CHAPTER TWO

COMMUNICATION IN CHILDREN WITH PERVASIVE DEVELOPMENTAL DISORDER

"Ryan got wet and muddy when he was playing outside in the back yard.. I told him to take off his socks and put new ones on. A bit later I said: 'Ryan, put your socks in the washing machine please'. I went to the laundry to do the washing after lunch and when I lifted the lid on the washing machine I was surprised to see about 20 pairs of socks in there. Ryan had put all of his socks in the washing machine. I couldn't be cross, could I? He had done exactly what I said … he put his socks in the washing machine. Next time I'll remember to be more specific and say 'put your wet, muddy socks in the washing machine'" (Brereton & Tonge, 2005, p. 56).

The previous chapter introduced PDD and provided an orientation to the study. This chapter focuses on the communication characteristics of children with PDD. Furthermore, how these communication characteristics relate to popular language processing models is discussed. Limitations of these models and a revised processing model that is able to account for the paralinguistic and non-verbal aspects of communication, in addition to the verbal aspects, is presented. The communication characteristics of PDD are discussed in relation to this model.

Communication competence has been suggested to be the primary factor linked to the extent individuals with PDD can develop relationships and function in everyday activities (Woods & Wetherby, 2003). Communication competence has been found to be closely related to the development of social behaviour, as well as measures of outcome (Woods & Wetherby, 2003). A better understanding of individuals with PDD's communication impairments as well as the underlying basis of these, is therefore essential in helping to improve the quality of life of these individuals. While some children with PDD experience difficulty with the structural aspects of language, this does not apply to all children on the PDD spectrum, particularly children on the high end of the spectrum. However, all children on the PDD spectrum experience qualitative impairments in the use or the pragmatics of language (Goodman, 1989). It has been suggested that children with PDD's primary communication difficulties lie with the semantics and pragmatics of language (Tager-Flusberg, 1981, as cited

by Ungerer & Sigman, 1987). The main communication difficulties experienced by this group will be discussed below.

2.1   THE COMMUNICATION CHARACTERISTICS OF CHILDREN WITH PDD

The communication characteristics noted in children with PDD include: comprehension difficulties, difficulty with semantics, echolalia, difficulty with grammar, narrative difficulties, pragmatic difficulties and better skills in reading decoding than reading comprehension. Each of these characteristics will be discussed below.

2.1.1   Comprehension difficulties

Although comprehension difficulties have been suggested in children on the PDD spectrum, few studies have investigated the particular comprehension difficulties of these children (Lord & Paul, 1997; Beisler, Tsai & Vonk, 1987; Tager-Flusberg, Paul, & Lord, 2005). Understanding comprehension difficulties in PDD is, however, important as comprehension difficulties are felt to be one of the first indicators of a problem in these children (Tager-Flusberg et al., 2005). Delays in receptive language have been related to pragmatic impairments and, in the early stages, it is often difficult to differentiate children with receptive aphasia from those with autism (Cantwell, Baker, Rutter, & Mawhood, 1989). Children with PDD have been said to have better language use than language comprehension when the structural aspects of language are analysed (Rae Smith & Leinonen, 1992). Bartak et al. (1975, 1977, as cited by Beisler et al., 1987) reported that autistic children's comprehension difficulties were more severe than those with developmental language disorder. Sherman et al. (1983, as cited by Beisler et al., 1987) found that autistic pre-schoolers' comprehension difficulties were more marked than mentally retarded pre-schoolers. Beisler et al. (1987) examined the performance of a group of autistic versus non-autistic children on the Test for Auditory Comprehension of Language-Revised version (TACL-R, Carrow-Woolfolk, 1985). The children in the non-autistic group all presented with language delay and a non-autistic psychiatric diagnosis, including conduct disorder, attention deficit disorder, developmental language disorder, developmental reading disorder and elective mutism. Beisler et al. (1987) found that the autistic group performed similarly to the non-autistic group on the TACL-R, suggesting that while children with autism may present

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with language comprehension difficulties, these are not more severe than those found in children with a language delay and a non-autistic psychiatric diagnosis.

Studies on comprehension ability have produced mixed results and on formal language tests some children with PDD may even perform within their age range (Beisler et al., 1987). Eskes, Bryson, and McCormick (1990) did not find differences in the processing of abstract words in children with high functioning PDD. They suggest that the comprehension abilities of these individuals may be better than previously thought, and that the representation of word meanings and their underlying conceptual structure may not be deviant in children with HFPDD. It is more often in context that children with PDD's receptive language difficulties become evident (Sharp, 1992). Studies have shown that children with autism were able to use a word order strategy for processing sentences but that they experienced more difficulty using a semantically based probable event strategy to interpret sentences (Gaddes, 1984, as cited by Lord & Paul, 1997; Paul, Fischer, & Cohen, 1988; Tager-Flusberg, 1981). Receptive language has been found to be worse in individuals with PDD where no explicit cues are provided (Paul & Cohen, 1985). Autistic adolescents were found to score more poorly than non-autistic adolescents on emotion-related items from the British Picture Vocabulary Scale (BPVS, Dunn, Dunn, & Whetton, 1982) (Hobson & Lee, 1989). In contrast they did not score more poorly on highly abstract versus concrete items, suggesting specific impairments in the understanding of emotion related concepts in PDD. Individuals with Asperger's Syndrome have often been noted to possess intact language ability when observed superficially (Martin & McDonald, 2004). However, they have been found to be over literal in their language comprehension and to experience difficulty understanding non-literal language devices such as irony (Martin & McDonald, 2004). Understanding language at a conversational and discourse level appears to be the area of greatest difficulty for children with PDD (Tager-Flusberg et al., 2005).

