading	Begin reading the storybook with clear, prosodic intonation. If the participant obviously initiates communication (see below for individual methods of initiation) stop and ask, "Do you have something to say?" and then wait up to 3 seconds for a response: If the participant responses affirmatively, the partner scans through PODD until they signal taihts, then recap their message verbally. The partner then responds contingently to their message verbally. If the participant responds in the negative, the partner replies "OK" and continues reading.
After reading	Say "The book has finished." Close the storybook and put it down. Read the second story for the session in the same manner as above. Complete the session by saying "We've finished reading now. Let's get you back to class."

Key to PODD abbreviations:

Mts = more to say
Itys = I'm telling you something
Ttp = turn the page
Taihts= that's all I have to say

Typical gestures for initiation of a communication turn:

KT:

- vocalization and sustained eye contact with communication partner,
- vocalization and repeated eye gaze to PODD and back to communication partner

DS:

- vocalization and sustained eye contact with communication partner,
- vocalization and repeated eye gaze to PODD and back to communication partner
- upper limb movement directed towards PODD

Appendix E: Lesson Plan Intervention

INTERVENTION Name: **Text:**	**Date:**
	Teaching sequence
Before reading	"We're going to read a story". Show the book to the participant. Read the title. Make a comment using the participant's AAC about the book. E.g., label the subject of the book, e.g., "This book is about a monster" (mts/itys/ttp/characters/monster/taihts).
During reading, CAR strategy with AAC.	Begin reading the book with clear prosodic intonation. Make Comments on every 3rd to 4th page of the story, using PODD to model, and prefacing each comment with a model of the participant's initiation gesture (see below for individual gesture) and the words "I have something to say". After each Comment, pause silently with an open body posture, and facial expression that encourages or invites the participant to take a turn, for up to 10 seconds (count slowly in your head). Any time the participant initiates communication (see below for individual gesture for initiating) during the storybook reading, stop and ask, "do you have something to say?" and then wait quietly for their response. If the participant responds affirmatively, partner scan their AAC until they express that is all I have to say, then recap their message verbally. The partner then responds contingently using a direct model with PODD. Pause again for up to 10 seconds after responding. If the participant responds in the negative, reply "OK" and continue reading. If the participant does not initiate aided communication during this pause, the partner will model and verbally reference a possible way for the participate to initiate, and then model a further comment – taking a turn on behalf of the student. E.g., "I look at the PODD, I have something to say, yes. The sheep is not here". Continue reading the book.
After reading	Say "The book is finished" using PODD to model. Close the storybook and put it down. Pause silently with an open body posture, and facial expression that encourages or invites the participant to take a turn, for up to 10 seconds (count slowly in your head). If the participant initiates communication (see below for individual gesture for initiating), stop and ask, "Do you have something to say?" and then wait silently for their response. If the participant responds affirmatively, the partner scans their PODD until they signal taihts, then recaps their message verbally. The partner then responds contingently using a direct model with PODD. Pause again for up to 10 seconds after responding.

	If the participant responds in the negative, reply "OK" and either: pick up the next book and read it following the same method as above; or complete the session by saying "We've finished reading now. Let's get back to class." If the participant does not initiate aided communication during this pause, the researcher will respond OK" and either: pick up the next book and read it following the same method as above; or complete the session by saying "We've finished reading now. Let's get you back to class."

Key to PODD abbreviations:

Mts = more to say
Itys = I'm telling you something
Ttp = turn the page
Taihts= that's all I have to say

Typical gestures for initiation of a communication turn:

KT:

- vocalization and sustained eye contact with communication partner,
- vocalization and repeated eye gaze to PODD and back to communication partner.

DS:

- vocalization and sustained eye contact with communication partner,
- vocalization and repeated eye gaze to PODD and back to communication partner,
- upper limb movement directed towards PODD.

Appendix F: Storybook 9 Transcription

Transcription of ISB:9, including 3 pages of Edward the Emu, one full model of a comment and one comment made by DS.

