Identifying and Validating Prelinguistic Communicative Forms and Functions in

Children with Developmental Disability

Michelle L. Stevens

Victoria University of Wellington

A thesis

submitted to Victoria University of Wellington

in fulfillment of the requirements for the degree of

Doctor of Philosophy

Victoria University of Wellington

2015

ABSTRACT

While children with developmental disabilities often fail to develop speech, many will nonetheless engage in a range of prelinguistic behaviours. Prelinguistic behaviours include actions such as eye gaze or eye pointing, pointing with a finger, facial expressions (e.g., smile, frown), and body movements (e.g., waving an arm, leg extension). The purpose of this research project was to evaluate procedures for (a) identifying prelinguistic forms in the repertoires of children with developmental disability, and (b) validating the communicative function, if any, of these existing prelinguistic behaviours. This was achieved through a three-phase study involving a total of 10 children with developmental disabilities and their parents. For Phase 1, the author interviewed each child's parent(s) and teacher using a structured protocol; The Inventory of Potential Communicative Acts (IPCA; Sigafoos, Woodyatt, Keen et al., 2000). The IPCA has been used in numerous previous studies to identify prelinguistic behaviours that are interpreted as forms of communication. In Phase 2, the author used informant report to identify and replicate six situations: three in which each participant was reported to communicate a specific function and three in which he/she reportedly did not communicate. The author then compared the children's responses during the clinical trials to the behaviours he/she was reported to use for the targeted function. In Phase 3, the parent replicated the structured trials used in Phase 2 to determine whether participant performance varied relative to communicative partner. Findings from this study provide evidence to support the validity of the IPCA as an interview protocol for identifying potential communicative acts in children with developmental disability and severe communication impairment. The comparisons made between the reported communicative behaviours used for each function revealed both similarities and differences across children. The results also provide evidence that children with severe communication impairment and developmental disability are using similar behaviours to communicate specific functions across different environments and with different communicative partners.

ACKNOWLEDGEMENTS

DECLARATION BY THE AUTHOR

This thesis is composed of my original work conducted for this PhD degree under supervision at Victoria University. No part of it has been previously submitted for another degree or diploma. Work by other authors has been duly referenced in text and contribution by others has been clearly stated.

Ethical approval for all three of the studies was gained through the Victoria University of Wellington Faculty of Education Ethics Committee. The ethical approval letter is included in Appendix A.

Input and feedback were received from the author's primary supervisor, Professor Jeff Sigafoos, and other members of a cohort team supervised and employed by Professor Sigafoos. However, the studies presented in the current thesis were solely the independent work of the author, with assistance in conceptualization, data analysis, interpretation of results, and editing of chapters from Sigafoos and secondary supervisors Vanessa Green and Flaviu Hodis.

The author reports no conflicts of interests. The author takes sole responsibility for the content and writing of this thesis.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

Developmental Disability

The term developmental disability (DD) refers to a class of disorders characterized by chronic and severe intellectual and/or physical impairment that manifests before age 22 (Developmental Disabilities Assistance and Bill of Rights Amendment, 2000). The term encompasses (a) autism spectrum disorder (ASD), (b) intellectual disability (ID), and (c) cerebral palsy (CP). To receive a diagnosis of DD, the person must have significant functional limitations in three or more major life areas, such as (a) self-care, (b) expressive or receptive language, (c) learning, (d) mobility, (e) capacity for independent living, (f) economic self-sufficiency, and/or (g) self-direction (Developmental Disabilities Assistance Bill of Right Amendment, 2000). In addition to functional limitations, DD is associated with maladaptive behaviour, such as self-injury, aggression, and stereotyped movements (Camarata, Hughes, & Ruhl, 1988; Luiselli, 2012). Such maladaptive behavior has been linked to severity of intellectual disability, autism diagnosis, and deficits in communication and social skills (Matson & Minshawi, 2007).

Severe Communication Impairment in DD

Communication is arguably one of the more prevalent and significant areas of impairment and educational need associated with DD (Drasgow & Halle, 1995; Schuler & Baldwin, 1981; Sigafoos & Drasgow, 2001). Children with DD can display a range of deficits with respect to communication functioning, ranging from a delay in the development of functional language to the almost complete lack of speech (Schuler, 1995). This latter condition is referred to as severe communication impairment (SCI; American Speech-Language-Hearing Association [ASHA], 1981, pg. 268; Lancioni, Sigafoos, O'Reilly, & Singh, 2013; Green, Sigafoos, O'Reilly, & Arthur-Kelly, 2006), complex communication need (Binger & Light, 2006; Iacono, 2004) or minimally verbal (Kasari, Brady, Lord, & Tager-Flusberg, 2013). The term SCI refers to individuals that have unintelligible speech, have lost the ability to speak, or have not developed sufficient speech or communication ability to meet their communication needs (Hemsley et al., 2001). The term SCI has been used in the literature to refer to children with DD, aged 3 years or more, who present with an expressive vocabulary of 20 words or less (Brady, Thiemann-Bourque, Fleming, &

Matthews, 2013; Thiemann-Bourque, Brady, & Fleming, 2012). Similarly, the term minimally verbal was defined by Kasari et al. (2013) as having minimal words or fixed phrases (e.g., 20 to 30) that are used to communicate. These words or phrases are often restricted to specific contexts or only used to serve one or two functions. This thesis focuses on assessing the communicative forms and functions in the repertoires of children with DD and SCI.

Incidence and Prevalence of SCI in Children with DD

It is estimated that less than 1% of the school-age population in the United States has SCI. These children are estimated to make up about 4 to 6% of the special education population (Glennen & DeCoste, 1997). Bloomberg and Johnson (1990) estimated the incidence of SCI in Victoria Australia to be .12%. A more recent study by Perry, Reilly, Cotton, Bloomberg and Johnson (2004), estimated the prevalence of SCI in Victoria, Australia to be 1 in 500, the majority of whom had a diagnosis of DD. Similarly, Matas, Mathy-Laikko, Beukelman and Legresley (1985) examined prevalence of nonspeaking children in schools across 12 counties in the state of Washington, USA. Matas et al. included in their definition of nonspeaking children those with a severe speech problem secondary to physical, neuromuscular, cognitive or emotional (not due primarily to hearing impairment). Therefore, their definition would be more consistent with SCI. Matas et al. (1985) found that children with SCI made up .6% of the total school population and 6% of the students registered under special education. Of these children, 47.3% were classified as having multiple disabilities, 28.2% as having mild to moderate ID, and 13.6% as having severe to profound ID.

SCI and ASD

With respect to children with ASD, it appears that approximately 25 to 30% of such children have SCI (Anderson, Lord, & Risi, 2007; Osterling, Dawson, & McPartland, 2001; Tager-Flusberg & Kasari, 2013; Tager-Flusberg, Paul, & Lord, 2005). Findings from a study by Deb and Prasad (1994) showed that impaired communication, as well as repetitive and restrictive behaviours, was more common in persons with ASD and ID than in persons with ASD alone. Wodka, Mathy, and Kalb (2013) looked at the language acquisition of 535 children aged 8 to 18 years with a diagnosis of ASD that were classified as severely language delayed with no reported use of words or phrase speech before the age of 4 years. This included both children who were considered nonverbal as well as those that were using single words and

only occasional phrases by age 4 years. They used various measures to identify whether there was a relationship between social impairment, intellectual functioning, and speech development. They found that higher nonverbal IQ levels and lower social impairment levels were predictors for development of both phrase and fluent speech. These findings were consistent with those found by Anderson, Lord, and Risi (2007). They looked at the language development of 130 children with a diagnosis of ASD from age 2 to 9 years. They found that 30% of the children with ASD were classified as nonverbal at age 9. They also found that the most salient predictors of language acquisition were nonverbal intelligence and joint attention.

SCI and CP

Reports on the percentage of children with CP that have some level of communication impairment range from 25 to 70%, with the level of impairment ranging from mild dysarthria to a complete inability to speak (Andersen, Mjoen, & Vik, 2010; Cruickshank, 1966; Nordberg, Miniscalco, Lohmander, & Himmelman, 2013). For example, Andersen, Mjoen, and Vik (2010) examined a Norwegian registry and found that 25% of those with CP were reported to have minimally intelligible speech or to be nonverbal. In addition to SCI, such children may also present with speech that is largely unintelligible. For example, a whole population study of Iceland reported that 16% of children with CP between 4 and 6 years of age were severely dysarthric (Sigudardottir & Vik, 2011). One reason why it might be difficult to ascertain the precise prevalence of SCI in this population is because of the heterogeneity of severity and co-morbid conditions associated with CP (e.g., level of intellectual disability, degree of motor impairment, respiration hindrance, and control of the vocal musculature for speech sound articulation) (Cockerill et al., 2013).

Other studies have shed light on a possible etiology of SCI within this population. For example, Nordberg, Miniscalco, Lohmander and Himmelmann (2013) conducted a retrospective chart review of 129 children with CP born from 1999 to 2002 to determine whether the children's speech ability was related to CP subtype, motor function, cognitive level, or neuroimaging findings. They found that 32% of the children were nonverbal and the children in this group were most likely to have basal ganglia lesions.

SCI and ID

Several studies have provided data on the prevalence of communication disorders among individuals with ID (e.g., Aiello, 1980; Enderby & Philipp, 1986;

Ando & Yoshimura, 1979; McQueen, Spence, Garner, Pereira, & Windsor, 1987; Pinborough-Zimmerman, Satterfield, Miller, Hossain, & McMahon, 2007). Ando and Yoshimura (1979) looked at the communication skills of 275 children aged 6 to 14 years. Forty-seven of the children had a diagnosis of autism and 128 of the children had a diagnosis of ID based on the criteria of the American Association of Mental Deficiency (AAMD; Grossman, 1973), although levels of ID were not reported. The authors asked teachers and teacher aides to rate each child on his/her use of communication skills on a 4-level scale. Level 1 and Level 2 indicated that the child was able to communicate in full sentences; children at Level 3 used one-word sentences, and children at Level 4 did not communicate any information. Reported communication levels indicated that 10% (14) of the children with ID used one-word sentences and 11% (15) did not communicate. With regards to the group of children with autism, 17% (8) were reported to use one-word sentences and 47% (22) did not communicate. Although there cannot be a direct comparison between these groups as they were not matched for number, age, or other developmental and medical factors, it is valuable to note the number of children with a diagnosis of either autism or ID who were reported or perceived to be communicating at a one-word level or to have no communication at all. It is also important to note that there was no information regarding the level of ID of the children in the ID group, therefore the level of communication based on level of ID cannot be determined.

Early demographic research on the nonspeaking population was conducted by Aiello (1980) in Orange County, California. Aiello looked at school-age nonspeaking individuals, defining nonspeaking as either those with severe speech problems due to neuromuscular or physical deficits and/or those who cannot use speech independently as their primary communication mode. Aiello sent questionnaires to all of the special education teachers in the Orange County school district. Based on an 87% return rate, Aiello identified 918 nonpseaking students, making up a total of .2% of the school population. Most of the children categorized as nonspeaking were identified to have severe to profound ID. Several years later Enderby and Philipp (1986) conducted a literature review to identify the incidence and prevalence of communication disorders in the United Kingdom and their association with varying etiologies. They compiled information through several sources: (a) from a review of university textbooks used in the United Kingdom and the United States, (b) through a Medlars search of related literature from 1975 to 1982, (c) from a systematic review of the Index Medicus for

related publications from 1972 to 1984, and (d) from information obtained from the Office of Population, Censuses and Surveys, England and Wales (OPCS). The estimated prevalence of mental handicap (ID) per 100,000 in the UK was 2,500, which includes all levels of severity (e.g., mild, moderate, severe and profound). The number of those persons with SCI was 800 per 100,000, comprising over 30% of the identified ID population. Their definition of severe included those who were unable to be understood by people other than their close family members as well as those who were nonverbal.

In another relevant study, McQueen et al. (1987) focused on 7- to 10-year-old children with significant ID (i.e., IQ < 55). They first identified all children residing in the Maritime region of Canada that were born between 1969 and 1972 that had an IQ of less than 55 or a diagnosis from a psychologist of moderate, severe, or profound ID. With the assistance of multiple agencies (e.g., school boards, health and social service agencies, institutions) they compiled demographic, medical and educational information on 307 children that fit the inclusion criteria. From this group, 129 had a diagnosis of severe or profound ID (i.e., IQ < 40) and 145 (65%) of the total group had reported speech disorders, making speech disorders one of the top three related disorders. The level of speech impairment was not identified, nor was there any analysis as to whether there was a statistical relationship between speech disorders and level of severity of ID. Nonetheless, both statistics identify that greater than 30% of the ID population were identified as having severe or profound ID and/or a speech disorder. These results are consistent with the findings that over half of children with ID have related speech or language disorders (Rutter, Tizard, & Whitmore, 1970). The definition of speech disorders was not provided, therefore it is unclear how many of these children had SCI. However, it is evident from this that more than 50% of children with ID also have communication impairment.

With respect to severity of intellectual disability, SCI is generally associated with severe to profound ID (Grossman, 1983; Matas, Mathy-Laikko, Beukelman, & Legresley, 1985; Matson, Dixon, Matson & Logan, 2005; McLean, McLean, Brady & Etter, 1991; Murphy et al., 2005). In a publication by the American Association of Mental Deficiency, Grossman (1983) identified most people with severe ID as having severe language delay with only minimal communication skills up into adulthood. McLean, Brady, and McLean (1996) compiled information from questionnaires that were sent to staff working directly with participants identified through the Kansas

State Board of Education and the Kansas Department of Social and Rehabilitative Services as having severe ID. Data were collected for a total of 211 participants (117 children, 94 adults). In total, 59% of the cohort were reported to use at least one form of symbolic communication (e.g., speech, manual sign, communication device), 19% were reported as nonverbal but showed intentional communication behaviours, and 21% were identified as using no intentional communication. Compared with children, a significantly larger number of adults were reported to be symbolic communicators (80%), with 73% using greater than five words or symbols. Only 43% of children were identified as symbolic communicators, with 36% of this group reported as using more than five words or symbols. This provides strong evidence that SCI does in fact affect a large proportion of persons with severe ID, with 40% showing no formal symbolic communication. From those that use a symbolic form of communication, 14% use less than five words or symbols.

Higher estimates have been made in more recent demographic research. The percentage of people with ID that have SCI has been estimated to be 50% (Scottish Executive, 2000) and 60% (Australian Institute of Health and Welfare, 2008). In a study by Wing and Gould (1979), social interaction impairments in children with severe ID occurred in 21.2 of every 10,000 children under the age of 15 in the Camberwell, London area. Sixty of the 132 children (45%) identified were classified as nonverbal.

Belva, Matson, Sipes, and Bamburg (2012) used the Vineland Adaptive Behaviour Scales (VABS; Sparrow, Cicchetti, & Balla, 2005) to identify levels of communication ability in 204 people aged 27 to 85 years ($M = 52$ years) with profound ID living in a residential facility in the Southeastern region of the United States. The measure was used to interview direct care staff in order to identify the receptive, expressive, and written communication skills of each participant. The raw scores on each of the three subdomains as well as the proportion of total scores endorsed (the number of points earned by each participant divided by the number of possible points that can be awarded in each subdomain) for each participant were compared. They found that the participants showed deficits across all three subdomains, with overall higher scores in receptive language. The expressive language total scores were significantly lower than the receptive language results, yet significantly higher than the written scores. These results highlight the importance of assessing both receptive and expressive language in people with ID as there may be a

significant difference between their understanding of language and what they are able to verbally communicate. These results also show that although many people with ID and SCI may benefit from augmentative and alternative communication (AAC), the level of literacy required to use a device needs to be considered when choosing an appropriate communication method (e.g., manual sign, Picture Exchange Communication System [PECS], speech generating device [SGD]).

Belva and Matson (2012) also used the VABS to measure and compare the daily living skills of people with profound ID across three domains: personal, domestic, and community. They found that the participants showed the greatest skills in personal care, followed by domestic skills. There was a significant difference between the participants' reported domestic skills and their community skills. Belva and Matson (2012) discussed the possibility that the participants scored significantly lower on the community skills due to the fact that these skills require higher level cognitive abilities such as understanding the concept of time or money. What they did not indicate is that many of these skills also require verbal or alternative communication skills (e.g., talking on the telephone, stating the current date when asked, stating the value of money). These results therefore are in line with the finding that people with profound ID have significant communication deficits that impact their daily living, particularly in the community setting.

Overall, the studies discussed provide strong evidence that SCI is prevalent among individuals with ID and is most commonly associated with severe to profound levels of ID. However, varying prevalence estimates have been reported in these studies. The differing prevalence estimates are likely due to differences in the size and composition of the samples studied. In addition, the varied findings could suggest that the prevalence, type, and severity of a co-morbid communication disorder may vary in relation to severity and etiology of the primary disability.

Communication Impairment in Relation to Etiology of DD

There is evidence to suggest a relationship between etiology and communicative functioning. Duker, van Driel, and van de Bercken (2002) used the Verbal Behavior Assessment Scale (VerBAS; Duker, 1999) to compare the communicative profiles of 77 individuals aged 3.2 to 52.2 years. Twenty-six people had a diagnosis of Angelman syndrome (AS); 26 people had a diagnosis of Down syndrome (DS); and 25 with pervasive developmental disorder (PDD). The VerBAS is a questionnaire made up of 15 items which measure the frequency (using a scale of

0 to 4) of a person's use of communicative functions: mands (e.g., requesting, rejecting), tacts (e.g., labeling of objects), and echoics (e.g., imitation). The VerBAS measures the use of each communicative function regardless of the modality used (e.g., speech, sign, PECS, gesture). When comparing the results for the participants from each of the different etiologies, those with AS were reported to have better manding skills than tacting. In contrast, those with DS and PDD had stronger skills in tacting than manding. These findings have implications on the focus for communication intervention for specific etiologies. For example, it may be more appropriate to focus on manding for those with PDD or DS as this was found to be an area of relative weakness. To the same extent, it also brings to question whether certain intervention strategies should be chosen based on the communicative strengths related to etiology so that better gains can be made.

Similar findings have been made by other researchers looking at the communication profiles of children with developmental disability. For example, Wetherby, Yonclas, and Bryan (1989) looked at the communication profiles of 11 preschool children, four with DS, four with specific language impairment (SLI), and three with autism. They obtained a 30-min communication sample from each child using both a structured and unstructured protocol. Each sample was analysed for the following communication measures: (a) rate of intentional communicative acts, (b) communicative functions used, (c) discourse structure, (d) communicative means, and (e) syllabic shape. Although the main focus of the study was to compare the communication ability of the total participant group to that of typically developing children, the authors also identified differences in communication profiles relative to etiology. The participants with DS all showed use of communicative means, discourse structure and syllable shape similar to typically developing children at the same language developmental level. While the children with autism showed appropriate communication rates for their stage of communication, they demonstrated a deficient proportion of joint attention acts, an increased amount of initiated acts, an increased amount of isolated gestural acts, and a deficient level of vocal acts using consonants. This is evidence that early communication development in children with DD compares differently to that of typically developing children as well as to those with DD of a different etiology.

There is also evidence of similarities in communication profiles across etiology when comparing separate studies in which similar assessment protocols and

procedures were used. For example, Didden et al. (2009) used the Inventory of Potential Communication Acts (IPCA; Sigafoos, Woodyatt, Keen et al., 2000) as a questionnaire for parents and/or caregivers of individuals with Angelman syndrome (AS). Didden et al (2010) used the same procedures to identify communicative profiles of adults with Rett syndrome (RS). Both studies resulted in the identification of syndrome-specific communication characteristics. The forms of communication used by both those with AS and RS were mostly prelinguistic or nonsymbolic. The most commonly reported form of communication used by people with AS was laughing, whereas only a few participants were reported to request information or imitate communicative behaviours. Those with RS were also reported to most often use the communicative form of laughing/smiling as well as eye contact/gazing. Both populations used these forms for social convention, commenting, and answering. Thus, the etiology of DD would appear to have some implications for communication assessment and intervention. For example, when assessing a child's communication, it is important to identify the child's areas of strength so that these can be used to support other areas of relative weakness. If we are able to identify possible areas of strength based on etiology, then more emphasis can be placed on those areas during assessment. This will then allow for intervention to focus on developing areas of strength to compensate for relative areas of weakness. In addition, for diagnostic purposes, specific language profiles can be very useful for differentiating between two possible diagnoses.

Summary of Epidemiological Issues

In summary, evidence from previous epidemiological research on children and adults with DD supports the claim that SCI is prevalent among individuals with DD. There is also evidence to indicate that although individuals with DD may exhibit SCI, the expression of these deficits will vary based on multiple factors, including etiology and severity of disability. These statistics and communication profiles however only provide a guideline as to the type of communication assessment that should be used when assessing the skills of individuals with DD. Given the variability in communication impairment between and within different etiologies, it is important that the communicative potential of each individual is identified on an individual basis.

Potential Communicative Functioning of Children with DD and SCI

While a significant percentage of the DD population can be expected to present with SCI, this label might not be indicative of a person's overall communicative ability or potential. For example, when comparing the expressive, receptive and written communication skills of 204 adults with profound ID, Belva et al. (2012) found that the person's receptive language skills were, on average, rated as being significantly higher than expressive and written communication skills. This finding could indicate that individuals with profound ID and SCI might have a better understanding of language then they are able to express. Alternatively, it could mean that the level of receptive speech is more difficult to assess and hence more likely to be overestimated.

In a relevant study into the communicative ability or potential of individuals with ID and SCI, Cascella (2005) investigated the communicative forms and functions used by 14 people, aged 21 to 48 years, with a diagnosis of severe (10 persons) or profound (four persons) ID who resided in a community group home setting. Cascella developed a 28-item expressive communication rating scale based on earlier works by several authors: McLean, McLean and colleagues (e.g., McLean, Brady, McLean, & Behrens, 1999), the Functional Communication Profile (Kleinman, 2003), and Analyzing the Communication Environment (Rowland & Schweigert, 1993). The rating scale included 14 communicative forms and 14 communicative functions. Informants had to use a scoring rubric to identify the frequency in which each participant used each skill: never to rarely (0 to 10%), some of the time (20 to 30%), half the time (50%), most of the time (70 to 80%), or nearly always to always (90 to 100%). One or two direct-care staff members for each participant completed the scale. The staff member had to have known the participant for at least 6 months and be regarded as having a good personal relationship with the participant. Results from the rating scales were analysed to determine several factors, including the number of participants reported to use a specific communication skill at least 20 to 30% of the time, and whether the degree of ID was associated with a participant's communication ability. The results indicated that most participants used at least 12 of the listed communicative forms at least 20 to 30% of the time. All participants were reported to use reaching gestures and facial expressions to communicate. Most of the participants used 11 of the 14 functions and were able to

convey emotional state and use protest behaviours; many of them were reported to make choices, request desired items, and initiate communication. Also, all of the participants were reported to use at least one form of symbolic communication (e.g., sign language, spoken words, object/picture board use) at least 20 to 30% of the time. The results indicated that the participants with severe ID had higher ratings than those with profound ID. These results are consistent with previous research investigating expressive communication abilities of people with severe to profound ID (e.g., McLean, Brady, & McLean, 1996; McLean, Brady, McLean, & Bethrens, 1999) that showed people with severe to profound ID often are intentional communicators and are capable of using one or more modes of symbolic communication. The results also reinforce previously discussed findings that SCI is associated with higher levels of ID, specifically severe to profound levels. Although the results of this study were based on staff reports and involved a small number of participants, the results are in line with other research that has used similar as well as different types of information gathering (e.g., direct assessment, interview) and from different sources (e.g., teachers, parents). Collectively, these data suggest that despite limited intellectual ability and associated receptive language deficits, people with a diagnosis of DD and SCI may nonetheless have some communication ability that needs to be assessed and considered when informing intervention services.

Children with DD and SCI might develop some level of communication ability that is expressed via one or more prelinguistic behaviours (Iacono, Carter, & Hook, 1998). The term prelinguistic behaviour refers to the subtle, informal and/or idiosyncratic behaviours such as vocalizations (e.g., make noise, yell/scream, laugh); body movement (e.g., reach, touch, push, pull, move away); face/eye movement (e.g., purse lips, stare, open eyes, gaze away); breathing (e.g., rapid, slow, sigh, blow); problem behaviours (e.g., aggression, tantrums, self-injury); or stereotypical movements (e.g., flap arms, rock body) that typically occur in children prior to the acquisition of spoken language or other symbolic communication forms (e.g., formal gestures; Iacono, Carter, & Hook, 1998; Sigafoos, Arthur-Kelly, & Butterfield, 2006; Wetherby, Yonclas, & Bryan, 1989). The possibility that children with DD and SCI may develop prelinguistic forms of communication is consistent with studies into the speech and language development of typically developing children.

Typical Language Development

During typical language development, prelinguistic behaviours, such as eye gaze, pointing, facial expression, and body movement, emerge around nine months of age in what Bates and colleagues referred to as the illocutionary stage of language development (Bates, Camaioni, & Volterra, 1975). For example, the child might look at an object and vocalize. Such acts are often interpreted by the listener as an attempt by the child to request the object. Children can also use prelinguistic behaviours to comment. For example, a child might squeal at the sight of a dog running in a park in an apparent attempt to draw the adult's attention to the animal.

Following this stage, at around 12 months of age, typically developing children are reported to begin moving into the locutionary stage of language development. This stage is characterized by the gradual emergence of more conventional and symbolic forms of communication, such as spoken words and use of conventional signs/gestures (e.g., headshake for yes and no; Bates et al., 1979). For example, when a child wants a desired item (e.g., cookie), he/she may point to the object, look at the listener and say *cookie*. Compared to prelinguistic acts, such conventional forms of communication are generally more effective signals for listeners to interpret (Keen, Sigafoos, & Woodyatt, 2005; Sigafoos, Arthur-Kelly, Butterfield, & Foreman, 2006). That is, the form is generally more readily understood by others and the function or purpose of the communicative act is consequently less likely to be misinterpreted.

However, children with DD and SCI often fail to progress to the locutionary stage and might instead continue to rely on prelinguistic behaviours (Brady, Steeples, & Fleming, 2005; Casby & Cumpata, 1986; Coggins, Carpenter, & Owings, 1983; Keen, Sigafoos, & Woodyatt, 2001). This reliance can be problematic because the child's prelinguistic acts might be rather subtle (e.g., briefly moving towards or looking at an object) and thus perhaps more difficult to interpret. For example, the child may move his hand towards a food item on the table in an attempt to reject that item. However, caregivers may interpret the act as an attempt by the child to request the item. This could result in the child being presented with a nonpreferred item. This mis-match between the function of the child's prelinguistic act and the listener's reaction to that act can result in a communication breakdown that might either lead to an escalation to problem behavior or to extinction of the child's prelinguistic act (Brady & Halle, 2002; Keen et al., 2005; Reichle, Beukelman, & Light, 2002;

Sigafoos, Arthur, & O'Reilly, 2003). Another possibility is that some prelinguistic behaviours might be overinterpreted by parents and caregivers as communicative when in fact the child's actions are not communicative, but rather reflexive/orienting responses (Sigafoos, Woodyatt, Keen, et al., 2000).

Considering the subtle, idiosyncratic nature of prelinguistic behaviours, and the findings that children with ASD may not progress to the locutionary stage, it is challenging to identify whether or not these children's prelingusitic behaviours can be defined as intentional. Intentional communication is defined by Bates (1979) as when a child deliberately uses a specific symbol to have a preplanned effect on another person. Intentionality of communication in typically developing children is often measured by their use of joint attention abilities, such as gaze monitoring, protodeclarative and protoimparative pointing, and gaze switching (Drew, Baird, Taylor, & Milne, 2007).   Given that research has identified these behaviours are often not evident in young children with autism (Carpenter, Pennington, & Rogers 2002; Wetherby, 1986; Camaioni, Perucchini, P., Muratori, F., Parrini, B., & Cesari, A., 2003), attempts to determine intentionality in children with autism using similar measures have only led to identification of deficits rather than the existence or nonexistence of intentionality (Drew et al. 2007).

Given these potential problems, it is important to ensure that the communicative function, if any, of the child's prelinguistic acts are identified and correctly interpreted. Sigafoos and colleagues (Keen et al., 2001; Sigafoos, Woodyatt, Keen, et al., 2000) argued for the importance of identifying and correctly interpreting the prelinguistic acts of children with DD, given that such acts have potential value in communication intervention programmes. Sigafoos and colleagues used the term potential communicative acts (PCAs) to define any behaviour interpreted by others as a form of communication. The term PCA therefore bypasses the argument as to whether or not these behaviurs are in fact intentional and place importance on how these acts are perceived by others.

If prelinguistic forms and functions used by a child can be identified, these forms can be targeted for intervention so as to promote generalization across other partners and/or settings. For example, if the parent reported that the child currently lifts his finger to his mouth to request a drink at home, the teachers could help to generalize this form to the classroom by providing him with a drink every time he puts his finger to his mouth during snack time. Also, identified prelinguistic forms

that are socially acceptable can be encouraged and reinforced (Sigafoos, Woodyatt, Keen et al., 2000), whereas inappropriate forms (e.g., tantrums) might be targeted for replacement with more appropriate forms serving the same function (Carr & Durand, 1985; Keen et al., 2001). For example, a child with DD might indicate that she is finished with a snack by putting the food back into her box, but consistently screams if she wants to stop any other classroom activity. Teachers could have her place an item into a box as an alternative form for requesting cessation of an activity to try and replace screaming.

Knowledge of the child's prelinguistic acts and their communicative functions, if any, might also impact a caregiver's expectations of the child and positively impact the quality of interpersonal interactions with others. This might be the case, for example, when a parent responds only to spoken communication and is not aware that the child might be communicating via prelinguistic behaviours. Helping the adult to identify these communicative forms and to respond appropriately to them might help to increase and strengthen the child's communication skills (Yoder, McCathren, Warren, & Watson, 2001). A further potential use or implication of identifying prelinguistic forms and functions of children with DD is that it can help to enhance communication between different environments and social partners by collecting, comparing, and sharing social partner's observations on a child's communicative forms and perceived functions (Schuler, Peck, Willard, & Theimer, 1989). For example, a child could be using the same behavior in two different settings but different social partners perceive the function of this behaviour differently. Sharing of information around a child's communication can reduce miscommunication between the child and different social partners, allowing the communicative exchange to proceed more effectively.

Identifying Prelinguistic Behaviour

There are various methods for identifying prelinguistic behaviours in people with DD. These include: (a) structured observation, (b) naturalistic observation, and (c) indirect informant-based assessments.

Structured Observation. Structured observation generally refers to a systematic method of collecting behavioural data during a specified task or time period, and usually requires prior delineation of objectively defined behaviours prior to beginning the observation (Garwood, 2006). Structured observation has the potential advantages of providing first-hand information on a particular behaviour as

it occurs in real time. Potential limitations are that it can be very time consuming and that it generally will only identify predefined behaviours (Garwood, 2006). As an example, Iacono, Carter, and Hook (1998) used a structured observation procedure involving the provision of communication temptations (Wetherby, Cain, Yonclas, & Walker, 1988) to identify prelinguistic behaviours in children with DD. The study involved four children aged 5:4 to 8:8 (years:months) all with a diagnosis of CP, ID, and SCI. The aim of the study was to assess the forms and functions of each child's intentional and preintentional communicative acts. An act was coded as intentional if the student's communicative behaviour was directed toward the adult, if the child used alternating eye gaze, and if the child appeared to show a desire to achieve a goal, such as through persistence or ceasing the behaviour after obtaining the goal. Preintentional acts, or acts which could be assigned a communicative function, but which did not meet the criteria to be intentional, were also coded. The assessment procedure involved demonstrating an activity of interest (e.g., wind-up toy) and then deactivating the item or limiting access to it (e.g., putting the lid back on a bottle of bubble fluid) to see what, if any, behaviours the child would use might be interpreted as his/her way of indicating that he/she wanted the item or wanted the activity reinstated. These structured assessments took place over two 25 to 35 min videotaped sessions with each child. The authors then coded the videotapes for intentional and preintentional communicative acts. They found that no more than 4% of the observed communicative acts could be classified as intentional and all of these were identified as requests. These findings suggest that criteria used for identifying intentional communicative acts in typically developing children might not be as effective or appropriate when used for children with DD. For example, a child with DD may be communicating intentionally without making eye contact with the listener. Other factors, such as persistence and modification of behaviour, could possibly be more indicative of emerging intentionality than more published criteria such as eye gaze.

Naturalistic Observation. Naturalistic observation generally involves observing participants in their natural environment (i.e., home, school) while the person interacts with a caregiver or familiar person (McKechnie, 2008). Naturalistic observation provides a way of observing and analysing behaviour without manipulating the environment. Naturalistic observation has several limitations. First, the observer(s) must have in mind what they are looking for prior to observation. While focusing on specific aspects of the interaction or situation, they may miss other

important factors that are influencing the child's behaviours at the time of observation (McKechnie, 2008). Second, given the lack of stimulus discrimination for the observed function during naturalistic observation, the observed action at that moment may not represent the child's overall communication skills across time and place (Lipinski & Nelson, 1974). For example, if all naturalistic observations occur in the afternoon at school, then the child's communication forms used only in the home environment or during morning greetings are not represented. Third, although naturalistic observation is meant to be unobstructed or affected by the observer, researchers have found that this is not always the case (Lipinski & Nelson, 1974), even when video is used (Peregrine, Drews, North, & Slupe, 1993) as children are often aware of the observer or a camera and can become distracted or try to engage with the observer.

Callendrella and Wilcox (2002) presented an example of naturalistic observation. They completed observations of children and their mothers to investigate whether there is a relation between prelinguistic behaviours and subsequent expressive and receptive language abilities (12 months later). The participants were 25 children (17 to 38 months old) with global developmental delay (GDD). Thirteen of the participants had a diagnosis of DS and 12 had a diagnosis of GDD of undetermined etiology. They were all judged to have less than three spoken words and used prelinguistic acts 95% of the time during the initial assessment. For the initial assessment, the researchers used the Battelle Developmental Inventory (BDI; Newborg, Stock, Wneck, Guidubaldi, & Svinicki, 1984) along with initial communication samples and parent report. The BDI is an early childhood developmental assessment that measures personal-social, adaptive, motor, communication, and cognitive ability through structured observation, unstructured observation, and interview. The researchers videotaped interactions with the child and his/her mother at 6-month intervals over a 12-month period. Each interaction period included two 15 to 35 min videotaped interactions over a 2-week period. The videotapes were taken in the home or in an early intervention centre room that was set up as a family lounge or living room. The researchers provided the mother with age-appropriate toys and books and instructed her to interact with the child in a natural manner. A total of 25 to 30 min of videotaped interaction was analyzed for each 6-month interval. The first two 6-month intervals were coded for use of prelinguistic behaviour; specifically intentional nonverbal communication acts, social interaction

signals, and gestural indicating behaviours. The researchers defined intentional nonverbal communication acts as differential gestures and/or vocalizations linked to an object or event that were coordinated with visual attention to the mother. Social interaction signals were gestures and/or vocalizations that were not linked to the environment but involved visual attention to the mother. Conversely, gestural indicating behaviours were those that indicated or referred to an object or action in the environment, but did not involve visual attention to the mother. The third and final interval was coded for symbol use, specifically any words or signs used across context to refer to an object, event or person. Conventional gestures such as nodding "yes" were also counted. Results indicated that intentional nonverbal communication with coordinated attention was a significant predictor of expressive language outcome measures. Gestural indicating behaviours that did not include coordinated attention were an indicator of receptive language outcomes. This evidence suggests that a child's use of prelinguistic communication may be indicative of later expressive and receptive language outcomes, and highlights the potential importance of identifying prelinguistic communication acts of children with receptive and expressive language deficits.