It has been suggested that children with PDD's difficulty in the area of receptive language may be due to difficulty integrating linguistic input with real world knowledge and using knowledge about social events to foster their language understanding (Tager-Flusberg et al., 2005). Receptive language difficulties have been suggested to be related to poor play skills (Lord & Paul, 1997; Sigman & Ungerer, 1981); poor theory of mind abilities (Martin & McDonald, 2004); and difficulty integrating sources of information from different sensory systems in the understanding of verbal input (Lord & Paul, 1997). Further research is

required to understand the underlying basis of the apparent comprehension difficulties in PDD, as well as the relationship between language comprehension and language use in these children (Lord & Paul, 1997). Furthermore, it would be beneficial to better understand which areas of language comprehension are most affected in PDD and why certain areas may be more affected than others.

2.1.2   Difficulties in the areas of semantics

Semantic complexity concerns the "level at which words refer to something, ranging from concretely noticing and identifying the object or entity through engaging in high levels of reasoning about it" (Norris & Hoffman, 1993, p. 88). This continuum has also been referred to as the "perceptual-language distance" (Blank, Rose & Berlin, 1978), i.e. the continuum along which language is used to label or name materials or objects, to a distanced relationship where perceptions must be evaluated, judged or mentally manipulated to determine what may happen. With increased perceptual-language distance, the focus must change from recognizing to abstracting (Blank et al., 1978). Norris and Hoffman (1993) proposed various levels of semantic complexity and depths of meaning.

The first level, indication, includes non-linguistic communication, such as gestures, vocalizations and imitation of sounds (Norris & Hoffman, 1993). In relation to children with delayed language, young children with PDD have been found to experience particular difficulty with communication functions, gestural communicative means, reciprocity and social-affective signaling. In contrast, children with delayed language experienced relative weaknesses in vocal and verbal communicative means (Wetherby et al., 1998).

The second level, labeling, refers to using language to refer to objects or parts of objects (Norris & Hoffman, 1993). Conceptual difficulties and difficulties with word meaning have been reported in PDD, with language being described as overly concrete, with particular difficulty being experienced with non-literal language (Kerbel, Grunwell, & Grundy, 1996) and emotional terms (Tager-Flusberg et al., 2005). Vocabulary acquisition has been described as "patchy" (Schoenbrodt, Smith, & Robinette, 1995). However, overall lexical knowledge may be an area of relative strength in PDD, although there may be reduced usage of certain classes of words, in particular mental state words (Tager-Flusberg, 2005) and difficulty with the expression of conscious feelings (Shalom et al., 2006).

Children with PDD may present with neologisms, jargon, pedantic or stereotypical utterances and metaphorical language use (Ghaziuddin & Gerstein, 1996; Tager-Flusberg, 2005; Volden & Lord, 1991). Word finding difficulties have been reported in individuals with SPD (Smedley, 1989). Children with PDD appear to develop idiosyncratic ways of expressing basic meanings (Schoenbrodt et al., 1995). These often appear to be based on unconventional associations (Sharp, 1992). Botting and Adams (2005) examined a small group of autistic children and found that they had difficulty making semantic choices. It has been suggested that autistic children can represent word meanings in memory but that they experience difficulty using meaning to retrieve and organize these representations (Lord & Paul, 1997; Tager-Flusberg, 1991). Despite showing that individuals with autism have intact conceptual relationships for common words, Toichi and Kamio (2001, 2003) suggested that their semantic processing may be different from that of controls. Furthermore, they showed that, unlike controls during a memory task, individuals with autism did not show superior recall of concrete over abstract nouns (Toichi & Kamio, 2003).

Children with PDD have been reported to experience difficulty with a range of deictic contrasts (Rees, 1984, as cited by Jordan, 1989), i.e. those aspects of language that mark shifts of reference between speaker and listener (Lord & Paul, 1997). In particular, a confusion with first person (e.g. "my") and second person (e.g. "your") pronouns have frequently been reported in children with PDD (Jordan, 1989; Lee, Hobson, & Chiat, 1994; Oshima-Takane & Benaroya, 1989). The extent of their difficulty with personal pronouns frequently appears out of keeping with other aspects of their language development, such as the development of their grammar (Lee et al., 1994). General difficulty with deixis has been suggested to be due to difficulty with joint attention and taking another person's perspective and with understanding the notion of self versus other (Lord & Paul, 1997). Difficulty with first versus second person pronouns has been suggested to be a result of the use of echolalia; due to a more general difficulty with deixis (Jordan, 1989); due to difficulty taking another person's perspective as a result of personal-social understanding limitations (Lee et al., 1994); or due to a lack of the ability to attend to speech addressed to others (Oshima-Takane & Benaroya, 1989). Pronoun reversal has, however, also been reported to occur in children with language disorder and blind children (Fraiberg, 1977, as cited by Tager-Flusberg et al., 2005). Comparing pronoun reversal in children with PDD to another group of children who may present with this difficulty (although to a lesser extent), for example SLI, may provide a better understanding of this phenomenon in children with PDD.

The third level, description, involves selective attention to perceptually salient qualities or features rather than the global perception of objects or events (Norris & Hoffman, 1993). It involves slotting new information into an existing knowledge structure of already acquired categories and concepts (Lane & Molyneaux, 1992) and requires the integration of different elements into unified ideas (Norris & Hoffman, 1993). Ungerer and Sigman (1987) found that autistic children's knowledge of function, form and colour categories did not differ from that of mental age matched mentally retarded and normal comparison groups. Dennis, Lazenby and Lockyer (2001) found that high functioning children with autism could identify multiple meanings for ambiguous words, as well as define words. However, a study by Ziatas et al. (2003, as cited by Tager-Flusberg et al., 2005) demonstrated that older higher functioning children with autism seldom used their language to describe events, suggesting that difficulties at the level of description may be present.