R = Researcher

D = DS

Time		Verbal	Non-verbal
13.51	R	So, remember… Edward has jumped from his pen. And he went to play with the seals. The seals are best anybody can tell. So tomorrow, I'll just be a seal as well.	Holds book up in front of D.
14:05	R		Turns the page
14.08	R	The next morning at 9, when they opened the zoo. The seals were swimming and Edward was too. He dived in the water and he basked in the sun. And he balanced a ball on his beak, just for fun.	
14:26	R	I have something to say.	
14:30 14:38	R	I touch you and I touch my PODD and I look at you.	Touches D's arm, touches PODD, exaggerated look at D.
14:42	R	I have something to say. One of those. Yes. More to say. Yes. I think it's, something's wrong, get my switch, I need the toilet. Yes I think its… Yes. No. No. Yes. Funny.	 Points at symbols in column 1 (C1). Nods head. Points at symbol. Nods head. Turns to section 2. Points at symbols 1n C!. Nods head. Points to symbol. Nods head. Points down C1. Shakes head. Points down C2. Shakes head. Points down C3. Nods head. Points to symbol.
15:13- 15:16	D	*Vocalizes.*	*Smiles and eye contact.*

15:18 15:20	R	Yes. I think it's funny. Oops, a mistake. No. Another word. No. That's all I have to say. Yes. "I think he's... I think it's funny".	 Points to symbol. Head shake. Points to symbol. Head shake. Points to symbol. Head nod.
15.34 15:38 15:40	D D D		*Looks at R, looks at book, looks at PODD.* *Has been resting arm against PODD. Now moves it across PODD. Looks up at R.*
15:43	R	Touching your PODD. Looking at me. Something to say?	Imitates D's movement.
15:50 15:55	D D		*Smiles. Looks down at PODD.* *Looks up at R. Nods head.*
15:56	R	I see your head, and your eyebrows.	Puts down book and places PODD in front of D.
16:11	R	(Whisper voice) More to say, turn the page, I don't know, I need the toilet.	Points to symbols in column 1 (C1).
16:16	D		*Nods head. Looks at R. Smiles. Nods head.*
16:21	R	More to say	Points to symbol.
16:27	D		*Quick head nod.*
16:28	R	I'm going to take that one as a yes. A quick yes.	Turns page to section 2.
16.32 16.34	R R	More to say. I think it's, something's wrong, get my switch, I need the toilet.	 Points to symbols in C1.
16.39	D	*Vocalizes,*	*Smiles, head shake*
16.41	R	I see No.	Shakes head.
16.43	R	(whisper) I'm asking a question, I'm telling you something, I'm telling a story, remember when.	Points to symbols in C2.
16.47	D	*Vocalizes.*	*Smiles. Eyebrows raise several times.*
16.51	R	I'm asking a question.	Points to symbol.
17.01	D		*Head shakes. Looks at no symbol.*
	R R	No. I'm telling you something.	 Points to symbol.
17.08	D	*Vocalizes.*	*Shakes head. Smiles.*
17.11	R	Your head is telling me no. I'm telling a story.	Shakes head. Points to symbol.
17.23	D		*Nods head. Smiles.*

17.24	R	Yes. Telling a story.	Nods head. Turns page to categories page.
17.27	R	It's already happened, it's about now, it's going to happen, it's always happening.	Points to symbols in C1.
17.35	D		*Shakes head.*
17.36	R	I see that no	Shakes head
17.39	R	People, actions, descriptions, day and times.	Points to symbols in C2.
17.53	D		*Looks at yes symbol*.
17.54	R	Yes.	
17.56	R	People	Points to symbol.
18.02	D		*Shakes and nods head.*
18.05 18.11	R	I'm not sure D. You're telling me… yes or no. People.	Repositions D and supports head into midline. Points to symbol again.
18.11	D		*Looks at PODD.*
18.19	R	People.	
18.24	D		*Looks at no.*
18.25	R	No. Actions.	 Points to symbol.
18.33	D		*Shakes head.*
18.36	R	I'm going to take that as a no.	
18.40		Descriptions.	Points to symbol.
18.44	D		*Nods head.*
18.47	R	Oh. Descriptions.	
18.49	D		*Nods head.*
18.50	R	Yes. I see that. You are telling story…	
18.54		More to say, telling a story, descriptions.	Turns to Descriptions page.
18.58	R	Not, see, same different.	Points to symbols in C1.
19.03	D		*Looks away to window and camera (as noisy car goes past outside).*
19.10	D		*Looks at No symbol.*
19.11	R	No.	
19.12	R	Fast, slow, broken, fixed.	Points to symbols in C2
19.20	D		*Looks up at R. Smiles. Slight head shake.*
19.26	R	I see you telling me no.	
19.28	R	New, old, young, loud.	Points to symbols in C3
19.33	D		*Shakes head.*
19.34	R	I'm gonna take that as no(?)	
19.35	R	Colours, shapes, feels, quiet.	Points to symbols in C4
	D		*Looks at PODD.*
19.54	D		*Sneezes*