      Informant-Based Assessment. Informant-based assessment refers to the use of questionnaires or interviews with individuals who are familiar with the participant to obtain information about his/her performance and/or ability (Hall, 2005). There are potential advantages to this form of assessment. For example, informant-based assessment is generally easy to administer and time efficient (Hall, 2005). Also, informant-based assessments are viewed as a way of identifying a child's use of communication across contexts (Schuler, Peck, Willard, & Theimer, 1989). The potential disadvantages of informant-based assessment are that the interviewer may inadvertently "lead" the respondent to answer in a certain way, or the respondent may try to target their answers to what he/she perceives the interviewer wants to hear (Lewis-Palmer, Reed-Schindler, & Ingram, 2005).

      One illustration of the use of informant-based assessment with children with DD is an interview protocol developed by Schuler et al. (1989) to learn about behaviours associated with five communicative functions: (a) requesting attention, (b) requesting an action, (c) requesting food or an object, (d) protesting, and (e) commenting or the declarative function. Using this interview protocol with the parent of a child with SCI, the authors identified a number of communication forms that the

parent reported the child used. One example of a communicative act that was obtained through parent report is when a mother reported that her child would pick up a favourite book and drop it in the mother's lap as a way of getting the mother to read the book. Based on this information, the aim of intervention was to expand this behaviour, therefore the child was given a communication book and encouraged to point to items he wanted to request while making eye contact. It was envisaged that the communication book could also help the child learn more appropriate forms of rejecting as well. Thus, in this study, the interview protocol appeared to be a promising method for obtaining information on a child's prelinguistic acts, which could then be targeted for intervention.

      Combining Assessment Methods. Another approach to identifying the communicative forms and functions of prelinguistic behaviours in children with DD and SCI involves combining structured, naturalistic, and/or informant-based assessments. Using a combination of approaches may offset the disadvantages of each individual approach. A combination approach may also be used to gain information across settings, informants, and situations. This information can also be compared and used as a way of validating each approach (Granlund & Olsson, 1993).

      To illustrate, Granlund and Olsson (1993) looked at the communicative functions used by 16 adolescents and adults described as having profound ID. Through direct observation and structured interviews with direct-care staff or school staff, they looked specifically at the communicative functions of behaviour regulation (i.e., dyadic interaction over one or several turns without objects), social interaction (i.e., dyadic interaction over one or several turns with objects), and joint attention (i.e., interaction of short duration using a person as a means to reach a goal). They used an adaptation of the Early Social Communication Scale (ESCS; Karlan, Ward, Pennington, & Granlund,1985; Siebert & Hogan, 1982). The ESCS is intended to measure the complexity of communicative behaviour within the context of behaviour regulation, social interaction, and joint attention. Initially they interviewed a staff member using the ESCS to obtain information on each child's communication skills. Independent observers then conducted structured observations during participant interactions with school or direct-care staff. The staff member was instructed to involve the participant in semi-structured free-play with and without objects. These interactions were videotaped for 15 min and then analyzed for the qualitative complexity of communicative functions used during the videotaped interaction as

well as the frequency of use of the communicative behaviours. For nine of the children, the videotaped interactions were done with the staff member that completed the ESCS for that child, whereas seven of the participants were taped interacting with a different, but still familiar staff member. Results showed a high correspondence between the results of the interview and the observations in terms of the frequency and complexity of communicative acts for the majority of participants. There was a tendency for lower complexity scores and greater frequency scores from observational data than from interview data. They also found that the correspondence between these measures was only statistically significant when the same staff member was involved in the interview and the videotaped interaction, as compared to when the videotaped interactions were done with a different staff member. These results suggest the potential value of combining observation and interview for identifying prelinguistic communicative forms and functions in individuals with DD and SCI.

Summary of Assessment Approaches

When considering these various approaches to identifying communicative functions in people with DD and SCI, there appears to be several benefits associated with each strategy. Parent interviews, for example, are: (a) potentially less costly and time consuming than direct observation, (b) allow for assessment across contexts without multiple observations, and (c) the information is obtained directly from caregivers who should know the child best (Peck, Schuler, Tomlinson, Theimer, & Haring, 1984; Schuler et al., 1989). Gaining information directly from caregivers may therefore provide first-hand information on a range of communicative behaviours observed by the caregiver (Schuler et al., 1989). Furthermore, interview allows one to also find out the perceived impact such behaviours have on the environment, or the environment's responsiveness to the behaviours since the informant can provide information on how they interpret and react to these perceived communicative acts (Schuler et al., 1989). However, there are disadvantages to interviews including the possibility of bias from either over- or under-interpretation of the child's communication skills (Peck et al.,1984; Schuler et al.,1989).

Direct observation is potentially advantageous in the sense that it can provide both qualitative and quantitative data about a child's communication. It can also be done in a variety of settings and samples of communication behaviour can be obtained directly from the natural environment (Peck et al., 1984). The disadvantages are that direct observation can be time consuming and the data might only represent

performance at one or a few specific points in time and under one set of conditions (Peck et al., 1984) and therefore may not be representative of the child's overall communicative ability (Lund & Duchan, 1983). Also, when dealing specifically with prelinguistic communication, communicative behaviour can vary significantly across situational contexts (Schuler et al., 1989) and so it would be necessary to observe across a variety of situations and environments in order to get a representative sample of prelinguistic communication.

In response to these advantages and disadvantages, Sigafoos, Woodyatt, Keen et al. (2000) argued for adopting a combined (i.e., interview plus naturalistic observation plus structured observation) approach for identifying communicative forms and functions. For the interview component, Sigafoos, Woodyatt, Keen, et al. (2000) developed the Inventory of Potential Communicative Acts (IPCA) as a way of initially identifying the potential communicative acts of children with DD. A potential communicative act (PCA) can be defined as "any behaviour interpreted by others as a form of communication" (Sigafoos, Woodyatt, Keen, et al., 2000, p. 79). The IPCA is a questionnaire developed to assess the form and function of communicative behaviour in people presenting with SCI. It looks at 10 communicative functions: social convention (SC), attention to self (AS), rejection/protestation (R/P), request for an object (RO), request for an action (RA), request for information (RI), comment (C), choice making (CM), answer (A), and imitation (I). These were chosen based on their documented occurrence in children with SCI (Sigafoos, Woodyatt, Keen, et al., 2000) as well as early language of typically developing children (Halliday, 1977). The IPCA was developed following review of the literature on prelinguistic communicative intent and through field testing with 30 children with SCI (Keen, Woodyatt, & Sigafoos, 2002; Sigafoos, Arthur-Kelly, & Butterfield, 2006; Sigafoos, Woodyatt, Keen, et al., 2000; Sigafoos, Woodyatt, Tucker, Roberts-Pennell, & Pittendreigh, 2000). Field testing suggested that the IPCA was a useful interview protocol for identifying the PCAs of children with SCI related to DD or other etiologies such as syndromes or physical disabilities. Studies involving the IPCA further support its use for this purpose.

In the next chapter, I provide a systematic review of the literature on use of the IPCA to identify potential communicative acts in children with developmental disability. The aim of this review was to identify different ways the IPCA has been used for communication assessment and intervention, whether or not the IPCA was a

valid and useful measure in these situations, and to hypothesize other ways that the IPCA can be used to further enhance our knowledge of PCAs in this population.

CHAPTER 2

SYSTEMATIC REVIEW OF THE LITERATURE ON THE USE OF THE IPCA

Method

A literature search was undertaken to identify peer-reviewed research articles that reported on use of the IPCA to assess prelinguistic communicative forms and functions in individuals with DD. Studies meeting the inclusion criteria were summarized in terms of participants (age and diagnosis), research aim(s), procedures, and results.

Search Procedures

The search centred on five electronic databases using the keywords "Inventory of Potential Communicative Acts" or "IPCA." The electronic databases included the Cumulative Index of Nursing and Allied Health Literatures (CINAHL); Education Resources Information Center (ERIC); Medline; Linguistics and Language Behavior Abstracts (LLBA); and PsycINFO. Searches were not date restricted, but were restricted to peer-reviewed articles in English. The returned records were reviewed for relevance and to determine whether each study met the inclusion criteria. The author then searched for other relevant articles by the authors identified in the initial search as well as searching the reference lists for the included articles to identify any additional articles. The search was started and completed in March 2014.

Inclusion Criteria

To be included in this review, the article had to explicitly focus on the assessment of the forms and/or functions of potential communicative acts. The IPCA needed to be one of the assessment protocols used and how it was used needed to be specified in the methods. For example, the article needed to specify whether the IPCA was used as an interview protocol or if it was sent out as a questionnaire. The relationship of the informant(s) to the participant also had to be specified (e.g., it had to be stated whether a parent/caregiver or a teacher/therapist completed the IPCA). The reported forms and functions of at least one of the participants had to be included in the results section. In addition, at least one participant had to have a diagnosis of DD and had to be reported to be nonverbal, have an expressive language age of less than 32 months, and/or have less than 20 spoken words. DD was defined as a class of

disorders characterized by chronic and severe intellectual and/or physical impairment that manifests before age 22 (Developmental Disabilities Assistance and Bill of Rights Amendment, 2000). This included (a) autism spectrum disorder (ASD), (b) intellectual disability (ID), and (c) cerebral palsy (CP).

Process for Screening Studies for Possible Inclusion

From the initial database search, seven studies were identified for possible inclusion. Each article was read by the present author to determine whether it met the inclusion criteria. Following this, six additional articles that met the inclusion criteria were identifed by an author search and another three articles were identified by searching the reference lists of the previously included articles. Each of these articles was then read independently by another doctoral student to assess the reliability of applying the inclusion criteria. Agreement on which articles were included was 100%. The final result was that 16 articles met the inclusion criteria.

Data Extraction and Analysis

Each included study was summarized in terms of (a) participants, (b) aim(s) of the study, (c) procedures, (d) results, and (e) whether or not using the IPCA allowed the researcher(s) to acquire the information needed to answer their research question effectively. These summaries were checked by independent readers to assess whether each was an accurate representation of the study. The author put each summary into a table format to identify information related to each of the five categories. Each table, along with a copy of the original article, was given to one of three independent reviewers who were either PhD or masters students with training in the area of nonverbal communication. The reviewer checked each of the five categories and judged them to be in (a) full agreement, (b) partial agreement, or (c) not in agreement with the original article. Categories with full agreement received 20 points, those with partial agreement received 10 points, and those with no agreement received zero points. This allowed for a calculation of agreement between zero and 100 and was then translated into percentage. The results of the independent check revealed 95% agreement across all of the included studies. Any discrepancies were checked by a second reviewer, using the same procedures, to reach consensus.

Results

Table 2.1 provides a summary of each of the 16 included articles. Each section is discussed below.

Participant Characteristics

The 16 included studies had a combined total of 287 participants. Twelve participants were included in more than one study (Keen, Sigafoos, & Woodyatt, 2001; Keen, Sigafoos, & Woodyatt, 2005; Keen et al., 2002). There were 83 (29%) male participants and 204 (71%) female participants. Participant ages ranged from 9 months to 70 years. Forty of the participants (14%) were under the age of 3 years while the majority of the participants were between the ages of 3 and 70 years. The participants had various DD diagnoses: Rett syndrome (RTT; n =152, 53%), Angelman syndrome (AS; n = 79, 28%), ASD (n = 36, 12%), cerebral palsy (CP; n = 11, 4%), fragile X syndrome (FXS; n = 7, 2%), or a dual diagnosis of Foetal Alcohol Spectrum Disorder (FASD) and atypical autism (n = 1, less than 1%). There was one participant who was typically developing and was included for comparison purposes. Some participants were also specifically noted to have ID (n = 53), severe language impairment (SLI; n = 4), vision impairment (n = 4), hearing impairment (n = 1), or chromosome 16 deletion (n = 1). Reported expressive language ages ranged from 0 to 30 months *(M = 9 months)* or participants were described as having 20 spoken words or less.

Aims of the Studies

The aim(s) for each of the 16 research articles varied according to population type and the reason for use of the IPCA. Six articles (37%) focused on identifying the prelinguistic or socio-communicative behaviours of girls with RTT (Bartl-Pokorny et al., 2013; Didden et al., 2010; Didden et al., 2009; Marschik et al., 2013; Marschik et al., 2012; Sigafoos, Woodyatt, Keen, et al., 2000); five articles focused on identifying PCAs of children with ASD (Braddock et al., 2013; Keen et al., 2001, 2005; Keen et al., 2002; Plavnick & Ferreri, 2011); two of the articles identified PCAs in children with CP (Sigafoos et al., 2004; Tait, Sigafoos, Woodyatt, O'Reilly, & Lancioni, 2004); one article examined PCAs across children with a diagnosis of either RTT, ASD, or CP (Sigafoos, Woodyatt, Tucker, et al., 2000); one article investigated PCAs in children with a diagnosis of AS (Didden et al., 2009); and one aimed to examine similar information in children with FXS (Marschik et al., 2014). Four of the six articles looking at children with RTT included participants with varying types of RTT (i.e., with typical RTT and with the preserved speech variant of Rett syndrome [PSV-RTT]; Bartl-Pokorny et al., 2013; Didden et al., 2010; Hetzroni & Rubin, 2006;

Sigafoos, Woodyatt, Keen, et al., 2000); while two of the articles focused on comparing the different forms and functions of communication used by females with PSV-RTT and RTT (Marschik et al., 2013: Marschik et al., 2012) with one of these articles including comparison with a typically developing child (Marschik et al., 2013).

The main purpose for using the IPCA was to gain information related to the form and function of PCAs in the repertories of the participating children. However, this information was collected for a number of more specific purposes, such as

- to compare form and function of communication to other participant variables (e.g., language expression scores, motor behaviours, age, living situation);
- to compare the PCAs and the function(s) they serve across a large sample (i.e., n = greater than 75) of participants with the same diagnosis (i.e., RTT or AS);
- to observe the use of PCAs during environmental changes (e.g., during situations of high vs. low social interaction);
- to identify socially inappropriate or inconsistent use of communicative forms to target during intervention;
- to compare the use of nonverbal forms to (pre)linguistic forms;
- to verify information gained from the IPCA through other measures and/or to develop the IPCA as an informative tool;
- to investigate teacher response to PCAs; or
- to investigate ways of measuring the intentionality of communicative acts in children with DD.

Four of the 16 articles compared the communication profiles of participants with similar etiology either at specific time periods or across time (Bartl-Pokorny et al., 2013; Marschik et al., 2014; Marschik et al., 2013; Marschik et al., 2012). For example, Bartl-Pokorny et al. (2013) and Marschik et al. (2012) reported on the communicative repertoires of children with RTT between the ages of 9 and 24 months. Similarly, Marschik et al. (2014) analysed the early socio-communicative development of children aged 9 to 12 months who were later diagnosed with FXS.

Two of the 16 studies investigated the use of PCAs across large-scale samples (i.e., greater than 50 participants; Didden et al., 2009; Didden et al., 2009). For example, Didden et al. (2009) investigated the forms and functions used by 79 participants with a diagnosis of AS. Didden et al. (2010) looked at 129 participants

with a diagnosis of either RTT or PSV: this was the largest sample of participants used across all of the included articles.

There were four studies that focused on using the IPCA for preintervention assessment, with the goal of intervention being to improve the participants' social communication through functional communication training (Hetzroni & Rubin, 2006; Keen et al. 2001; Plavnick & Ferreri, 2011; Tait et al, 2004). Plavnick and Ferreri (2011), for example, examined the potential of using video modeling to teach children with severe verbal behaviour impairments to request.

Another three studies compared the use of nonlinguistic communication forms to (pre)linguistic forms: that is the use of gestures compared to the use of vocalisations or speech (Bartl-Pokorny et al, 2013; Marschik et al., 2014; Marschik et al., 2014). Bartl-Pokorny et al. (2013) used this comparison as part of their analysis of pre-regression communication in girls who were later diagnosed with RTT.

 Two of the studies compared findings from the IPCA in children with DD to other developmental measures such as expressive language measures, motor behaviours, syndrome stage, and presence of epilepsy (Braddock et al, 2013; Didden et al, 2010). Braddock et al. (2013) compared the PCAs of preschool-aged children with ASD to their profiles of language comprehension, language expression, non-verbal thinking, social/personal skills, and motor behaviours. Didden et al. (2010) questioned whether there was an association between the form and function of communication used by females with RTT and other characteristics, such as their syndrome stage, the presence of epilepsy/breathing difficulties, the female's age, and/or her living setting.

Four other studies investigated communicative acts that may not be classified as intentional communication, but may be perceived as communicative and looked at whether in fact these forms were used by the children to communicate during various conditions (Keen et al., 2002; Keen et al., 2005; Sigafoos, Woodyatt, Keen, et al., 2000; Sigafoos, Woodyatt, Tucker et al., 2000). Finally, four studies aimed to develop and verify the IPCA as a valid tool by comparing the information gained from the IPCA to data collected through other methods, such as direct observation or verification trials (Keen et al., 2002; Keen et al., 2005; Sigafoos, Woodyatt, Keen, et al., 2000; Sigafoos, Woodyatt, Tucker et al., 2000). Keen et al. (2002) used naturalistic and structured observation to verify the reported function of communicative forms reported by the participants' teachers on the IPCA. Similarly,

Keen, Sigafoos, and Woodyatt (2005) compared the functional way in which teachers responded PCAs of students during classroom activities to the teacher's previously reported function of those same behaviours. One study (Didden et al., 2009) analysed the reported communicative forms and functions of children with AS to determine whether there were patterns that could identify whether various behaviours were potentially communicative or not.

Use of the IPCA

The IPCA was designed as an interview protocol for identifying forms and functions of prelinguistic communication in children with DD and SCI, although it has been used in a variety of ways within the research. The IPCA was used in its intended format as an interview in 8 of the 16 studies (Hetzroni & Rubin, 2006; Keen et al., 2001, 2005; Keen et al., 2002; Sigafoos et al., 2004; Sigafoos, Woodyatt, Keen, et al., 2000; Sigafoos, Woodyatt, Tucker, et al., 2000; Tait et al., 2004). The interviews in five of the studies were with each participant's teacher that had known the child for at least three months (Hetroni & Rubin, 2006, Keen et al., 2001, 2005; Keen et al., 2005; Sigafoos, Woodyatt, Tucker, et al., 2000); two were with the participants' parent (Tait et al., 2004; Sigafoos et al., 2004); and one study included an interview with both the parent and the teacher separately using the IPCA (Sigafoos, Woodyatt, Keen, et al., 2000).

There were four studies that used the IPCA as a questionnaire to be filled out directly by the parent or teacher (Braddock et al, 2013; Didden et al., 2010; Didden et al., 2009; Plavnick & Ferreri, 2011). In three of these four studies, the IPCA was mailed to parents and they were asked to complete the IPCA and return it by mail (Braddock et al., 2013; Didden et al., 2010; Didden et al., 2009); whereas in one study the IPCA was given to the teacher and the Speech-Language Therapist, who were asked to complete it together (Plavnick & Ferreri, 2011). The remaining four studies used the IPCA and its classification of PCAs to complete retrospective analysis on videos of children between the ages of 9 and 36 months to determine early use of communicative acts (Bartl-Pokorny et al., 2013; Marschik et al., 2014; Marschik et al., 2013; Marschik et al., 2012).

Communicative Forms

Three of the articles reported on the forms of communication used by participants with a diagnosis of RTT (Bartl-Pokorny et al., 2013; Didden et al., 201

Table 2.1.

Summary of the Articles Included in the Literature Review

Study	Participants	Aims	Use of IPCA	Findings
Bartl-Pokorny, Marschik, Sigafoos, Tager-Flusberg, Kaufmann, Grossman & Einspieler (2013)	6 females (9-12 months) RTT	Identify communicative forms and functions used pre-regression	Analysis of video recordings	The participants used 15 different communicative forms in total and a range of 3 to 7 different functions. All used direct attention to self and answer.
Braddock, Pickett, Ezzelgot, Sheth, Korte-Stroff, Loncke, & Bock (2013)	14 males, 3 females (20-46 months) ASD	Describe communicative acts and their role used by nonverbal children with ASD. Compare this to the children's developmental profiles.	Parent/caregiver questionnaire	The majority of communicative acts were body movements, followed by vocalizations and gestures. A positive relationship was found between higher numbers of gesture types used and increased scores on language measures.
Didden, Korzilius, Smeets, Green, Lang, Lancioni & Curfs (2010)	129 females (5-55 years) RTT or PSV-RTT	To assess the range of communicative forms and functions in females with RTT. Identify associations between this and other participant characteristics	Parent/caregiver questionnaire	Most communicative behaviours were pre-linguistic or non-symbolic; The most common were eye contact and laughing/ smiling. Higher numbers of forms/functions were found in those that lived at home, had no epilepsy and were relatively young.

Table 2.1.

Summary of the Articles Included in the Literature Review

Study	Participants	Aims	Use of IPCA	Findings
Didden, Sigafoos, Korzilius, Baas, Lanicioni, O'Reilly & Curfs (2009)	42 males, 37 females (3-66 years) Angelman syndrome	Explore the forms and functions of communicative behaviour in individuals with Angelman syndrome	Parent/caregiver questionnaire	Most forms reported were pre-linguistic or non-symbolic. 90% of the participants used laughing for commenting, social convention and/or answering. Only manual signing for social convention was related to level of ID.
Hetzroni & Rubin (2006)	8 females (6-11 years) RTT	Identify communicative forms and functions in girls with RTT. To develop a criteria for identifying potentially communicative acts.	Teacher interview	Alternating eye gaze increased and persistence decreased when activities were interrupted. Inconclusive evidence that stereotypical behaviours were communicative.
Keen, Sigafoos, & Woodyatt (2001)	3 males (4;5 – 7;7 years) 1 female (3;7 years) ASD	To evaluate a teacher-implemented intervention to replace prelinguistic behaviours.	Teacher interview, naturalistic observation and structured assessment	Intervention was successful in teaching the children appropriate replacement behaviours. Intervention targeted reported functions that were verified through naturalistic and structured observation.

Table 2.1.

Summary of the Articles Included in the Literature Review

Study	Participants	Aims	Use of IPCA	Findings
Keen, Sigafoos & Woodyatt (2005)	7 males (4;5 – 7;7 years) 1 female (3;7 years) ASD	To investigate teacher response to prelinguistic communicative acts.	Teacher interview and naturalistic observation	Teachers responded to the child's communicative behaviours. Teachers were more likely to ignore protesting/rejecting behaviours
Keen, Woodyatt & Sigafoos (2002)	7 males (4;5 – 7;7 years) 1 female (3;7 years) ASD	To verify communicative forms used by the children as reported by teachers.	Teacher interview, naturalistic observation and structured assessment	Seventy-seven percent of communicative acts observed in a naturalistic setting were consistent with those identified by teachers on the IPCA.
Marschik, Bartl-Pokorny, Sigafoos, Urlesberger, Pokorny, Didden, Einspieler, & Kaufmann (2014)	5 males, 2 females (9-12 months) Fragile X syndrome	To identify early communicative forms and functions used by children with Fragile X syndrome prior to diagnosis	Video analysis	Participants demonstrated a range of 2 to11 communicative forms and 3 to 6 functions. Non-verbal behaviours were more frequent than verbal behaviours.
Marschik, Bartl-Pokorny, Tager-Flusberg, Kaufmann, Pokorny, Grossmann, Windpassinger, Petek & Einspieler (2013)	1 female (9-24 months) PSV-RTT; 1 female (9-24 months) RTT; 1 female (9-24 months) typically developing	Determine the forms and functions used between 9-24 months, whether they change over time and are there differences between nonlinguistic and prelinguitic behaviour development.	Video analysis	Participants exhibited overall 27 different communicative forms. All exhibited some behaviours for the purpose of social convention, attention to self and answer. The female with RTT showed more overall forms compared with the female with PSV earlier in development.

Table 2.1.

Summary of the Articles Included in the Literature Review

Study	Participants	Aims	Use of IPCA	Findings
Marschik, Kaufmann, Einspieler, Bartl-Pokorny, Wolin, Pini, Budimirovic, Zappella, & Sigafoos (2012)	5 females (12-24 months) PSV-RTT	Development of communicative forms and functions at age 2 years.	Video analysis	All participants showed requesting for an object and commenting, while none exhibited requesting information or choice-making. Verbal forms were used more often than nonverbal forms for rejecting.
Plavnick, & Ferreri (2011)	3 males, 1 female (4;6 – 6;6 years) ASD	Examine the potential of function-based video modeling for teaching alternative mand forms.	Teacher and Speech Therapist questionnaire	Video modeling procedures based on identified functions of communicative behavior are more effective in teaching new responses than similar procedures that are unrelated to identified functional relations.
Sigafoos, Drasgow, Reichle, O'Reilly, Green &Tait (2004)	1 male (26 months) CP spastic quadriplegia	To design and implement intervention to teach communication and adaptive behaviour skills	Parent interview	Intervention effective for replacing identified inappropriate forms of prelinguistic rejecting with socially acceptable forms.
Sigafoos, Woodyatt, Keen, Tait, Tucker, Roberts-Pennell & Pittendreigh (2000)	8 females (4-15 years) RTT; 7 males, 1 female (4-8 years) ASD; 4 females, 1 male (16-38 months) CP	Development and validation of the IPCA	Parent and teacher interview	Information from the IPCA provided an accurate and verifiable inventory of PCAs of children with DD and SCI

Table 2.1.

Summary of the Articles Included in the Literature Review

Study	Participants	Aims	Use of IPCA	Findings
Sigafoos, Woodyatt, Tucker, Roberts-Pennell & Pittendreigh (2000)	3 females (10;6 – 19;5 years) RTT	To determine whether reported functions of communicative acts were accurate across environments	Staff interview; high vs. low social interaction observations	All participants were reported to exhibit behaviors that were perceived as communicative, though the reported function of these behaviours varied. No conclusive evidence that reported behaviours were socially motivated.
Tait, Sigafoos, Woodyatt, O'Reilly, & Lancioni (2004)	3 females, 3 males (16-47 months) CP spastic quadriplegia	To evaluate parent use of functional communication training for training new forms of communication	Parent interview	Participants showed an increase in replacement behaviours and a decrease in their previous prelinguistic behaviuors across targeted functions. The behaviours reported on the IPCA were consistently observed during baseline.

Note. Age = year:month

Marschik et al., 2013). At 9 to 12 months of age, the children exhibited 15 different forms of communication including body movements, vocalizations, facial expressions/eye movements, and gestures. Prelinguistic vocalizations or protowords were observed in a child with PSV-RTT but not in a comparison child the same age with RTT. When observed across time between the ages of 9 months and 2 years, one participant with PSV-RTT exhibited a total of 18 different communicative forms, while the child with RTT exhibited a total of 15 different forms. These results were compared to a typical developing (TD) child at the same age that exhibited a total of 26 different forms and used protowords as well as word combinations. Overall, the TD child showed the most variability with using communicative forms, while the child with RTT showed the most limited repertoire at around 35 months. However, the female with typical RTT showed a greater number of communicative forms at 9 to 12 months and 18 months than either the child with PSV-RTT or TD. At 2 years of age, children with PSV-RTT were observed to use body movements, facial expressions, eye movements, and vocalizations. Symbolic forms of communication were rarely observed. Each child had a repertoire of one to five gestures in total.

Within a large sample of participants with RTT, aged 5 to 55 years, the participants were most often reported to use eye contact/gazing and laughing/smiling to communicate. Most communicative forms used were either prelinguistic or nonsymbolic, although 15 to 16% of the participants used some type of symbolic communication (e.g., speech, words) for the function of requesting.

A group of children age 9 to 12 months, each with a diagnosis of FXS, was observed to use 14 different communicative forms, each child using two to 11 different forms (Marschik et al., 2014). In total they exhibited five different body movements, five nonlinguistic vocalizations, two facial expressions/eye movements, one prelinguistic vocalization, and one gesture.

Didden et al., (2009) asked families of people with AS to report on the person's communication by completing the IPCA. The people with AS whose families returned the IPCA were aged 3 to 66 years. They were reported to use mostly communicative forms that could be classified as prelinguistic or nonsymbolic. The symbolic forms that were used were identified as serving the function of answering or imitating. Ninety percent of the sample used laughing for commenting, social convention and answering. Stereotypical behaviours such as arm flapping were used by 25% of the participants for social convention and/or commenting. Problem

behaviours were reportedly used by 10 to 35% of the sample for the purpose of rejecting and/or commenting.

In one study looking at 17 preschool children with ASD, or a diagnosis of ASD along with FASD or chromosome 16 deletion (Braddock et al., 2013), the researchers found that the highest proportion of communicative acts used by the children involved body movement, followed by vocalization and gestures. Other forms used by the children with ASD were challenging behaviour, eye gaze, facial expression, imitation, and stereotyped movements.

Communicative Functions

Results showed evidence of six children with RTT between the ages of 9 to 12 months (Bartl-Pokorny et al., 2013) using the functions of directing attention to self and answering. None of the six girls were observed to request for information or make choices. When observing children with PSV-RTT at 12 to 24 months (Marschik et al., 2012) researchers reported that all of the girls were observed to request objects and comment, though less than half (i.e., two of the five participants) showed acts for the functions of social convention, attention to self, reject/protest, request object, request action, comment, answer, or imitate. One study (Marschik et al., 2013) compared the functional use of language in three children, one with RTT, one with PSV-RTT, and one TD child. All participants exhibited behaviours for social convention, attention to self, and answering. They all were observed to comment and to demonstrate requesting object, though the TD child requested objects in the first year of life while the children with RTT or PSV-RTT did not show this function until the age of 2 years. The child with RTT and the child with PSV-RTT showed imitation (but not of prelinguistic vocalizations), while the TD child imitated vocalizations. None of the children were reported to use requesting information or commenting. These results can be compared to those found by interviewing parents of participants aged 5 to 55 years (Didden et al., 2010) with a diagnosis of RTT or PSV-RTT. Common functions used by this larger range of participants post diagnosis were social convention, commenting, answering, requesting, and choice making.

Young children with FXS at age 9 to 12 months were observed using the functions of attention to self and answering (Marschik et al., 2014). They were not observed to use the functions of requesting action, requesting information, choice making, or imitating. Preschool-aged children with ASD most often used the function of commenting, followed by attention to self and rejecting, while requesting

information was the least commonly reported by parents (Braddock et al., 2013). A large-scale study of people with AS (Didden et al., 2009) revealed that the participants were reported to use a variety of behaviours to communicate requesting, rejecting/protesting, and commenting. The least well developed functions were requesting information and imitation, though these were reported as used by some of the participating children.

Verbal versus Nonverbal Behaviour

Comparisons between the use of nonverbal and verbal communicative forms were reported for children with RTT and for one-year-old males with FXS (Bartl-Pokorny et al., 2013; Marschik et al., 2014; Marschik et al., 2013; Marschik et al., 2012). At 9 to 12 months of age, children with RTT showed more nonverbal behaviours than nonlinguistic vocalizations for use of all communicative functions with the exception of rejecting/protesting. Both females with typical RTT and PSV-RTT used nonlinguistic vocalization(s) to reject than nonverbal behaviour(s). All vocalizations observed were judged to be nonlinguistic, with no instances of prelinguistic (e.g., protowords) communication. Overall, there were more nonverbal behaviours used than vocalizations in each child's communicative repertoire. This finding was consistent across two studies looking at communication of children age 9 to 24 months with a diagnosis of RTT (Marschik et al., 2013; Marschik et al., 2012). When the communication of a child with typical RTT was compared to that of a child with PSV-RTT and a TD child (Marschik et al., 2013), the use of nonlinguistic vocalizations increased with age for the child with PSV-RTT; increased from age 9 to 12 months to 13 to18 months for the child with RTT, then decreased at age 19 to 24 months; and decreased for the TD child. Prelinguistic vocalizations were only observed in the PSV-RTT and TD child and showed an increasing trend in the female with PSV-RTT. When videos of children with PSV-RTT at 12 to 24 months were analysed (Marschik et al., 2012), the researchers noted that nonverbal forms dominated over verbal forms across six of the eight pragmatic categories, though verbal and nonverbal forms were equally present for the functions of commenting and answering. None of the females with PSV showed verbal imitation. Overall however all verbal forms were rare and most of the observed communicative behaviours used by participants with RTT across studies were nonverbal behaviours, regardless of the child's age or type of RTT.

Children with FXS aged 2 to 12 months were reported to use more nonverbal than verbal behaviours for social convention, attention to self, and answering (Marschik et al., 2014). Nonlinguistic vocalization was used more often than nonverbal behaviour for the purpose of commenting. At least one child was observed to use nonlinguistic vocalizations for commenting, attention to self, and answering. Nonverbal behaviour and nonlinguistic vocalizations were used equally as often to reject/protest and request an object. Overall nonverbal behaviours were observed more often than nonlinguistic vocalizations.

Correlation to External Factors

When the type or number of different forms and functions used was compared to other variables, such as living environment, presence/absence of epilepsy, or developmental scores, participants' use of form and function was found to correlate with several different factors. For example, girls with RTT who lived at home were reported to use certain behaviours more often to express specific functions than were girls with RTT who lived in a facility (Didden et al., 2010). The girls with RTT living at home were more likely to use eye contact/gaze to reject/protest or request an object. They were also more likely to vocalize to request an action, and to laugh or smile to answer. The girls with RTT that lived in a facility were more likely to close their eyes to comment. Researchers also concluded that the use of communicative forms and functions was present more often in females with RTT without epilepsy than those with epilepsy. For example, females without epilepsy were more often reported to look happy for the purpose of answering and to use approaching another person for social convention and drawing attention to self than those females with epilepsy. In general, the females with RTT who were young, lived at home, and did not have epilepsy, used a greater percentage of forms and functions to communicate than their counterparts.

Similar factors were compared to the use of communicative forms and functions in a group of people with AS (Didden et al., 2009). Participants with AS deletion were reported to more often use manual signs for the purpose of social convention, request an object, and comment than those participants with AS disomy. Similarly, more individuals with severe ID used manual sign for social convention functions than those with profound ID. In addition, participants with AS who lived at home were significantly more often reported to use crying to comment and laughing to answer than those living in a residential facility. A significantly greater proportion

of participants who had AS without epilepsy were reported to use aggression to reject/protest and were reported to use more symbolic forms to communicate than those with epilepsy. In relation to age, a greater number of younger children used arm flapping and laughing to answer than older youths and adults. Overall, participants with AS disomy who lived at home, did not have a diagnosis of epilepsy, were comparatively young, and who had severe ID were more likely to use a larger number of communicative forms and functions than their counterparts.

One study compared measurements of children with autism's developmental abilities using the Birth to Three Assessment and Interventions System-Comprehensive Test of Developmental Abilities (B-3 CTDA) to each child's use of communicative forms and functions (Braddock et al., 2013). There was a positive correlation between a child's total number of different types of PCAs used and the B-3 CTDA language expression percent development score. There was also a positive correlation between the number of gesture types used and a child's language comprehension, language expression, and non-verbal thinking percent development scores. Children with ASD that scored lower on the B-3 CTDA language expression percent development score had fewer gesture types. There were no differences found however between this group of children with ASD and those with ASD that scored higher in expressive language with regard to the number of body movements, vocalizations, or total number of PCAs used.