Norris and Hoffman's (1993) higher levels of semantics include interpretation, inference, evaluation and meta-language. Interpretation involves psychological causality or response rather than perceptual or observable qualities (Norris & Hoffman, 1993). Inference involves discerning information that is implied but not provided (Norris & Hoffman, 1993). Evaluation involves aspects such as justifying, evaluating and judging inferences that are made (Norris & Hoffman, 1993). Finally, meta-language involves using language to reflect on language itself (Norris & Hoffman, 1993). It would appear that these higher levels of semantics are areas of particular difficulty for children with PDD. Silliman et al. (2003) reported difficulty with both logical and psychological causality and inferencing in a group of pre-adolescents and adolescents with PDD. Zaitas et al. (2003, as cited by Tager-Flusberg et al., 2005) demonstrated that older high functioning children with autism seldom used their language for explaining. Grant, Riggs and Boucher (2004) found that children with autism experience greater difficulty with counterfactual conditional, mental state reasoning and drawing inferences and generating propositions when important information is not made obvious. A number of studies (Frazier Norbury & Bishop, 2002; Happe, 1994; Jolliffe & Baron-Cohen, 1999) have demonstrated that children with autism have a particular difficulty with language tasks requiring inferential processing. Smedley (1989) has suggested that language tasks involving inference are particularly difficult for children with SPD. Dennis et al. (2001) demonstrated that high functioning children with autism have particular difficulty making inferences that form the basis of successful social communication including difficulty with: inferring what mental state verbs imply in context; making inferences about

social scripts; understanding metaphor; and producing speech acts. Individuals with Asperger's Syndrome have been noted to experience particular difficulty interpreting irony and with verbal problem solving. Children with SPD have been shown to experience particular difficulty interpreting idioms (Kerbel & Grunwell, 1998). Sahlen and Nettelbladt (1993) suggested that the pragmatic difficulties seen in children with SPD may be secondary to their semantic and conceptual difficulties.

No studies appear to have taken place that assess whether semantic difficulties in PDD increase with greater depths of meaning. This may further our understanding of the specific semantic difficulties in this group and how they relate to other communication and general difficulties seen in children with PDD.

2.1.3   Echolalia

Echolalia is often reported in PDD (Tager-Flusberg et al., 2005). Echolalia has been described as the repetition of words or phrases that someone has said, with these usually being produced with similar intonation to how they were uttered (Lord & Paul, 1997). Echolalia may be both immediate or delayed (Rydell & Mirenda, 1994). It may serve different communication functions for different children and may serve several communication functions for one child (Lord & Paul, 1997; Prizant & Rydell, 1984; Schoenbrodt et al., 1995; Tiegerman, 1993).

Echolalia may exist without communicative intent; with intent but limited linguistic comprehension; and with intent and linguistic ability (Tiegerman, 1993). Echolalia has been suggested to be due to the combination of the difficulty of processing language semantically occurring in conjunction with good memory skills (Schoenbrodt et al., 1995); to be due to these children's tendency to be gestalt learners of language (Lord & Paul, 1997; Schoenbrodt et al., 1995); or to be due to their receptive language difficulties (Roberts, 1989). Echolalia has, however, not been found to occur in all groups of children on the autistic spectrum and occurs in certain other groups of children, for example, blind children, children with other language impairments and certain normally developing children (Lord & Paul, 1997). A better understanding of the communication profile that children with PDD present with, as well as a better understanding of the possible underlying difficulties that may account for this profile, may provide more insight into the possible reasons for echolalia in this population.

2.1.4   Grammatical language difficulties

Few studies have investigated the grammatical aspects of language in PDD (Tager-Flusberg et al., 2005). A number of studies have indicated that autism does not involve a primary impairment in grammatical ability (Tager-Flusberg et al., 1990). However, more recently it has been suggested that this needs to be reviewed (Frazier Norbury & Bishop, 2003). Children with HFA were noted to perform similarly to children with SLI and to children with pragmatic language impairment on various syntactic measures after the elicitation of a narrative (Frazier Norbury & Bishop, 2003). Children with HFA were noted to use less complex sentences and to make more tense errors than typically developing children (Frazier Norbury & Bishop, 2003). Jarrold, Boucher, & Russell (1997) examined the language profiles of children with autism. On formal measures of comprehension, vocabulary and grammar, superior performance on the grammatical measures was not noted. Smedley (1989) has suggested that children with SPD experience difficulty with grammar involving temporal language and causal relationships. He suggests that difficulties with sentence formulation occur at and beyond stage V of the Language Assessment and Remediation Screening Procedure (Crystal, Fletcher, & Garman, 1988). While Tager-Flusberg et al. (1990) did not find differences in mean length of utterance between children with autism and Down Syndrome, they did report a narrower range of grammatical structures in the spontaneous language of children with autism. Ghaziuddin et al. (2000) reported that individuals with Asperger's Syndrome used syntactically more complex language than those with HFA. This would suggest that individuals with high functioning PDD's syntactic abilities may differ according to their specific diagnosis. It is possible that different sub-groups may exist among children with PDD, some presenting with grammatical language difficulties and others not (Tager-Flusberg et al., 2005). It is still, however, unclear whether syntactic ability in children with PDD is more similar to children with normal development, children with SLI or whether it follows a pattern of its own. It is also unclear how the grammatical difficulties noted in children with PDD link to the difficulties seen in other aspects of their language.

2.1.5   Narrative difficulties

A limited number of studies has looked at the narrative ability of children with autism and findings have been somewhat conflicting. It is, however, accepted that individuals with PDD experience difficulty with many of the core aspects of narratives (Losh & Capps, 2003).