19.55	R	Bless you.	Wipes D's mouth.
19.59	R	I'm going to ask you that again.	
20.02		Colours, shapes, feels, quiet.	Points to symbols in C4
20.09	D		*Looks at no*
20.12	R	No, telling me no. Numbers, size, weather, turn the page.	Points to symbols in C5
20.29	D		*Head nod/shake? Look at no?*
20.32	R	Hm, I'm not sure. It was an up and a down. Up and an across.	Imitates D's movements.
20.38	R	Numbers, size, weather, turn the page.	Points to symbols in C5
	R		R leans on wheelchair. It rolls backwards a little.
20.43	R	Oop!	Pulls wheelchair forward again.
20.50	R	Numbers, size, weather, turn the page.	Points to symbols in C5
20.56	D		*Head nod?*
21.04	R	Tell me again.	
21.10	D		*Head nod.*
21.11 21.14	R	I'm gonna take that one as a yes. Numbers.	Points to symbol.
21.20	D		*Head nod and looks at yes symbol.*
21.21	R	Yes. Looking at yes. Nodding your head.	Nods head in imitation.
21.24 21.26		Numbers. Telling a story, descriptions, numbers.	
21.31	R	How many, not, all, some.	Points to symbols in C1
21.36	D		*Looks at R and PODD.*
21.51 22.00	R	D. D. You said: more to say, I'm telling a story, descriptions, numbers. How many, not, all, some.	
22.07	D		*Looks at No symbol.*
22.07	R	No.	
22.08	R	More, less, few, lots.	Points to symbols in C2
22.12	D		*Nods head.*
22.13	R	I see you nod.	
22.15	R	More.	Points to symbol.
22.18	D	*Vocalizes.*	
20.20	D	*Vocalizes.*	*Shakes head.*
22.23	D		*Smiles, head shakes.*
22.24	R	I'm seeing a head shake.	Shakes head in imitation.
22.27	R	Less, less than.	Points to symbol.
22.29	D		*Head shake.*

22.30 22.31	R	No. Few	Shakes head in imitation. Points to symbol.
22.36	D		*Head shake.*
22.37	R	No. Lots.	Shakes head in imitiation. Points to symbol.
22.39	D		*Head nod.*
22.40	R		Nods head in imitation.
22.41	R	Telling me about lots.	
22.40	R	Oops, mistake.	Points to symbol.
22.47	D		*Head shake.*
22.50	R	Gonna… you said that no.	Shakes head in imitation.
22.51	R	Another word.	
22.54	D		*Shakes head.*
22.55 22.56	R	No. That's all I have to say.	Shakes head in imitation.
23.06	D		*Nods head.*
23.07	R	Eyebrows are telling me yes.	Imitates D's movement.
23.10	R	More to say, I'm telling a story, descriptions, numbers, lots.	Turns back to page 1a.
23.18	R	Yeah, you're telling me about lots.	
23.19 23.56 24.01	R	More to say, I'm telling a story, descriptions, numbers, lots, oops a mistake, no. another word, this page, no, categories, yes. Categories. Lots… Animals. No, no, no, no, oops, a mistake no, another word, no, taihts. Lots animals. In our story. There are lots of animals in our story.	Points to all symbols and turns pages as necessary to create message from first page. Puts PODD down.
24.31	R		Picks up book.
24.38	R	Lots. Lots of animals.	Turns page.
24.40	R	Well Edward was really enjoying the day, till he overheard someone behind the fence say… the seals are always amusing it's true, but the Lion's the best thing to see at the zoo.	
24.55	R		Turns page.
24.57	R	So that night, when the zookeeper went home to bed, Edward jumped from the pool and he smiled as he said, "The Lions' the best, anybody can tell.	

		But, oh. So tomorrow I'll just be a lion as well.	
25.15	End transcription.		