Teacher Response to PCAs

One study observed the responses of teachers to PCAs of children with DD in the classroom that the teachers had previously reported to carry functional meaning (Keen et al., 2013). Overall the teachers showed some acknowledgement of the child's communicative intention approximately 63% of the time. Around 38% of the time the teachers did not respond to communicative attempts by the children that they had identified as intentional communicative behaviours. The teachers were found to most often ignore behaviours that served the function of protesting/rejecting in comparison to other communicative functions.

Verification of the IPCA for use in Assessment and Intervention Planning

Various methods of measurement used to verify the IPCA as a way of identifying PCAs in children with DD have all found the forms and functions reported on the IPCA to be verifiable on average 50% or more of the time (Keen et al., 2001; Keen et al., 2002; Sigafoos, Woodyatt, Tucker et al., 2000). Researchers reported that

77% of PCAs observed in the classroom during natural observations were consistent with those identified by teachers during an interview using the IPCA (Keen et al., 2001). During structured assessment, children with DD used on average the same form reported by teachers 70% of the time. In a study of the communicative behaviours of three children with RTT, they all engaged in several behaviours that were identified by staff as well as observed with a high degree of reliability (Sigafoos, Woodyatt, Tucker et al., 2000). This study also looked at variations of reported communicative acts during high and low social interaction, however the results were inconclusive as to the effect this had on the performance of the children. Overall, the included studies indicated that the IPCA was a reliable assessment tool for identifying form and function of PCAs, although there has been noted variation as to the reported and observed function(s) of the PCAs.

The IPCA was also found to be valuable for intervention purposes. One intervention study targeted three communicative forms that each child with ASD was both observed and reported (by the teacher on the IPCA) to demonstrate and that were considered by social partners as inappropriate (Keen et al., 2001). The intervention goal was to teach replacement behaviours for each of the three selected forms and functions. The intervention was successful and the researchers discussed how this could likely have been related to the assessment data collected using the IPCA, along with observations, as it allowed them to clearly identify target behaviours. Similar findings occurred in three other studies using the IPCA to identify inappropriate forms to target for intervention (Plavnick & Ferreri, 2011; Sigafoos et al., 2004; Tait et al., 2004). All interventions proved to be successful in teaching children with DD a more appropriate replacement form of communication. Each of the studies noted that the assessment process (using the IPCA) was an important part of the intervention process as it allowed the identification of appropriate targets as well as assisted with choosing an appropriate intervention target form.

Measure Intentionality

Hetzroni and Rubin (2006) observed the actions of girls with RTT during familiar and unfamiliar activities and compared them to the participants' responses or actions when these activities were interrupted. The aim was to try and discriminate behaviours that were intentionally communicative from those that were not communicative. They found that alternating eye gaze changed significantly between the activities and the interruptions. Other behaviours showed an increase or a decrease

in frequency during the activity and interruptions (e.g., stereotypical hand movements, touches to the object or adult, switch use, persistence) though these were not found to change significantly. Overall it was concluded that there needs to be more research into ways of determining whether behaviours related to the diagnosis of RTT are in fact communicative in nature or whether they are stereotypical and neurologically manifested.

Discussion

Findings from the 16 studies included in this review suggest that the IPCA appears to be a promising measure for identifying and assessing PCAs in children with DD and SCI. The findings from these studies were summarized in terms of (a) participants, (b) aims of the studies, (c) procedures, (d) results, and (e) extent to which whether using the IPCA allowed the researcher(s) to acquire the information needed to answer their research question effectively. The combined results provide a comprehensive picture of the various uses of the IPCA and ways in which it can be used to identify PCAs in a range of persons with DD.

The combined total of participants ($N =287$) represented a range of DD diagnoses, including RTT, AS, ASD, CP, FASD, FXS, and ID. Participant age ranged from 9 months to 70 years. A significant number of participants were reported to have other diagnoses (e.g., severe language impairment, vision impairment, hearing impairment) as well as dual diagnoses (e.g., FASD and ASD). The IPCA can also be used with prelinguistic TD children for comparison purposes, albeit this usage has been very limited. From this data we can surmise that the IPCA is a suitable protocol to use with a wide range of participants of all ages with DD.

In general the IPCA was used to identify the form and function of PCAs of various participants with DD. This information however was collected for a multitude of purposes. These included (a) to compare communication profiles of people with similar diagnoses, (b) to compare the form and function of communication to other developmental variables, (c) to compare the use of nonverbal to (pre)linguistic forms, (d) to verify the IPCA as a reliable measure of PCAS, (e) to observe the consistency of use of PCAs during environmental changes, (f) to identify PCAs appropriate to target for intervention, (g) to investigate measures for identifying intentional communication, and (h) to investigate teacher responses to PCAs. The IPCA was used

successfully in each of the studies in order to obtain the information necessary for the stated purpose(s).

The IPCA was used as an interview protocol with different informant groups such as parents, teachers, caregivers, and clinicians. It was also used as a questionnaire for gathering information from larger samples via mail, and as a guide for analyzing and coding PCAs from videotaped observations. Additionally, it has been shown to be valid for intervention planning with intervention aimed at replacing PCAs identified on the IPCA with new forms of communication.

There were similarities and differences with regards to forms of communication identified across different etiologies. The majority of PCAs across participants with DD were reported to be prelinguistic or nonsymbolic, with some reported instances of symbolic communication. The forms of communication most often used by persons with RTT were body movements, vocalizations, facial expression/eye movement, and gesture. Participants with PSV-RTT showed a greater number of different communicative forms with some evidence of prelinguistic vocalizations or protowords compared to those with RTT. The most commonly reported PCAs were eye contact/gazing and laughing/smiling. Use of symbolic communication was reported in 15 to 16% of the participants. Similarly, people with AS were found to most often use prelinguistic or nonsymbolic forms to communicate; 90% of the participants with AS used laughing for commenting, social convention and/or answering. Stereotypical behaviours were used by 25% of the participants with AS and 10 to 35% used problem behaviours for the purpose of rejecting

The highest proportion of PCAs demonstrated by preschool-age participants with ASD (or with dual diagnosis of ASD and FASD or chromosome 16 deletion) were body movements, followed by vocalizations and gestures. Other reported forms used were challenging behaviour, eye gaze, facial expression, imitation, and stereotyped movements. A group of children aged 9 to 12 months with FXS were also reported to use the highest proportion of body movements, followed by nonlinguistic vocalizations. There was some evidence of prelinguistic vocalization and gesture. Although there were participants included in the research with a diagnosis of CP, information on the communicative profiles of these children were not provided as the IPCA was used to identify intervention targets rather than to assess each participant's communicative repertoires.

With respect to the functions expressed by participants, all of the participants with RTT were found to use the functions of directing attention to self and answering at the age of 9 to 12 months, as were children aged 9 to 12 months with a diagnosis of FXS. Neither group exhibited requesting information or choice making. At age 12 to 24 months, children with RTT were requesting objects and commenting. Preschool-age children with ASD most often used PCAs for commenting, followed by attention to self and rejecting. At this age some children with ASD were reported to request information, though it was the least commonly reported function. Participants with AS, aged 3 to 66 years, used a variety of behaviours to request, reject/protest, and comment. The functions of requesting information and imitation were used by a limited number of participants. When looking at the PCAs reported to be used by those with RTT or PSV-RTT aged 5 to 55 years, the most commonly used functions were social convention, commenting, answering, requesting, and choice making. From these findings it is evident that the use of communicative functions varies both within populations with similar diagnoses as well as between similar aged populations with varying diagnoses.

The use of nonverbal versus verbal behaviours was compared for children with RTT as well as for children with FXS. Children aged 9 to 12 months with RTT used predominantly nonverbal behaviours over nonlinguistic vocalizations except when rejecting/protesting. Use of nonlinguistic vocalizations was found to increase for those with PSV-RTT between 9 and 24 months of age. In comparison, for those with RTT there was an increase from 9 to 12 months and 13 to 18 months, but then a decrease in use of nonlinguistic vocalizations from 19 to 24 months. At 12 to 24 months, children with PSV-RTT used verbal and nonverbal forms equally for commenting and answering, though for other functions nonverbal forms dominated over nonverbal forms. For the children with FXS, aged 2 to 12 months, nonverbal behaviours were observed overall more often than nonlinguistic vocalizations, however nonlinguistic vocalizations were used more often for commenting.

Participants' use of communicative forms and functions was found to correlate with external factors in girls with RTT, participants with AS, and children with ASD. Girls with RTT who lived at home used eye contact/gaze to reject/protest or request an object more often than those residing in a residential facility. They were also more likely to vocalize to request an action, and to laugh or smile to answer than those girls with RTT living in a facility. The girls living in a facility were more likely to close

their eyes to comment. Overall, the females with RTT who were young, lived at home, and that did not have epilepsy used a greater percentage of forms and functions to communicate. Similarly, participants with AS disomy who lived at home, did not have a diagnosis of epilepsy, were comparatively young, and had severe ID used a greater number of forms and functions compared to their counterparts. Participants with AS deletion used more manual signs for social convention, requesting an object, and commenting than those participants with AS disomy. In addition participants with AS with severe ID used manual sign for social convention more often than those with profound ID. For children with ASD, a positive correlation was found between the total number of types of PCAs used and their language expression percent development score on the B-3 CTDA, as well as a positive correlation between the number of gesture types and the child's language comprehension, language expression, and nonverbal thinking percent development scores.

There was only one study looking at how teachers responded to PCAs of children with DD that the teachers had reported as communicative. The teachers responded to these behaviours in the classroom approximately 63% of the time and gave no response 38% of the time. They most often ignored forms representing protesting/rejecting.

Various methods of measurement have been employed to verify information gained from the IPCA. These methods include naturalistic classroom observation, structured assessment, and high and low social interaction situations. Using structured assessment and naturalistic observation revealed that participants used similar forms and functions to those reported by teachers on the IPCA 70 to 77% of the time. The use of PCAs during high and low social interaction situations was inconclusive as there was no clear evidence that these situations had a significant effect on the participants' behaviours. The IPCA was also found to be a useful and appropriate tool for identifying appropriate forms and functions to target during intervention. All intervention studies using the IPCA as a preintervention assessment tool were successful in replacing inappropriate behaviours with socially acceptable forms that served the same function.

One study looked at identifying intentionality in stereotypical behaviours found in girls with RTT. Alternating eye gaze was found to be the only behaviour that increased significantly when an activity was interrupted. The girls also used more stereotypical hand movements during interruption, though this was not found to be

significant. Behaviours that decreased during interruption of the activity were switch use, persistence, and touches though these also did not reach significance. The research concluded that there was no concrete evidence that certain behaviours were in fact communicative and that further research needs to be done to determine appropriate measures of intentionality for identifying whether actions are communicative or simply stereotypical or neurological behaviours that do not serve a communicative function.

Several main conclusions can be derived from the findings of this literature review. First, the IPCA is an interview protocol that can be used for people with SCI that demonstrate a wide range of disabilities. Evidence from the current research demonstrates how the IPCA may be used for both children and adults with DD regardless of his or her level of impairment, diagnosis, physical ability, or existence of concomitant impairments such as hearing or vision impairment. Second, it is apparent that the IPCA may be used in a variety of ways other than its intended use as an interview protocol. The IPCA is an effective tool for gathering information from different informants given that they are knowledgeable of the person's communication ability. It can be used as an interview protocol or as a questionnaire, and provides a sound framework for analyzing PCAs during naturalistic or structured observations. In addition, the IPCA assists with both identifying PCAs and the function(s) that they serve. This becomes particularly important when identifying inappropriate or undesirable behaviours for the purpose of teaching replacement behaviours; the function of the undesired behaviour must be evident in order to choose an appropriate replacement behaviour that will serve the same purpose. Fourth, given the findings from the verification trials done on the information gained from teachers using the IPCA, it can be assumed that the information is consistent with the child's classroom performance. Using the IPCA can therefore be used as an alternative to classroom observation or structured assessment. This will limit time spent on data collection for assessment purposes. Finally, there is evidence to support the idea that a person's use of PCAs is correlated with other developmental and environmental factors. The IPCA may therefore, with additional research, prove to be a useful tool for measuring a person's expressive, receptive, or pragmatic communication skills. It may also help to identify risk factors for ongoing or deteriorating communication skills.

Given the promise of the IPCA, it would seem that further research using the IPCA is warranted. For example, it would seem important to assess inter-informant agreement as a measure of the reliability of the IPCA when used for various purposes. Is the information gained from the IPCA more reliable when it is used as in interview protocol than as a questionnaire? Do the categorizations on the IPCA provide adequate detail to fully analyse the PCAs of children with SCI?

Another apparent strength of the IPCA is the ability to use it with a variety of people who work with a child across different environments. Further research needs to reinforce these findings by comparing reports from various communication partners, for example comparing the forms and functions reported by a child's teacher with those reported by his/her parent. Further support for the reliability of the data can be gained by using structured assessment trials as a further comparison of the child's use of PCAs with different communication partners and across different environments. There have been reported results for structured assessment trials with the teacher or the researcher implementing the trials, however there has only been assessments using unstructured observations of the child interacting with his/her parent(s).

Although there was evidence from previous literature that there is a correlation between a child's use of PCAs and their scores on developmental assessments, further research in this area is needed to determine whether data on a child's use of PCAs can be compared to other measures of development, such as their level of adaptive behaviour. This information is valuable and necessary for determining whether PCAs in this population may have any predictive value for later use of communication.

Limitations

There were several limitations to this literature review. Given the limited number of articles published that have used the IPCA (n = 16), we can only surmise the extent to which the IPCA can be used effectively. There is also the possibility that more research has been completed using the IPCA, but has not been published in a peer-reviewed journal or in English, or that it was not uncovered using the search procedures. Moreover, although there were several participants included that had a diagnosis of CP, the specific communicative profiles of these participants were not reported and therefore could not be analysed to identify possible similarities and differences in PCAs related to CP. Finally, there are other types of DD (e.g., Down syndrome, Muscular dystrophy) that were not represented in the participant sample,

therefore it cannot be definitively concluded that the IPCA may be used with all populations that fall within the category of DD.

Conclusion

From this systematic literature review we can conclude that the IPCA is a valid and reliable tool for use with a range of people with a diagnosis of DD; specifically ASD, ID, AS, and RTT. Findings show that there are both similarities and differences in the reported use of communicative forms and functions relative to a person's age, diagnosis, intellectual ability, social situation, and the existence of other medical impairments (e.g., epilepsy). Using the IPCA as an assessment tool provides researchers, families, communication partners, and therapists with information that facilitates our understanding of the nature of prelinguistic and nonverbal communication.

CHAPTER 3

PURPOSE OF THE PRESENT STUDIES AND RESEARCH QUESTIONS

The focus of this research thesis is to develop an understanding of the potential communicative acts (PCAs) used by children with developmental disability (DD) and severe communication impairment (SCI). Research in the area of prelinguistic communication indicates that these children do in fact use a variety of behaviours to communicate for different purposes. Given the importance of understanding their communication for assessment of communication skills as well as for intervention purposes, further knowledge of these idiosyncratic, subtle ways of communicating is warranted. Although promising, previous research has only given preliminary evidence that the Inventory of Potential Communicative Acts (IPCA) is a valid and reliable measure of children with DD and SCI's perceived communication acts. This research will provide further information on the reliability of the IPCA, which will be measured in terms of the percentage of agreement between the parent's and the teacher's responses to the IPCA. This type of reliability data can be referred to as inter-informant agreement. This research will also provide additional information to determine whether information gained from the IPCA can be verified through structured assessment trials. In addition, it will also look at the types of forms used by children with DD, specifically the different types of behaviours and whether there are similarities or differences across participants. Further analysis will include comparing the use of various functions across participants to see whether any developmental trends are apparent. Finally, the findings from the IPCA and the structured assessment trials will be compared to determine whether the children's' PCAs vary relative to communication partner.

Research Questions

The overall question of this thesis is the following: *How do children with DD and SCI use PCAs to communicate with different communication partners across different environments?*

Aspects of this question are addressed in three separate research projects. The results from each of the studies will be analysed and synthesized to provide answers to the following questions:

1. What are the similarities and differences between the reported PCAs of
   children with DD when comparing the information provided by the school
   teacher/teacher aide and the parent? Do children show similarities in their use
   of communicative forms across communication partners and environments?
   Do the results indicate that interviewing communication partners using the
   IPCA is a reliable method of assessment?
2. Are the PCAs used by each child during structured assessment trials,
   implemented by the researcher in a clinic setting, similar to those reported by
   the parent?
3. Are the PCAs used by each child during structured assessment trials,
   implemented by the parent in a clinic setting, similar to those reported by the
   parent?

The IPCA was chosen as the preferred method for obtaining information on the
forms and functions of a child's reported PCAs for several reasons. First, using the
IPCA as an interview protocol allows for one-to-one contact with the parent as well as
the teacher or teacher aide. This makes it possible for the interviewer to probe further
on questions when the informant's answer is vague or unclear. Second, the IPCA
takes approximately one hour to administer, which would seem to be a reasonable
amount of time considering the amount of information that is gained. Third, the IPCA
allows the interviewer to easily identify the forms that are used for specific functions
as well as examples of how and when these behaviours occur. Finally, research
findings looking at the validity of the IPCA have shown that it is a reliable and useful
tool for identifying PCAs in children in the target population. Therefore it was the
preferred choice for using in the first study.

CHAPTER 4
STUDY 1
IDENTIFYING THE COMMUNICATIVE FORMS AND FUNCTIONS IN CHILDREN WITH DEVELOPMENTAL DISABILITY

METHOD

Participants

Ten children, aged 2 years 6 months to 11 years of age, along with each child's parent and classroom teacher and/or teacher aide, participated in this study. Each child participant was recruited either through the Victoria University Educational Psychology Clinic or through Ministry of Education, Special Education. All 10 of the child participants met the following criteria: (a) a diagnosis of developmental disability (e.g., autism spectrum disorder or intellectual disability), (b) aged 2 to 12 years, (c) communication age equivalencies of 2 years or less as measured by the Vineland-II Adaptive Behavior Scales (Vineland-II; Sparrow et al., 2005) and the Rossetti Infant-Toddler Language Scale (Rossetti; Rossetti, 2006); and (d) no evidence or report of significant auditory of visual impairment.

Table 4.1 provides a summary of the characteristics of each child participant. Table 4.2 provides a summary of the Vineland-II results for each child. Table 4.3 provides a summary of the Rossetti results for each child. The Vineland-II (Sparrow, et al., 2005) is a standardised measure used for assessing adaptive behaviour skills from preschool age to 18 years. It covers five domains: communication, daily living skills, socialization, motor skills, and maladaptive behaviour. The survey form can be administered to a parent or teacher who is familiar with the child and is aware of his/her current level of functioning. The information can then be used to calculate a standard score, percentile rank, and age equivalent score. For the purpose of this research, all participants' scores on the Vineland II were reported as age equivalent scores. This allowed the communication scores to be directly compared to the communication scores on the Rossetti. Age equivalent scores were also considered to be an appropriate way of reporting each participant's scores as they have also been used to report communication scores in previous research.

The Rossetti (Rossetti, 2006) is a criterion-referenced assessment tool that measures a child's level of (a) interaction-attachment, (b) pragmatics, (c) gesture, (d) play, (e) language comprehension, and (f) language expression. The target behaviours are separated into age categories at three-month intervals from birth to 3 years of age. Mastery of a behaviour can be demonstrated through observation, direct elicitation or parent/caregiver report. From this information, the administrator is able to obtain basal and ceiling levels of performance in each of the categories measured.

Parents served as informants for the Vineland and Rossetti assessments. Parents were given the Vineland II (Sparrow et al., 2005) with instructions and examples for how to fill out the form. The researcher asked the parent if he/she had any questions, then the parent took the form home to complete. All Vineland forms were completed within four weeks of the IPCA interview. During the IPCA interview session, the researcher also administered the Rossetti (Rossetti, 2006) as an interview protocol to assess the child's expressive and receptive communication age level. Based on the information from the IPCA, an age level appropriate to the child's reported communication was chosen as a starting point. The researcher then asked the parent the questions related to the starting age level, marking off whether each skill was reported to be present or absent from the child's repertoire. Once a parent reported that hise/her child was able to perform all of the items at a given age level, the researcher proceeded to ask whether the child showed each of the skills for the next highest age level. This continued for each of the sections on the Rossetti until the parent reported that the child did not have any of the skills at that age level, or the child reached the highest age level. Descriptive information about each child participant is provided below.

Participant 1: Ian. Ian was a 10-year-old male diagnosed with autism by a paediatrician. He attended a Montessori school where there was a learning unit for children with special needs. English was the only language he was exposed to at school and at home. Ian received an age equivalence score of 1:2 (years:months) for receptive communication, and 1:6 for expressive communication on the Vineland-II communication subdomain (Sparrow et al, 2005). Ian had a written score of 6:5 on the Vineland II due to the fact that he was able to write high frequency words independently when prompted. Based on parent report using the Rossetti (Rossetti, 2006), Ian had a basal score of 0 to 3 months for pragmatics, language comprehension, and language expression. He had a ceiling score of 18 to 21 months

for pragmatics, 27 to 30 months for language comprehension, and 21 to 24 months for language expression. Ian had limited spoken language consisting of one-word utterances that were mainly echolalic. Ian's mother reported that he used gesture, leading, and vocalisation to communicate his basic wants and needs. Ian had received eight months of weekly communication intervention aimed at teaching him to use Proloquo2Go on the iPad, with a specific focus on requesting and/or rejecting preferred/nonpreferred items. Ian learned to use the iPad to request and also began verbally requesting preferred items using single words. He learned to use the iPad to reject items (i.e., pressed *no thanks* if he did not want an item). However, when the iPad was not available, he reverted to using physical means (e.g., pushing item away) to reject rather than using speech.

Participant 2: Jack. Jack was a 7-year-old male with a diagnosis of autism made by a paediatrician. Jack's home and school language was English. He attended a local school and was mainstreamed in an age-appropriate classroom with one-to-one teacher aide assistance. His age equivalence scores on the Vineland-II (Sparrow et al., 2005) were 1:4 for receptive communication and 0:8 for expressive communication. He had a basal score of 0 to 3 months for pragmatics and language comprehension, and did not obtain a basal score for language expression on the Rossetti (Rossetti, 2006). Jack's ceiling scores on the Rossetti were 12 to 15 months for pragmatics, 21 to 24 months for language comprehension, and 9 to12 months for language expression. Jack was not reported to ever use words to communicate; his mother reported that he used vocalisation, leading, and gesture to request. Jack had received communication intervention for the past eight months to teach him how to use the iPad as a communication device using Proloquo2Go software. Jack learned to request a break from a structured activity independently using the iPad. He also learned to choose an item to play with by pushing the picture of the preferred item from a field of two on the iPad.

Participant 3: Ryan. Ryan was a male, aged 10 years 1 month at the time of the study. He was diagnosed by a paediatrician with Global Developmental Delay (GDD) and autism. He was spoken to in English at both home and school. Ryan's age equivalent scores on the Vineland-II (Sparrow et al, 2005) were 1:4 for receptive language and 1:7 for expressive language. He did not reach a basal score for language comprehension on the Rossetti (Rossetti, 2006), but his ceiling age was 21 to 24 months. His language expression basal was 9 to 12 months and his ceiling score

was 24 to 27 months. Ryan's ceiling score for the pragmatics portion of the Rossetti was 0 to 3 months. Ryan was reported to use verbal speech at times for requesting or to avoid/escape activities. He demonstrated echolalic speech, with only a few words reported to be spontaneous. Ryan had received communication intervention for using the iPad as a communication device with Proloquo2Go software. Ryan learned to match objects and words from picture cards to symbols and words on the iPad. He also learned to request preferred items by discriminating between four pictures on the iPad. Ryan wore glasses during all sessions to compensate for his vision impairment. He had no reported hearing impairment.

  Participant 4: Ronald. Ronald was a male, aged 8 years 7 months, who had a diagnosis of GDD and autism, as diagnosed by the paediatrician. Ronald was spoken to in English at school and in Hindi and English at home. He attended a special unit at his local school for children with specific learning needs and had teacher aide assistance for part of the school day. His age equivalencies on the communication domain of the Vineland-II (Sparrow et al., 2005) were 1:4 and 1:1 for receptive and expressive language respectively. Ronald had a written score of 5:10 on the Vineland II as he was able to write several words of items that he was interested in. Ronald did not obtain a basal score on the Rossetti (Rossetti, 2006) for pragmatics, language comprehension or language expression. His ceiling scores were 3 to 6 months, 21 to 24 months, and 15 to 18 months for pragmatics, language comprehension and language expression respectively. Ronald did not have any spoken language, but approximated a few words occasionally while signing. Ronald had received six months of intervention for learning to use the iPad to request and reject items when offered to him. He had no reported visual or auditory deficits.

  Participant 5: Sean. Sean was a male, aged 3:6, with a diagnosis of GDD and autism made by his paediatrician. Sean's family spoke both English and Russian at home. He attended a childcare facility part-time during the week where he interacted with peers his own age. The rest of the week he was at home with this mother. Sean had received speech-language therapy through the Ministry of Education. His mother contacted the Educational Psychology Clinic at Victoria University about intervention due to her concerns that he had not developed any verbal speech. His age equivalency scores for receptive and expressive communication on the Vineland-II (Sparrow et al., 2005) were 0:8 and 0:6 respectively. As per parent report, he did not meet all the criteria for pragmatics, language comprehension or language expression at the 0 to 3

month level on the Rossetti (Rossetti, 2006) and therefore basal scores could not be established. His ceiling scores were 9 to 12 months for pragmatics and 12 to 15 months for both language comprehension and language expression. Sean was reported to be nonverbal and communicated through gesture, leading, and vocalizing. There were no reported hearing or visual impairments.

Participant 6: Sara. Sara was a female, aged 2 years 7 months at the time of the study, who had a recent diagnosis of autism and GDD made by a psychologist and a paediatrician. Her receptive and expressive age equivalency scores on the Vineland-II (Sparrow et al., 2005) were 11 months and 8 months respectively. She did not meet the criteria for any basal scores on the Rossetti (Rossetti, 2006) and her ceiling scores for pragmatics, language comprehension and language expression were 12 to 15 months, 6 to 9 months, and 6 to 9 months respectively. Sara did not use speech to communicate and relied on prelinguistic forms such as handing items to her mother, unzipping her mother's bag to obtain an item, and sitting in her mother's lap for comfort. She showed little interest in social interaction, but did exhibit enjoyment while listening to her mother read or sing songs as evidenced by smiles and eye contact. She had been receiving private speech-language therapy to focus on developing her nonverbal and verbal communication and interaction skills; she was however not receiving intervention at the time of this assessment study. Sara had no reported visual or hearing deficits.

Participant 7: Jane. Jane was 4 years 1 month old at the time of the study. She had a recent diagnosis of autism by a paediatrician. She had no reported deficits in hearing or vision. Her receptive and expressive age equivalency scores on the Vineland-II (Sparrow et al., 2007) were 1:6 and 1:2 respectively. Jane did have some reported spoken language consisting of one-word utterances that were generally used for requesting, with some echolalia of phrases. Her basal scores on the Rossetti (Rossetti, 2006) were as follows: language comprehension, 6 to 9 months; pragmatics, 0 to 3 months; and gesture, play, and language expression, 9 to 12 months. Her ceiling scores for language comprehension and language expression were 27 to 30 months and 24 to 27 months. Jane received teacher aide support at her kindergarten and was also receiving speech-language therapy privately.

Participant 8: Kate. Kate, age 6 years 11 months, had a diagnosis of PCDH19 related encephalopathy, a rare genetic disorder that occurs predominantly in females and is associated with mild to severe ID and poor language development

(Depienne & LeGuem, 2012). She received a diagnosis of moderate to severe ID by a clinical psychologist prior to starting school. Kate received one-to-one teacher aide support at school and was taught in a classroom on her own. She has a twin sister who is mainstreamed in a classroom with age-appropriate peers. English was spoken in the home and at school. Kate was not reported to use any verbal speech to communicate. Her receptive and expressive age equivalency scores on the Vineland-II (Sparrow et al., 2005) were 1:9 and 7 months. Kate's basal scores on the Rossetti (Rossetti, 2006) were all at 0 to 3 months except for play, where there was no basal established. Her ceiling score for language comprehension was 27 to 30 months and 15 to 18 months for language expression.

Participant 9: Harold. Harold was a male, aged 8 year 6 months, with a diagnosis of autism. Harold was spoken to in English at home and school. He attended a special unit for children with high needs at his local school. Harold was reported to be nonverbal but at times used an iPod to request preferred items. His receptive and expressive age equivalency scores on the Vineland-II (Sparrow et al., 2005) were 11 months and 7 months respectively. Harold did not demonstrate a basal level on the Rossetti (Rossetti, 2006) for any categories other than play, for which his basal was 3 to 6 months. His ceiling scores ranged from 3 to 6 months up to 27 to 30 months, with his lowest score in language expression, and his highest score in Play. Harold did not have any reported hearing or vision impairment.

Participant 10: John. John, a male aged 6 years 10 months, had a diagnosis of autism made by a paediatrician. English was the primary language both at school and at home. John attended a special unit for children with high needs at his local school. He also received ABA therapy several days a week at home. John was nonverbal but was able to use an iPod to make requests for objects or activities using up to two button combinations (e.g., I want to play). His scores on the Vineland-II (Sparrow et al., 2005) for expressive and receptive communication were 0:8 and 1:0 respectively. He did not meet all of the developmental milestones at any age on the Rossetti (Rossetti, 2006) therefore no basal scores were established. His ceiling score for language comprehension was 12 to15 months and 3 to 6 months for language expression. There was no reported or suspected vision or hearing impairment.

Setting

Nine of the 10 parent interviews took place at The Educational Psychology Clinic at Victoria University of Wellington's Karori Campus. One parent interview

took place in the child's home. The teacher or teacher aide interviews were conducted
at the child's school or daycare centre. The interviews generally involved the
researcher and the person being interviewed, although in several instances a second
teacher or a teacher aide participated in part of the interview to provide additional
information.

Interview Protocol

The Inventory of Potential Communicative Acts (IPCA) was used as an
interview protocol during all of the interview sessions. As discussed previously, the
IPCA is a structured interview protocol that is designed to identify PCAs used by

Table 4.1

Summary of the Characteristics of Each Child Participant

Participant	Name	Age	Diagnosis	Home Language
1	Ian	10:0	Autism	English
2	Jack	7:0	Autism	English
3	Ryan	10:1	GDD, Autism	English
4	Ronald	8:7	GDD, Autism	English, Hindi
5	Sean	3:6	Autism	English, Russian
6	Sara	2:7	GDD, Autism	English
7	Jane	4:1	Autism	English
8	Kate	7:1	PCDH19 related Encephalopathy, ID	English
9	Harold	8:6	Autism	English
10	John	6:10	Autism	English

Note. Age = year:month; GDD = Global Developmental Delay; ID = Intellectual
Disability

children to express 10 different functions. The interview should be used with people
who have known the child or the individual for at least 6 months and who interact
with him/her on a regular basis (i.e., parent, teacher, teacher aide, therapist, support
worker). The protocol systematically works through 10 communicative functions,

Table 4.2

Summary of the Vineland II Results for Each Child

Participant	1	2	3	4	4	6	7	8	9	10
Name	Ian	Jack	Ryan	Ronald	Sean	Sara	Jane	Kate	Harold	John
Age	10:0	7:0	10:1	8:7	3:6	2:7	4:1	7:1	8:6	6:10
Communication Domain										
Receptive	1:2	1:4	1:4	1:4	0:8	0:11	1:6	1:9	0:11	1:0
Expressive	1:6	0:8	1:7	1:1	0:6	0:8	1:2	0:7	0:7	0:8
Written	6:5	1:10	4:2	5:10	1:10	-	1:10	1:10	2:5	1:10
Dailing Living Skills Domain										
Personal	3:11	1:9	2:0	3:7	1:8	1:1	-	2:11	2:1	1:5
Domestic	4:7	-	2:8	3:11	1:2	0:7	-	2:11	0:10	0:10
Community	2:10	1:6	2:10	3:2	0:11	< 0:1	-	< 0:1	< 0:1	0:11
Socialization Domain										
Interpersonal relationships	0:7	0:9	0:7	0:6	0:6	0:7	1:3	0:9	0:7	0:5
Play and leisure time	0:8	0:9	0:9	2:2	0:4	0:9	0:9	1:10	0:11	0:4
Coping Skills	0:4	-	2:7	0:10	0:10	1:6	1:9	< 0:1	0:1	0:7
Motor Skills Domain										
Fine	3:11	2:8	2:1	3:6	2:3	1:9	1:10	2:11	3:2	4:1
Gross	1:5	3:5	1:9	2:0	0:4	2:2	2:4	0:11	2:4	2:5
Maladaptive Behavior Index										
Internalizing	Clinically significant	Elevated	Clinically significant	Elevated	Clinically Significant	Elevated	-	-	Elevated	Elevated
Externalizing	Average	Average	Clinically significant	Average	Average	Average	-	-	Elevated	Average
Other	-	-	-	-	-	-	-	-	Elevated	Elevated

Note. Age = year:month; - = information not available.

Table 4.3

Summary of Rossetti Results for Each Child

Name	Age	Basal/ Ceiling	Interaction- Attachment	Pragmatics	Gesture	Play	Language Comprehension	Language Expression
Ian	10:0	B	NE	0-3	NE	NE	0-3	0-3
		C	NE	18-21	NE	27-30	27-30	21-24
Jack	7:0	B	0-3	0-3	NE	3-6	0-3	NE
		C	NE	12-15	9-12	12-15	21-24	9-12
Ryan	10:1	B	NE	NE	NE	3-6	NE	9-12
		C	0-3	0-3	12-15	12-15	21-24	24-27
Ronald	8:7	B	NE	NE	9-12	6-9	NE	NE
		C	NE	3-6	NE	30-33	21-24	15-18
Sean	3:6	B	NE	NE	NE	NE	NE	NE
		C	9-12	9-12	12-15	12-15	12-15	9-12
Sara	2:7	B	NE	NE	NE	NE	NE	NE
		C	15-18	12-15	12-15	12-15	6-9	6-9

Note. NE = not established; B = basal score; C = ceiling score; age scores are in months

Table 4.3

Summary of Rossetti Results for Each Child (continued)

Name	Age	Basal/Ceiling	Interaction-Attachment	Pragmatics	Gesture	Play	Language Comprehension	Language Expression
Jane	4:1	B	6-9	0-3	9-12	9-12	6-9	9-12
		C	NE	NE	NE	21-24	27-30	24-27
Kate	7:1	B	0-3	0-3	NE	NE	0-3	0-3
		C	NE	18-21	NE	30-33	27-30	15-18
Harold	8:6	B	NE	NE	NE	3-6	NE	NE
		C	NE	18-21	NE	21-24	21-24	9-12
John	6:10	B	NE	NE	NE	NE	NE	NE
		C	9-12	12-15	21-24	27-30	12-15	3-6

Note. NE = not established; B = basal score; C = ceiling score; age scores are in months

providing questions for eliciting information on specific communicative behaviours that are used by the individual as well as examples of when these behaviours are used. A copy of the IPCA is included as Appendix B. A scoring grid is also provided to help summarize the information obtained during the interview. By placing the reported behaviours vertically down the grid, you can mark off which behaviours were reportedly used for each function (listed horizontally on the grid). Examples of the completed scoring grids are provided in Tables 4.10 to 4.19.