However, to what extent their difficulties are specific to PDD is not completely clear. Narratives represent both an important communicative tool and an important mechanism for making sense of experiences, relationships and who we are (Losh & Capps, 2003). As narrative ability draws on social-emotional, cognitive and linguistic knowledge it is particularly important to study in the PDD population (Losh & Capps, 2003).

One of the first studies of narrative ability in autism examined the bedtime stories of an autistic child (Baltax & Simmons, 1977). This study found that compared to a matched control, there was a greater proportion of echolalia, including mitigated echolalia, versus propositional (creative) language in the child with autism. The child with autism was also noted to experience more difficulty taking the hearer's perspective. Baron-Cohen, Leslie, and Frith (1986) looked at both the sequencing and narration of mechanical versus behavioural and intentional stories in children with autism and Down syndrome. The children with autism were as good as the controls in sequencing and relating mechanical and behavioural stories. They, however, experienced more difficulty with the sequencing and narration of intentional stories, with them using causal and behavioural language but very little mental state language. Loveland, McEvoy, and Tunali (1990) investigated the ability of high functioning verbal children and adolescents with autism and Down syndrome to retell a story. Their results appeared to indicate that, on a task of story recall, subjects with autism's stories resemble that of language-matched, mentally retarded persons. They found that in their retellings the groups did not differ in general story characteristics, with both groups exhibiting differences in language use. Subjects in the group with autism, however, tended to produce more bizarre language and adopt an 'externalized' point of view, where the characters in the story were seen as objects. They also produced fewer communicative gestures than the Down syndrome group.

It would appear that the type of narrative task may affect the results in children with PDD. Loveland and Tunali (1993) suggested that the following tasks were most likely to result in increasing difficulty for individuals with autism: recitations and performances would be the most easy; retellings of stories would be more difficult; anecdotes and informative/didactic narratives would be more difficult; script narratives would be even more difficult; and, finally, original story narratives would be the most difficult. Greater difficulty with original story narratives would appear to be supported by a study by Tager-Flusberg (1995). A group of children with autism, mental retardation and children with typical development were asked

to tell a story from a wordless picture book. In relation to the other two groups, the children with autism were noted to produce significantly shorter stories and to include less causal relationships between events. In the group with autism, use of a story schema, referential devices and enrichment devices were found to be correlated. In contrast, Tager-Flusberg and Sullivan (1995) found that when a group of subjects with autism and a group of subjects with mental retardation were closely matched on various standardized measures of language ability, no significant differences were found on narrative length, lexical cohesion and mental state terms. However, in relation to the subjects with mental retardation, the subjects with autism had greater difficulty explaining emotional states correctly. For the autistic group, narrative measures were significantly correlated to the theory of mind task. A study by Capps et al. (2000, as cited by Losh & Capps, 2003) confirmed these findings. On a wordless picture book children with autism were found to use a more restricted range of evaluative devices in relation to typically developing children. They were also less likely to provide descriptions of causal circumstances related to the character's thoughts and feelings; and their stories were found to be limited in grammatical complexity. However, the children with autism performed in a similar manner to mental age matched mentally retarded children, making it difficult to determine to what extent the difficulties noted were specific to autism. The autistic children's use of evaluation and their reference to the character's cognitive and emotional states appeared to be correlated to their performance on false belief tasks.

Most of the above studies looked at children with more severe autism, often comparing these to children with mental retardation. However, two more recent studies have looked at the narrative abilities of children on the higher end of the PDD spectrum. A study by Frazier Norbury and Bishop (2003) compared the narratives of children with SLI, pragmatic language impairment and HFA (age range 6-10 years). Children were asked to generate a story from a wordless picture book and the narratives were analysed according to global structure, local linguistic structure and use of evaluative comments. Group differences were not seen in global structure or evaluation. The SLI and HFA groups made more syntactic errors and children from the HFA group provided more ambiguous references in their stories. The complexity of the language was noted to be related to evaluation in all the clinical groups. Frazier Norbury and Bishop (2003) conclude that core language abilities appear to influence narrative ability, rather than pragmatic skill or diagnostic status. Losh and Capps (2003) looked at the narrative abilities of older children (mean age 11.3 years) with HFA and Asperger's syndrome and typically developing children. The children with HFA and

Asperger's Syndrome performed relatively well on the storybook condition but experienced difficulty with narratives of personal experience. These children were also noted to experience difficulty inferring and building on causal relationships within and across story episodes. Their narrative abilities were associated with measures of emotional understanding, but not theory of mind or verbal IQ.

The above studies indicate that narrative ability is impaired in PDD. However, the extent to which the difficulties seen are specific to PDD is not yet clear. There appear to be no studies to date that look at narrative ability in the pre-school population. Furthermore, there appear to be no studies that do an in-depth analysis of story coherence. Sinoff's (1993) Coherence Analysis of Narratives may be useful in this regard, as the areas evaluated (temporal organisation, relevance, development of character(s), supporting description and ending) may be specifically impaired in PDD, as many of these areas relate to skills that have been previously found to be impaired in this population.

2.1.6   Pragmatic ability

Pragmatics is "the study of the rules of the use of language in a social context" (Bates, 1976, in McTear & Conti-Ramsden, 1989). Prutting and Kirchner (1983, 1987) divide pragmatics into verbal, paralinguistic and non-verbal aspects. Pragmatic difficulties have been found among all individuals with PDD, with difficulties in the social use of language (particularly in conversation and discourse) being widely reported for individuals with PDD (Tager-Flusberg et al., 2005). It would appear that all three aspects of pragmatics (verbal, paralinguistic and non-verbal aspects) are impaired in PDD and studies relating to these three areas will be discussed below.