Appendix G: Transcription Template

Name: Book: Date:

Time code	Vocalisation	Direct gaze towards partner	Smile, laugh, giggle	Head nod/shake for yes/no	Directs gaze towards aided language (yes/no symbols,	Direct gaze towards another object	Comments/Aided language …

Appendix H: Code Book

Represents the inductive coding from the qualitative analysis.

Codes	Definition/Example
Researcher responsiveness measures	Number of responses made by the researcher to the child's unaided communication acts, per storybook and, any observations about factors that may influence this frequency measure. E.g., "touched PODD on his tray but this was not always taken as initiation as it did not seem intentional".
Intelligibility of yes/no response	Change to the signals accepted for yes/no during the scan. Generalisation to classroom. E.g., "yes/no responses clearer and faster."
Scan speed	Time taken to select a single symbol, from start of intervention. E.g., "faster yes/no", "quick to respond."
Functions/Intents	Range of intents expressed with and without pragmatic branch starters. E.g., "messages expressed are conversational."
Imitation	Imitation of previous comment made by researcher. E.g., "repeated utterance from yesterday."
Word order	Use of correct or incorrect word order in multi-symbol messages. E.g., "persevered with a couple of messages today, e.g., hello as he missed it the first time and needed AW to scan the page/column again."
Seizures	Incidence or impact of seizures. E.g., "Lots of seizures today… not her usual self", "had a couple of seizures… less to say"
Medications	Scheduling of sessions as well as effects of medications, and interruption of sessions for medications. E.g., "just had meds… less to say", "interrupted twice for meds and feed".
Other	Susceptibility to coughs and colds, fatigue. E.g., "appeared tired and flushed… had several episodes of gagging… vomited. Session was stopped at this point", "absent all week with a cold and Botox appointment".
Equipment, positioning and comfort	Time taken to transfer into equipment; ill-fitting, new or missing equipment; poor positioning, and comfort. E.g., "KT quiet and soft grunts as mouths hand-splints".
Personal care	Availability of children during the school day; intrusion during sessions for mealtimes; reduced attention and concentration during bowel movements E.g., "session cut short as needed back in class".

Length of session	Reduction in the length of each session; changes to number of books read/session and the number of CAR prompts per storybook. E.g., “The Gruffalo was too long with too many CARs (9)”, “session cut at ~40 mins after first storybook, as needed back in class”.
Wait time	Increase in wait time in response to perceived need during individual sessions dependent on challenges outlined above. E.g., “if I miss his small, quick movements when scanning he takes a long time to make them again”.

Appendix I: Expanded Code Book

Represents the inductive coding from the qualitative analysis plus the communication frequency measures from the deductive quantitative analysis.

Codes	Definition/Example
Aided communication measures	Number of symbols communicated (NSC) per aided turn by each child per storybook; Number of aided turns taken per CAR prompted opportunity, by each child per storybook, and, any observations about factors that may influence this frequency measure. E.g., "seemed very tired today, and no responses or initiations".
Unaided communication measures	Number of unaided communication acts made by each child, per storybook and, any observations about factors that may influence this frequency measure. E.g., "fatigue affected responsiveness." Number of unaided communication acts which converted to an aided turn, for each child per storybook and, any observations about factors that may influence this frequency measure. E.g., "DS doesn't always go on to express a message, but he often initiates".
Researcher responsiveness measures	Number of responses made by the researcher to the child's unaided communication acts, per storybook and, any observations about factors that may influence this frequency measure. E.g., "touched PODD on his tray but this was not always taken as initiation as it did not seem intentional".
Intelligibility of yes/no response	Change to the signals accepted for yes/no during the scan. Generalisation to classroom. E.g., "yes/no responses clearer and faster."
Scan speed	Time taken to select a single symbol, from start of intervention. E.g., "faster yes/no", "quick to respond."
Functions/Intents	Range of intents expressed with and without pragmatic branch starters. E.g., "messages expressed are conversational."
Imitation	Imitation of previous comment made by researcher. E.g., "repeated utterance from yesterday."
Word order	Use of correct or incorrect word order in multi-symbol messages. E.g., "persevered with a couple of messages today, e.g., <u>hello</u> as he missed it the first time and needed AW to scan the page/column again."
Seizures	Incidence or impact of seizures. E.g., "Lots of seizures today… not her usual self", "had a couple of seizures… less to say"