Procedures

Each teacher and parent was provided with an information sheet and a verbal description of the research project. They were given an opportunity to read through the information and ask the researcher questions related to the project. They were then given a Consent Form to sign indicating they agreed to participate in the research. Once this was completed the researcher gave the informant a written list of examples of PCAs. The researcher discussed the different types of behaviours that could potentially be communicative. The researcher then explained the questions that would be asked on the IPCA and gave several examples of appropriate answers. The researcher asked the informant if he/she had any questions before the interview began. For each question on the IPCA, the researcher asked the informant to explain all of the behaviours that the child might use to communicate the specified function. For example, one of the questions on the IPCA states the following: *Describe how (child's name) lets you know if they are hungry*. The researcher then recorded all of the behaviours described by the informant onto the IPCA form. The researcher then asked for the informant to provide an example of when the child has demonstrated the reported behaviours for the given function. If the information provided by the informant was unclear, for example the informant said that the child *speaks*, the researcher asked for clarification. (e.g., *Please explain what this sounds like,* or *How would you describe further what [child's name] does*).   The interviews took an average of 55 min to complete, ranging from 45 to 80 min.

The author summarised all of the information from each interview into table format (see Tables 4.10 to 4.19). The author randomly chose 40% of the interviews (four parent interviews and four teacher interviews) to be checked for reliability. The author gave a graduate student, who was trained in identifying PCAs in children with DD, the original notes taken by the researcher during each of the randomly chosen IPCA interviews, along with the tables in which the author had summarized the information from each interview. The graduate student was asked to compare the information from the interview to the information on the table. If there was agreement between the behaviour reported on the IPCA and the behaviour reported on the

summary chart, then the graduate student indicated this by marking a tick on the chart next to the behaviour. If there was a reported behaviour from the interview that was either not on the summary chart or incorrectly reported, then the graduate student placed an X on the summary chart to note a discrepancy. All forms were returned to the author, who then calculated the number of behaviours recorded that were in agreement and divided this by the total number of behaviours reported, including any discrepancies noted by the graduate student, for each participant.   The mean agreement of the data entry was 96% with a range of 94 to 98% agreement.

RESULTS

The main purpose of gathering information from different informants on the participants' PCAs was to address the following research questions: First, what are the similarities and differences between the reported PCAs of children with DD when comparing the information provided by the school teacher/teacher aide and the parent? Second, do children show similarities on the forms of communication used across communication partners and environments? Third, do the results indicate that interviewing communication partners using the IPCA is a reliable method of assessment? Along with this, I have also used the data to investigate the overall types of behaviours the participants reportedly use as means of communication by categorizing them into eight separate types of behaviours. Additionally, I calculated the percentage of children that reportedly use each behavior in a communicative manner to determine whether there are specific behaviors that are commonly used as PCAs, and whether children are using idiosyncratic behaviours that may be more difficult for the unfamiliar observer to identify and/or interprete. The function(s) of the reported behaviours was also analysed to identify any similarities and/or differences across participants.

Participant Behaviours

All of the behaviours reported by both informants for each child are summarised individually in Tables 4.10 to 4.19. These tables outline the behaviours reported for each participant, the agreement and differences across informants, the use of certain behaviours across various functions, and the functions that these behaviours served for each participant. This information was later analysed across participants to determine similarities and differences across the sample.

Reported Use of Functions Across Informants

The reported use of communicative functions by the teacher and by the parent was compared within each participant as well as across participants. The reported presence of a

specific function in a child's communicative repertoire was determined by whether or not each informant reported a behaviour used to express at least one specific communicative function included in each of the 10 general functional categories. For example, within the functional category of social convention, the informant was asked to describe how the child (a) greets you/others, b) indicates farewell to you/others, and c) responds to his/her own name. If the informant reported that the child does not communicate in any of these situations, then the child would be viewed as not demonstrating the function of social convention. However, if the informant reported that the child used a specific behaviour to demonstrate *at least* one of the functions within the umbrella category of social convention (e.g., the child was reported to smile to greet others but did not communicate farewell or respond to his name), then the function of social convention would be considered present in his/her communicative repertoire. The results from this analysis are presented in Table 4.4. Across the 10 participants, there was 90 to 100% (M = 94%) agreement between teacher and parent report for the presence or absence of the 10 communicative functions on the IPCA. Differences across parent and teacher report were found in the functional categories of requesting information (one participant), answering (three participants), and imitation (two participants). All 10 participants were reported by both parent and teacher to demonstrate at least one example of the following functions: social convention, attention to self, reject/protest, request object, request action, comment, and choice making.

When looking at the number of functions exhibited by each child (as per both parent and teacher report), all 10 children showed behaviours within at least seven of the communicative functions and as many as nine of the communicative functions. There was only one participant (10%) that was reported by both informants to request information.   Six participants (60%) were reported by both informants to answer, and five participants (50%) were reported by both informants to use imitation.

Agreement Across Informants for Behaviours Used

The behaviours reported by both parent and teacher for each of the questions on the IPCA can be seen in Tables 4.10 to 4.19. The percentage of agreement between parent and teacher report of behaviours used to express a specific function was calculated by dividing the total number of behaviours that were in agreement by the total number of behaviours reported. The percentage agreement across 41 questions on the IPCA for each participant ranged from 57 to 75% (M= 68%).

Reported Use of Forms

The behaviours reported to be used as PCAs were first analyzed across participants to determine (a) how many different forms of communication were reported across all 10 participants, (b) whether any behaviours were used by all participants, (c) what types of behaviours were most commonly used, and (d) how the reported behaviours compared relative to their reported function.

All reported behaviours were first combined as a complete list across participants. When behaviours were reported using different terminology but represented the same act, then the behaviours were combined under one term and considered to be equivalent. For example, if one informant reported that a child *cuddles* into them, while another informant reported that a child *snuggles* into them, these were combined into one behavior labeled *cuddle/snuggle*. Another example of this was where informants reported that the child either *laughs* or *giggles*; these were interpreted as the same behaviour and categorized as such. In contrast to this, several behaviours that involved the same action but were directed at different objects and/or people were categorized separately. For example, the action *point* was counted as a separate behaviour if it was used as a gesture towards an object (e.g., point to the kitchen) or as a form of alternative communication (e.g., point to word; point to picture). Another example of this was scratching. One child reportedly would scratch speakers as a form of auditory stimulation, while another child was reported to scratch people when he was angry. These were therefore counted as two separate behaviours.

A total of 219 different behaviours were reported across participants. In order to further analyse the types of behaviours used, each behaviour was categorised into one of eight categories: (a) vocalizations, (b) body movements, (c) face/eye movements, (d) symbolic communication, (e) gestures, (f) problem behaviours, (g) stereotypic behaviours, and (h) other descriptors. Vocalizations included any production of sound produced by the vocal tract. Examples of vocalizations are yell/scream, cry, and sing. Raspberries were also included as a vocalization because the child that used them was reported to vocalize while making them. Body movements were defined as any physical movement that was reported as a PCA that did not meet the definition for any other category, such as run, jump, reach, or turn. Face/eye movements were defined as any behaviours that involved independent movement of the eyes and/or facial features. Examples of face/eye movements are eye contact, blinking, scrunching up face, and furrowed brow. Actions that involved the face as well as another part of the body (e.g., rubbing eyes) were counted as physical actions rather than face/eye movements. Symbolic

Table 4.4

Agreement Across Behaviours for Functions Used

Participant	Informant	Social Convention	Attention to Self	Reject/Protest	Request Object	Request Action	Request Info	Comment	Choice-making	Answer	Imitation	Interinformant Agreement
1. Ian	Parent	■	■	■	■	■	■	■	■	■	O	100%
	Teacher	■	■	■	■	■	■	■	■	■	O	
2. Jack	Parent	■	■	■	■	■	O	■	■	■	O	90%
	Teacher	■	■	■	■	■	O	■	■	O	O	
3. Ryan	Parent	■	■	■	■	■	O	■	■	■	■	90%
	Teacher	■	■	■	■	■	O	■	■	O	■	
4. Ronald	Parent	■	■	■	■	■	O	■	■	■	O	100%
	Teacher	■	■	■	■	■	O	■	■	■	O	
5. Sean	Parent	■	■	■	■	■	O	■	■	■	O	90%
	Teacher	■	■	■	■	■	O	■	■	■	■	
6. Sara	Parent	■	■	■	■	■	O	■	■	O	■	90%
	Teacher	■	■	■	■	■	O	■	■	O	O	
7. Jane	Parent	■	■	■	■	■	O	■	■	■	■	90%
	Teacher	■	■	■	■	■	■	■	■	■	■	
8. Kate	Parent	■	■	■	■	■	O	■	■	O	■	90%
	Teacher	■	■	■	■	■	O	■	■	■	■	
9. Harold	Parent	■	■	■	■	■	O	■	■	■	■	100%
	Teacher	■	■	■	■	■	O	■	■	■	■	
10. John	Parent	■	■	■	■	■	O	■	■	■	■	100%
	Teacher	■	■	■	■	■	O	■	■	■	■	

Note. ■ = reported present; O = reported absent

communication was defined as any form of communication based on a standard communication system that may be understood by the majority of the population (Dowden & Cook, 2012). This included speech generating devices (e.g., iPads, iPods), sign language, Picture Exchange Communication System (PECS), or pointing to words or pictures on a personalized communication board. Problem behaviours were defined as any behaviour that was reported to cause physical harm to the participant or another person, or that was destructive (Fox, Vaughn, Wyatt, & Dunlap, 2002). Examples of problem behaviours include hitting, biting, tearing books, kicking objects, and pulling hair. Stereotypical behaviours were defined as those involving repetition, rigidity, invariance, and were considered inappropriate to the social context (Turner, 1999). Examples of stereotypical behaviours are body rocking, hand flapping, echolalia, toe walking, and spinning objects (Bodfish, Symons, Parker & Lewis, 2000). Other descriptors was anything the parent used to describe a child's behaviour or state that could not be categorized in one of the other categories but nevertheless was interpreted as a PCA. Examples of these include parent report of the child not moving, being focused, starting an activity, or slowing down.

Percentage of Participants Using Each Behaviour

The number of children that used each of the reported behaviours was calculated as a percentage (Table 4.5). The behaviours were then categorized as follows: behaviours that were used (a) by all 10 participants (100%); by eight or nine participants (80 to 90%); by five, six, or seven participants (50 to 70%); by 2 to 4 participants (20 to 40%), or by one participant (10%). Table 4.5 shows the number of behaviours that occurred within each frequency level.

Table 4.6 lists the 11 behaviours that were reported to be used by all 10 participants. Of the 11 behaviours, two were vocalizations, and nine were body movements. Six (2%) of the 219 total behaviours reported were exhibited by 80 to 90% of the participants. These included vocalize, smile at others, smile to self, and point. Twenty-three (11%) of the total behaviours reported were used by 50 to 70% of the participants. There were 74 (34%) behaviours that were used by 20 to 40% of the participants, while 107 of the reported behaviours were only reported to be used by one participant; the behaviours used by only 10% of the participants account for almost half of the total behaviours reported (48%).

Reported Functional Use of Behaviours

Further analysis was completed to determine what types of behaviours were used for each function and whether there were any behaviours that were used across several

Table 4.5

Number of Behaviours Used by a Specified Percentage of Participants

	Types of Behaviours							
	Vocalisations	Body Movements	Face/Eye Movements	Symbolic Forms	Gestures	Problem Behaviours	Stereotypic Behaviours	Other Descriptors
100% of Participants	2	9	0	0	0	0	0	0
80 - 90% of Participants	1	0	3	0	1	0	0	1
50-70% of Participants	1	12	4	2	0	2	1	1
20-40% of Participants	6	41	5	1	5	6	2	8
10% of Participants	1	46	9	5	7	15	12	10
Total No. of Behaviours	11	108	21	8	13	23	15	20

Table 4.6

Behaviours Reported as Used by 100% of Participants

Behaviour	Type
Cry/whine	Vocalisation
Laugh/giggle	Vocalisation
Approach	Body movement
Grab hand/arm	Body movement
Get independently	Body movement
Give object to adult	Body movement
Lead person	Body movement
Lie down	Body movement
Move/walk away	Body movement
Push object away	Body movement
Take/grab object	Body movement

participants for the same function. The symbolic behaviours used for each of the functions, if any, were also identified. Table 4.7 shows which behaviours were used for a specific function(s) by 50% or more of the participants. Table 4.8 depicts the breakdown of types of behaviours used for each functional category.

Behaviours Used for Social Convention

There were a total of 30 different behaviours reported to be used for the function of social convention. Forty-three percent of the behaviours were categorised as body movements, 20% as face/eye movements, 10% as gestures, 10% as vocalizations, 6% as symbolic, and 6% as other descriptors. Eye contact was used for social convention for 100% of participants. Eighty percent of the participants were reported to either approach an adult, smile, or not respond during typical social convention situations. The symbolic behaviours used for social convention were sign (10%) and speech (20%). All other reported behaviours were used by 30% or less of the participants.

Behaviours Used for Attention to Self

Parents and teachers combined reported 59 different behaviours used across participants for the purpose of attention to self. Thirty-nine of the behaviours were categorized as body movements, seven as vocalizations, four as face/eye movements, three as

gestures, two as symbolic communication, and one for both stereotypical behaviour and other descriptor.   The most widely used behaviour was to grab the hand/arm of the adult, which was reported to be used by 90% of the participants. Approaching the adult, using eye contact, and leading the adult were reported to be used for attention to self by 80% of the participants. Cuddling another person was used by 60% of participants and sitting on the adults lap or sitting/standing beside the adult was used by 50% of participants. Forty percent of the participants used speech, whining, putting adults hand on their own body or touching the adults arm to gain attention. Eighty percent of the participants were reported not to demonstrate this function in at least one circumstance.   The symbolic communication modes used were speech and SGD (i.e., iPad). The only stereotypic behaviour that was perceived as communication for attention to self was wiggling fingers.

Behaviours Used for Rejecting

From a total of 84 different behaviours reported as used to express rejecting, 44% were body movements, 12% were problem behaviours, 11% were face/body movements, 9% were vocalizations, 8% were stereotypic behaviours, 7% were other descriptors, 4% were symbolic behaviours, and 3% were gestures. The most common behaviours were to move away or push away (90%), yell/scream (80%), cry, lead an adult or grab an adult (70%), grab an object, turn away or throw/drop an object (60%), hit, not move/go limp, and vocalise (50%). All other reported behaviours were used by 40% or less of the participants. All of the children were reported to not respond in at least one of the scenarios.

Behaviours Used for Requesting Objects

In total, parents and teachers reported 38 different behaviours that participants potentially used to request objects. Almost half of the behaviours (47%) were body movements. Face/eye movements, gestures, vocalizations, and symbolic communication each made up 11% of the total behaviours, while 5% were categorised as other descriptors. Ninety percent of the children would get desired objects independently without making a request in at least one scenario, while 80% would, in at least one scenario, grab an adult's hand and lead them to

the desired object. There were seven children (70%) who would give the adult the desired object to request. For 60% of the children, parents or teachers reported that he/she would look at the desired item to request it; while 50% would, in some instances, use manual sign, point to the object, or point to the room where the object was. Approaching an adult, looking at the adult, vocalising, and using speech to request were each used by 40% of the children to request objects.

Table 4.7

Behaviours Used for a Specific Function by 50% or More of Participants

Behaviours	Social Convention	Attention to Self	Reject/ Protest	Request Object	Request Action	Request Info	Answering	Commenting	Choice Making	Imitation
Eye Contact	✓	✓	✓		✓		✓			
Grab Adult		✓	✓	✓	✓					
Approach Adult	✓	✓			✓			✓		
Not Respoond	✓	✓				✓	✓			
Smile	✓						✓	✓		
Lead Adult		✓	✓	✓	✓					
Vocalise			✓					✓		
Give Adult Object				✓	✓					
Point				✓						✓
Cry			✓					✓		
Yell/Scream			✓					✓		
Move Away			✓					✓		
Get Object Independently				✓					✓	
Grab Object			✓						✓	

Note. Shaded box indicates behaviour used by 50% or more of participants.

Behaviours Used for Requesting Actions

There were a total of 35 different behaviours reported as used for requesting actions across informants. Body movements made up 60% of the total behaviours, while gestures and symbolic communication each made up 8% of the total behaviours. Face/eye movements, vocalizations, stereotypical behaviours, and other descriptors each made up 6% of the total behaviours. There were no reported behaviours that were categorized as problem behaviours. Eighty percent of the participants were reported to give an object to an adult, or lead an adult, in order to request an action. Grabbing the adults hands was used by 60% of the children, and approaching the adult, with or without grabbing their hand, was used by 50% of the children. Forty percent were reported to manipulate the adult's hand or to use speech to request an action. All of the

Table 4.8

Percentage of Each Type of Behaviour Used for Each Functional Category

	Behaviour Functions									
Behaviour Type	Social Convention	Attention to Self	Rejecting	Requesting Objects	Requesting Actions	Requesting Information	Answering	Choice Making	Commenting	Imitation
Body Movements	43%	66%	44%	47%	60%	0%	29%	50%	47%	0%
Face/eye Movements	20%	7%	11%	11%	6%	50%	14%	6%	12%	0%
Gestures	10%	5%	3%	11%	8%	25%	7%	9%	2%	43%
Vocalizations	10%	12%	9%	11%	6%	0%	18%	3%	6%	29%
Symbolic	6%	3%	4%	11%	8%	0%	11%	19%	2%	14%
Stereotypic	0%	2%	8%	0%	6%	0%	0%	0%	6%	0%
Problem	0%	0%	12%	0%	0%	0%	4%	6%	13%	0%
Other Descriptors	6%	2%	7%	5%	6%	25%	18%	6%	8%	14%
Total # Behaviours	30	59	84	38	35	3	28	32	5	7

Table 4.9

Use of Symbolic Communication Forms Across Functions

Speech	Sign	iPad	PECS	Write Word	Point to Picture/Word
Social Convention	Social Convention	Attention to Self	Choice Making	Choice Making	Choice Making
Attention to Self	Reject/Protest	Reject/Protest			Request Object
Reject/Protest	Request Object	Request Object			
Request Object	Request Action	Request Action			
Request Action	Answer	Answer			
Answer	Comment				
Comment					
Choice Making					
Imitation					

children were reported to not respond in some circumstances where they would be expected to request an action from and adult. The symbolic modes of communication used to request an action were manual sign (10%), iPad as an SGD (10%) and speech (40%).

Behaviours Used for Requesting Information

All of the participants (100%) were reported in at least one instance to not request information, while 80% of them were reported to never request information. There were three different behaviours, each used by one participant (10%), which were used for requesting information: point (gesture), eye contact (face/eye movement), and look at the adult questioningly (face/eye movement). There were no behaviours reported that were categorized as body movements, face/eye movements, vocalizations, symbolic communication, problem behaviours, or stereotypical behaviours.

Behaviours Used for Answering

There were a total of 28 different behaviours reported across informants that were used for answering. Twenty-nine percent of the behaviours were categorised as body movements, 18% were categorized as vocalizations or as other behaviours, 14% as face/eye movements, 11% were categorized as symbolic communication, 7% as gestures, and 4% as problem behaviours. There were no stereotypical behaviours reported to be used for answering. Smiling was used by 70% of the participants, while eye contact was used by 60%, and pushing an object away by 40% of participants. All other behaviours were used by 30% or less of the participants. The three types of symbolic communication reported to be used were the SGD (i.e., iPad; 10%), speech (30%) and manual sign (20%). All of the children were reported to not respond in at least one of the scenarios.

Behaviours Used for Choice Making

In total, informants reported 32 behaviours used by the participants for choice making. Body movement made up 50% of the behaviours and symbolic behaviours made up 19%. Face/eye movements, problem behaviours, and other descriptors each made up 6% of the total behaviours. Gestures made up 9% of the behaviours and vocalizations made up 3%. None of the reported behaviours for choice making were categorized as stereotypic behaviours. All of the participants were reported by at least one informant to grab the desired object (if available) or to independently obtain his/her item of choice as a way of making a choice. Ninety percent of the children were reported to walk away from an item if they did not want it, while 70% were reported to push an unwanted item away. Other behaviours used by at least 40% of the participants included approaching the adult, giving the object to the adult, putting the

object/activity away (if they did not want it) or pointing to the desired object. Symbolic communication used to make choices included using an iPad as a SGD (30%), speech (30%), PECS (10%), pointing to pictures (10%), and writing a word (10%).

Behaviours Used for Commenting

There were 116 different behaviours reported as used by the participants to comment during different situations. Body movements made up 47% of the total behaviours; face/eye movement and problem behaviours made up 12 and 13% respectively. Eight percent of the behaviours were classified as other descriptors, while vocalizations and stereotypical behaviours made up 6 and 7% respectively. Gestures and symbolic behaviours each made up 2% of the total behaviours used for commenting. All of the children were reported to giggle/laugh or to lie down to comment (e.g., that something is funny, that he/she is tired). There were four specific behaviours that 90% of the participants were reported to use: cry, move away (from adult/activity), smile, and vocalize. Yelling/screaming was reported as used by 70% of the participants, while the child being quiet and not making any noise was perceived as communicative for the purpose of commenting in 70% of the children. Approaching an adult, hand flapping, and grizzling/whining were used by at least half of the children. The forms of symbolic communication reported were speech ($n = 3$) and manual sign ($n = 1$).

Presence of Imitative Behaviours

Six of the 10 participants were reported to show imitation of at least one behaviour. Five children were reported to imitate at least one word and to imitate pointing. Two children were reported to imitate shaking head no and one was reported to imitate a shrugging gesture. One child was reported to imitate laughing and singing. None of the children were reported to imitate nodding head yes.

DISCUSSION

Information on the PCAs of 10 children aged 2 years 6 months to 11 years of age, each with a diagnosis of DD, was gathered using the IPCA. A list of the each child's communicative repertoire was compiled based on the information provided on the IPCA by two informants; one parent and one teacher/teacher aide. This information was then summarized for each participant and compared across participants to answer the following questions:

- What are the similarities and differences between the reported PCAs of children with DD when comparing the information provided by the school teacher/teacher aide and the parent?

- Do children show similarities in use of communicative forms across communication partners and environments?

- Do the results indicate that interviewing communication partners using the IPCA is a reliable method of assessment?

- What types of behaviours are the children using and what are the similarities and differences across participants?

- What functions are these behaviours used for and are certain types of behaviours used more often for certain functions than for others?

There was an average of 94% agreement between teacher and parent report for the presence or absence of the 10 communicative functions on the IPCA. All participants reportedly demonstrated at least one example of social convention, attention to self, reject/protest, request object, request action, comment, and choice making. Sixty percent of participants were reported across informants to answer, 50% to use imitation, and 10% to request information. We can surmise from this that the participants in the study are presenting behaviours that are consistently interpreted across informants to represent seven of the 10 communicative functions. Approximately half are seen to be imitating the actions or speech of others around them, and to answer or respond when they are asked a question. There was limited report of children requesting information which indicates that this skill is either not fully developed in our representative sample or that the children's attempts to request information are not being recognized as such.

The percentage of agreement for behaviours reported across informants for a given function ranged from 57 to 75% ($M = 68\%$). This indicates that over half of the behaviours reported by the separate informants were in agreement for all children. This suggests that children are reportedly using similar behaviours across environments (e.g., school and home) and that these behaviours are being interpreted in a similar way more than 50% of the time. This finding suggests that the IPCA might be useful for identifying both similarities as well as differences in children's use of behaviours across environments. It is valuable to gather information from a variety of informants in order to determine whether the child is using behaviours consistently as well as whether these behaviours are being interpreted similarly across informants. This information is essential when choosing target goals and implementing intervention strategies across multiple social situations.

The types of behaviours reported by informants were broken down into eight categories: body movements, problem behaviours, vocalizations, stereotypic behaviours,

gestures, symbolic communication, face/eye movement, and other descriptors. Combined, body movements, problem behaviours, face/eye movements and other descriptors made up 79% of the total 219 reported behaviours that were interpreted as PCAs (49%, 11%, 10% and 9% respectively). The other four categories combined (vocalizations, stereotypic behaviours, gestures, symbolic forms) made up approximately 20% of reported behaviours. It is important to note that these results reflect the number of *different* behaviours reported within each category. Therefore by nature the variation in the category body movements will be greater than those for symbolic forms as there are a vast number of possible body movements in comparison to possible forms of symbolic communication. With this in mind, we can gain a broad picture of the communicative repertoires of the participants and surmise that the majority of their communication is interpreted through body movement, face/eye movement, problem behaviour, and other descriptors. This highlights the importance of these behaviours and the meaning that is taken from them by these children's communication partners.

The percentage of participants using each of the reported behaviours was also calculated. Eleven behaviours were reported as used by all of the participants (see Table 4.5). Six behaviours were used by 80 to 90% of participants, and 23 were used by 50 to 70% of the children. There were 23 behaviours used by 50 to 70% of the participants, and 105 behaviours that were only reported as used by one participant. Therefore, 82% of reported behaviours were used by less than 50% of the participants, with 48% of total behaviours reported only for one child. The behaviours that were reportedly used by all the participants included vocalizations and body movements. There were no face/eye movements, gestures, stereotypical behaviours, problem behaviours, gestures, or symbolic communication reported as used by all participants. The behaviours that were seen in all the participants were all behaviours that would be developed at a young age and did not include any advanced communicative behaviours; this would be in line with each child's communication development level. Gestures and stereotypic behaviours were the only categories where only one behavior was used by more than 50% of the children. It would be expected, given the idiosyncratic nature of stereotypical behaviours, that there would be variation in the types observed in a small sample of 10 children. The only gesture that was similar across multiple participants was pointing, which was seen in 80 to 90% of participants. It may be hypothesized that these children use a limited amount of gestures and therefore it is less likely that they would all be exhibiting similar gesture types. Findings that almost half (48%) of the gestures reported were only observed in one child is significant in that it demonstrates the unique nature

of each child's communicative repertoire. These differences limit the child's ability to be understood by unfamiliar communication partners, as the PCAs do not follow a general pattern. Therefore each individual child's communicative forms must be assessed and learned on a very individual basis.

The types of behaviours used for each function varied. Body movement made up the greatest percentage of behaviours used for eight of the ten functional categories: social convention, attention to self, rejecting, requesting object, requesting action, answering, choice making, and commenting. These accounted for 29 to 60% of the total gestures in each of the categories. Face/eye movements made up the greatest percentage of behaviours for requesting information (50%), and gestures made up the greatest number of behaviours reported to be imitative (43%). Face/eye movements made up the next largest number of behaviours used for social convention (20%). Vocalizations made up the second largest number of behaviours for attention to self (12%), answering (18%), and imitation (29%). Symbolic communication made up the second largest number of behaviours for choice making (19%), while problem behaviours were the second most common types of behaviours used for rejecting and commenting (12 and 13% respectively). Behaviours categorized as face/eye movements, gestures, vocalizations, and symbolic communication were used to the same extent for requesting object, with each category comprising 11% of the total behaviours. These behaviours, along with stereotypic behaviours, were all used 6 to 8% of the time for requesting actions. It is evident from these results that body movements predominate across the majority of functions as the most commonly used type of behaviour. The use of other types of behaviours, however, varies relative to the function of the behaviour. Symbolic communication was used most often for the purpose of choice making, while requesting objects and information were reported as communicated using an equal distribution of four to five different types of behaviours. Problem behaviours were related to rejecting as well as commenting, while stereotypic behaviours were not used significantly more often for any of the specific functions. These results support several ideas about the PCAs of children with developmental disability. First, it is evident that body movements comprise a large percentage of the PCAs in this study and therefore should be observed closely during any communication assessment in children with SCI and DD. Second, the function of a behaviour is important to take into consideration when looking at developing a child's communicative repertoire. For example, if the goal is to increase the child's use of socially appropriate behaviours and reduce problem behaviours, it would be important to look at what behaviours he/she uses for rejecting

and commenting, and to choose replacement behaviours that were similar in type to other acceptable behaviours that the child may already be using for those functions. Third, when trying to decrease the use of stereotypical behaviours, it would be necessary to identify whether the behavior was being used for a number of different functions and the extent to which they were being used for each of these functions. If the replacement behavior taught is not appropriate for a number of different functions then it is not likely not generalize to different situations.

The behaviours that were used by 50% or more of the participants were analysed to see what functions they served. Table 4.7 summarises the results of the behaviours used by 50% or more participants across more than one function. More than half the participants used eye contact across five different functions: social convention, attention to self, reject/protest, request action, and answering. Grabbing adult, approaching adult, leading adult, and not responding were each used across four different functions. Grabbing adult was used for attention to self, reject/protest, request object, and request action. Approaching adult was used for social convention, attention to self, request action, and commenting. Leading adult was used for attention to self, reject/protest, request object, and request action. Not responding was reported for social convention, attention to self, request information, and answer. The function that showed the most behaviours used by at least 50% of the participants was reject/protest, with eight of the reported behaviours being used by half or more of the participants. Those behaviours were eye contact, grab adult, lead adult, vocalize, cry, yell/scream, move away and grab object. It can be surmised from this information that there are general behaviours that are reported to be used or are perceived as used to communicate specific functions. There is also evidence that one behavior may be interpreted as serving multiple functions. Likewise, it suggests that that the limited communicative repertoires of these children make it necessary to use a single behaviour to communicate various functions. Regardless, it is necessary to take into consideration the fact that when determining the function of a behaviour, it should not be assumed that the behaviour serves only one function. It should also not be assumed that a single behaviour is used to express a specific function.

While it is interesting to look at the similarities across participant use of behaviours for various functions, it is important to also note that the similar behaviours make up only 6% of the total behaviours reported across participants. Most behaviours were used for a specific function by one or two participants. Furthermore, a significant proportion of behaviours were individual to a given participant and were not used or seen as communicative for other children

in the study. This further highlights the importance of identifying an individual's communicative behaviours and ensuring that any replacement behaviours taught will be appropriate for serving more than one function, when possible.

The findings from this study give insight into the similarities and differences between the reported PCAs of children with DD. It provides information to guide our decision-making for how we assess the communication of a child with SCI, and the importance of looking at the child's full communicative repertoire as well as the function(s) that each behaviour serves. The sample, however, is small and further analysis of a larger sample would need to be completed in order to verify these findings. It is also important to realise that the behaviours used in this analysis were all taken from parent or teacher/teacher aide report and were not observed behaviours. Therefore it is necessary for these behaviours and their reported functions to be verified through further observation and verification trials. Further evidence that these children's reported behaviours are in fact used to serve their reported functions would strengthen the current findings.

Table 4.10

IPCA Data Chart for Participant 1: Ian

Legend: ▨ = crosshatch shading (parent report); ▣ = gray shading (teacher report); ■ = black shading (reported by parent and teacher)

Reported Communicative Forms	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	talk to them	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	point
	Social Convention			Attention to Self				Reject/Protest					Request Object				Request Action				Request Info		Comment								Answer			Choice Making			Imitation				
approach	▣		▣	■											▨			▨																			▣				
bite hand								▣																▣					▣												
bounce																							▣			▣			▣												
blow raspberries																							■																		
cry/whine								▣			▣													▨				▨													
curl up											■																														
eye contact	▣		▣															▣		▣		▨	▣																		
flap																												▣													
follow instruction																															▨										
furrowed brow																													▣												
frown																								▨																	
gesture													▨																												
get/do independently													■																						■	▣					
get up from seat																									▨																
give object to adult															▨	▣																									
grab hand/arm				■				▣			▣	■	■				▨	▨											▣												
grab object											▣																														
grunt																													▨												
growl								▣	▣				▣											▣					■												
hide face																								▣					▣												
hug/cuddle	■					▣																		▣					▣												
kick								▨			▨																														
laugh																								▨		■															
look up			■																																		▣				

Note. Crosshatch shading = parent report; gray shading = teacher report; black shading = reported by parent and teacher

Table 4.10

IPCA Data Chart for Participant 1: Ian (continued)

Legend: ▦ = parent report (crosshatch); ▒ = teacher report (gray); ■ = reported by parent and teacher (black)

Reported Communicative Forms	Social Convention			Attention to Self				Reject/Protest					Request Object				Request Action				Request Info		Comment									Answer		Choice making			Imitation				
	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	talk to them	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	point
lead person				▒									■	▦				▦		■																					
lie down																												▒		■											
look at person																																									
move away									▒																▒		▦														
not move								▦																																	
pat seat beside him																				▦																					
pace				▒														▒		▒																					
point															▦		▦					■																			
pull adult back												▦																													
push away								■	▒	▒															▒														▒		
put object away																																				▒					
raspberries																							■																		
seek familiar adult																											▦														
shake											▦																														
shake head no										▦																			▦												
sing																																									
sit adult down				▒																▒																					
sit on adults lap					▒																																				
smile	▒																						■			▦	▒														
speech				■				▒	■		▒				▦	▒	▒	▒									▦	▦					▒								
stand beside adult																			▒								▦	▦													
stand beside object													▒						▒																						
take desired object																																				▒					

Note. Crosshatch shading = parent report; gray shading = teacher report; black shading = reported by parent and teacher

Table 4.10

IPCA Data Chart for Participant 1: Ian (continued)

		Social Convention			Attention to Self				Reject/Protest					Request Object				Request Action				Request Info		Comment								Answer			Choice making			Imitation				
		greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	talk to them	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	point
Reported Forms	take both																																		crosshatch							
	turn adults head				crosshatch																																					
	turn to adult												gray																													
	verbalize														gray															gray												
	walk away																									black																
	yell/scream								crosshatch			black																														
	no response		black			crosshatch		black			black		gray	gray		gray	gray				crosshatch	black						gray				crosshatch	black	black			crosshatch	black	black	black	black	black

Note. Crosshatch shading = parent report; gray shading = teacher report; black shading = reported by parent and teacher

Table 4.11

IPCA Data Chart for Participant 2: Jack

Communicative Functions. Legend: P = parent report (crosshatch shading); T = teacher report (gray shading); B = reported by parent and teacher (black shading).