2.1.6.1   Verbal aspects

Individuals with PDD's utterances at the conversational level have frequently been regarded as inappropriate (Bishop & Adams, 1989). It appears that across different children with PDD, all the features of verbal pragmatics (both communicative intents and conversational devices) are shown to be at fault in some way. According to Prutting and Kirchner (1983, 1987), the verbal aspects of pragmatics include aspects such as: speech acts, topic skills, turn taking skills, lexical selection (including specificity/accuracy and cohesion) and stylistic variations.

In the domain of speech acts, individuals with PDD have been reported to present with less varied and less frequent speech acts (Dennis et al., 2001; Lord & Paul, 1997). Younger children with SPD have been found to initiate less, while older children have been found to produce more utterances that serve the conversational function of initiating, rather than responding or acknowledging (Adams & Bishop, 1989; Bishop, Hartley, & Weir, 1994). Individuals with PDD have also been reported to use more persistent and perseverative questioning, not as a means of requesting, but rather as an attempt to initiate (Lord & Paul, 1997). Frith (1989b) has suggested that their repetitive questioning/requests may occur as a form of stereotyped speech. In PDD, language is also often said to be used for instrumental, rather than spontaneous expressive purposes (Schoenbrodt et al., 1995). Difficulty comprehending conversational questions has also been reported (Hewitt, 1998a; Lord & Paul, 1997).

In the area of topic skills, individuals with autism have been noted to have greater contextual inappropriateness of speech and to make fewer references to mental states (Lord & Paul, 1997). McCaleb and Prizant (1985) found that individuals with autism encoded old information as frequently as they encoded new information and they often produced repetitions of previously encoded information when they failed to provide new information. Related to this, Bernard-Opitz (1982) noted topic perseveration when studying a single child with autism. Individuals with autism have been shown to experience difficulty forming context relevant communicative intentions (Eales, 1993). Loveland and Tunali (1991) found that in relation to individuals with Down Syndrome, high functioning verbal individuals with autism experienced more difficulty responding appropriately to conversational "social scripts", where their communication partner related a personal experience of distress. Paul and Feldman (1984, as cited by Tager-Flusberg et al., 2005) found that highly verbal adolescents and adults with autism experienced difficulty identifying the topic that had been introduced by their conversational partner. Furthermore, children with autism have been noted to experience difficulty with introducing and dealing with new information at a discourse level (Tager-Flusberg et al., 2005).

With regard to turn taking skills, children on the PDD spectrum have been noted to experience more difficulty with tasks of referential communication (Baltaxe & D'Angiola, 1996; Leinonen & Letts, 1997) and to experience more difficulty with contingent discourse (Tager-Flusberg & Anderson, 1991). Ferrier, Bashir, Meryash, Johnston, & Wolff (1991)

found that individuals with autism provided more inappropriate responses than those with Down syndrome or Fragile X. Difficulty repairing communication after requests for clarification has been noted (Lord & Paul, 1997) and when compared to language matched controls, children with PDD have been noted to be significantly more likely to respond to a request for clarification with an inappropriate response (Volden, 2004). Children with SPD were noted more frequently to violate turn taking rules by, for example, interrupting their conversational partner (Adams & Bishop, 1989; Bishop & Adams, 1989). Both children with autism and children with SPD have been noted to experience difficulty with Grice's maxim of quantity (Grice, 1968, 1975, as cited by Lord and Paul, 1997), appearing to experience difficulty judging how much information is appropriate to give, providing their conversational partner with either too much or too little information (Bishop & Adams, 1989; Lord et al., 1989, as cited by Lord & Paul, 1997). Difficulty with reciprocity in conversation (i.e. engaging in mutual, cooperative dialogue) has been reported (Tager-Flusberg et al., 2005).

With regard to lexical selection, both lexical specificity and accuracy and lexical cohesion have been found to be problematic. Words chosen are not always specific or accurate (Rumsey, 1992). The use of stereotypical language, metaphorical language, peculiar use of speech and language, and overly literal language have all been reported (Rumsey, 1992). Furthermore, difficulty with the use of mental state words has been noted (Tager-Flusberg & Sullivan, 1995). Children with PDD have been found to experience difficulty with different patterns of cohesion (linguistic ties) in their discourse (Baltaxe & D'Angiola, 1992). Their use of cohesive ties of reference was noted to be less successful than children with SLI and children with normal language development (Baltaxe & D'Angiola, 1996). They have been noted to make less use of cohesive markers and to refer less to a previous aspect of the conversation (Fine, Bartolucci, Szatmari, & Ginsberg, 1994). In contrast Adams and Bishop (1989) found that children with SPD's use of cohesion was not significantly affected. Of note is the observation that the use of cohesion in other language-impaired children was limited (Adams & Bishop, 1989). It is possible that the use of cohesion is linked to grammatical ability.

Studies looking at communication style have reported an overly repetitive style in a case with autism (Dobbinson, Perkins, & Boucher, 1998) and a 'pedantic' style in Asperger's Syndrome (Ghaziuddin & Gerstein, 1996). Difficulty appreciating the importance of their

communicative partner's intentions (Sabbagh, 1999) and following the rules of politeness has also been reported (Hewitt, 1998b; Lord & Paul, 1997). Individuals with PDD have been reported to think out loud and to talk to themselves (Rumsey, 1992), possibly suggesting poor development of inner speech.

A review of the literature would appear to suggest that all the verbal aspects of pragmatics are affected in PDD. In PDD increased language ability has been found to be associated with increased peculiarities in language use, while in non-autistic mentally handicapped groups peculiarities in language use decreased as expressive language abilities improved (Volden & Lord, 1987, as cited by Tager-Flusberg et al., 2005). It would appear that how these verbal aspects of pragmatics relate to other aspects of language, as well as to the paralinguistic and non-verbal aspects of pragmatics and other aspects affected in PDD such as theory of mind and cognitive processing, may provide further insight into understanding them.