Medications	Scheduling of sessions as well as effects of medications, and interruption of sessions for medications. E.g., “just had meds… less to say”, “interrupted twice for meds and feed”.
Other	Susceptibility to coughs and colds, fatigue. E.g., “appeared tired and flushed… had several episodes of gagging… vomited. Session was stopped at this point”, “absent all week with a cold and Botox appointment”.
Equipment, positioning and comfort	Time taken to transfer into equipment; ill-fitting, new or missing equipment; poor positioning, and comfort. E.g., “KT quiet and soft grunts as mouths hand-splints”.
Personal care	Availability of children during the school day; intrusion during sessions for mealtimes; reduced attention and concentration during bowel movements E.g., “session cut short as needed back in class”.
Length of session	Reduction in the length of each session; changes to number of books read/session and the number of CAR prompts per storybook. E.g., “The Gruffalo was too long with too many CARs (9)”, “session cut at ~40 mins after first storybook, as needed back in class”.
Wait time	Increase in wait time in response to perceived need during individual sessions dependent on challenges outlined above. E.g., “if I miss his small, quick movements when scanning he takes a long time to make them again”.

Appendix J: Ethics Approval

MASSEY
UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

Date: 15 November 2017

Dear Helen Bayldon

Re: Ethics Notification - **NOR 17/49 - The effect of dialogic reading on the early communication skills of children with complex physical, cognitive and sensory needs.**

Thank you for the above application that was considered by the Massey University Human Ethics Committee: **Human Ethics Northern Committee** at their meeting held on **Wednesday, 15 November, 2017**.
On behalf of the Committee I am pleased to advise you that the ethics of your application are approved.

Approval is for three years. If this project has not been completed within three years from the date of this letter, reapproval must be requested.

If the nature, content, location, procedures or personnel of your approved application change, please advise the Secretary of the Committee.

Yours sincerely

Dr Brian Finch
Chair, Human Ethics Chairs' Committee and Director (Research Ethics)

Research Ethics Office, Research and Enterprise
Massey University, Private Bag 11 222, Palmerston North, 4442, New Zealand T 06 951 6841; 06 95106840
E humanethics@massey.ac.nz; animalethics@massey.ac.nz; gtc@massey.ac.nz

Appendix K: Additional Ethics Approval

Subject: Re Ethics application NOR 17/49 – Postgraduate Student Research

Lindsay, Alice <A.Lindsay@massey.ac.nz> Mon, 9 Apr, 10:06

to me, Sally

Dear Helen

Thank you for your request for an amendment to NOR 17/49. The request to seek authorisation to collect some additional data so that if necessary, you can report my findings as a case study is approved.

Best wishes for your project.

Kind regards
Alice

Alice Lindsay
Research Ethics Administrator
Massey University Human Ethics Committee Northern
P O Box 102 904 NSMC AUCKLAND

Appendix L: Principal Information Letter

THE IMPACT OF DIALOGIC READING STRATEGIES ON THE EARLY COMMUNICATION SKILLS OF CHILDREN WITH COMPLEX PHYSICAL, COGNITIVE AND SENSORY NEEDS.

Dear [redacted]

I am undertaking research as part of my Masters of Speech-Language Therapy degree through Massey University, under the supervision of Dr Sally Clendon. I am proposing to study the effect of a shared reading intervention on the early communication skills of children with complex physical, cognitive and sensory needs, and would like to ask for your assistance in recruiting potential participants.

The aim of the intervention will be to support language learning and encourage social interaction in children who are learning to use augmentative and alternative communication (AAC). I will carry out all of the intervention sessions. Components of the intervention will include: use of AAC to provide aided language modelling, commenting on the text and/or related topics; encouraging and inviting the children to communicate; and responding to the children's communication. The study will examine the children's communicative responses (including initiation, turn taking and message length) to determine whether the intervention has a positive effect on early language learning with this population.

I would like to recruit three children to participate in the study from [redacted] School. My plan is to begin the study in Term 1, as soon as parental consent is obtained. The intervention will be carried out over 6-8 weeks. The children will participate in 3 x 20-30 minute reading sessions each week during the school day. Some additional sessions may be needed if children are absent from school.