Reported Communicative Forms	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	yes	someone	no	choice	activity	start/stop	shrug	yes	no	point	words
			Social Convention		*Attention to Self*					*Reject/Protest*				*Request Object*				*Request Action*			*Request Info*					*Comment*						*Answer*			*Choice Making*				*Imitate*		
approach			P										P				P		P																						
bang																									T																
cry													T											B				T	T												
curl up																								P																	
eye contact	P																																								
flap hands								T																																	
flick																								T	T																
focus																							T																		
follow instruction																															P										
furrow brow																											P														
gaze toward object													P																												
get lunchbox														B																											
get independently											T		P	B																	P				B	P					
give object to adult														P						P																					
giggle	P					T	P																P			B															
grab object											T																														
grab hand/arm				P		P							P															P													
grunt									P		P																			P											
hit					T			T	T																																
kick								P	P																																
look away/at floor																											P														
lead person				P		P							P		P				P																						

Note. Crosshatch shading = parent report; gray shading = teacher report; black shading = reported by parent and teacher

Table 4.11

IPCA Data Chart for Participant 2: Jack (continued)

Reported Communicative Forms	Social Convention			Attention to Self				Reject/Protest					Request Object				Request Action				Request Info		Comment								Answer			Choice Making			Imitate				
	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	yes	someone	no	choice	activity	start/stop	shrug	yes	no	point	words
leave object										T																										P					
lie down																								P				P		B											
lip tremble																																									
look at person				P									P					P														P									
make noise				P					T									P										P													
not focused														T																											
not move																																P									
pace																								T		P															
push object/adult away								T	T	B																		T						P							
put face up to adults						T														T																					
put adult hand on injury					P																							P													
quiet																								P			P														
respond to interaction																							T																		
rub eyes																														P											
run in place																							P																		
run around							P																																		
sit next to adult					P																																				
smile	P																						B			P						P									
speech																																									P
squeal				T		T																																			
stop activity																																T									
take favoured object																																			B						

Note. Crosshatch shading = parent report; gray shading = teacher report; black shading = reported by parent and teacher

(continued)

Table 4.11

IPCA Data Chart for Participant 2: Jack (continued)

Reported Communicative Forms	Social Convention			Attention to Self				Reject/Protest					Request Object				Request Action				Request Info		Comment								Answer			Choice Making			Imitate				
	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	yes	someone	no	choice	activity	start/stop	shrug	yes	no	point	words
take both																																		▦							
throw body down																													▦												
throw object										▨																			▦												
turn away									▦																																
turn head			▦																																						
walk on tiptoes								▦																																	
walk away										▨															▨							▨				▨					
whine/moan														▦										▦									▦								
yawn																														▨											
yell/scream							■																		▦				▦	■											
not respond	▦	■			▦		▦				■			■	▦	▦				■	■	■					▦		■		■	▦	■			▦	■	■	■	■	■

Note. Crosshatch shading = parent report; gray shading = teacher report; black shading = reported by parent and teacher

Table 4.12

IPCA Data Chart for Participant 3: Ryan

Legend for cell shading: **P** = crosshatch shading (parent report); **T** = grey shading (teacher report); **B** = black shading (reported by parent and teacher).

Reported Communicative Forms	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	leave	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	talk to them	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	sing	point	laugh
Social Convention	greet	farewell	name	**Attention to Self**	comfort	cuddle/tickle	show off	**Reject/Protest**	do	dislike	take	adult	**Request Object**	food	more	tv	**Request Action**	game	toilet	come	leave	**Request Info**	info	**Comment**	sad	bored	funny	fright	pain	angry	tired	**Answer**	yes	no	**Choice making**	activities	start/stop	**Imitation**	nod yes	shake no	shrug	sing	point	laugh
approach object													T																							T								
approach person	P					T									P	P																												
arch back											T																																	
clap																								P																				
cry/whine									P		P						T								B																			
eye contact	T	T	T			T																																						
flop body around								P			B																			P														
flap arms																								B																				
gesture with finger				P																																								
independent																																				P								
give object to adult																		P																										
grab hand/arm	P			B		P					B																																	
grab object										P							T																			T								
head down								P																																				
hit/swipe									T																					T														
hug					P																																							
kiss																																												
laugh																								T			B																	P
lean on adult																				T																								
leave unwanted object																																				T								
look at adult			B								P																									P								
look at object										T					P																					P								
lead person											T										T																							

Note. Crosshatch shading = parent report; grey shading = teacher report; black shading = reported by parent and teacher

(continued)

Table 4.12

IPCA Data Chart for Participant 3: Ryan (continued)

Legend for cell shading: ■ = black, ▨ = gray, ▦ = hatched

Reported Communicative Forms	Social Convention			Attention to Self				Reject/Protest					Request Object				Request Action					Request Info		Comment								Answer			Choice Making			Imitation						
	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	leave	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	talk to them	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	sing	point	laugh
lie down											▨																				■													
make noise																								▦																				
move adults hand											▦																																	
open and close hands																												▦																
pace																										▦																		
point				▨									■	■		■	▨																		▦	▨							▦	
push									▨								▨								▨										▦									
put adult hand on injury																																												
put adult hand on head					▦																																							
push chair back																																					▨							
pull adult											▨																																	
quiet																															▦													
scrunch and release face																				▦																								
sign													▦						▦																▦	▦								
sing																					▦																					▦		
single word speech																																					▨							
sit down																															▨													
sit next to adult				▦																▨																								
smash object									▦																																			
sleep																															▨													
speech	■	▦	■			▦				▦			■	■	■	■	▦	▦						▨			▦	▦					▦	▦	▦	▦	▨	■	■	■				
startle																												▦																
stomp									▨															▨																				

(continued)

Table 4.12

IPCA Data Chart for Participant 3: Ryan (continued)

Cells are marked by report source: **P** = crosshatch shading (parent report); **T** = grey shading (teacher report); **B** = black shading (reported by parent and teacher).

Forms	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	leave	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	talk to them	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	sing	point	laugh
Communicative Functions →	Social Convention			Attention to Self				Reject/Protest					Request Object				Request Action					Request Info		Comment								Answer			Choice Making			Imitation						
tantrum											B																																	
throw object									P	P	B						T								T																			
touch person																																P												
walk in circles																										P																		
walk away									P		P																									T								
wiggle fingers						T																																						
turn away									P																																			
yawn																															T													
yell/scream								P	B	B	B														B				T	B														
not respond	B		P	B			B	T		T		P	P	T	T					B						T		T	P			B	B						B	B	B	P	T	

Note. Crosshatch shading = parent report; grey shading = teacher report; black shading = reported by parent and teacher

Table 4.13

IPCA Data Chart for Participant 4: Ronald

Legend: P = parent report (crosshatch shading); T = teacher report (grey shading); B = reported by parent and teacher (black shading)

Reported Communicative Forms	Social Convention			Attention to Self				Reject/Protest					Request Object				Request Action				Request Info		Comment								Answer			Choice Making			Imitation					
	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	other talks	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	sing	point
AAC - big mac																																			T							
aggression																													T													
approach					T						P						P											T	P						P							
bite										P	P																		P													
cheek to cheek with adult					P																																					
chew objects								P																																		
climb																									B																	
cry/whine					T			T																B				P														
destroy items																									T																	
eye contact	T	P	P	P									P																		P				P							
eyes widen																											P															
face to face												P																														
face drops																								T																		
flop body around																																										
flap hands	P																			P			P																			
follow instruction																																										
get on adult lap					P																																					
give plate to adult														P																												
grab hand/arm	P											T																														
grab object										P																																
grunt/growl									T	T																																
hand around adults neck												P																														
hand object to adult														P			P																									
hide face					P																																					
independent														T	T		P																		T							
go limp/not move									B																																	

Note. Crosshatch shading = parent report; grey shading = teacher report; black shading = reported by parent and teacher

Table 4.13

IPCA Data Chart for Participant 4: Ronald (continued)

Legend: ▦ = crosshatch shading (parent report); ▨ = grey shading (teacher report); ■ = black shading (reported by parent and teacher)

Reported Communicative Forms	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	other talks	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	sing	point
jump up and down																							■																			
kick legs																							▦																			
laugh								▦	■																	■																
look at object													▦																													
lean on adult									▨																					▨												
lead person									▨			▨	▦																													
lie down									▨															▦				▨		▨												
look at person			■																												■											
manipulate adults hand													▨					▦																								
move away										▨																																
not engage																														▨												
point to pictures													▨																											▦		
point													▦		▦																				▦							
point to kitchen														▦																												
point to word																																										
push away										■															▦									■								
push adult away									▨																				▨													
push adult toward object													▦			▦				▦																						
pull adult					▦						■								▦																							
pull shirt up						▦																																				
pull objects off shelves																									▦																	
put object away										▨																										▨						
put adult hand on tummy						▦																																				
put object in adults lap																		▦																								
pull curtains								▦																																		
pull hair									▦																▦				▦													

Note. Crosshatch shading = parent report; grey shading = teacher report; black shading = reported by parent and teacher

(continued)

Table 4.13

IPCA Data Chart for Participant 4: Ronald (continued)

Legend: P = crosshatch shading (parent report); T = grey shading (teacher report); B = black shading (reported by parent and teacher).

Reported Communicative Forms	Social Convention			Attention to Self				Reject/Protest					Request Object				Request Action				Request Info		Comment									Answer		Choice Making			Imitation					
	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	other talks	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	sing	point
quiet																								P			P			P												
run to adult																			P							P																
run on tippy toes																			P																							
show adult injury																												T														
scratch				P					P		P																		P													
shake head no																																										
sign													T	P	B																											
silly behaviour									T																																	
sit down																														P												
sit next to adult																				T																						
sleep																																										
smile																							B																			
speech	B			T									B		P	P																								P		
stop activity					T																																					
stuff paper In mouth								P																																		
switch lights on/off																																										
take pants/nappy off																			P																							
take object																																		B								
tears																								P																		
tense body																										P																
throw object								P												P																						
touch person					T																																					
turn towards adult																															B											
not move								P																																		
walk away										T														P																P		
vocalize																			P									T		P												
wave		B																																								
write																																								T		
yawn																														T												
yell/scream				P	T			B	P	P	P													B							B											
no response	P		B	T			B		T		T	T					T	T	T	B			T								P	B		B			B		B		P	B

Note. Crosshatch shading = parent report; grey shading = teacher report; black shading = reported by parent and teacher

Table 4.14

IPCA Data Chart for Participant 5: Sean

Communicative Functions

Reported Communicative Forms	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	talk to them	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	sing	point
Social Convention	greet	farewell	name																																							
Attention to Self				get attention	comfort	cuddle/tickle	show off																																			
Reject/Protest								routine	do	dislike	take	adult																														
Request Object													object	food	more	tv																										
Request Action																	dress	game	toilet	come																						
Request Info																					clarify	info																				
Comment																							happy	sad	bored	funny	fright	pain	angry	tired												
Answer																															talk to them	yes	no									
Choice Making																																		between objects	activities	start/stop						
Imitation																																					speech	nod yes	shake no	shrug	sing	point
approach adult	P				B																			P				P														
bang objects														P										T					T													
bite								T	T															P					B													
bring object to adult														T			P																									
climb on adult				T	T															T																						
comply with request																																			T							
cry					P			T																T				P														
cuddle																												P														
eye contact	T	T	B																												B											
frown																								T																		
get/do independently														T	P																								B	B		
grab adult's hand				B		P							B	B					P	B																						
hit								T																					T													
kick																								P																		
laugh																							B			B						P										
lead adult				P									T	B	P				P	P																						
lean forward						B																																				
lethargic																												P														
lie down																												B														
look at adult	P		B																P												B	T										
look/turn away	P									P														P							P				P							
look at object										P			T																													
nod with body																																							T			
one word speech																																					T					
pinch																								P																		

Note. Crosshatch shading = parent report; grey shading = teacher report; black shading = reported by parent and teacher

(continued)

Table 4.14

IPCA Data Chart for Participant 5: Sean (continued)

Legend for shading markers: **P** = crosshatch (parent report); **T** = grey (teacher report); **B** = black (reported by parent and teacher).

Reported Communicative Forms	Social Convention: greet	farewell	name	Attention to Self: get attention	comfort	cuddle/tickle	show off	Reject/Protest: routine	do	dislike	take	adult	Request Object: object	food	more	tv	Request Action: dress	game	toilet	come	Request Info: clarify	info	Comment: happy	sad	bored	funny	fright	pain	angry	tired	Answer: talk to them	yes	no	Choice Making: between objects	activities	start/stop	Imitation: speech	nod yes	shake no	shrug	sing	point
play quietly																														P												
point													T																													
pull/push away								P	B	B																																
pull adult's hair				T	T		T																						T													
push object away										P																				P				B								
put adult's hand on item				P		B							P		T	P				P																						
rub injury						T																																				
run away/around									P														P						P													
yell/scream	P							B		P													P																			
shake head no								T	B	T																								T	T				T			
sit on adults lap						B	P																						P													
sit down																														P												
smile	B																						B		P						T	T										
squeal	P																						T																			
take desired object															P																			B								
touch adult's face					T																																					
vocalize								P						T																												
walk away																																				B						
wave		T																																								
whimper/whine				P				P							P									T																		
not respond			P				B				P	B	B	T	P	B								T	B				T		P	P	P							P	B	B

Note. Crosshatch shading = parent report; grey shading = teacher report; black shading = reported by parent and teacher

Table 4.15

IPCA Data Chart for Participant 6: Sara

Communicative Functions — grouped as: Social Convention (greet, farewell, name); Attention to Self (get attention, comfort, cuddle/tickle, show off); Reject/Protest (routine, do, dislike, take, adult); Request Object (object, food, more, tv); Request Action (dress, game, toilet, come); Request Info (clarify, info); Comment (happy, sad, bored, funny, fright, pain, angry, tired); Answer (talk to them, yes, no); Choice Making (between objects, activities, start/stop); Imitation (speech, nod yes, shake no, shrug, point).

Reported Communicative Forms (rows). Shading codes: P = parent report (crosshatch); T = teacher report (grey); B = reported by parent and teacher (black).

Form	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	talk to them	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	point
approach	P					P																																			
arch back								P			T													P					B												
arms outstretched	P																																								
bounce																							T																		
bring object to adult																																				T					
bury face in adult																											P														
cry								P			B													P			P	P													
cuddle					B	B																																			
drop object										T															T				B					T		P					
eye contact	B	T	P	T																											B										
frown																								P																	
giggle/laugh																							B			B															
grab adults hand				B							T		T							T			B																		
hand flap																							B																		
hold up item															T																										
ignore object																						P												B							
independent													T																						B						
jump																										T															
lead adult				B							P	P	P	P	P					T															P						
lean on adult																														P											
lie down																				T										B											
limp																													B												
look at adult		T	P																																						
not focus																									T		T														
smile	B	T																					B			B					T										
point				P																															P						P
point with adults hand													P	P																											
forehead to forehead																			T																						
push/pull away									T																				T												

Note. Crosshatch shading = parent report; grey shading = teacher report; black shading = reported by parent and teacher

Table 4.15

IPCA Data Chart for Participant 6: Sara (continued)

Legend: **P** = crosshatch shading (parent report); **T** = grey shading (teacher report); **B** = black shading (reported by parent and teacher)

Reported Communicative Forms	Social Convention			Attention to Self				Reject/Protest					Request Object				Request Action				Request Info		Comment								Answer			Choice Making			Imitation				
	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	talk to them	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	point
point with adults hand													P	P																											
forehead to forehead																				T																					
push/pull away									T																				T												
push item away				P					T	B																								B							
put adults hand on item														T																											
put adults hands on eyes																											P														
quiet																								P																	
repeat action							P																																		
rub eyes																														P											
run around/in place																							B																		
shake head																																									
sit																														T											
sit on adults lap					B	T				P														T						P											
stand near object															T																										
stamp feet											P													P					B												
startle																											B														
tantrum																								P																	
take adults hand													P	P						P																					
take desired object													T																					B							
tense body										T																															
turn away									B																																
vocalize/babble																							T																		
walk away																									T											B					
whine/grizzle				P				P		T																		T	T												
yell/scream																																									
no response	B	B	B				T	T			P	B	B	B	B		B	B		B							P		B	B	B	B		B	B		B	B	B	B	B

Note. Crosshatch shading = parent report; grey shading = teacher report; black shading = reported by parent and teacher

Table 4.16

IPCA Data Chart for Participant 7: Jane

Note. Shading legend used in cells below: P = parent report (crosshatch); T = teacher report (grey); B = reported by parent and teacher (black).

Reported Communicative Forms	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	talk to them	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	point
Social Convention	greet	farewell	name																																						
approach adult				T	P												P			P								P													
approach activity																																				T					
bang head								P																P																	
bring adult object													T		T	B				P																					
clap																							T	T		T															
cry								T		P														T			P														
dance							B																																		
engage in activity																															T										
eye contact	B		B		P		B						T																		B										
eyes wide																											P														
go to bed																														P											
grab											P																														
hand adult object													T		T					B																					
put hands up																											T														
hit								P	P															P					B					P							
hit leg									P	P																															
hold out object													T																												
ignore adult								T																																	
jump																							P																		
wander around room																								T																	
lead adult											P																														
laugh					P																		B			B								P							
lie down																														B											
look up			T																																						
look at adult questioningly																					T																				
look for adult												T																													

Note. Crosshatch shading = parent report; grey shading = teacher report; black shading = reported by parent and teacher

Table 4.16

IPCA Data Chart for Participant 7: Jane (continued)

Reported Communicative Forms	Social Convention			Attention to Self				Reject/Protest					Request Object				Request Action				Request Info		Comment								Answer			Choice Making			Imitation				
	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	talk to them	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	point
obtain independently													▨	▨		▨																			■						
point														▨																				▨							▨
pull adult arm				▨		▨					▨									▨																					
push											■																		▨						▨						
put adult hand on injury																												▨													
refuse to move								▨																																	
repeat action																										▨															
turn off																																				▨					
run/walk away		▨						▨																▨				▨								■					
wave	▨																																								
yell/scream				■				▨	▨		■							▨										▨													
show injury					▨																																				
shake head no																																							▨		
shrug shoulders																																								■	
sign										■																															
sing							▨					▨																													
smile		▨	▨																				■		▨						▨										
speech	▨	■		▨		▨		▨			▨	▨	▨	■	■	▨							▨	▨							▨	■		▨		▨	■				
startle																																									
take adults hand				▨																								▨													
take wanted object																																			▨						
sit/stand beside adult						▨														▨																					
throw								■	▨									▨								▨			▨												
turn																																		▨							
throw body down								▨		▨															▨																
turn away																																		▨							
touch aduls arm/body				■	▨																																				
wrap adults arms around self																																									
vocalize					▨						▨													▨																	
no response				■									▨					▨	■	▨	■			▨					▨					▨			■	■			▨

Table 4.17

IPCA Data Chart for Participant 8: Kate

Legend for shading: ▦ = parent report (crosshatch); ▒ = teacher report (grey); ■ = reported by parent and teacher (black)

Communicative Functions

Category spans — Social Convention: greet, farewell, name · Attention to Self: get attention, comfort, cuddle/tickle, show off · Reject/Protest: routine, do, dislike, take, adult · Request Object: object, food, more, tv · Request Action: dress, game, toilet, come · Request Info: clarify, info · Comment: happy, sad, bored, funny, fright, pain, angry, tired · Answer: talk to them, yes, no · Choice Making: between objects, activities, start/stop · Imitation: speech, nod yes, shake no, shrug, point

Reported Communicative Forms	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	talk to them	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	point
approach	▦				■									▦	■				▦									▦													▦
bite hand								▒	▦															▒																	
blow raspberry																							▒																		
bring chair over																				▒																					
cry									▦	▒														■			▒	■													
disengage										▒		▒																													
extend body part						▒																						▦													
eye contact	▦			■		▒							▒	■	▒	▒								▒				▒	▒	▒					▒						
feel material										▒														▒			▒		▒												
flick hand															▒																										
follow adult												▦																													
get object																																		▒							
giggle/laugh																							▦			■															
give object to adult													▦		▦	■																		▦		■					
go to door		▦																																							
grab desired object																																			▒						
grab hand				■									▒																												
grab own tongue									▦																																
hide under blanket/beanbag						▦																																			
high five																							▦																		
hold out object														▒	▒																										
ignore unwanted object									▒																										▦						
independent													▦	■	▦					▒																■	▦				
lift cd player lid															▒																										
lie down						▦			▦															▦																	
leave area																								▒																	

Note. Crosshatch shading = parent report; grey shading = teacher report; black shading = reported by parent and teacher

Table 4.17

IPCA Data Chart for Participant 8: Kate (continued)

Communicative Functions. Column groups: Social Convention (greet, farewell, name); Attention to Self (get attention, comfort, cuddle/tickle, show off); Reject/Protest (routine, do, dislike, take, adult); Request Object (object, food, more, tv); Request Action (dress, game, toilet, come); Request Info (clarify, info); Comment (happy, sad, bored, funny, fright, pain, angry, tired); Answer (talk to them, yes, no); Choice Making (between objects, activities, start/stop); Imitation (speech, nod yes, shake no, shrug, point).

Shading key: P = crosshatch (parent report), T = grey (teacher report), B = black (reported by parent and teacher).

Reported Communicative Forms	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	talk to them	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	point
lead adult				T		P							T		P				P																T						
lean on adult				P	P																							T													
look at adult	T		B			T				P			P			B		T	T												T										
look for adult				P		P					P																P														
move away										T															T											T					
open cupboard													T																												
pull pants down																			T																						
push away										P																															
push object									T																									B							
put face up to adult's	T			P									T										B																		
put adults hand on sore																												T													
put activity away																																				T					
quiet																														T											
raise hand/extend arm out				T		T	P				P		T	T	B			T																	T						B
reach for object							P				P		P																												
roll around									P															P																	
rub/hold material																											P														
scratch speakers																	T																								
sit beside adult					P																																				
sit down																																									
slap thigh								T		P	T												B		T			B		T											
smile		B											T										B																		
squeal										T																															
start activity																																			T						
stomp										T	T																														
swing in swing																								T						T											

Note. Crosshatch shading = parent report; grey shading = teacher report; black shading = reported by parent and teacher

Table 4.17

IPCA Data Chart for Participant 8: Kate (continued)

Legend: ▓ = grey, █ = black, ▦ = hatched/grid pattern

Reported Communicative Forms	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	talk to them	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	point
Social Convention → greet/farewell/name; **Attention to Self** → get attention/comfort/cuddle-tickle/show off; **Reject/Protest** → routine/do/dislike/take/adult; **Request Object** → object/food/more/tv; **Request Action** → dress/game/toilet/come; **Request Info** → clarify/info; **Comment** → happy/sad/bored/funny/fright/pain/angry/tired; **Answer** → talk to them/yes/no; **Choice Making** → between objects/activities/start-stop; **Imitation** → speech/nod yes/shake no/shrug/point																																									
suck thumb																								▓				▓		█											
touch chest							▦																																		
turn			▦																																						
turn away										▦																															
vocalize							▦						▦	▦	▦		▦										▦										█				
wait											▦								▦																						
watch adult leave		█																																							
whine				▓																																				▓	
wipe saliva on objects									▦																																
yell/scream	▓							▓		▓	▓																		▦				▓								
no response			█				▓	▦		▦	▦	▦					▦	▦	▦	█				▦							▦	▦	▦					█	█	█	█

Table 4.18

IPCA Data Chart for Participant 9: Harold

Legend: P = crosshatch shading (parent report); T = grey shading (teacher report); B = black shading (reported by parent and teacher)

Reported Communicative Forms	Social Convention			Attention to Self				Reject/Protest					Request Object				Request Action				Request Info		Comment								Answer			Choice Making			Imitation				
	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	talk to them	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	point
AAC device						T							T	B																					P						
approach	P																						P						T												
arch back																													P												
bite																								P				P	P												
bite clothes									P																																
cower/hide																											P														
cry				P				T	P		B	P											B				B	B	P				P								
curl up																																									
drop object																																		P		P					
eye contact	B					P																	P						T												
eyes widen																											T		T												
fingers in ears								T			T													T																	
flick fingers																														T											
get object																																			T	P					
get up high/climb							P						P	P																											
give adult object																																			T						
go to door																															T										
grab adults hand/arm				B		T							T	P																											
grab person	P										T																		B	P											
high five		P																																							
hold hand out						P																																			
independent													B	P	B																				B						
jump back																											P														
kick object																																			P						
kiss	P																																								
laugh/giggle																							P			P															

Note. Crosshatch shading = parent report; grey shading = teacher report; black shading = reported by parent and teacher

(continued)

Table 4.18

IPCA Data Chart for Participant 9: Harold (continued)

Legend: P = parent report (crosshatch shading); T = teacher report (grey shading); B = reported by parent and teacher (black shading)

Reported Communicative Forms	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	talk to them	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	point
lead adult				P								B	P	P															P												
lean forward																							T																		
lean toward adult		P				T																																			
lie in bed																												P		P											
lie on tummy																									T					T											
look	P	T	T	T																																					
look at adult							T					T	T												T																
look at object													T	T																					T						
look away																								T																	
look for adult							P				T																														
make faces									T																																
manipulate adults hand																				T																					
not move										P																		B													
open cupboard													P																												
peer into the room							P																																		
point																																									T
pull arm behind him									P																			B													
pull hair											P																		P												
push adult to door	P																																								
pull nappy off shelf																			P																						
push object away										T																													B		
put arms around adults neck					P																																				
put adults hand on his body						B																						P													
quiet																												P													
raise eyebrows																											T														
reach for object													T																												

Note. Crosshatch shading = parent report; grey shading = teacher report; black shading = reported by parent and teacher

Table 4.18

IPCA Data Chart for Participant 9: Harold (continued)

Shading legend: P = crosshatch (parent report); T = grey (teacher report); B = black (reported by parent and teacher)

Reported Communicative Forms	Social Convention: greet	farewell	name	Attention to Self: get attention	comfort	cuddle/tickle	show off	Reject/Protest: routine	do	dislike	take	adult	Request Object: object	food	more	tv	Request Action: dress	game	toilet	come	Request Info: clarify	info	Comment: happy	sad	bored	funny	fright	pain	angry	tired	Answer: talk to them	yes	no	Choice Making: between objects	activities	start/stop	Imitation: speech	nod yes	shake no	shrug	point
lead adult				P								B	T	P															P												
lean forward																							T																		
lean toward adult		P				T																																			
lie in bed																												P		P											
lie on tummy																									T					T											
look	P	T	T	T																																					
look at adult							T						T	T											T																
look at object													T	T																				T							
look away																								T																	
look for adult							P					T																													
make faces							T																																		
manipulate adults hand																		T																							
not move										P																		B													
open cupboard													P																												
peer into the room							P																																		
point																																									T
pull arm behind him									P															B																	
pull hair												P																	P												
push adult to door	P																																								
pull nappy off shelf																			P																						
push object away										T																								B							
put arms around adults neck					P																																				
put adults hand on his body						B																						P													
quiet																																									
raise eyebrows																											P														
reach for object													T																												

Note. Crosshatch shading = parent report; grey shading = teacher report; black shading = reported by parent and teacher

Table 4.18

IPCA Data Chart for Participant 9: Harold (continued)

		Social Convention			Attention to Self				Reject/Protest					Request Object				Request Action				Request Info		Comment								Answer			Choice Making			Imitation				
		greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	talk to them	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	point
	touch other person	▦																																								
	turn		▨				▨																																			
	twist hands									▦															■																	
Communicative Forms	vocalize				▨					▨	▨					▨					▨						▨			▨											▦	
	wait at door												▦																				■									
	walk around room																								▦																	
	walk away	▦																							▨					■					▦		■					
	walk on tops of feet								▨	▦		▨													■					▨												
	no response		▨	■		▨			▦		■	■		■	▦	▨	■		▦	▨	■				■				▦	■			■	▨				■	■	■	■	▦

Note. Crosshatch shading = parent report; grey shading = teacher report; black shading = reported by parent and teacher

Table 4.19

IPCA Data Chart for Participant 10: John

Legend: P = parent report (crosshatch shading); T = teacher report (grey shading); B = reported by parent and teacher (black shading)

Reported Communicative Forms	Social Convention			Attention to Self				Reject/Protest					Request Object				Request Action				Request Info		Comment								Answer			Choice Making			Imitation				
	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	talk to them	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	point
approach	P											P																													
avoid eye contact										T																							T								
bang cupboards				T							P														P				P												
bang head/head butt																								T	T				B												
give adult object				P								P			P					P															P						
clench teeth								T																					T												
close eyes																							T																		
cry																								T			B	B		P											
cross arms							T																																		
cuddle/snuggle	P					B										T								P			P			P											
ignore adult									T															P										T							
eye contact	T		P								P		P		P																										
flapping																							P				P														
follow with eyes	P																																								
frown																								P																	
get in bed					P																																				
get book					P																			P																	
grab adult																								T			P														
grab desired object											T																							T	B						
grizzle/moan								P			P																		B												
high five																																									
hit								P			P													T			P														
ignore unwanted object																																				P					
initiate activity																																			B						
independent													T	P	B																				T						
iPad				B	T	B			T		T	B	P	T	P				T					P				B						T	T	T					

Note. Crosshatch shading = parent report; grey shading = teacher report; black shading = reported by parent and teacher.

(continued)

Table 4.19

IPCA Data Chart for Participant 10: John (continued)

Legend: P = crosshatch shading (parent report); T = grey shading (teacher report); B = black shading (reported by parent and teacher)

Reported Communicative Forms	greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	talk to them	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	point
rub/bend twig or object																									P																
shake body																											P														
sit down at activity																																				T					
sit on adults lap																											T														
sit near door								P																																	
skip																							T																		
slouch/slump																									P																
smile	T					T																	B								B										
spit food										P																															
squeeze adults arm								T																																	
stop activity				T																																					
take adults hand				P	B			P			P	P						P		B			P						P						T						
tap desired object																																		P							
tense body																											P														
throw item										T																															
touch adults arm				B																																					
unzip adult's jacket						P																																			
vocalise							T	T															B											T							
walk away								P																	P										T	B					

Note. Crosshatch shading = parent report; grey shading = teacher report; black shading = reported by parent and teacher

(continued)

Table 4.19

IPCA Data Chart for Participant 10: John (continued)

Forms		greet	farewell	name	get attention	comfort	cuddle/tickle	show off	routine	do	dislike	take	adult	object	food	more	tv	dress	game	toilet	come	clarify	info	happy	sad	bored	funny	fright	pain	angry	tired	talk to them	yes	no	between objects	activities	start/stop	speech	nod yes	shake no	shrug	point
		Social Convention			Attention to Self				Reject/Protest					Request Object				Request Action				Request Info		Comment								Answer			Choice Making			Imitation				
	wrap arms around adult						black																																			
	wrap arms around himself																							grey								grey										
	wiggle																							grey			grey															
	wriggle away									black																																
	no response	grey	black	black				crosshatch				black	grey				grey	black	grey	black		black	black									crosshatch		crosshatch				black	black	black	black	

Note. Crosshatch shading = parent report; grey shading = teacher report; black shading = reported by parent and teacher

CHAPTER 5

STUDY 2

VALIDATION OF IPCA PARENT AND TEACHER REPORT OF POTENTIAL COMMUNICATIVE ACTS USING VERIFICATION TRIALS WITH THE RESEARCHER

Aims and Hypothesis

The present study was designed to validate the information gathered from interviews with parents and teachers on the PCAs of 10 children with DD, as discussed in Study 1 (Chapter 4). For the purposes of this study, validity refers to the extent to which the information provided in the IPCA was verified during the direct observations. Verification trials were completed in the clinic setting to replicate scenarios of six communicative acts that were reported by the participants' parent or teacher to either be present or absent from each child's communicative repertoire. The information gained from the IPCA, from either parent or teacher report, was considered validated if it agreed with the child's communicative behaviour(s) in 60% of the verification trials, as this was the level of agreement used in previous research on validity of the IPCA. Based on previous research on validity of the IPCA as a communication measure for children with developmental disability (Chapter 2) and the results of Study 1 (Chapter 4) it was hypothesised that the verification trials would be consistent with either parent and/or teacher report for 60% or greater of the communicative forms and functions that were tested. It was also hypothesised that given the verification trials were completed in a new environment with a different communicative partner, that the child may show some variation in communicative behaviour from what was reported on the IPCA by his/her parent and teacher.

METHOD

Participants

Ten children, aged 2 years 6 months to 11 years of age participated in this study. Descriptive information about each child participant is provided in Study 1 (Chapter 4).

Setting

Verification trials related to this study were all conducted in a clinic room at Victoria University of Wellington. The clinic room was a 5 x 3 m room with a one-way mirror that allows people in the adjacent viewing room to observe sessions. Equipment in the room

consisted of one large adult-size table with two chairs, one small child-size table with two chairs, a whiteboard, and for 40% of the sessions a video recorder on a tripod was set up in the corner of the room. The author conducted the procedures for all of the trials and all interactions with the participants. One other adult was in the room recording data for procedural and reliability purposes but did not interact with the child directly. The additional adult was seated next to the video recorder or in the corner of the room. The child was not accompanied by anyone although parents were able to observe sessions from the viewing room.

Procedures

The first author designed the verification trials based on the information gained from the IPCA interview with the parent and the teacher. Six examples of a child's communicative behaviour(s) were taken from the IPCA and replicated in the clinic setting. Three of the chosen functions were reported by both informants to not be present in the child's communicative repertoire. The other three functions were ones that the participant was reported by at least one informant to, at least some of the time, communicate using PCAs. The six targeted functions were chosen based on the following criteria: (a) they needed to be appropriate for replication in the clinic setting, (b) they could not be reported to prompt undesirable behaviour or upset the participant, (c) the likely responses to the prompts had to be observable behaviours, (d) they had to be replicable by the lead researcher on her own, and (d) they needed to be replicable using stimuli that were appropriate to the clinic setting (e.g., toys, books, favourite foods, music). There were instances where two of the chosen specific functions fell under the same functional category. For example, two of the prompts for Participant 4, Sara, fell under the functional category of imitation. One of the tasks was to prompt her to head nod "no" in imitation of the researcher, while another task was to prompt her to imitate pointing. The author chose two tasks from the same functional category when the child was reported to demonstrate the majority of functional categories, or the functions that they were not reported to demonstrate were considered inappropriate for replication in the clinic setting. For example, when choosing the specific functions for the verification trials with Jack, I decided to use the following: respond to his name (social convention); reject an item that is offered that is not of interest (reject/protest); request more of a favourite food (request an object); clarification of what someone has said (requesting information); imitating head nod yes (imitation); and imitating pointing (imitation). Responding to his name was chosen because he was reported by both parent and teacher to respond to this

particular social convention situation. It was also chosen because it was considered socially appropriate to probe multiple times in a session. The other two functions that are specified for social convention on the IPCA (i.e., greet others and farewell others) were not considered ideal to replicate in the clinic setting as both would require the researcher to leave the clinic room and come back in multiple times; this would be unrealistic and potentially confusing for Jack. The second function that was probed, rejecting an item that is offered that is not of interest, was chosen based on the report that Jack would reject the item but did not become distressed or upset when presented with an item he did not prefer. This avoided any unnecessary removal of preferred items to prompt a reject/protest. Requesting more of a favourite food was a function that he was reported to communicate using specific behaviours and was motivated to communicate if offered a highly preferred item. Clarification of what someone has said, imitating head nod yes, and imitating pointing were all functions that both parent and teacher reported were not in Jack's repertoire. Requesting clarification was a more realistic and appropriate way of prompting Jack to request information compared to prompting him to request information about an object, which is the other scenario on the IPCA for the function of requesting information. Imitation of head nod yes and pointing were chosen from the gestures specified on the IPCA for imitation as they were considered age appropriate for Jack and potentially familiar to him; therefore
 they were the gestures he was most likely to imitate if he was able to do so. When looking at the reported functions expressed by Jack on the summary chart of his IPCA results (see Table 4.11) it is evident that there were multiple instances where he was reported to not use specific functions. From this data it would appear that there were multiple functions to use for verification trials. However, many of these were deemed inappropriate to use for verification trials as they were either not appropriate to replicate in the clinic (e.g., requesting help with dressing or going toilet) or that could not be prompted in a way that would elicit a clear response from Jack (e.g., answer yes in response to a question).