2.1.6.2   Paralinguistic aspects

Many individuals with PDD have been reported to experience difficulty with paralinguistics, for example, vocal quality, stress patterns, intonation and rhythm (Gerken & McGregor, 1998; Lord & Paul, 1997; Schoenbrodt et al., 1995). Loudness levels may be aberrant, they may sound monotonic and they may use the inflection originally heard as part of the gestalt of the utterance (Schoenbrodt et al. 1995). Other intonational oddities include using a sing-song voice, a voice of high fundamental frequency and less commonly, but also reported, a hoarse, harsh, hypernasal or hyponasal voice (Tager-Flusberg et al., 2005). Individuals with PDD may produce fewer non-grammatical pauses (Thurber & Tager-Flusberg, 1993) and experience difficulty taking advantage of stress cues for meaning (Baltaxe, 1984). However, it has been difficult to define what comprises PDD related paralinguistic abnormalities as different features have been observed and reported (Fay & Schuler, 1980; Lord & Paul, 1997). Furthermore, the methodologies used in studies on prosody vary greatly and findings are sometimes conflicting (McCann & Peppe, 2003). Differences in intonation between sub-groups of PDD have been suggested. Abnormalities in intonation and prosody have been found to be even more prevalent in children and adults with Asperger's syndrome than verbal children and adults with autism (Tager-Flusberg et al., 2005). However, Fine et al. (1991) found that individuals with HFA less often produced useful patterns of intonation for communication when compared to individuals with Asperger's Syndrome and psychiatric

outpatient controls. It has been suggested that these difficulties with the suprasegmental aspects of language may be linked to right hemisphere impairment in children with SPD (Shields, 1991). Comparing children with PDD's paralinguistic aspects of communication to children with SLI (where the underlying difficulty is thought to be in the left hemisphere) may provide further insight into this. Unlike children with SLI, children with PDD's articulation skills are usually intact, although articulation difficulties can occur (Tager-Flusberg et al., 2005).

2.1.6.3   Non-verbal aspects

The pragmatic difficulties noted in PDD appear to extend into the areas of non-verbal communication. These children have been shown to have a marked absence of certain gestures (pointing and showing), i.e. those gestures that regulate shared attention (Charman et al., 1997; Kasari, Sigman, Mundy, & Yirmiya, 1990). They have been noted to make better use of instrumental, rather than spontaneous expressive gestures (Schoenbrodt et al., 1995). They have also been noted to experience difficulty responding to the gestures of others (Landry & Loveland, 1988). They have been noted to experience difficulty using gesture to compensate when they are unable to express themselves verbally (Schoenbrodt et al., 1995) and to experience difficulty initiating communication with gestures (Stone & Caro-Martinez, 1990) However, some studies have reported conflicting findings with Capps, Kehres, and Sigman (1998) finding that the group of autistic children they studied did not differ in their use of gesture, when compared to children with developmental delays. Children with PDD have been reported to experience difficulty interpreting affect on faces (Braverman, Fein, Lucci, & Waterhouse, 1989). This has been put forward as a possible contributory factor to their poor eye contact, a frequently reported feature in PDD (Carter, Davis, Klin, & Volkmar, 2005). In contrast to PDD, children with typical SLI's gestural understanding and use has been found to be largely intact (Bishop, 2000). Comparing children with SLI and children with PDD's use of non-verbal communication aspects may provide further insight into children with PDD's difficulties in this area.

2.1.6.4   Pragmatic impairments as one of the first manifestations of PDD

It is now accepted that pragmatic impairments are more specifically associated with PDD than specific linguistic deficits (Rumsey, 1992; Ramberg et al., 1996). When compared to

normal and developmentally delayed children without autism, children with HFA have been suggested as developing in a similar pattern in the areas of phonology and syntax, just at a slower rate (Ramberg et al., 1996). However, their pragmatic skills have been found to be qualitatively different (Ramberg et al., 1996). This difficulty in the area of pragmatics would appear to be observable in the first year of life in children with PDD, with difficulties already being observed during the pre-linguistic stage. Pre-verbal children with autism have been shown to display a deficit in joint attention (Mundy & Stella, 2000; Wetherby et al., 1998; Wetherby & Prutting, 1984; Woods & Wetherby, 2003). Joint attention involves socially orientating while engaging in observing an object or event, in order to share their experience of that object or event with others (Mundy, 1995, as cited in Mundy & Stella, 2000). Joint attention usually emerges between the ages of 6 and 12 months. This would suggest that one of the most fundamental aspects of PDD may be observed during the first year of life (Mundy & Stella, 2000). Joint attention may be interpreted as a pragmatic skill. Children with autism's joint attention skills have been noted to emerge after, instead of before, other social-cognitive skills, such as imitation and object permanence (Carpenter, Pennington, & Rogers, 2002). Carpenter et al. (2002) suggest that children with PDD may use imitation rather than joint attention to learn language.

Pragmatic impairments, being one of the first manifestations of the PDDs and appearing to be one of the fundamental difficulties in PDD, would provide support for further investigation of this area. It would appear that how pragmatic impairment relates to other aspects of communication functioning, as well as to the theory of mind and cognitive processing of individuals with PDD, requires further investigation.

2.1.7   Written language difficulties

Reading accuracy for word reading, non-word reading and text reading has been found to fall within the average range for children with PDD, although reading comprehension is often impaired (Nation, Clarke, Wright, & Williams, 2006). Individual variation in reading abilities has, however, been reported (Nation et al., 2006).