I will come to school on my non-work days to complete the study, but would like your permission to continue with the project on my regular work days as needed. The potential participants will be part of my regular caseload. I would also appreciate the opportunity to book a small room for use at a regular time each day to complete the study.

Participation or non-participation in this study will not affect regular provision of therapy for the students. This will be made clear to parents in the Information Sheet that they will receive.

If you grant permission, I would also like to ask you to facilitate the process by distributing the Information Sheet to the families of selected students.

I will not name the school or the participants in my thesis, or in any publications or presentations arising from my research. There is a possibility, however, that the school could be identified if people are familiar with me and my workplace.

If you have any questions relating to this project please contact my supervisor, Dr Sally Clendon, on 09 414 0800 Ext. 43537.

Thank you for considering this request for assistance. I am very willing to meet with you to discuss the project and provide more information should you require.

Yours sincerely,

Helen Bayldon,
Masters in Speech-Language Therapy Student,
Massey University

Appendix M: Parent Consent Form

THE IMPACT OF DIALOGIC READING STRATEGIES ON THE EARLY COMMUNICATION SKILLS OF CHILDREN WITH COMPLEX PHYSICAL, COGNITIVE AND SENSORY NEEDS.

CONSENT FORM

This consent form will be held for a period of five (5) years from the date of the study.

I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

Please tick all that apply

- ❑ I give permission for the researcher, Helen Bayldon, to read my child's school reports.
- ❑ I agree for my child to undertake formal Speech-Language Therapy assessment to describe their receptive language.
- ❑ I agree to my child being videotaped.
- ❑ I agree that my child may participate in this study under the conditions set out in the Information Sheet.

Signature _____ Date _____

Full name (printed)_____

Child's name _____

Appendix N: Parent Consent Form Field Notes

THE IMPACT OF DIALOGIC READING STRATEGIES ON THE EARLY COMMUNICATION SKILLS OF CHILDREN WITH COMPLEX PHYSICAL, COGNITIVE AND SENSORY NEEDS.

CONSENT FORM

This consent form will be held for a period of five (5) years from the date of the study.

I wish to collect further information about your child during the research sessions that I am undertaking. This will provide a richer description of the intervention and the effect on his/her behaviour and early language skills. The new information collected will be in the form of field notes based on observations and self-reflections. No names or any identifying features will be shared.

Please tick

- ❑ I give permission for the researcher, Helen Bayldon, to collect field notes based on observations and self-reflections from the research sessions with my child.

Signature _____ Date _____

Full name (printed)_____

Child's name _____

Appendix O: Cultural Consultation Letter

Tihei mauri ora!
E ngā mana, e ngā reo, e ngā hau e wha,
Tēnā koutou, tēnā koutou, tēnā koutou katoa

Kia Ora,

This is to confirm that Helen Bayldon and I have discussed her project and she has asked me to review the following documents listed below in my capacity as Kaumatua Cultural Advisor for [redacted] School and [redacted] School (to be merged as [redacted] School from January 28th, 2017).

I am aware of the research being carried out with the tamariki (children) from these schools: The impact of dialogic reading strategies on the early communication behaviours of children with complex physical, cognitive and sensory needs.

The following documents have been reviewed:

- Parent Information Form
- Parent Consent Form
- Demographic Information Form

With the addition of a greeting in Te Reo to the Parent Information Form, I agree that the recruitment process and data collection are culturally sensitive and appropriate for their target audience.

I wish to extend every success to this project, for the future of our tamariki with complex needs and the development of their language skills.

He aha te mea nui o te ao,
What is the most important thing in the world?
He tangata, he tangata, he tangata.
It is the people, it is the people, it is the people.

Noho ora mai,

Bill Tangariki,
Cultural Advisor,
Kaumatua Cultural Services

Appendix O: Research Assistant Confidentiality Agreement

THE IMPACT OF DIALOGIC READING STRATEGIES ON THE EARLY COMMUNICATION SKILLS OF CHILDREN WITH COMPLEX PHYSICAL, COGNITIVE AND SENSORY NEEDS.

RESEARCH ASSISTANT CONFIDENTIALITY AGREEMENT

I agree to keep confidential all the information provided to me.

I will not make any copies of the data or keep any record of them, other than those required for the project.

Signature: …… Date: ……

Full name – [printed]……