        Once the specific communicative functions were chosen, the author designed activities and scenarios to prompt each function from each individual child. I designed the activities based on (a) parent report of the child's preferred activities or foods, (b) the reported situations in which the child used the target behaviour (as per IPCA report), (c) the likelihood that the activity and prompt would elicit the targeted function, and (d) the availability and appropriateness of the materials needed for the activity. Continuing with

Table 5.1

Elicitation Tasks for Prompting Participants to Communicate Targeted Functions

Function	Task	Steps	Procedures	Participants
Social Convention	Respond to his/her own name	1	Get the participant involved in an independent task (e.g., drawing, looking at a book, doing a puzzle).	Ian, Jack, Ryan, Ronald, Sean, Sara, Jane, Kate, Harold, John
		2	Stand 1 to 2 m behind the participant while he/she is still engaged in the task.	
		3	Call out his/her first name clearly in a volume appropriate for gaining his/her attention.	
		4	Wait 10 s for the participant to respond then record his/her behaviour during that time.	
Attention to Self	Gain adult's attention	1	Engage the participant in a game or activity that requires turn-taking or for them to access an item from you.	Ronald
		2	Once the participant is engaged in the activity, sit in the corner of the room in a chair with your back to him/her. Ensure that he/she requires your assistance to continue the preferred activity (e.g., he/she needs access to the cupboard, more snack, the next puzzle piece).	
		3	Wait there for a maximum of 1 min or until the participant tries to get your attention.	
		4	Record his/her behaviours either once they've given you attention or after one minute of waiting. Engage with them in the activity again for 1 min once he/she gets your attention or after one minute.	

Table 5.1

Elicitation Tasks for Prompting Participants to Communicate Targeted Functions (continued)

Function	Task	Steps	Procedures	Participants
Reject/Protest	Reject an item that is not of interest	1	Show the participant two items on a tray, one preferred and one nonpreferred.	Jack, Jane
		2	Ask him/her, "Which would you like?"	
		3	Wait for the participant to indicate which item he/she wants.	
		4	Hand him/her the other item (that he/she did NOT request). Wait 10 s for the participant to respond then record his/her behaviours during that time. Remove the item immediately if the child rejects it and record his/her behaviours.	
		5	Show the participant the other item and ask, "Did you want this one?"	
		6	Allow the participant to play with the preferred item for 30 s or to eat the desired item. Rotate between presenting two or three different items (one preferred and one nonpreferred) every two trials.	
	Reject a nonpreferred item	1	Hold out an item (e.g., toy, food) that the parent reported the participant consistently refuses or does not like. Ensure that the item will not cause the participant to become upset or distressed.	Sean
		2	Place the item on the table in front of the participant or hold it out approximately 50 cm from him/her. When he/she is looking at the item ask, "Do you want this?"	
		3	Wait 10 s for the participant to respond, then record his/her behaviours during that time. Remove the item from sight immediately if the participant rejects it.	

(continued)

Table 5.1

Elicitation Tasks for Prompting Participants to Communicate Targeted Functions (continued)

Function	Task	Steps	Procedures	Participants
Reject/Protest	Removal of a favourite item	1	Play the participant's favourite video on the iPad. Once he/she is engaged in the video let him/her watch for 2 min.	Ian, Sara
		2	After two minutes, tell the participant you want a turn watching the video and remove it from in front of him/her.	
		3	Wait 10 s for the participant to respond then record his/her behaviours during that time.	
		4	If the participant communicates that he/she wants the iPad back, say to him/her "Your turn," then return it to them and let them watch for another a video for 2 min.	
Answer	Answer when asked to play a game	1 2 3	Complete steps 1, 2, and 3 from reject/protest, removal of a favourite item.	Ian
		4	Ask the participant "Would you like to watch more of the video?"	
		5	Wait 10 s for the participant to respond then record his/her behaviours during that time.	
		6	Return the iPad to the participant unless they reject it. Allow him/her to watch another 2 min of the video.	
	Answering a question	1	Ask the participant a question that should be answered "yes" or "no" (e.g., "Is your name correct name/incorrect name?").	Ryan, Ronald, Sara, John
		2	Look at the child expectantly.	
			Wait 10 s for the participant to respond then record his/her behaviours during that time.	

Table 5.1

Elicitation Tasks for Prompting Participants to Communicate Targeted Functions (continued)

Function	Task	Steps	Procedures	Participants
Answer	Reaction to someone talking to him/her	1	Wait until the participant is engaged in an activity on his/her own.	Kate, Harold
		2	Approach the participant and comment on what he/she is doing (e.g., "That looks like lots of fun!")	
		3	Wait 10 s for the participant to respond then record his/her behaviours during that time.	
Request Object	Request more of something	1	Engage with the participant through a game or activity that requires him/her to access a necessary object (e.g., game piece, food) from you. Continue the game until he/she is fully engaged and interacting with you.	Jane, Harold, John
		2	Take the remaining items that are of interest to him/her and place them in a clear plastic container on your lap. Place your hand over the top of the box and look at the participant expectantly.	
		3	Wait 10 s for the participant to respond then record his/her behaviours during that time.	
Request Action	Ask for help with a toy	1	Let the participant play with a favourite toy for 1 minute.	Jack, Ryan
		2	Say to him/her, "My turn now." Take the toy and turn it off or close it (e.g.. turn off the iPad, close the bottle of bubbles).	
		3	Hand the toy back to the participant and say "Your turn."	
		4	Wait 10 s for the participant to respond then record his/her behaviours during that time.	
		5	Open/turn on the toy, hand it back to the participant and say, "Try it now."	

Table 5.1

Elicitation Tasks for Prompting Participants to Communicate Targeted Functions (continued)

Function	Task	Steps	Procedures	Participants
Request Information	Ask for clarification	1	Get the participant to look up at you when you are seated across from him/her.	Ian, Jack, Ryan, Ronald, Sean, Jane, Kate, Harold, John
		2	Ask the participant if he/she wants a nonsense item (e.g., "Want a zug?") and look at him/her expectantly.	
		3	Wait 10 s for the participant to respond then record his/her behaviours during that time.	
Comment	Express pleasure or enjoyment	1	Let the participant play with a favourite toy or engage in a favourite activity for 2 min.	Ian, Sara, Kate, Harold, John
		2	After 2 min, observe his/her behaviour for 10 s then record his/her behaviours during that time	
Choice Making	Choose from two items	1	Offer two items that are familiar to the participant.	Ryan, Ronald, Kate
		2	Hold the items up in front of the participant and ask, "Which one do you want?"	
		3	Wait 10 s for the participant to respond then record his/her behaviours during that time.	
		4	Allow the participant access to one or both items if requested.	

Table 5.1

Elicitation Tasks for Prompting Participants to Communicate Targeted Functions (continued)

Function	Task	Steps	Procedures	Participants
Imitation	Nod head yes	1	Ask the participant a basic question that should correctly be answered yes (e.g., "Is your name Jack/Jane?")	Jack, Jane
		2	Immediately after the question, prompt him/her by saying, "Do this" as you nod your head up and down.	
		3	Wait 10 s for the participant to respond then record his/her behaviours during that time.	
	Shake Head No		Follow the same procedures as nod head yes but ask the participant a question that should be correctly answered no (e.g., "Is your name Bruce?") then shake your head back and forth.	Ian, Ryan, Sara, Kate, John
	Point	1	Choose a book or a picture (A4 or larger) that interests the participant.	Jack, Ronald, Sean, Sara, Jane, Harold
		2	While the participant is looking at the picture, identify one salient item in the picture (e.g., "I see a horse").	
		3	Say to the child, "Do this" while pointing your finger at the horse.	
		4	Wait 10 seconds for the participant to respond then record his/her behaviours during that time.	
	Another's speech	1	Get the participant's attention. Make sure they are watching you.	Sean
		2	Prompt him/her with "Say this," then produce a CVCVCV combination (e.g., bababa, mamama).	
		3	Look at the participant expectantly.	
		4	Wait 10 seconds for the participant to respond then record his/her behaviours during that time.	

Jack as an example, his mother was asked prior to the verification trials to list his most preferred items and/or activities, his most nonpreferred items or activities, and then other preferred or nonpreferred items. With this information the author was able to capture his motivation with requesting food by using a highly preferred item. I was also able to elicit a reject/protest behaviour without causing any unnecessary frustration by offering nonpreferred items yet avoiding the most nonpreferred or adversive items. Table 5.1 provides examples of the elicitation tasks used, the procedures for each task, and the participants with whom each prompt was used.

      Assessment sessions. The elicitation trials were all completed in the clinic over one or two sessions lasting 30 to 45 min in duration. The trials were spread over two sessions if it was felt that the child was not able to attend for a long enough period of time to complete the trials in one session. The child was given 5-min breaks every 10 to 15 min to engage in a favourite activity or to have a snack.

      Ten trials of each elicitation task were completed over the two sessions, with a total of 60 trials completed in total. The first author conducted each of the trials. The elicitation tasks were alternated depending upon the child's interest and the opportunities for eliciting tasks in a socially appropriate manner. For example, if the child was happily engaged in an activity at the table, such as drawing or doing a puzzle, then the researcher conducted the elicitation task for responding to name. Likewise, if the child was looking at a poster or a book and was interested in the picture(s), the researcher would prompt for imitation of pointing.

Interobserver Agreement

      The first author collected data on the child's response during the 10-sec time period immediately following the prompt. All behaviours observed were recorded immediately after the 10-sec interval. To assess the reliability of the trainer's data collection, an independent observer also collected data on the child's response. The independent observer was one of three other PhD students working in the Educational Psychology Clinic who had training in the area of nonverbal communication and had experience working and observing children with developmental disability. All data were collected during the session therefore the independent observer was in the room during the session. Prior to each elicitation trial, the lead researcher would identify the task she was going to elicit by number (as noted on the data sheet) so that the independent observer was aware which task was being presented. Prior to the sessions the independent observer was given a written and verbal explanation of the

tasks that were going to be presented and the function that should be elicited. They were also given a list of PCAs as examples of behaviours that should be noted and recorded. The independent observer was blind to the information obtained by the lead researcher on the IPCA in order to eliminate bias. The independent observer was instructed to write down all of the behaviours that the child demonstrated during the 10-sec interval following the prompt. Following the session, the data recorded by the first author and the independent observer was compared. Agreement was judged for each trial as: (a) full agreement, (b) partial agreement, or (c) no agreement. Full agreement was when all of the behaviours recorded by both observers were the same. Partial agreement was when one or more of the behaviours recorded by each observer were in agreement but one or more of the behaviours were in disagreement. No agreement was when there were no behaviours recorded that were in agreement. Each trial in full agreement was given 1 point, each trial in partial agreement was given .5 points, and all trials with no agreement were awarded zero points. Percentage agreement for each set of 10 trials was calculated using the formula: Full Agreements/ Total Trials x 100%. The mean percentage of total agreement across 20 sets of 10 trials each was 95% with a range of 82% to 100%.

Procedural Integrity

To assess procedural integrity, the author gave the independent observer a list of the procedures for each trial. If the first author administered all of the procedures during a trial appropriately, a tick was placed in a corner box on the record sheet. If the author incorrectly administered one or more of the steps during a trial, the observer placed an X in the corner box of the record sheet for that trial. Procedural integrity was calculated across each set of 10 trials using the formula: trials administered correctly/total trials. The procedural integrity was assessed across 80% of trials across all 10 participants. Procedural integrity ranged from 90% to 100% with an overall mean of 98%.

RESULTS

The behaviours used by a participant during each of the ten trials for each elicitation task were compared to those reported as used for the same function by the parent and teacher on the IPCA. The child's behaviour was considered to be in agreement with parent and teacher report if he/she demonstrated at least one of the behaviours reported by either informant. For example, if the parent reported that the participant would respond to his name either by making eye contact or not responding, while the teacher reported that the participant does not respond to his name being called, then if the child either made eye contact or did not

respond to the researcher calling his name during the clinical trial, then it was determine to be in agreement with informant report. If the child made eye contact and smiled, this was also considered to be in agreement with informant report since at least one of the reported behaviours was present despite the fact that an additional behaviour was observed during the clinical trial. The percentage of trials that were in agreement across the set of 10 trials for each elicitation task was calculated using the formula: trials in agreement/total trials x 100%. This resulted in an overall percentage of agreement for each of the 6 different elicitation tasks. Table 5.2 shows the percentage of agreement between clinic trials with the researcher and informant report. The percentage of agreement across all participants and functional categories, resulting in a total of 60 sets of trials, ranged from 10% to 100% with a mean of 85.5%.

Agreement Within Participants Across Functions

The percentage of agreement between clinical trials and informant report for each participant across the six clinical trials was calculated by the formula: Total percentage agreement across all six trials/6. This ranged from 73% to 98% with a mean of 85%. Jack and Sean had the lowest percentages of agreement between clinical trials and informant report at 75% and 73% respectively. John and Kate had the highest levels of agreement between clinical trials and informant report with 98% and 93% respectively.

Agreement Within Functions Across Participants

The highest percentage of agreement between clinical trials and informant report across participants was found for the functions of requesting information and imitation, with 100% and 99% respectively. The lowest levels of agreement were found for attention to self (20%), reject/protest (70%), social convention (75%) and Commenting (78%). It is important to note however that each function was not used in an equal number of clinical trials, therefore they can not be directly compared.

DISCUSSION

By comparing the behaviours presented by each participant in the structured clinical trials to informant report on the IPCA, we are able to surmise whether the IPCA is a reliable form of obtaining information on a child's PCAs. The PCAs reported for each participant by the parent and the teacher were considered validated if there was 60% or greater agreement with the clinical trials across all 10 pragmatic functions. This level of agreement was also used to verify information from the IPCA using clinical trials by Sigafoos et al. (2000). The

Table 5.2

Percentage of Agreement between Clinic Trials With Researcher and Parent/Teacher Report

	Social Convention	Attention to Self	Reject/Protest	Request Object	Request Action	Request Info	Comment	Answer	Choice Making	Imitation
Ian	90	-	10	-	-	100	80	100	-	100
Jack	20	-	60	70	-	100	-	-	-	100;100
Ryan	30	-	-	-	90	100	-	90	80	100
Ronald	100	20	-	-	-	100	-	100	100	100
Sean	40	-	80	20	-	100	-	-	-	100;100
Sara	100	-	100	-	-	-	30	100	-	100;100
Jane	90	-	100	60	-	100	-	-	-	100;90
Kate	100	-	-	-	-	100	100	100	60	100
Harold	80	-	-	90	-	100	80	80	-	100
John	100	-	-	90	-	100	100	100	-	100

Note. - = functions that were not included in clinical trials; two numbers under one section (e.g. 100;100) indicate that two separate elicitation tasks were completed for that function.

findings from this study indicate that the agreement across all participants was adequate for validation of informant report on the IPCA. Overall agreement across functions was

greater than 70% for all 10 participants. This indicates a high level of validity for the IPCA as a tool for identifying PCAs of children with DD and SCI.

When looking at the validity of informant report for each of the pragmatic functions, it is evident that 90% of functions reached an acceptable level of validity for informant report. The one functional category that did not reach an acceptable level of validation when comparing clinical trials to informant report was attention to self. However clinical trials were only done with one participant for attention to self and therefore would need to be further investigated in order to determine whether the IPCA is in fact a reliable method of assessing PCAs used for this particular function.

The findings that the majority of behaviours that were interpreted as communicative by all informants were body movements agrees with the findings of Braddock et al. (2013), that 100% of caregivers inferred meaning through body movement. Braddock et al. also found that caregivers most frequently inferred meaning through certain informal motor behaviours including grab hand/arm, grab/take object, and move away from person or object. These were all reported as used to communicate by all of the participants in this study. Reaching for a toy or food was also found to be a consistent behaviour reported and exhibited by participants with ASD, aged 3:7 to 7:7 years, for the purpose of requesting and choice making (Keen, et al., 2001). Braddock and colleagues reported that participants produced higher mean proportion of body movement, followed by vocalization and gestures. Challenging behaviour, eye gaze, facial expression, imitation, and stereotyped movement were produced at lower proportions.

There are multiple factors that need to be taken into consideration when evaluating the results of this study. First, due to restrictions on what can be tested in clinical trials in a pragmatically appropriate manner, there was a disproportionate amount of trials carried out for each functional category. Because of this, there cannot be a clear comparison between the percentages of agreement for each of the function categories. Those functions where there were more clinical trials were statistically more likely to have a higher percentage of agreement than those with fewer trials across participants.

Second, although the procedural integrity for the presentation of the elicitation tasks was very high, there were variations to the level of response by participants. There are multiple internal and external factors that we can speculate to have influenced the participants level of response: (a) the participant's level of alertness, (b) his/her ability to attend to the task, (c) level of interest in the activity, (d) attention to external noise or movement (e.g., noise from cars outside, the trees outside the windows, (e) his/her understanding of the task, and (f) the participant's familiarity with the researcher. Also, because the trials were completed over one or two sessions, the children may have responded differently from one session to the next. This is in fact a strength as it captures more of the child variation of behaviour; nevertheless it is likely to influence the participants' behaviours. Each participant's familiarity with the researcher also varied. Four of the children had interacted with the researcher before in the clinic setting (Participants 1, 2, 4, and 8) or had met the researcher previously in an educational setting, whereas six of the participants (3, 5, 6, 7, 9, 10) had only previously had a brief encounter with the clinician prior to the clinical trials. The child's level of familiarity may have influenced his/her level of response in certain instances. Although the impact that these factors on the participants' behaviours is speculative, it is important to take them into consideration when interpreting the data.

When calculating the agreement between clinical trials and informant report, full agreement was given if at least one of the child's behaviours noted during the clinical trials was in line with either parent report, teacher report, or both for the targeted function. This likely resulted in higher levels of agreement than if the behaviours from the clinical trials were compared to behaviours reported by only one informant, or to behaviours that were reported by both informants. The calculations were done using both the parent and the teacher's reported behaviours as it was felt to be a more realistic reflection of each participant's PCAs across environments and communication partners. Given that all clinical trials were completed in a setting that was different to the environments where the informants interacted with the participants (e.g., home, school, community), and that the researcher implementing the trials was either not known to each participant or was not a regular communication partner, it was necessary to incorporate the behaviours reported to be used in different settings and from different communication partners.

There are limitations to this research that should be addressed in future studies. First, the clinical trials were not evenly spread between the different communicative functions. This was a consequence of the limited communicative repertoires of the participants, the number of trials that could be completed in the timeframe allowed, as well as the limitations of replicating situations in a clinical setting. However, further research may employ other methods of assessment and validation, such as classroom observation or videotaped communication sessions, in order to include a wider range of pragmatic functions. These methods have been used in previous research using the IPCA (Keen et al., 2001, 2005; Keen et al., 2002), however they may be replicated on a larger scale.

This research was limited to 10 children with a diagnosis of DD and SCI. Future research may include a larger sample size for greater comparison across informants. It may also include participants with a wider range of diagnoses, such as RTT or AS. There is also a need for this research to be replicated with adults who have similar diagnoses to the current participants.

Further replication of this study should include clinical trials that are conducted either in a setting in which at least one of the participant's informants would normally interact with the participant, or with one of the informants presenting the clinical trials. This would allow for a meaningful comparison between results from three separate sources of information: the child's behaviours during the clinical sessions, behaviours reported on the IPCA by the person conducting the trials (or by the informant that was from the familiar environment used during the trials), and behaviours reported on the IPCA by the informant that is not involved in the clinical trials. This may provide more information on the percentage of agreement of data collected via different methods and informants.

The current findings are in line with previous research (as discussed in Chapter 2) and support the validity and reliability of parent and teacher report when using the IPCA as an interview protocol. These are promising findings that support the need for further research in this area. Future research should focus on replication of this study and previous studies with greater numbers of participants and should use varying methods of data collection to provide further validation and assessment of PCAs in children with DD and SCI.

CHAPTER 6

STUDY 3

Validation of IPCA Parent and Teacher Report of Potential Communicative Acts Using Verification Trials with the Parent

Aims and Hypothesis

The present study was designed to validate the information gathered from interviews with parents and teachers on the PCAs of 10 children with DD, as discussed in Study 1 (Chapter 4). Verification trials were presented by the parent in the clinic setting to replicate scenarios of six communicative acts that the parent or teacher reported to be either present or absent from the child's communicative repertoire. The information gained from the IPCA, from either parent or teacher report, was considered validated if it agreed with the child's communicative behaviour in 60% of the verification trials. Based on previous research on validity of the IPCA as a communication measure for children with DD and SCI (Chapter 2), the results of Study 1 (Chapter 4), and findings from Study 2 (Chapter 5), it was hypothesised that the verification trials conducted by the parent would be consistent with parent and teacher report for 60% or greater of the communicative forms and functions that were tested. It was also hypothesised that given the verification trials were completed in a clinical environment, each child may show some variation in communicative behaviour from what was reported on the IPCA by his/her parent and teacher.

METHOD

Participant*s*

Ten children aged 2 years 6 months to 11 years of age participated in this study. Descriptive information about each child participant was provided in Study 1 (Chapter 4).

Setting

Verification trials related to this study were all conducted in a clinic room at Victoria University, Wellington (see Chapter 5 for a further description).

Procedures

The verification trials used to prompt the child to communicate specific functions are described in detail in Study 2 (Chapter 5).

Assessment sessions. The elicitation trials used were the same for each participant as were used in Study 2 (see Chapter 5). The child's parent conducted all of the trials. Two other adults, one of which was the first author, along with a graduate student, were in the room recording data for procedural integrity and reliability purposes but did not interact with the child directly. Prior to the session, the parent was given instructions on how to present the elicitation tasks. Each parent had also watched the trials previously conducted by the researcher from the viewing room and had seen how the tasks were presented to their child. During the session the first author gave the parent instructions on when to elicit certain tasks, however the parent could prompt behaviours at other times if was felt to be appropriate.

Inter-Observer Agreement

The first author and the second observer collected data on the child's response during the 10-sec time period immediately following the prompt. All behaviours observed were recorded immediately after the 10-sec interval.

Prior to the sessions, the first author gave the independent observer a written and verbal explanation of the tasks that were going to be presented and the function that each task was designed to elicit. They were also given a list of PCAs as examples of behaviour that should be noted and recorded. The independent observer was blind to the information obtained by the lead researcher on the IPCA in order to eliminate bias. The first author instructed the independent observer to write down all of the behaviours that the child demonstrated during the 10-sec interval following the prompt.

Following the session, the first author compared the data recorded by herself and the independent observer for each trial. Agreement was judged for each trial as: (a) full agreement, (b) partial agreement, or (c) no agreement. Full agreement was when all of the behaviours recorded by both observers were the same. Partial agreement was when one or more of the behaviours recorded by each observer were in agreement but one or more of the behaviours were in disagreement. No agreement was when there were no behaviours recorded that were in agreement. Each trial in full agreement was given 1 point, each trial in partial agreement was given .5 points, and all trials with no agreement were awarded zero points. Percentage agreement for

each set of 10 trials was calculated using the formula: Full Agreements/ Total Trials x 100%. The mean percentage of total agreement across 60 sets of 10 trials each was 95% with a range of 81% to 100%.

Procedural Integrity

To assess procedural integrity, the independent observer and the lead researcher had with them a list of the procedures for each trial. If the parent administered all of the procedures during a trial appropriately, a tick was placed in the corner box located to the right of each space designated for writing down the behaviours seen after each trial. If the parent was observed to incorrectly administered one or more of the steps during a trial, the observer(s) would signal to each other with a raise of the hand and both observers would disregard the trial. This was marked as an X across one of the boxes on the record sheet. If this occurred across two consecutive trials, the lead researcher reviewed the steps with the parent before further trials were presented to the participant. Trials for each set of prompts were continued until there were 10 correct elicitations, therefore in some instances the parent conducted more than 10 trials in total. Procedural integrity was calculated across each set of trials using the formula: trials administered correctly/ total trials. The procedural integrity was assessed across 80% of trials across all 10 participants. Procedural integrity ranged from 76% to 100% with an overall mean of 91%.

RESULTS

The behaviours used by a participant during each of the 10 trials for each elicitation task were compared to those reported as used for the same function by the parent and teacher on the IPCA. Three separate comparisons were conducted: (a) parent report on the IPCA was compared to the behaviours observed during the clinical trials, (b) teacher report was compared to the behaviours observed during the clinical trials, and (c) combined parent and teacher report were compared to behaviours observed during the clinical trials. Separate comparisons were made in order to observe whether there was greater agreement when there were similar independent variables across data samples (e.g., was there a higher level of agreement between parent report and parent-conducted clinical trials compared to teacher report and parent-conducted clinical trials?). In addition, comparing the level of agreement for parent and teacher report both individually as well as combined may provide

insight into the value of administering the IPCA to more than one informant for each participant.

The child's behaviour was considered to be in agreement with parent report if he/she demonstrated at least one of the behaviours reported by the parent. For example, if the parent reported that the participant would respond to his/her name either by making eye contact or not responding, then if the participant either made eye contact or did not respond to the researcher calling his name during the clinical trial, then it was determined to be in agreement with parent report. If the child made eye contact and smiled, this was also considered to be in agreement with informant report since at least one of the reported behaviours was present despite the fact that an additional behaviour was observed during the clinical trial. Agreement between the participant's behaviour and teacher report was judged in a similar manner; at least one of the behaviours reported by the teacher had to be demonstrated by the participant during a clinical trial for there to be agreement. Agreement between informant report and the participant's behaviours during the clinical trials was reached when the participant exhibited at least one behaviour reported by either the parent or the teacher. The percentage of trials that were in agreement across the set of 10 trials for each elicitation task was calculated using the formula: trials in agreement/total trials x 100%. This was calculated across all six elicitation tasks for all 10 participants for (a) parent report, (b) teacher report, and (c) parent and teacher report combined. If the percentage of agreement for all 10 trials of an elicitation task was 60% or greater, then the clinical trials and informant report were considered to be in agreement. If the percentage of agreement was less than 60%, then the clinical trials and informant report were considered to be in disagreement.

Agreement Between Parent Report and Parent-Conducted Clinical Trials

There were a total of 60 elicitation tasks across all 10 participants. The percentage of agreement between parent report and parent-conducted clinical trials was calculated by dividing the total number of elicitation tasks across participants that were in agreement with parent report by the total number of elicitation tasks across participants (total number of tasks in agreement/ 60) x 100. Forty-eight of the 60 elicitation tasks were found to be in agreement with parent report, resulting in 78% agreement.

Agreement Between Teacher Report and Parent-Conducted Clinical Trials

The percentage of agreement between teacher report and parent-conducted clinical trials was calculated by dividing the total number of elicitation tasks across participants that were in agreement with teacher report by the total number of elicitation tasks across participants (total number of tasks in agreement/ 60) x 100. A total of 45 elicitation tasks were in agreement with teacher report, resulting in 75% agreement.

Agreement Between Combined Parent-Teacher Report and Parent-Conducted Clinical Trials

The percentage of agreement between parent-conducted clinical trials and parent and teacher report combined was calculated by dividing the total number of elicitation tasks across participants that were in agreement with both parent and teacher report by the total number of elicitation tasks across participants (total number of tasks in agreement/ 60) x 100. A total of 52 elicitation tasks were in agreement with combined parent-teacher report, resulting in 87% agreement. This also indicates that a total of 13% of the elicitation trials did not reach agreement with either parent or teacher report.

Agreement Across Aspects

Each of the elicitation tasks was categorised into one of four categories based on the agreement across all three aspects (e.g., agreement with parent report, agreement with teacher report, agreement with both parent and teacher report): (a) tasks that reached agreement for all three aspects, (b) tasks that reached agreement with only parent or only teacher report, (c) tasks that reached agreement only with combined parent and teacher report, and (d) tasks that did not reach agreement with any aspects. Table 6.1 displays the percentage agreement across aspects.

The percentage of tasks that showed agreement with all three aspects was calculated using the equation: (total tasks in agreement with all three aspects/ 60) x 100. The result showed that 72% (n = 43) of the elicitation tasks agreed with all three aspects. The percentage of tasks that reached agreement with only parent report or teacher report was calculated using the equation: (total tasks in agreement with only parent or teacher report/ 60) x 100. This showed that 15% (n = 6) of the tasks agreed with either teacher or parent report but not both. Four of the six tasks reached agreement only with parent report and two tasks only reached agreement with teacher report. Three of the 60 trials (5%) only reached agreement when the behaviours

Table 6.1

Percentage Agreement Between Parent and Teacher IPCA Report and Behaviours
Exhibited During Clinic Trials

		IPCA Report			
		Parent	Teacher	Both	Present or Absent
Participant 1: Ian	Social Convention	40	40	40	Present
	Reject/Protest	0	20	20	Present
	Comment	90	90	90	Present
	Request Info	100	100	100	Absent
	Answer	100	100	100	Absent
	Imitation	80	80	80	Absent
Participant 2: Jack	Social Convention	20	30	30	Present
	Reject/Protest	80	80	80	Present
	Request Action	50	50	80	Present
	Request Info	100	100	100	Absent
	Imitation	100	100	100	Absent
	Imitation	100	100	100	Absent
Participant 3: Ryan	Social Convention	60	60	60	Present
	Choice Making	100	90	100	Present
	Request Action	100	0	100	Present
	Request Info	100	100	100	Absent
	Answer	100	100	100	Absent
	Imitation	100	100	100	Absent
Participant 4: Ronald	Social Convention	90	100	100	Present
	Attention to Self	80	90	90	Present
	Choice Making	100	100	100	Present
	Request Info	100	100	100	Absent
	Answer	100	100	100	Absent
	Imitation	90	90	90	Absent
Participant 5: Sean	Social Convention	50	50	50	Present
	Reject/Protest	70	60	100	Present
	Request Object	70	0	70	Present
	Request Info	100	100	100	Absent
	Imitation	100	0	100	Both
	Imitation	80	80	80	Absent

Note. Shaded areas = acceptable level of agreement (60% or greater)

Table 6.1

Percentage Agreement Between Parent and Teacher IPCA Report and Behaviours

Exhibited During Clinic Trials (continued)

		IPCA Report			
		Parent	Teacher	Both	Present or Absent
Participant 6: Sara	Social Convention	100	90	100	Present
	Reject/Protest	40	40	70	Present
	Comment	50	70	70	Present
	Answer	100	100	100	Absent
	Imitation	100	100	100	Absent
	Imitation	100	100	100	Absent
Participant 7: Jane	Social Convention	100	100	100	Present
	Reject/Protest	100	100	100	Present
	Request Object	10	10	10	Present
	Request Info	100	100	100	Absent
	Imitation	30	70	100	Both
	Imitation	100	100	100	Absent
Participant 8: Kate	Social Convention	20	20	20	Present
	Comment	100	100	100	Present
	Choice Making	70	80	100	Present
	Request Info	100	100	100	Absent
	Imitation	100	100	100	Absent
	Answer	70	30	100	Both
Participant 9: Harold	Social Convention	90	100	100	Present
	Comment	100	80	100	Present
	Request Object	90	90	90	Present
	Answer	30	50	50	Both
	Request Info	100	100	100	Absent
	Imitation	50	50	50	Both
Participant 10: John	Social Convention	100	80	100	Present
	Comment	100	100	100	Present
	Request Object	70	70	70	Present
	Answer	40	40	80	Both
	Imitation	100	100	100	Present
	Request Info	100	100	100	Absent

Note. Shaded areas = acceptable level of agreement (60% or greater)

Table 6.2

Percentage Agreement Between IPCA Informant Report and Clinical Trials For Each Communicative Function

	IPCA Report			
	Parent	Teacher	Both	Present or Absent
Social Convention	67	67	70	Present
Reject/Protest	58	60	74	Present
Request Object	62	42	60	Present
Request Action	75	25	90	Present
Request Info	100	100	100	Absent
Comment	88	88	92	Present
Answer	77	74	90	Both
Choice Making	90	90	100	Present
Imitation	84	84	93	Both

(left margin, rotated) Communicative Functions

reported by the teacher and the parent were taken into account. For example, participant 6, Sara, exhibited behaviours reported by the parent in 40% of the 10 trials conducted for reject/protest, and exhibited behaviours reported by the teacher in 40% of the trials. However, her exhibited behaviours were in agreement with combined parent and teacher report for 70% of the trials.

Eight of the total 60 elicitation trials (13%) did not reach agreement for any of the three aspects. Therefore 13% of the total trials across participants did not agree with either parent or teacher report at least 60% of the time.

Percentage Agreement Across Aspects for Each Communicative Function

In order to determine whether there were significant differences in levels of agreement between aspects for different communicative functions, the percentage agreement for each communicative function across participants was calculated. The agreement levels were calculated by adding up the percentage of agreement across

participants for each elicitation task presented for a given function, then dividing by the number of elicitation tasks. For example, across all 10 participants, there were 5 elicitation tasks presented for reject/protest. The percentage of agreement between parent-run clinical trials and (a) parent IPCA report, (b) teacher IPCA report, and (c) combined parent and teacher IPCA report across all five trials were added and then divided by 5. The mean percentage of agreement for each comparison (i.e., parent IPCA report, teacher IPCA report, and (combined parent and teacher IPCA report) and for each of the 10 functions is shown in Table 6.2. The communicative functions that did not meet the agreement criteria with parent report across participants were reject/protest and request object. The communicative functions that did not meet the agreement criteria with teacher report across participants were request object and request action. All 10 communicative functions met agreement criteria for combined parent and teacher report.

Given that Study 2 (Chapter 5) provided data on the percentages of agreement between clinic trials with the researcher to combined parent and teacher IPCA report, there was also the opportunity to make the following comparison: the percentage of agreement between researcher-conducted clinical trials and combined parent/teacher IPCA report to the percentage of agreement between parent-conducted clinical trials and combined parent/teacher IPCA report. This comparison was done to identify whether the levels of agreement varied relative to who presented the clinical trials to the participants (i.e., parent or researcher). The results of this comparison are displayed in Table 6.3. The percentage of agreement with combined IPCA report was higher for researcher-conducted clinical trials for 4 of the 10 communicative functions: social convention, request object, answer, and imitation. Likewise the percentage of agreement with combined IPCA report was higher for parent-conducted clinical trials for 5 of the 10 communicative functions: attention to self, reject/protest, request action, comment, and choice making. Requesting information reached 100% agreement for both parent- and researcher-conducted trials. The overall mean average of agreement across all functions for researcher-conducted trials was 77.5% and 87.3% for parent-conducted trials. Overall there was a higher percentage of agreement within and across communicative functions for clinical trials with the parent compared to clinical trials with the researcher.

Table 6.3

Percentage Agreement Between Combined Parent/Teacher IPCA Report and Parent-Presented Clinical Trials Compared with Researcher-Presented Clinical Trials

		Researcher-Presented Clinical Trials	Parent-Presented Clinical Trials
Communicative Functions	Social Convention	75	70
	Attention To Self	20	90
	Reject/Protest	70	74
	Request Object	66	64
	Request Action	90	100
	Request Info	100	100
	Comment	78	92
	Answer	96	90
	Choice Making	80	100
	Imitation	100	93

DISCUSSION

The behaviours exhibited by 10 children with DD and SCI during parent-conducted clinical trials were compared to the PCAs used by the children in other settings, as reported by a parent and teacher using the IPCA. In order to fully analyse and interpret the data, three separate comparisons were conducted: (a) parent report on the IPCA was compared to the behaviours observed during the clinical trials, (b) teacher report on the IPCA was compared to the behaviours observed during the clinical trials, and (c) combined parent and teacher report were compared to behaviours observed during the clinical trials. Agreement between the data sets (e.g., parent report, teacher report, and clinical trials) for each of the elicitation trials was also analysed to determine whether there was any evidence to indicate possible causes or reasons for disagreement.