An interesting finding in the literature is that the incidence of hyperlexia is significantly greater in children with PDD, than in children with non-PDD diagnoses (Grigorenko, Klin, Pauls, Senft, Hooper, & Volkmar, 2002; Nation et al, 2006). Children with hyperlexia appear

to have advanced decoding skills, often having excellent oral reading, yet poor reading comprehension (Snowling, 2000). Children with hyperlexia often read without formal instruction and at a rate in excess of that which would be predicted by their IQ (Snowling, 2000). Hyperlexia contrasts with dyslexia, which is more commonly seen in children with language difficulties and where decoding skills are poor (Snowling, 2000). Children with hyperlexia often experience difficulty answering questions about or retelling what they have read (Healy, 1982, as cited in Snowling, 2000). Autistic children with hyperlexia have been noted to experience difficulty pronouncing ambigious words in context, for example "bow" (Frith & Snowling, 1983, as cited in Snowling, 2000) and modifying their pronunciation of written homographs (e.g. "lead) based on context (Happe, 1997, as cited in Snowling, 2000). Autistic children with hyperlexia were noted to experience difficulty with a story close procedure. This appeared to be related to difficulty going beyond the information provided in the text and difficulty making inferences across the text as a whole (Snowling & Frith, 1986, as cited by Snowling, 2000). Snowling and Frith (1986, as cited in Snowling, 2000) found that the best predictor of reading comprehension was verbal mental age and that children with hyperlexia were more likely to have a lower verbal mental age. Hyperlexic children with autism were also noted to experience more difficulty detecting text anomalies (Snowling & Smith, 1986, as cited in Snowling, 2000). Autistic children with hyperlexia were noted to experience more difficulty correcting their reading errors based on context. This was observed even in those individuals with near normal verbal ability (Happe, 1997, as cited in Snowling, 2000). Grigorenko et al. (2002) found that children with hyperlexia present a broad IQ range.

The relatively strong reading accuracy ability in children with PDD and the strong association between PDD and hyperlexia is an interesting one. Factors put forward to explain this have included: children with PDD have a particular pattern of cognitive strengths and weakness, being interested in local rather than global coherence and being preoccupied with text and reading (Nation et al., 2006). Investigating the particular communication and cognitive strengths and weakness in this population may provide more insight into this.

2.2 __RATIONALE FOR THE STUDY__

It is now recognized that language in PDD is variable and that sub-groups of individuals with distinct language profiles may exist on the spectrum (Tager-Flusberg et al., 2005). Investigating children with HFPDD's communication difficulties and comparing them to children with SLI's communication difficulties may provide a better understanding of which difficulties are core to PDD, both in relation to SLI and more severe manifestations of the disorder. Particular aspects that appear to require further investigation include:

- Whether comprehension difficulties in HFPDD are seen in formal measures of comprehension or only in context.

- Whether greater semantic difficulties are seen in tasks involving greater depths of meaning.

- Whether or not a primary grammatical impairment occurs in the HFPDD group.

- Whether specific narrative difficulties occur in the HFPDD population, for example, specific difficulty with narrative coherence.

- How the fundamental communication difficulties noted in the area of pragmatics relate to other communication difficulties in the HFPDD group and how these compare to the pragmatic difficulties noted in children with SLI.

In particular, further investigation appears to be required regarding:

- Whether a particular communication profile exists in children with HFPDD and how this links to the communication profile seen in children with SLI.

- How particular communication difficulties seen in children with HFPDD link to particular cognitive processing and theory of mind difficulties seen in this group.

It would appear that a better understanding of the communication characteristics of PDD is required. Understanding the communication characteristics in relation to models of language processing may assist in better understanding the communication characteristics of this population. It has been suggested that a theoretical model for communication difficulties in PDD needs to be able to explain the range of communication difficulties seen and to be able to relate these to other social and cognitive functions seen in PDD, so that the underlying mechanisms of the communication difficulties seen can be better understood (Tager-Flusberg et al., 2005). Most importantly, a better understanding of the communication difficulties in PDD should assist in better intervention for these individuals (Tager-Flusberg et al., 2005).

2.3 HOW DO MODELS OF LANGUAGE PROCESSING HELP US UNDERSTAND THE COMMUNICATION CHARACTERISTICS OF PDD?

According to Bishop (1999), understanding the underlying processes that may be affected in different developmental language disorders will assist us in better understanding these disorders. It, therefore, would appear useful to look at the communication problems in PDD in relation to popular language processing models.

2.3.1 Popular psycholinguistic models of language processing

Cognitive neurospychology is becoming an increasingly popular way of studying developmental language disorders (Temple, 1997, as cited by Bishop, 1999). Over the last number of years a number of information processing models of language has been developed to explain language difficulties in children and adults. These models have been applied extensively to adult language disorders and to some extent to child language impairment (Harris & Coltheart, 1986). They, however, do not appear to have been used in an attempt to understand the communication characteristics of PDD.