Analysis of the data resulted in findings related to several factors: (a) the validity of the IPCA as a tool for identifying PCAs in children with DD and SCI, (b) the consistency with which the participants used communicative behaviours across settings and communication partners, and (c) possible factors which may lead to disagreement across different methods of assessment.

The results from this study are in agreement with previous research and suggest that the IPCA might provide a useful approach for identifying PCAs used by children with DD and SCI. Parent report, based on the use of IPCA as an interview protocol, was consistent with the behaviours demonstrated by the participants in the clinic trials conducted by his/her parent 78% of the time. Teacher report using the IPCA as an interview protocol was consistent with the participants' behaviours during parent-conducted clinical trials 75% of the time. As would be expected, comparing the combined parent and teacher report to the participant's behaviours presented during the clinic-based trials resulted in an even higher level of agreement of 87%. These findings, along with previous findings that the IPCA is a reliable method for obtaining information about the PCAs of children with DD and SCI, are reassuring for professionals who wish to use the IPCA as an assessment tool. The IPCA appears to be relatively quick and easy to administer and may be used by a wide range of professionals without a need for specialist certification as is required for many standardised assessments. The IPCA can be used with a variety of communication partners that are familiar with the participant, regardless of whether or not he or she interacts with the participant across various settings. In addition, the IPCA can be completed in a short timeframe and does not require any technical equipment or expensive resources to administer. This is a major advantage for professionals who need to complete assessments in a reasonably short amount of time but need to assess a child's full range of expressive communication. In addition to this, it is reasonable to say that clinic trials presented by the parent are also a reliable method of assessing a child's communicative repertoire should an interview method be inappropriate in some circumstances.

In order to look more indepth into the levels of agreement as well as the types of disagreement that occurred between different methods of data collection (e.g., informant report, clinic trials) and between different informants, the agreement across aspects for each set of the elicitation tasks was calculated. The participants showed behaviours that were consistent with both parent and teacher report for 72% of the elicitation tasks. Fifteen percent of the tasks were in agreement with only one informant report: four were in agreement with only parent report and two were in agreement only with teacher report. Five percent of the tasks needed both parent and teacher report combined to reach 60% agreement or higher. The participants' behaviours were not consistent with either teacher or parent report in 13% of the

clinical trials. Both parent and teachers had a similar percentage of agreement with the child's behaviours during clinical trials, therefore the results do not favor using the IPCA with one type of informant over the other. Although agreement was higher when taking into account both parent and teacher report, the reliability of report from just one informant using the IPCA reached an acceptable level of agreement. In view of this finding, it appears that using the IPCA with only one informant for each child is sufficient. However, if time allows then interviewing two separate informants is of benefit.

There is value also in considering the elicitation trials that were not in agreement with either parent or teacher report. Given that the different communicative functions were not equally represented in the number of elicitation tasks presented, a comparison between the agreement in tasks relative to function was not reported. Overall, there were eight elicitation tasks that did not reach agreement with informant report: four of these were designed to elicit behaviours related to social convention, one for reject/protest, one for commenting, one for answering, and one for imitation.

There were two instances where the participants' behaviours were consistent with parent and teacher report 50% of the time. One instance occurred during the elicitation trials targeting social convention with Sean. Sean's parent and teacher both reported that he would look or make eye contact if his name was called. Sean either looked or made eye contact with his parent during half of the clinical trials but did not respond in the other half of the trials. Therefore neither of the reported behaviours met the criteria for agreement with informant report. The other instances of this were found during elicitation trials with Harold and his parent. Harold was reported by one informant to not imitate pointing, while the other informant reported that he did in fact imitate pointing. During the clinical trials, Harold pointed in imitation of his parent 50% of the time and did not imitate pointing 50% of the time. Therefore, although he demonstrated the behaviour reported by the informants, neither report met the required level of agreement. This also occurred during the elicitation task to prompt Harold to answer: informant report differed on whether he did in fact demonstrate PCAs for answering. He demonstrated behaviours consistent with teacher report 50% of the time but he either did not respond or demonstrated other behaviours 40% of the time. This may be interpreted as an instance where the

participant has emerging behaviours to communicate a specific function but is only using them in specific circumstances or environments.

Three other tasks aimed at eliciting social convention behaviours did not reach agreement with either informant because the participants did not respond to the parent calling his/her name in 60% or more of the trials, while both informants reported that the child did in fact respond when his/her name was called. This is an example where external factors, such at the child's interest in another activity, may have kept him/her from responding, when in other circumstances he/she would have acknowledged the adult's initiation of communication.

The remaining two elicitation tasks that did not reach agreement with either informant were the reject/protest task with Ian and the request object task with Jane. Both parent and teacher reported relatively extreme behaviours related to reject/protest with Ian. During the clinic task, Ian showed some behaviours that may have been interpreted as reject/protest but were not reported as such. Given that the task was designed so that it would not cause Ian to become upset, it was likely that the procedures did not prompt him to reject/protest. The low level of agreement was therefore likely due to the inappropriately chosen elicitation task. This was also likely the case with the low level of agreement between informant report and behaviours demonstrated by Jane during the request object task. Jane's mother was given an object that she could hold in her lap so that Jane could see it but would need to ask for the item. Jane tried to obtain the object independently 90% of the time, only requesting the object once. If the task had been designed so that the object could only be obtained through requesting, such as by having it in a box that Jane could not open herself, or having up on a high shelf, then it may have been more effective in eliciting behaviours similar to those reported by the informants.

Several limitations exist with the research. First, there was a disproportionate number of elicitation tasks presented for the various communicative functions. Although this occurred due to the limitations of presenting certain functions realistically within a clinic setting, it meant that there could not be a direct comparison of the agreement between informant report and clinic-based trials across communicative functions. Second, there were several instances, as discussed, where the elicitation task was not appropriate for the participant as it did not elicit behaviours related to the targeted function. Third, there were only 10 participants

involved in the study, therefore the findings represent a small sample of children with DD and SCI.

Overall, the findings show that PCAs reported by parents and teachers during interviews using the IPCA were consistent with behaviours demonstrated by the children during clinical trials that were presented by the parent. This supports the use of the IPCA for identifying communicative behaviours in children with DD and SCI. There was no evidence to support the use of parent report over teacher report or vice versa. Both informant report using the IPCA and clinical trials conducted by the parent were reliable methods for assessing the communication of the participants. Further research should investigate the use of the IPCA with a larger number of participants with a wider range of diagnoses that fall under the category of DD. Further research may also look at using the IPCA to assess changes in a child's communicative repertoire over an extended time period or post intervention. Given the current findings, along with previous research using the IPCA, further research into the use of the IPCA as a means of assessing the communicative repertories of children with DD and SCI is warranted.

CHAPTER 7

Discussion

The three studies that make up this thesis were undertaken in order to answer the following overall question: *How are children with DD and SCI using PCAs to communicate with different communication partners across different environments?* Each of the studies targeted specific aspects of this question. Study 1 looked at the similarities and differences between parent and teacher/teacher aide report of the PCAs used by each participant. The information gathered from interviewing each participant's parent(s) and classroom teacher or teacher aide was analysed to answer the following questions:

- What are the similarities and differences between the reported PCAs of children with DD when comparing the information provided by the school teacher/teacher aide and the parent? For example, are teachers and parents reporting to have observed the participant expressing the same functions? Or are the participant's behaviours being interpreted differently by different communication partners?

- What behaviours were reported to be communicative for each participant and how were they similar or different to those of other participants? What types of behaviours were reported as used by the majority of participants?

- What functions are the reported behaviours being used for and how does the function(s) of these behaviours compare across participants?

- Do the results indicate that interviewing communication partners using the IPCA is a reliable method of assessment?

Study 2 was designed to examine whether the PCAs used by each child during structured assessment procedures, implemented by the researcher in a clinic setting, were similar to parent and teacher IPCA report. The behaviours reported by both the parent and teacher/teacher aide were compared to the behaviours observed during structured clinical trials implemented by the first author. The results were analysed in order to answer the following questions:

- Are the behaviours reported to be used by each participant on the IPCA in agreement with the behaviours that the child exhibits in structured trials with another communication partner?

- Did the levels of agreement vary between different communicative functions across participants?

- Is the IPCA a reliable method of assessment when compared to other assessment measures of PCAs?

Study 3 was designed to investigate whether the PCAs used by each child during structured assessment procedures, implemented by the parent in a clinic setting, were similar to those reported by the parent and the teacher/teacher aide on the IPCA.

- Was there an acceptable level of agreement between parent report and clincial trials administered by the parent?
- Was there an acceptable level of agreement between parent-conducted clincial trials and teacher report?
- Was there an acceptable level of agreement between parent-conducted clincial trials and combined parent and teacher report?
- How do the levels of agreement across functions compare with the levels of agreement across functions in Study 2?
- Is the IPCA a reliable method of assessment when compared to other assessment measures of PCAs?

This discussion will focus on the results of the three studies and identify whether or not the results provided answers to the proposed research questions. I will also discuss how the information obtained from this research project expands on the current literature on the IPCA and how it may provide further insight into the communication repertoires of children with DD and SCI.

Use of Communicative Functions as Reported on the IPCA

For Study 1, the first author interviewed at least one parent and teacher/teacher aide for each participant using the IPCA. The purpose of this was to gather information regarding the use and the interpretation of PCAs across environments and communication partners. The information gathered from each informant was compared to identify similarities as well as differences in each participant's communication across settings and communication partners.

Results showed 90 to 100% ($M = 94\%$) agreement between teacher and parent report for the presence or absence of the 10 communicative functions on the IPCA. Differences across parent and teacher report were found in the functional categories of requesting information (one participant), answer (three participants), and imitation (two participants). All 10 participants were reported by both parent and teacher to demonstrate at least one example of the following functions: social convention, attention to self, reject/protest, request

object, request action, comment, and choice making. Six participants (60%) were reported by both informants to answer, and 5 participants (50%) were reported by both informants to use imitation. Both parent and teacher reported the presence of requesting information for one (10%) participant.

The high levels of agreement between informants shows an acceptable level of validity for the IPCA in terms of identifying the presence or absence of a communicative function in a child's repertoire. Previous research has also looked to verify information gained from the IPCA. Similar to the current study, Sigafoos et al. (2000) compared informant report using the IPCA to idenfity agreement on the presence of communication functions in the communicative repertories of three girls with RTT, aged 10:6 to 19:5 years. They interviewed two separate staff members who were familiar with each child.   Results were that inter-informant agreement for forms used was 70 to 80% agreement but agreement related to the function of these forms was 33 to 45%. There was inconclusive evidence as to whether some of the behaviours reported to be communicative were in fact reflexive. The authors suggested the low level of agreement on the function of these behaviours could possibly be due to the subtlety of the behaviours, or that some behaviours may serve multiple functions.

Previous research also looked to validate informant report on the IPCA by comparing it with other methods of assessment. For example, Keen et al. (2002) looked at the PCAs of eight children with ASD, aged 3:7 to 7:7. They compared informant report to PCAs observed during naturalistic observation. They found that the functions of rejecting/protesting, requesting an object, and responding were verified as present across informant report using the IPCA as well as naturalistic observation, while requesting information was not reported or observed to be present in any of their participants. Their findings are therefore in agreement with the results from Study 1 with regards to the types of functions used by children with DD.

In addition, when identifying appropriate intervention targets for four of the participants, Keen et al. (2001) chose only behaviours and functions that could be verified by informant report as well as either structured assessment, naturalistic observation, or both. The results of this study did not identify all of the behaviours that met the criteria for use as an intervention target, however the final intervention targets for each child included greeting, requesting food, choice making, and turn taking. These are all functions that were reported by both informants in the current study to be present in each child's repertoire.

Findings from Study 1 can also be compared with those of Braddock, Bodor, Mueller & Bashinski (2014). Braddock and colleagues submitted a study for publication on parent perceptions of communicative acts of children with ASD. The data for this study was

obtained through three different methods: (a) administering the Autism Diagnostic Observation Schedule - 2 (ADOS-2; Lord et al., 2012) to six males, aged 17 to 30 months, who had a diagnosis of ASD or were considered to be at risk for ASD; (b) completing the Birth to Three Assessment and Interventions System-Comprehensive Test of Developmental Abilities - 2nd edition, (B-3 CTDA; Ammer & Bangs, 2000) using parent report; and (c) asking the parents of each child participant to complete the IPCA. All participants were reported and observed at least once to communicate social convention, attention-to-self, commenting, and choice making. Five of the six participants had at least one PCA for rejecting that was both reported and observed, and four of the six participants had PCAs verified for requesting an object and responding. The lower levels of agreement found in this study may be a reflection of the children's ages as some functions may still be developing at 17 to 30 months. This also may be due to the fact that this study was comparing reported use of functions to those exhibited during a structured assessment that may not have targeted the specific functions in question.

Presence of Communicative Functions Related to Diagnosis

Findings from Study 1 can also be compared to the functions identified as used by children with different diagnoses. For example, Marschik et al. (2013) found that girls with RTT at 9 to 24 months of age showed social convention, commenting, answering, attention to self, and requesting most frequently, while there were no instances of requesting information or choice making observed. This is in agreement with the findings of Bartl-Pokorny et al. (2013) and Didden et al. (2010) who also looked at communicative profiles of girls with RTT, although Didden et al. found that attention to self was not observed in their participant group. In comparison with findings from the current study, where all but one of the children had a diagnosis of ASD, there is evidence that the communicative repertoires of children with different diagnoses show some similarities as well as differences. For example, in both populations, there was evidence that children with SCI who have a diagnosis of RTT or ASD rarely use the function of requesting information. In contrast, the children with SCI and RTT demonstrated limited use of PCAs for choice making, while those with ASD in this study were all reported to communicate this function. This emphasizes the need to identify similarities and differences found related to diagnosis, which may lead to more accurate diagnoses through communication assessment and may assist with identifying appropriate communication intervention targets.

Agreement Across Informants for Behaviours Used

For Study 1, the percentage of agreement between parent and teacher report of behaviours related to a specific function was calculated by dividing the total number of behaviours that were in agreement by the total number of behaviours reported. The percentage of agreement across 41 questions on the IPCA for each participant ranged from 57 to 75% ($M = 68\%$). This was judged to be an acceptable level of agreement across informants. These results show a greater percentage of agreement compared with the results of Braddock et al. (2014). They calculated an average of 55% (with a range of 42 to 67%) agreement between the specific PCAs reported by parents to those observed to be used by participants during the ADOS-II assessment. These results suggest the possibility that agreement between different informants on PCAs is higher than for agreement between informant report and PCAs observed during standardized assessment. One explanation for this may be the restricted prompting of PCAs during standardized assessment and the time restrictions necessary to complete the ADOS-II. Whereas, during an interview, informants are able to report on a child's use of PCAs across a long period of time, in this case two months or more. Results from Study 2 and Study 3 provide further insight into the use of different types of assessment to validate IPCA report.

Use of Communicative Forms as Reported on the IPCA

The behaviours reported to be used as PCAs were first analyzed across participants to determine: (a) how many different forms of communication were reported across all 10 participants, (b) whether any behaviours were used by all participants, (c) what types of behaviours were most commonly used, and (d) how the reported behaviours compare relative to their reported function.

A total of 219 different behaviours were reported across participants. Behaviours were categorized under one of eight categories: (a) vocalizations, (b) body movements, (c) face/eye movements, (d) symbolic communication, (e) gestures, (f) problem behaviours, (g) stereotypic behaviours, and (h) other descriptors. Body movements made up 49% (n = 108) of the total 219 behaviours reported. Problem behaviours made up 11% (n = 23), while face/eye movements made up 10% (n = 21). The rest of the behaviours each made up less than 10% of the total: other descriptors made up 9% (n = 20), vocalizations were 5% (n = 11), stereotypic movements were 7% (n = 15), gestures made up 6% (n – 13), vocalizations were 5% (n = 11), and symbolic forms made up 4% (n = 8) of the total behaviours.

These findings are in agreement with other studies looking at the behaviours used as PCAs in children with DD. For example, Braddock et al. (2013) reported that participants

produced a higher mean proportion of body movement, followed by vocalization and gestures. Challenging behaviour, eye gaze, facial expression, imitation, and stereotyped movement were produced at lower proportions. There is evidence therefore that body movements are consistently the most commonly used forms of communication for children with DD. However, the percentage of use of other forms of behaviours, such as problem behaviours and face/eye movements, may vary.

In similar studies profiling the PCAs of females with RTT or RTT-PSV, it was found that the majority of communicative behaviours were described as prelinguistic, nonverbal, or nonsymbolic (Marschik et al. 2012; Didden et al., 2010) and that the most commonly used behaviour was eye contact/gazing (Didden et al., 2010). There was little reported use of speech used for communication, and no reported use of other types of symbolic communication (e.g., manual sign, SGD; Didden et al., 2010). These results highlight the importance of identifying PCAs relative to a child's diagnosis as there appear to be distinct communicative profiles related to specific diagnoses. For example, although the participants in the current studies were reported to use eye contact and gazing as a form of communication, other behaviours, such as body movements, predominated over face/eye movements. In addition, there was a much larger range of symbolic communication used by the participants in the current study compared to those reported to be used by females with RTT. This also brings to light the need to identify whether these differences are related to ability, opportunity, or both. The majority of participants in the current study had been exposed at one time or another to alternative forms of communication whereas it is unknown whether the females with RTT had ever had this opportunity. Further investigation into the reason(s) for this discrepancy is warranted.

Use of the IPCA with Different Populations

The participant group involved in all three studies pertaining to this thesis showed similarities and differences to participant groups in previous research using the IPCA. All of the children participants had a diagnosis of DD as did the majority of participants in previous research studies. Nine of the participants had a diagnosis of autism and one participant had a diagnosis of PCDH19 related encephalopathy and ID. Previous research that included children with autism included between one and 17 participants, with only one of these studies including more than 8 participants (See Chapter 2). This thesis presents IPCA data on one of the largest participant sets for children with ASD. It is also the only study using the IPCA that included a child with a diagnosis of PCDH19 related encephalopathy. In terms of males and females, the study had the highest female: male ratio for children with ASD (1:4) than

other studies. This thesis also had the largest age range for children with ASD in comparison to previous IPCA research, with the largest age range included in previous research being three to seven years (Keen, Sigafoos & Woodyatt, 2001; Keen, Sigafoos & Woodyatt, 2005; Keen, Woodyatt & Sigafoos, 2002). Therefore, although the participants included in this research have similarities to previous research on the IPCA, they also represent and distinct and unique group profile to provide new insight into the PCAs of children with DD and SCI.

Recent Literature on the IPCA

Since the systematic literature review on use of the IPCA in previous research was completed (see Chapter 2) there has been further research published or submitted for peer review that has used the IPCA as an assessment tool. Liang et al. (2013) used the IPCA as an interview protocol to investigate the communication ability of persons with trisomy 18 and trisomy 19, also known as Edwards syndrome and Patau syndrome, respectively. Trisomy 18 and 13 are the second and third most common trisomy syndromes after trisomy 21 (Carey, 2012). Both trisomy 18 and 13 are genetic disorders cased by the presence of a third copy of a chromosome. Both of these syndromes share certain characteristics, such as severe to profound neurodevelopmental disorders, low birth weight, and intellectual disability. Other characteristics of trisomy 18 are prominence of the posterior portion of the cranium, clenched hands, heart malformations, and kidney defects. Defining characteristics of Trisomy 13 include low birth weight, polydactyly, scalp defects, orofacial clefts or cleft lip and palate, eye malformation and decreased muscle tone (Lian, 2013). Given that statistics show only 5 to 8% of persons born with either trisomy 13 or 18 live beyond the first year of life (Baty, Jorde, Blackburn & Carey, 1994), there is little known about their communication potential. Liang et al. (2013) obtained information from the parents of 32 individuals with a diagnosis of trisomy 18 (n = 17) or trisomy 13 (n = 15), aged between 3 and 35 years. Parents were asked to fill out a case history form and the IPCA based on their child's developmental history and current communication skills. The communicative acts reported on each of the participant's IPCA were categorised into one of eight categories: facial expression, eye movement, vocalisation, challenging behaviour, body movement, stereotypic movement, symbolic communication, and imitative acts. A summary of the results across participants showed that parents most consistently reported that their children used PCAs for commenting, social convention, attention to self, and rejecting/protesting. The categories of behaviours with the highest median ranks were body movement, vocalisation, and facial expression. These behaviours are therefore those that are most likely to be interpreted as communicative. Challenging behaviours were rarely reported as PCAs for participants with trisomy 13 or 18.

Sixty-six percent of the participants reportedly used at least one type of symbolic communication: eight participants used at least one manual sign to communicate, one participant used an AAC speech-generating device, and two used eye pointing to select between two objects. Three participants were reported to use spoken words to communicate.

In comparison with the results of Study 1, there appear to be differences related to both the forms and functions of communication exhibited by children with trisomy 13 or 18 and those that participated in Study 1. First, the participants in the study by Liang and colleagues were found to use a relatively high percentage of vocalisation and facial expression and limited use of problem behavior to communicate. The participants in Study 1, however, showed a higher percentage of problem behaviours as PCAs than vocalizations or facial expressions. Also, facial expression and eye movement were categorized separately in the Liang et al. study, while in Study 1 these were combined as one category. Despite this, the number of facial expressions identified as PCAs was still higher for the participants in the Liang et al. study. In addition, the children in Study 1 were reported to demonstrate the use of communication for a wider range of functions, including requesting and choice making. Finally, the participants in Study 1 used a wider range of symbolic communication than those in Liang et al.'s study, with a greater percentage of them reported to use speech to communicate in at least one instance.

Another study by Julien, Parker-McGowan, Byiers and Reichle (2014) looked at adult interpretation of PCAs in children with RTT. Fourteen adults were asked to watch video clips of three girls with RTT (aged 8, 7, and 14 years) demonstrating PCAs during daily routines at home. Parents of each child were initially asked to complete portions of the MacArthur-Bates Communicative Development Inventories (M-CDI; Fenson et al., 1993), sections of the Vineland-II (Sparrow et al., 2005) and a semi-structured interview based on the IPCA (Sigafoos et al., 2006). Each child was then videotaped in the home setting participating in daily routines. Five video clips lasting 5 to 8 s were extracted from the videotape of each girl that showed her engaged in a PCA. The videotapes were shown to the 14 adult raters: four were parents of the participants, and the other ten were educators/professionals who had worked with one of the girls for at least two months. Each adult watched all 15 video clips and answered several questions: (a) was the child communicating? (b) Was the child's intention clear? (c) What was the child communicating? and (d) how confident are you with your response?

Results showed that agreement within and across adult rater groups on the function of each PCA was relatively low, ranging from 5 to 87%. There was also low agreement found

between adult rater group and the research team for identifying commenting and protesting. Unfamiliar parents and familiar professionals showed strong agreement with the research team for behaviours identified as requests, and familiar professionals showed the highest agreement for commenting behaviours. In comparison to the other rater groups, familiar parents gave the most ratings of unclear to the PCAs, indicating that either they felt that there was no communicative act or that the function was unclear. Familiar parents and professionals rated more clips as request than did unfamiliar raters. These findings support the idea that potential communicative acts are often interpreted differently across different communication partners (Meadan et al., 2012). When taking into consideration the finding from this thesis that children with DD and SCI will use the same behaviour to communicate different functions, it is likely that contextual cues play a very important role for communication partners to interpret the meaning of a PCA in different situations. Therefore the amount of contextual information available in the short video clips may be important to consider in future research.

Braddock, Bodor, Mueller & Bashinski (2014) examined parent perceptions of communicative acts of children with ASD. The data for this study was obtained through three different methods: (a) administering the Autism Diagnostic Observation Schedule – 2 (ADOS-2; Lord, Rutter, DiLavore, Risi, Gotham & Bishop, 2012) to six males, aged 17 to 30 months who had a diagnosis of ASD or were considered to be at risk for ASD; (b) completing the Birth to Three Assessment and Interventions System-Comprehensive Test of Developmental Abilities (2nd edition) (B-3 CTDA; Ammer & Bangs, 2000) using parent report; and (c) asking the parents of each child participant to complete the IPCA. PCAs reported on the IPCA were categorized under eight categories: (a) facial expression, (b) eye gaze, (c) vocalization, (d) challenging behavior, (e) body movement, (f) stereotypic movement, (g) imitation, or (h) symbolic forms. The PCAs observed in the videotaped ADOS-2 administration sessions were also coded and assigned to one of the eight categories. The PCAs observed during the ADOS-2 administration were then compared to the PCAs reported on the IPCA to find the specific PCAs, the communicative functions, and the broad PCA categories that were both observed and reported. An average of 55% of specific PCAs reported on the IPCA were verified during the ADOS-2 administration. An average of 83% of the broad categories of PCAs were verified through the ADOS-2 administration. All participants were reported and observed at least once to communicate social convention, attention-to-self, commenting, and choice-making; five of the six participants had at least one PCA for rejecting that was both reported and observed; and four of the six participants had

PCAs verified for requesting an object and responding. There was minimal reported or observed use of PCAs for requesting an action or imitation, and there were no reported or observed PCAs used by the children for requesting information. The authors concluded that the data showed parents to be moderately good reporters of PCA types. When evaluated from a different perspective however, the results may be interpreted as identifying the limitations of structured assessment for capturing a child's full communicative repertoire. The fact that all reported PCAs were not verified on the ADOS-II is likely related to the types of communicative functions that are targeted on the ADOS rather than a poor level of reliability from parent report.

Use of Informant Report and Clinical Trials for Assessment Purposes

In each of the three studies included in this thesis, using various methods of data collection proved an effective way of both identifying and verifying a wide range of communicative forms and functions used by the participants. Collecting data from two different informants allowed for comparison between informants and between the each participant's use of PCAs across environments. Further analysis on the similarities and differences between children's use of PCAs in different environments and communication partners was also possible by comparing informant report to clinical trials conducted by an unfamiliar communication partner. The results from the three studies provided confirmation that informant report, as well as clinical trials, are effective and reliable methods for collecting data on PCAs of children with DD.

One very important finding was that the overall levels of agreement were judged to be adequate for both parent report and teacher report when compared to PCAs observed during the clinical trials. This information is useful for clinicians or other health professionals who need to collect information on a child's PCAs and can only to interview one person due to time constraints. The results of this study show that, although combined report led to higher levels of agreement, parent and teacher report alone showed acceptable levels of agreement with clinical trials. This suggests that either a parent or a teacher would be an appropriate person to interview using the IPCA for diagnostic purposes.

The use of clinical trials was found to be an acceptable method of data collection for several reasons. First, the author was able to replicate all 10 communicative functions with at least one participant. Also, the clinical trials guaranteed that there would be 10 trials in which to observe the child's communicative behavior. Third, it proved to be an appropriate form of assessment to validate informant report given the high levels of agreement between the PCAs

shown by the child during clinical trials and informant report. There was a wide range of communicative functions elicited through clinical trials in Studies 2 and 3 of this thesis, although some of the functions (e.g., request action, attention to self) were limited to one participant. This reinforces the value of structured trials for verifying a wide range of different communicative functions in a limited time period. At the same time, there is value in considering naturalistic observation when observing those functions that are difficult to replicate in a clinic setting (e.g., responding to social greetings, requesting attention, requesting action).

These findings further validate previous research findings on the value of using structured trials or naturalistic observation to validate informant report. For example, Keen et al. (2002) used structure trials (in the school setting) along with naturalistic observation to verify informant report on the IPCA. They used structured observation to verify five of the 10 different communicative functions (choice making, reject/protest, request object, request action, and social convention). They were also able to verify the use of eight of the 10 functions through naturalistic observation. All of the participants showed instances of request object and reject/protest during naturalistic observation. However, the other five functions observed (request action, social convention, attention to self, comment, imitation) were not observed across all participants: the percentage of participants showing these functions ranged from 38 to 75%. Two of the functional categories, request info and answer, were not reported as observed in either naturalistic observation or structured trials.

As a further comparison, Marschik et al. (2013) used family videos of children aged between 9 and 24 months with RTT and one typically developing child. They noted that there were no instances of choice making exhibited by the participants in any of the family videos. They therefore questioned the use of family video as an appropriate means for identifying certain functions in a child's communicative repertoire.

Overall, previous and current findings related to the use of various assessment methods for verifying PCAs in children with DD and SCI indicate that when a clinician or researcher is deciding on the best method of assessment, he/she should take into consideration that different forms of assessment may be better suited to identify PCAS related to a specific function. For example, naturalistic observation may be more appropriate for identifying a child's use of social interaction (e.g.,

greetings) than would clinical trials. It is therefore important not to rely solely on one type of assessment but to be open to using a variety of methods in combination or as appropriate to the situation.

Use of the IPCA

All three studies included in this thesis provide strong evidence to support the findings from previous research that the IPCA is in fact a reliable and valid form of assessment for identifying PCAs in children with DD and SCI. By comparing the results of the IPCA within and across different informants and structured clinical trials with different communication partners, I was able to demonstrate several important factors about the IPCA: (a) it can be used with both parents and teachers to gain valid information on a child's communicative repertoire, (B) IPCA report by only one informant can provide reliable information on a child's communication across different environments, and (c) report by only one informant can provide reliable information on a child's communication across different communication partners. The results of this research project show equivalent or higher levels of agreement with other forms of assessment compared with previous research. There was no evidence to indicate any reason why the IPCA should not be used as a tool for assessing the communication skills of children with DD and SCI.

Limitations

Limitations to this research project are important to identify in order that the findings are understood to be representative of a set number of children with DD and SCI and to the information that was gathered at the time of the study. The limitations of this research study are related to the number of participants involved to their diagnoses, the restricted methods of data collection, and the lack of further diagnostic measures used as a comparison to the participants' communicative repertoires.

The results of this research project cannot be judged as applicable to all children with DD and SCI. Given that the term DD encompasses a range of disability diagnoses, a study including 10 participants, most of whom had a diagnosis of ASD, is not representative of all children with DD and SCI. Also, although in many respects it was beneficial to have a relatively wide age range, there were not enough participants from similar age groups to make comparisons based on age. There was a female: male ratio of 3:7, which would have allowed comparison between the two genders, however this was not the focus of this research. Comparison of participants with and without a diagnosis of ASD could also have been made given that there was

one participant without a diagnosis of ASD. However comparisons between our research findings and those of other researchers who looked at the PCAs of children with different diagnoses such as RTT and AS were compared in order to identify and significant similarities and differences in communicative repertoires relative to DD diagnosis.

The author used two different methods of data collection: parent interview/report and structured clinical trials. Naturalistic observation was not included in the data used to identify or validate PCAs. Observations of each participant's use of reported PCAs in their natural environment (e.g., home or school) or the identification of PCAs in the child's repertoire using an observational assessment method would have strengthened the findings and further validated the assessment procedures. Previous studies however have measured agreement between teacher report on the IPCA and classroom observation, and other PCAs identified on the IPCA have been observed in naturalistic settings, therefore these results can be compared with the current findings.

Previous research looking at the PCAs of children with DD and SCI have compared the communicative repertoires of the participants with his/her scores on developmental assessments (e.g., Braddock et al., 2013). One major limitation to this study is that a comparison between each child's scores on the Rossetti and the Vineland were not compared to their reported communicative repertories. This would have been a valuable addition to the project and would have allowed for further comparison between previous findings on the relationship between communication, and/or other developmental measures, and the forms and functions evident in the child's communication.

Finally, there was no intervention component of this research project. For this reason, the results cannot be compared with other research using the IPCA as a means of identifying PCAs for planning intervention. The PCAs and the functions they were reported to serve for each participant would have been further validated by a successful intervention plan to target inappropriate communicative behaviours. The information gained from informant report was however used to inform other clinicians on appropriate communicative behaviours to target during communication intervention for each of the participants. Therefore, although the results of the intervention plans were not systematically recorded for research purposes, the information was a valuable resource for those working with each participant.

Future Research

There is still much to be known about the communication of children with DD and SCI. The existing literature on this topic provides a consistent profile of the forms and functions that are used by a wide range of children and adults in this population. Our current understanding of the use of PCAs gives rise to further questions regarding nonverbal communication in those with DD. Further research will provide insight into various aspects related to nonverbal communication and its use in a variety of settings and communication as well as its role as an indicator or predictor of communication capability.

The IPCA has been shown through research to be a reliable method of gathering information related to the PCAs of people with DD and SCI. It has been validated by comparing report across informants, by identifying the same PCAs used by the participants through video analysis, structured assessment, and naturalistic observation. It has also been shown to be an effective tool for identifying intervention targets. Further research using the IPCA should move away from validation and focus further on its use as an intervention tool. For example, it would be beneficial to look at using the IPCA as a way of identifying appropriate forms and functions for using augmentative and alternative communication, such as speech generating devices. Using the IPCA as a method for identifying problem behaviours can also be done by comparing the findings from the IPCA to other forms of functional behavior assessment. Other factors such as the time and expertise necessary to administer the IPCA relative to other assessments should also be considered.

Further research needs to be done to address the inconsistencies that have been identified between observers on the interpretation of PCAs. It is evident through existing research that children with DD and SCI are identified as using idiosyncratic and subtle forms of communication that can be easily misinterpreted or understood to represent a number of different functions. It is important that each person's communication is understood across environments and communication partners so that his/her communicative forms can be positively reinforced. An example of a study that would help with the issue of inconsistency would be to look at the forms of behaviours that are used across a large number of participants with DD and SCI and identify whether certain behaviours are more often identified to serve specific functions than others. By identifying forms of communication that are consistently

interpreted to mean a specific function, interventionists may be able to make more informed choices on which behaviours to teach for a given function.

There is a paucity of research on the predictive value of the forms and functions used by children with DD and SCI. There has been a link identified between children with DD's use of gesture and later language development. The research has also shown that there is a relationship between a person's use of functions and their receptive/expressive language ability. There is minimal to no evidence however of the predictive ability of one's use of communicative forms and functions and their success with using augmentative and alternative communication. This would be valuable information when determining whether a person of any age who is nonverbal would be an appropriate candidate for a communication device.

Conclusion

This thesis has led to important findings related to the communicative forms and functions used by children with DD and SCI. It has also provided further confirmation that the IPCA is a valuable tool for assessing the communicative abilities of people with DD who use other means rather than speech to communicate. This research was conducted in hopes that it will assist with providing those who are unable to use speech to communicate an effective and reliable method of expression. The project was successful in answering the proposed research questions and also identified aspects of the participant's communication that had not been initially anticipated. The findings from this research should be used to identify further questions that need to be answered in order to understand the full communicative potential of this population.

REFERENCES

Aiello, S.C. (1980). *Non-oral communication survey: A one-county needs assessment and demographic study*. Unpublished manuscript, available from Plavan School, Fountain Valley, CA.

Ammer, J.J., & Bangs, T. (2000). Birth to Three Comprehensive Test of Developmental Abilities (2nd ed.). Austin, TX: Pro-Ed.

Andersen, G., Irgens, L. M., Haagaas, I., Skranes, J. S., Meberg, A. E., & Vik, T. (2008). Cerebral plasy in Norway: Prevalence, subtypes and severity. *European Journal of Paediatric Neurology, 12*(1), 4-13. doi: 10.1016/j.ejpn.2007.05.001

Andersen, G., Mjoen, T. R., & Vik, T. (2010). Prevalence of speech problems and the use of augmentative and alternative communication in children with cerebral palsy: a registry-based study in Norway. *Perspectives on Augmentative and Alternative Communication, 19*, 12-20.

Anderson, D. K., Lord, C., & Risi, S. (2007). Patterns of growth in verbal abilities among children with autism spectrum disorder. *Journal of Consulting and Clinical Psychology, 75*(4), 594-604.

Ando, H., & Yoshimura, I. (1979). Effects of age on communication skill levels and prevalence of maladaptive behaviors in autistic and mentally retarded children. *Journal of Autism and Developmental Disorders, 9*(1), 83-93.

American Speech, Language and Hearing Association (1981). *Position statement on nonspeech communication* (Vol. 23, pp. 377-581). Rockville, Maryland: ASHA.

Australian Institute of Health and Welfare. (2008). *Disability in Australia: Intellectual disability* (AIHW bulletin no. 67. Cat no. AUS110). Retrieved from http://www.aihw.gov.au/publication-detail/?id=6442468183

Bartl-Pokorny, K. D., Marschik, P. B., Sigafoos, J., Tager-Flusberg, H., Kaufmann, W. E., Grossmann, T., & Einspieler, C. (2013). Early socio-communicative forms and functions in typical rett syndrome. *Research in Developmental Disabilities, 34*, 3133-3138. doi: 10.1016/j.ridd.2013.06.040

Bates, E., Benigni, I., Bretherton, I., Camaioni, L., & Volterra, V. (1979). *The emergence of symbols: Cognition and communication in infancy*. New York: Academic Press.

Bates, E., Camaioni, L., & Volterra, V. (1975). The acquisition of performatives prior to speech. *Merrill-Palmer Quarterly, 21*(3), 205-226.

Baty, B.J., Jorde, L.B., Blackburn, B.L., & Carey, J.C. (1994). Natural history of trisomy 18 and trisomy 13: II. Psychomotor development. *American Journal of Medical Genetics*, 49, 189-184.

Belva, B. C., Matson, J. L., Sipes, M., & Bamburg, J. W. (2012). An examination of specific communication deficits in adults with profound intellectual disabilities. *Research in Developmental Disabilities, 33*, 525-529. doi: 10.1016/j.ridd.2011.10.019

Binger, C., & Light, J. (2006). Demographics of preschoolers who require aac. *Language, Speech and Hearing Services in Schools, 37*(3), 200-208.

Bloomberg, K., & Johnson, H. (1990). A statewide demographic survey of people with severe communication impairments. *AAC: Augmentative and Alternative Communication, 6*, 50-60.

Bodfish, J. W., Symons, F. J., Parker, D. E., & Lewis, M. H. (2000). Varieties of repetitive behavior in autism: Comparisons to mental retardation. *Journal of Autism and Developmental Disorders, 30*, 237-243.

Braddock, B.A., Bodor, R., Mueller, K., & Bashinski, S.M. (2014). *Verifying parent perceptions of the potential communicative acts of young children with autism spectrum disorder.* Manuscript submitted for publication.

Braddock, B. A., Pickett, C., Ezzelgot, J., Sheth, S., Korte-Stroff, E., Loncke, F., & Bock, L. (2013). Potential communicative acts in children with autism spectrum disorders. *Developmental Neurorehabilitation.* Advance online publication. doi: 10.3109/17518423.2013.799243.

Brady, N. C., & Halle, J. W. (2002). Breakdowns and repairs in conversations between beginning AAC users and their partners. In J. Reichle, D. Beukelman & J. C. Light (Eds.), *Exemplary practices for beginning communicators: Implications for AAC* (pp. 323-351). Baltimore: Paul H. Brookes Publishing.

Brady, N. C., Steeples, T., & Fleming, K. (2005). Effects of prelinguistic communication levels on initiation and repair of communication in children with disabilities. *Journal of Speech, Language, and Hearing Research, 48*(5), 1098.

Brady, N. C., Thiemann-Bourque, K. S., Fleming, K., & Matthews, K. (2013). Predicting language outcomes for children learning augmentative and

alternative communication: Child and environmental factors. *Journal of Speech, Language, and Hearing Research*, *56*, 1595-1612. doi: 10.1044/1092-4388(2013/12-0102)

Bryson, S. E. (1996). Brief report: Epidemiology of autism. *Journal of Autism and Developmental Disorders, 26*(2), 165-167.

Calandrella, A., & Wilcox, J. (2000). Predicting language outcomes for young prelinguistic children with developmental delay. *Journal of Speech, Language, and Hearing Research, 43*, 1061-1071.

Camaioni, L., Perucchini, P., Muratori, F., Parrini, B., & Cesari, A. (2003). The communicative use of pointing in autism: Developmental profile and factors related to change. *European Psychiatry*, *18*, 6-12.

Camarata, S. M., Hughes, C. A., & Ruhl, K. L. (1988). Mild/moderate behaviorally disordered students: A population at risk for language disorders. *Language, Speech and Hearing Services in Schools, 19*(2), 191-200.

Carr, E. G., & Durand, M. V. (1985). Reducing behavior problems through functional communication training. *Journal of Applied Behavior Analysis, 18*(2), 111-126.

Carpenter, M., Pennington, B.F., & Rogers, S.J. (2002). Inter-relations among social-cognitive skills in young children with autism. *Journal of Autism and Developmental Disorders*, 32, 91-106

Casby, M. W., & Cumpata, J. F. (1986). A protocol for the assessment of prelinguistic intentional communication. *Journal of Communication Disorders, 19*, 251-260.

Cascella, P. W. (2005). Expressive communication strengths of adults with severe to profound intellectual disabilities as reported by group home staff. *Communication Disorders Quarterly, 26*(3), 156 - 163.

Cockerill, H., Elbourne, D., Allen, E., Scrutton, D., Will, E., McNee, A., . . . Baird, G. (2013). Speech, communication and use of augmentative communication in young people with cerebral palsy: The SHAPE population study. *Child: Care, health and development, 40*(2), 149-157. doi: 10.1111/cch.12066

Coggins, T. E., Carpenter, R. L., & Owings, N.O. (1983). Examining early intentional communication in down's syndrome and nonretarded children. *British Journal of Disorders of Communication*, *18*(2), 98-106.

Council, N. R. (2001). *Educating Children with Autism*. Washington DC: The
        National Academies Press.

Cruickshank, W. (1966). *Cerebral palsy: Its individual and community problems*.
        Syracuse: University Press.

Deb, S., & Prasad, K. (1994). The prevalence of autistic disorder among children with
        a learning disability. *British Journal of Psychiatry, 165*, 395-399.

Depienne, C., & LeGuem, E. (2012). PCDH19-related infantile epileptic
        encephalopathy: An unusual x-linked inheritance disorder. *Human Mutation*,
        33: 627-634. Doi: 10.1002/humu.22029

Developmental Disabilities Assistance and Bill of Rights Act Amendments, Pub. L.
        No. 106-402 C.F.R. (2000).

Didden, R., Korzilius, H., Smeets, E., Green, V. A., Lang, R., Lancioni, G. E., &
        Curfs, L. M. (2010). Communication in individuals with Rett syndrome: An
        assessment of forms and functions. *Journal of Developmental and Physical
        Disabilities, 22*, 105-118. doi: 10.1007/s10882-009-9168-2

Didden, R., Sigafoos, J., Korzilius, H., Baas, A., Lancioni, G. E., O'Reilly, M. F., &
        Curfs, L. M. (2009). Form and function of communicative behaviors in
        individuals with angelman syndrome. *Journal of Applied Research in
        Intellectual Disabilities, 22*, 526-537.

Dowden, P., & Cook, A.M. (2012). Improving communicative competence through
        alternative selection methods. In S.S. Johnston, J. Reichle, K.M. Feeley, & E.
        A. Jones (Eds.), *AAC strategies for individuals with moderate to severe
        disabilities* (pp. 81-117). Baltimore, MD: Brookes Publishing.

Drasgow, E., & Halle, J. W. (1995). Teaching social communication to young
        children with severe disabilities. *Topics in Early Childhood Special
        Education, 15*(2), 164-186.

Duker, P. C. (1999). The verbal behavior assessment scale (VerBAS): Construct
        validity, reliability, and internal consistency. *Research in Developmental
        Disabilities, 20*(5), 347-353.

Duker, P. C., Van Driel, S., & Van, D. B. (2002). Communication profiles of
        individuals with down's syndrome, angelman syndrome and pervasive
        developmental disorder. *Journal of Intellectual Disability Research, 46*(1), 35-
        40.

Enderby, P., & Philip, R. (1986). Speech and language handicap: towards knowing the size of the problem. *British Journal of Disorders of Communication, 24*(3), 301-331.

Fox, L., Vaughn, B. J., Wyatte, M., & Dunlap, G. (2002). "We can't expect other people to understand": Family perspectives on problem behavior. *Exceptional Children, 68*(4), 437-450.

Fenson, L., Dale, P. S., Reznick, J. S., Thal, D., Bates, E., Hartung, J. P., Pethick, S., & Reilly, J. S. (1993). *The MacArthur communicative development inventories: User's guide and technical manual*. San Diego: Singular Publishing Group.

Garwood, J. (2006). Structured Observation. In V. Jupp (Ed.), *The SAGE dictionary of social research methods*. London: SAGE Publications, Ltd.

Glennen, S., & DeCoste, D. C. (1997). *Handbook of augmentative and alternative communication*. San Diego,CA: Singular Publishing Group.

Granlund, M., & Olsson, C. (1993). Investigating communicative functions in profoundly retarded persons: A comparison of two methods of obtaining information about communicative behaviours. *Mental Handicap Research, 6*(2), 112-130.

Green, V. A., Sigafoos, J., O'Reilly, M. F., & Arthur-Kelly, M. (2006). People with extensive to pervasive support needs. In I. J. Dempsey & K. Nankervis (Eds.), *Community disability services: An evidence-based approach to practise*. Indiana: Purdue University Press.

Grossman, H. (1983). *Classification in mental retardation*. Washington DC: American Association on Mental Deficiency.

Hall, S. S. (2005). Comparing descriptive, experimental and informant-based assessments of problem behaviors. *Research in Developmental Disabilities, 26*(6), 514-526.

Halliday, M. A. (1977). *Learning how to mean: Explorations in the development of language*. New York: Elsevier.

Hemsley, B., Sigafoos, J., Balandin, S., Forbes, R., Taylor, C., Green, V. A., & Parmenter, T. (2001). Nursing the patient with severe communication impairment. *Journal of Advanced Nursing, 35*, 827-835.

Hetzroni, O. E., & Rubin, C. (2006). Idenitfying patterns of communicative behaviors in girls with rett syndrome. *Augmentative and alternative communication, 22*(1), 48-61. doi: 10.1080/17461390500387320

Iacono, T. (2004). Patients with disabilities and complex communication needs. *Australian Family Physician, 33*(8), 586-589.

Iacono, T., Carter, M., & Hook, J. (1998). Identification of intentional communication in students with severe multiple disabilities. *AAC: Augmentative and Alternative Communication, 14*(2), 102-114.

Julien, H. M., Parker-McGowan, Q. P., Byiers, B. J., & Reichle, J. (2014). Adult interpretation sof communicative behavior in learners with rett syndrome. *Journal of Developmental Disabilities*. Advance online publication. doi: 10.1007/s10882-014-9407-z

Karlan, G. R., Ward, M., Pennington, G., & Granlund, M. (1985). *Early Social Communication Scale: Adapted for use with profoundly handicapped persons.* West Lafayette, Indiana: Purdue Univesity.

Kasari, C., Brady, N. C., Lord, C., & Tager-Flusberg, H. (2013). Assessing the minimally verbal school-aged child with autism spectrum disorder. *Autism Research, 6*(6), 479-493. doi: 10.1002/aur.1334

Keen, D., Sigafoos, J., & Woodyatt, G. (2001). Replacing prelinguistic behaviors with functional communication. *Journal of Autism and Developmental Disorders, 31*(4), 385-398.

Keen, D., Sigafoos, J., & Woodyatt, G. (2005). Teacher responses to the communicative attempts of children with autism. *Journal of Developmental and Physical Disabilities, 17*(1), 19-33. doi: 10.1007/s10882-005-2198-5

Keen, D., Woodyatt, G., & Sigafoos, J. (2002). Verifying teacher perceptions of the potential communicative acts of children with autism. *Communication Disorders Quarterly, 23*(3), 131-140. doi: 10.1177/15257401020230030201

Kennes, J., Rosenbaum, P., Hanna, S. E., Walter, S., Russell, D., Raina, P., . . . Galuppi, B. (2002). Health-status of school aged children with cerebral palsy: information from a population-based sample. *Developmental Medicine and Child Neurology, 44*, 240-247.

Kleinman, L. I. (2003). *Functional communication profile* (2nd ed.). East Moline, IL: Linguisystems.

Lancioni, G. E., Sigafoos, J., O'Reilly, M. F., & Singh, N. N. (2013). *Assistive Technology: Interventions for individuals with severe/profound and multiple disabilities*. New York: Springer.

Lewis-Palmer, T., Reed-Schindler, H., & Ingram, K. (2005). Behavioral assessment interviews. In M. Hersen, J. Rosqvist, A. M. Gross, R. S. Drabman, G. Sugai & R. Horner (Eds.), *Encyclopedia of behavior modification and cognitive behavior therapy: Vol. 3. Educational applications.* (pp. 1174-1177). Thousand Oaks: SAGE Publications Inc.

Liang, C.A., Braddock, B.A., Heithaus, J.L., Christensen, K.M., Braddock, SR., & Carey, J.C. (2013). Reported communication ability of persons with trisomy 18 and trisomy 13. Developmental Neurorehabilitation. Advance online publication doi: 10.3109/17518423.2013.847980

Lipinski, D., & Nelson, R. (1974). Problems in the use of naturalistic observation as a means of behavioral assessment. *Behavior Therapy, 5*, 341-351.

Lund, N., & Duchan, J. F. (1983). *Assessing children's language in naturalistic contexts*. Englewood Cliffs, NJ: Prentice-Hall.

Luiselli, J. K. (2012). *The handbook of high-risk challenging behaviors in people with intellectual and developmental disabilities*: Brookes Publishing Company.

Marschik, P. B., Bartl-Pokorny, K. D., Sigafoos, J., Urlesberger, L., Didden, R., Einspieler, C., & Kaufman, W. E. (in press). Development of socio-communicative skills in 9-to-12-month-old individuals with fragile x syndrome. *Research in Developmental Disabilities.*

Marschik, P. B., Bartl-Pokorny, K. D., Tager-Flusberg, H., Kaufman, W. E., Pokorny, F., Grossmann, T., Windpassinger, B., & Einspieler, C. (2013). Three different profiles: Early socio-communicative capacities in typical rett syndrome, the preserved speech variant, and normal development. *Developmental Neurorehabilitation*. Advance online publication. doi: 10.3109/17518423.2013.837537

Marschik, P. B., Kaufmann, W. E., Einspieler, C., Bartl-Pokorny, K. D., Wolin, T., Pini, G., Budimorovic, A., Sigafoos, J. (2012). Profiling early socio-communicative development in five young girls with the preserved speech variant of Rett syndrome. *Research in Developmental Disabilities, 33*(6), 1749-1756. doi: 10.1016/j.ridd.2012.04.012

Matas, J., Mathy-Laikko, P., Beukelman, D., & Legresley, K. (1985). Identifying the nonspeaking population: A demographic study. *Augmentative and Alternative Communication, 1*, 17-31.

Matson, J. L., Dixon, D. R., Matson, M. L., & Logan, J. R. (2005). Classifying mental retardation and specific strength and deficit areas in severe and profoundly mentally retarded persons with the MESSIER. *Research in Developmental Disabilities, 26*, 41-45.

Matson, J. L., & Minshawi, N. F. (2007). Functional assessment of challenging behavior: Toward a strategy for applied settings. *Research in Developmental Disabilities, 28*, 353-361.

McKechnie, L.E. (2008). Naturalistic observation. In L. M. Given (Ed.), *The SAGE Encyclopedia of Qualitative Research Methods* (pp. 551-553). Thousand Oaks: SAGE Publications Inc.

McLean, L. K., Brady, N. C., McLean, J. E., & Behrens, G. A. (1999). Communication forms and functions of children and adults with severe mental retardation in community and institutional settings. *Journal of Speech, Langauge, and Hearing Research, 42,* 231-240.

McLean, J. E., McLean, L. K., Brady, N. C., & Etter, R. (1991). Communication profiles of two types of gesture using nonverbal persons with severe to profound mental retardation. *Journal of Speech and Hearing Research, 34*, 294-308.

McLean, L. K., Brady, N. C., & McLean, J. E. (1996). Reported communication abilities of individuals with severe mental retardation. *American Journal of Mental Retardation, 100*(6), 580-591.

McQueen, P. C., Spence, M. W., Garner, J. B., Pereira, L. H., & Winsor, E. J. T. (1987). Prevalence of major mental retardation and associated disabilities in the canadian maritime provinces. *American Journal of Mental Deficiency, 91*(5), 460.

Murphy, G. H., Beadle-Brown, J., Wing, L., Gould, J., Shah, A., & Holmes, N. (2005). Chronicity of challenging behaviours in people with severe intellectual disabilities and/or autism: A total population sample. *Journal of Autism and Developmental Disorders, 35*(4), 405-418. doi: 10.1007/s10803-005-5030-2

Newborg, J., Stock, J., Wneck, L., & Guidubaldi, J. (1984). *Battelle Developmental Inventory*. Allen, TX: DLM Teaching Resources.

Nordberg, A., Miniscalco, C., Lohmander, A., & Himmelman, K. (2013). Speech
        problems affect more than one in two children with cerebral palsy: Swedish
        population-based study. *Acta Paediatrica, 102*(2), 161-166.

Osterling, J., Dawson, G., & McPartland, J. (2001). Autism. In C. E. Walker & M. C.
        Roberts (Eds.), *Handbook of clinical child psychology* (3rd ed., Vol. 3, pp.
        432-452). New York: John Wiley & Sons, Inc.

Palisano, R., Rosenbaum, P., Walter, S., Russell, D., Wood, E., & Galuppi, B. (1997).
        Development and reliability of a system to classify gross motor function in
        children with cerebral palsy. *Developmental Medicine and Child Neurology,
        39*, 214-223.

Peck, C. A., Schuler, A. L., Tomlinson, C., Theimer, K., & Haring, T. (1984). *The
        social competence curriculum project: A guide to instructional programming
        for social and communicative interactions* (G. S. O. Education, Trans.). Santa
        Barbara, California: California University, Santa Barbara.

Peregrine, P. N., Drews, D. R., North, M., & Slupe, A. (1993). Sampling techniques
        and sampling error in naturalistic observation: An empirical evaluation with
        implications for cross-cultural research. *Cross-Culturnal Research, 27*, 232 -
        245. doi: 10.1177/106939719302700304

Perry, A., Reilly, S., Cotton, S., Bloomberg, K., & Johnson, H. (2004). A
        demographic survey of people who have a disability and complex
        communication needs in victoria, australia. *Asia Pacific Journal of Speech,
        Language and Hearing, 9*, 259-271.

Pinborough-Zimmerman, J., Satterfield, R., Miller, J., Bilder, D., Hossain, S., &
        McMahon, W. (2007). Communication disorders: Prevalence and comorbid
        intellectual disability, autism, and emotional/behavioural disorders. *American
        Journal of Speech-Language Pathology, 16*(4), 359-367.

Reichle, J., Beukelman, D., & Light, J. C. (2002). *Exemplary practices for beginning
        communicators: Implications for AAC*. Baltimore: Paul H. Brookes
        Publishing.

Rossetti, L. (2005). *The Rossetti Infant-Toddler Language Scale*. East Moline IL:
        LinguiSystems Inc.

Rowland, C., & Schweigert, P. (1993). *Analyzing the communication environment*.
        Tucson, AZ.

Schuler, A. L. (1995). Enhancing communication in nonverbal children with autism. In K. A. Quill (Ed.), *Teaching children with autism: Strategies to enhance communication and socialization* (pp. 73-102). New York: Delmar Publishers.

Schuler, A. L., & Baldwin, M. (1981). Nonspeech communication and childhood autism. *Language, Speech and Hearing Services in Schools, 12*, 246-257.

Schuler, A. L., Peck, C. A., Willard, C., & Theimer, K. (1989). Assessment of communicative means and functions through interview: Assessing the communicative capabilities of individuals with limited language. *Seminars in Speech and Language, 10*(1), 51-62.

Scottish Executive (2000). *The same as you? A review of services for people with learning disabilities*. Edinburgh: Scottish Executive.

Siebert, J. M., & Hogan, A. E. (1982). *Procedures manual for the early social communication scale*. Miami, Florida: Center for Child Development, University of Miami.

Sigafoos, J., Arthur, M., & O'Reilly, M. F. (2003). *Challenging behavior and developmental disability*. London: Whurr.

Sigafoos, J., Arthur-Kelly, M., & Butterfield, N. (2006). *Enhancing everyday communication with children with disabilities*. Baltimore, MD: Brookes Publishing Company.

Sigafoos, J., & Drasgow, E. (2001). Conditional use of aided and unaided AAC: A review and clinical case demonstration. *Focus on Autism and Other Developmental Disabilities, 16*(3), 152-161.

Sigafoos, J., Woodyatt, G., Keen, D., Tait, K., Tucker, M., Roberts-Pennell, D., & Pittendreigh, N. (2000). Identifying potential communicative acts in children with developmental and physical disabilities. *Communication Disorders Quarterly, 21*(2), 77.

Sigafoos, J., Woodyatt, G., Tucker, M., Roberts-Pennell, D., & Pittendreigh, N. (2000). Assessment of potential communicative acts in three individuals with rett syndrome. *Journal of Developmental and Physical Disabilities, 12*(3), 203-216.

Sigudardottir, S., & Vik, T. (2011). Speech, expressive language and verbal cognition of preschool children with cerebral palsy in iceland. *Developmental Medicine and Child Neurology, 53*, 74-80.

Sparrow, S., Cicchetti, D., & Balla, D. (2005). *Vineland-II Adaptive Behavior Scales* (2nd ed.). Minneapolis: Pearson.

Tager-Flusberg, H., & Kasari, C. (2013). Minimally verbal school-age children with autism spectrum disorder: The neglected end of the spectrum. *Autism Research, 6*(6), 468-478. doi: 10.1002/aur.1329

Tager-Flusberg, H., Paul, R., & Lord, C. E. (2005). Language and communication in autism. In F. Volkmar, R. Paul, A. Klin & D. J. Cohen (Eds.), *Handbook of autism and pervasive developmental disorder* (Vol. 1, pp. 335-364). New York: Wiley.

Tait, K., Sigafoos, J., Woodyatt, G., O'Reilly, M. F., & Lancioni, G. E. (2004). Evaluating parent use of functional communication training to replace and enhance prelinguistic behaviours in six children with developmental and physical disabilities. *Disability and Rehabilitation, 26*(21/22), 1241-1254.

Thiemann-Bourque, K. S., Brady, N. C., & Fleming, K. (2012). Symbolic play of preschoolers with severe communication impairments with autism and other developmental delays: More similarities than differences. *Journal of Autism and Developmental Disorders, 42*, 863-873. doi: 10.1007/s10803-011-1317-7

Turner, M. (1999). Annotation: Repetitive behavior in autism: A review of pyschological research. *Journal of Child Psychology and Psychiatry, 40*, 839-849.

Wetherby, A.M. (1986). Ontogeny of communicative functions in autism. *Journal of Autism and Developmental Disorders, 16*, 295-316.

Wetherby, A. M., Cain, D. H., Yonclas, D. G., & Walker, V. G. (1988). Analysis of intentional communication of normal children from the prelinguistic to the multiword stage. *Journal of Speech and Hearing Research, 31*(240-252).

Wetherby, A. M., Yonclas, D. G., & Bryan, A. A. (1989). Communicative profiles of preschool children with handicaps: Implications for early identification. *Journal of Speech and Hearing Disorders, 54*(2), 148-158.

Wing, L., & Gould, J. (1979). Severe impairments of social interaction and associated abnormalitites in children: Epidemiology and classification. *Journal of Autism adn Developmental Disorders, 9*(1), 11-29.

Wodka, E. L., Mathy, P., & Kalb, L. (2013). Predictors of phrase and fluent speech in children with autism and severe language delay. *Pediatrics, 131*(4), 1128-1134.

Yoder, P. J., McCathren, R. B., Warren, S. F., & Watson, A. L. (2001). Important
distinctions in measuring maternal responses to communication in
prelinguistic children with disabilities. *Communication Disorders Quarterly,*
22(3), 135-147.

Appendix A
Ethics Approval Letters

FACULTY OF EDUCATION PO Box 17-310 Wellington 6012, New Zealand
Website www.victoria.ac.nz

12 December 2012

Michelle Stevens
PhD Student
Victoria University of Wellington Faculty of Education
C/- School of Educational Psychology and Pedagogy
Donald Street
Wellington

Dear Michelle

RE: Ethics application SEPP/2012/76 RM 19596

I am pleased to advise you that your ethics application '**Identifying and Validating Prelinguistic communicative Forms and Functions in Children with Developmental Disability**', with the required changes, has been approved by the Victoria University of Wellington Faculty of Education Ethics Committee. Please note that the approval for your research to commence is from the date of this letter.

Best wishes for your research.

Yours Sincerely

Dr Judith Loveridge

Co-Convener
Victoria University of Wellington Faculty of Education Ethics Committee

Appendix A
Ethics Approval Letters

FACULTY OF EDUCATION
PO Box 17-310 Wellington 6012, New Zealand
Website www.victoria.ac.nz

16 April 2013

Michelle Stevens
PhD Student
Victoria University of Wellington Faculty of Education
C/- School of Educational Psychology and Pedagogy
Donald Street
Wellington

Dear Michelle

RE: Ethics application SEPP/2013/23 Addendum to SEPP/2012/76 RM 19596

I am pleased to advise you that your ethics application addendum to '**Identifying and Validating Prelinguistic communicative Forms and Functions in Children with Developmental Disability**', with the required changes, has been approved by the Victoria University of Wellington Faculty of Education Ethics Committee. Please note that the approval for your research to commence is from the date of this letter.

Best wishes for your research.

Yours Sincerely

Dr Judith Loveridge

Co-Convener
Victoria University of Wellington Faculty of Education Ethics Committee

A

Inventory of Potential Communicative Acts

BACKGROUND

The Inventory of Potential Communicative Acts (IPCA) is based on 3 years of research funded by The University of Queensland and the Australian Research Council. To date, the research and field testing have involved more than 30 children with developmental disabilities and severe communication impairments. Current research is examining the validity of the IPCA for intervention purposes. At the present time, the instrument can be used for gathering descriptive information on communicative behaviors.

The IPCA is designed to be completed by educators, therapists, family members, or other people who know the individual well enough to serve as useful informants. As a general rule of thumb, anyone who has known and cared for the individual for at least 6 months could complete the IPCA. The IPCA seeks to identify any potential communicative acts that might be used by an individual for any of 10 different communicative functions.

A *potential communicative act* is defined as any behavior that you think the individual uses for communicative purposes. These behaviors might include vocalizations, body movements, facial expressions, breathing patterns, challenging behaviors, or stereotyped movements. They might also include more symbolic forms of communication, such as speaking some single words, producing a few manual signs, or using a picture-based communication board. To help you in identifying these types of behaviors, Table 2.1 lists a number of behaviors that are used by some individuals with developmental disabilities and severe communication impairments to communicate with others. This list is not exhaustive. In completing the IPCA, you are encouraged to identify any behaviors that you have observed the person using while communicating with others.

137

With the IPCA, the specific meaning that a person is attempting to communicate with a particular behavior is referred to as the *communicative function*. The IPCA seeks information on 10 distinct functions. Under each of these 10 functional categories, a number of more specific communicative functions are included. Again, this list of specific communicative functions is not exhaustive, and you are encouraged to include other specific messages or purposes that the person has been observed to express. Space is provided for you to record examples of other specific functions.

DIRECTIONS

The IPCA consists of a series of questions that are designed to identify the behaviors that a person uses to communicate. In completing the device, you are asked to list behaviors that you have observed the person using for a number of specific communicative functions. The IPCA also asks you to provide a concrete example of the circumstances under which the person has been observed using the behavior to communicate. These examples should be as detailed as possible. In writing your examples, please provide information about *when, where,* and *how* the behavior occurs.

If the person does not seem to express one of the specific functions, then you should write *Does not do this* in that section. For example, the first question asks you to *Describe how the person greets you/others.* For this question, you may have noticed that the person greets you by making eye contact, smiling, and extending his or her arms outward. Your specific example might be something such as *When I first see her in the morning and say "Hello," she always looks at me, smiles, and reaches out her arms.*

SCORING GRID

A Scoring Grid is included at the end of this inventory. The Scoring Grid is designed to provide a visual summary of the information documented in the IPCA. First of all, you would enter the person's behaviors into the blank spaces in the first column of the grid. Completing the Scoring Grid involves shading in those cells corresponding to the behaviors and functions that have been identified in the IPCA. For example, if the IPCA reveals that a person uses the behaviors of Reaching to make a Choice, then the cell that corresponds to the intersection of this behavior and this function would be shaded in. If an individual does not exhibit a particular behavior/function combination, then that cell would be left blank.

Once all of the identified behavior/function cells have been filled in, the Scoring Grid can be used to give an indication of the extent of a person's communicative repertoire. Scanning the completed Scoring Grid from top to bottom, for example, will provide a overview of the different behaviors that
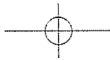
the person uses to communicate, whereas scanning from left to right will indicate the range of communicative functions exhibited by the individual. A more detailed summary of the information from the IPCA will come from examining individual cells as they indicate exactly what behavior(s) an individual uses to communicate a specific function.

A summary of the information from the IPCA can be shared among educators, therapists, family members, peers, and other relevant individuals to ensure that all communication partners are aware of the behaviors that the individual uses to communicate and what these behaviors mean when they occur in a particular context. When all communication partners are aware of the information collected in the IPCA, there is a much better chance that the person's communication attempts will be encouraged, acknowledged, and reacted to appropriately.

The IPCA was developed by Jeff Sigafoos from The University of Tasmania and by Gail Woodyatt, Deb Keen, Kathleen Tait, Madonna Tucker, and Donna Roberts-Pennell from The University of Queensland.

Inventory of Potential Communicative Acts

Name of the individual: _____

Name of the informant: _____

Informant's relationship with the individual:

    ❏ Teacher   ❏ Parent   ❏ Other _____ (Specify)

How long have you known this individual? _____ years _____ months

Individual's date of birth: _____

Diagnoses: _____

Social convention
Please describe how the individual...

Items	Behaviors	Examples
For example:		
1. Greets you/others	*Smiles* *Eye contact* *Extending arms out*	*When I walk up to Jenny in the morning and say hello, she always looks at me, smiles, and reaches out her arms.*
1. Greets you/others		
2. Indicates farewell to you/others		
3. Responds to his or her own name		

Enhancing Everyday Communication for Children with Disabilities by Jeff Sigafoos, Michael Arthur-Kelly, and Nancy Butterfield © 2006 Paul H. Brookes Publishing Co., Inc. All rights reserved.

4. Other	_____	_____
	_____	_____
	_____	_____

Attention-to-self
Please describe how the individual...

Items	Behaviors	Examples
1. Gets your attention	_____	_____
	_____	_____
	_____	_____
2. Seeks comfort	_____	_____
	_____	_____
	_____	_____
3. Requests a cuddle/tickle	_____	_____
	_____	_____
	_____	_____
4. Shows off	_____	_____
	_____	_____
	_____	_____
5. Other	_____	_____
	_____	_____
	_____	_____

(continued)

Reject/protest
What does the individual do if...

Items	Behaviors	Examples
1. His or her routine is disrupted	_____ _____ _____	_____ _____ _____
2. He or she is required to do something that he or she doesn't want to do	_____ _____ _____	_____ _____ _____
3. He or she doesn't like something	_____ _____ _____	_____ _____ _____
4. A favorite toy/food is taken away	_____ _____ _____	_____ _____ _____
5. An adult stops interacting with him or her (e.g., stops playing)	_____ _____ _____	_____ _____ _____
6. Other	_____ _____ _____	_____ _____ _____

Requesting an object
Please describe how the individual lets you know if he or she wants...

Items	Behaviors	Examples
1. An object (e.g., toy book) ,	_____ _____ _____	_____ _____ _____
2. Something to eat	_____ _____ _____	_____ _____ _____
3. More of something	_____ _____ _____	_____ _____ _____
4. Television or music	_____ _____ _____	_____ _____ _____
5. Other	_____ _____ _____	_____ _____ _____
6. Other	_____ _____ _____	_____ _____ _____

(continued)

Requesting an action

Please describe how the individual lets you know if he or she wants or needs...

Items	Behaviors	Examples
1. Help with dressing	_____	_____
	_____	_____
	_____	_____
2. Help with a game	_____	_____
	_____	_____
	_____	_____
3. To go to the bathroom	_____	_____
	_____	_____
	_____	_____
4. Someone to come/be near	_____	_____
	_____	_____
	_____	_____
5. Other	_____	_____
	_____	_____
	_____	_____
6. Other	_____	_____
	_____	_____
	_____	_____

Requesting information
Please describe how the individual lets you know he or she wants...

Items	Behaviors	Examples
1. Clarification (e.g., if he or she doesn't understand something you said)		
2. Information about something (e.g., the name of something)		
3. Other		

Comment
Please describe how the individual lets you know he or she...

Items	Behaviors	Examples
1. Is happy, pleased, enjoying something, or excited		
2. Is unhappy, sad, or anxious		
3. Is bored or disinterested		
4. Finds something funny		
5. Is frightened or surprised		
6. Is in pain or feels sick		

7. Is angry or feels frustrated	_____	_____
8. Is tired	_____	_____
9. Other	_____	_____

Choice making
Please describe how the individual...

Items	Behaviors	Examples
1. Makes a choice between two or more objects (e.g., foods, drinks, toys)	_____	_____
2. Chooses what he or she wants to do	_____	_____
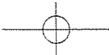
| 3. Chooses when to start or stop an activity | _____ _____ _____ | _____ _____ _____ |
| 4. Other | _____ _____ _____ | _____ _____ _____ |

Answer
Please describe how the individual...

Items	Behaviors	Examples
1. Reacts when someone talks to him or her	_____ _____ _____	_____ _____ _____
2. Tells you yes in response to a question	_____ _____ _____	_____ _____ _____
3. Tells you no in response to a question	_____ _____ _____	_____ _____ _____
4. Other	_____ _____ _____	_____ _____ _____

Imitation
Please describe how the person imitates or attempts to imitate the following communicative actions of others...

Items	Behaviors	Examples
1. Another's speech (e.g., sentences, single words, vocalizations)	_____	_____
2. Head nod "Yes"	_____	_____
3. Head nod "No"	_____	_____
4. Shrugging shoulders	_____	_____
5. Pointing	_____	_____
6. Other	_____	_____