Psycholinguistic models of language processing describe the functional architecture of the language processing system, describing the processes involved in the understanding and expression of spoken and written language (Coltheart, 1987). Popular models divide the language processing system into input, cognition/the semantic system and output (Coltheart, 1987; Harris & Coltheart, 1986; Kay, Lesser, & Coltheart, 1992; Hersch, 1994). The model depicted in figure 2.1 consists of an adaptation and combination of some of the most popular models used to explain the architecture of the language processing system (Coltheart, 1987; Kay et al., 1992; Hersch, 1994). At the first level, acoustic information is analysed into speech sounds and written information is analysed into graphemes. This information is then used to access the word form system in the auditory input lexicon and orthographic input lexicon respectively. The auditory input lexicon's role is to recognize familiar spoken words, while the orthographic input lexicon's role is to recognize familiar written words (Eysenck & Keane, 1993). These systems then access word meaning in the semantic system. The semantic system is common to all modalities, while earlier systems are modality specific (Harris & Coltheart, 1986).
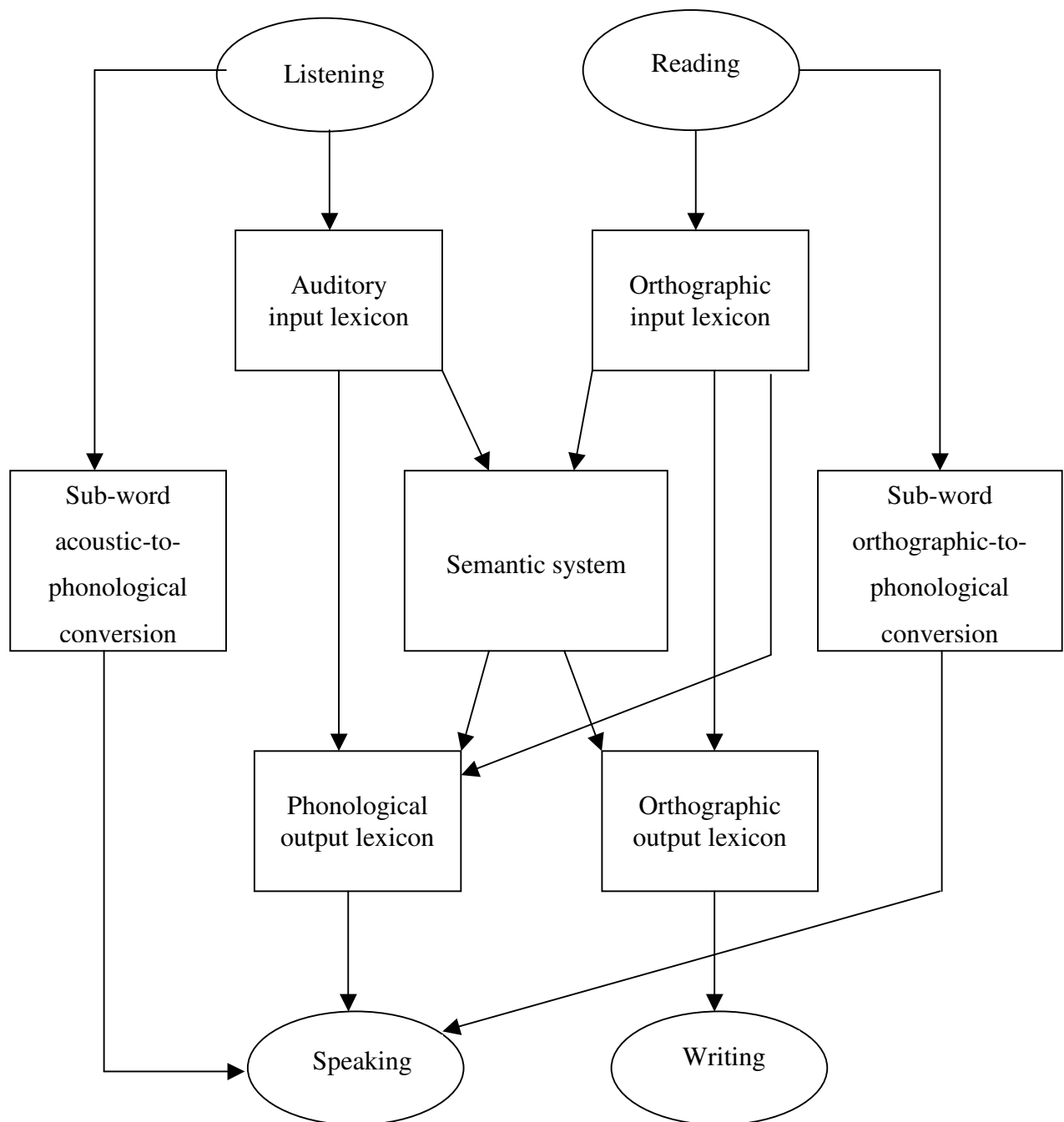
Figure 2.1: An adaptation and combination of Coltheart's (1987), Harris and Coltheart's (1986) and Kay et al.'s (1992) language processing models

On an output level, the forms of words are stored in output lexicons (phonological and orthographic), which are then converted to actual speech and writing (Kay et al., 1992). The phonological or speech output lexicon is for the storage of spoken word forms, while the orthographic output lexicon is for the storage of written word forms (Eysenck & Keane, 1993).

A word can be repeated by means of three routes. The first is by the sub-lexical repetition route. Here the lexicon is not accessed and this route can repeat non-words, through the use of a sub-word acoustic-to-phonological conversion system (Harris & Coltheart, 1986; Kay et al., 1992). The second route is the lexical repetition route. This accesses the auditory input lexicon and uses this to access the phonological output lexicon (speech output form) directly (Harris & Coltheart, 1986; Kay et al., 1992). The third route achieves repetition by accessing the semantic system (Franklin, 1989). In the same way that repetition is achieved, a word can be read with or without access to the semantic system, also being able to be read by three routes. Firstly, words can be read by a sub-word orthographic-to-phonological conversion system (the sub-word lexical reading route). This would be used for the reading of non-words. Secondly, they can be read by a direct route from the orthographic input lexicon to the phonological output lexicon (the lexical reading route). Lastly, they can be read by direct access to the semantic system (Coltheart, 1987).

While this model provides a basic understanding of the language processing system, it would appear to be too simplistic to assist in understanding the underlying processes that are affected in PDD, as many of the communication difficulties reported in PDD are not reflected in this model.

2.3.2   A revision of the phonological-orthographic processing model

The model described above appears to have limitations for explaining the communication difficulties seen in PDD, as it does not seem to take into account aspects such as non-verbal communication, paralinguistic aspects (such as intonation and prosody), as well as grammatical processing and grammatical expression. Furthermore, it does not include the role that visual processing may have on language processing. This model has, therefore, been revised and expanded in a number of ways and the revised model is depicted in figure 2.2.
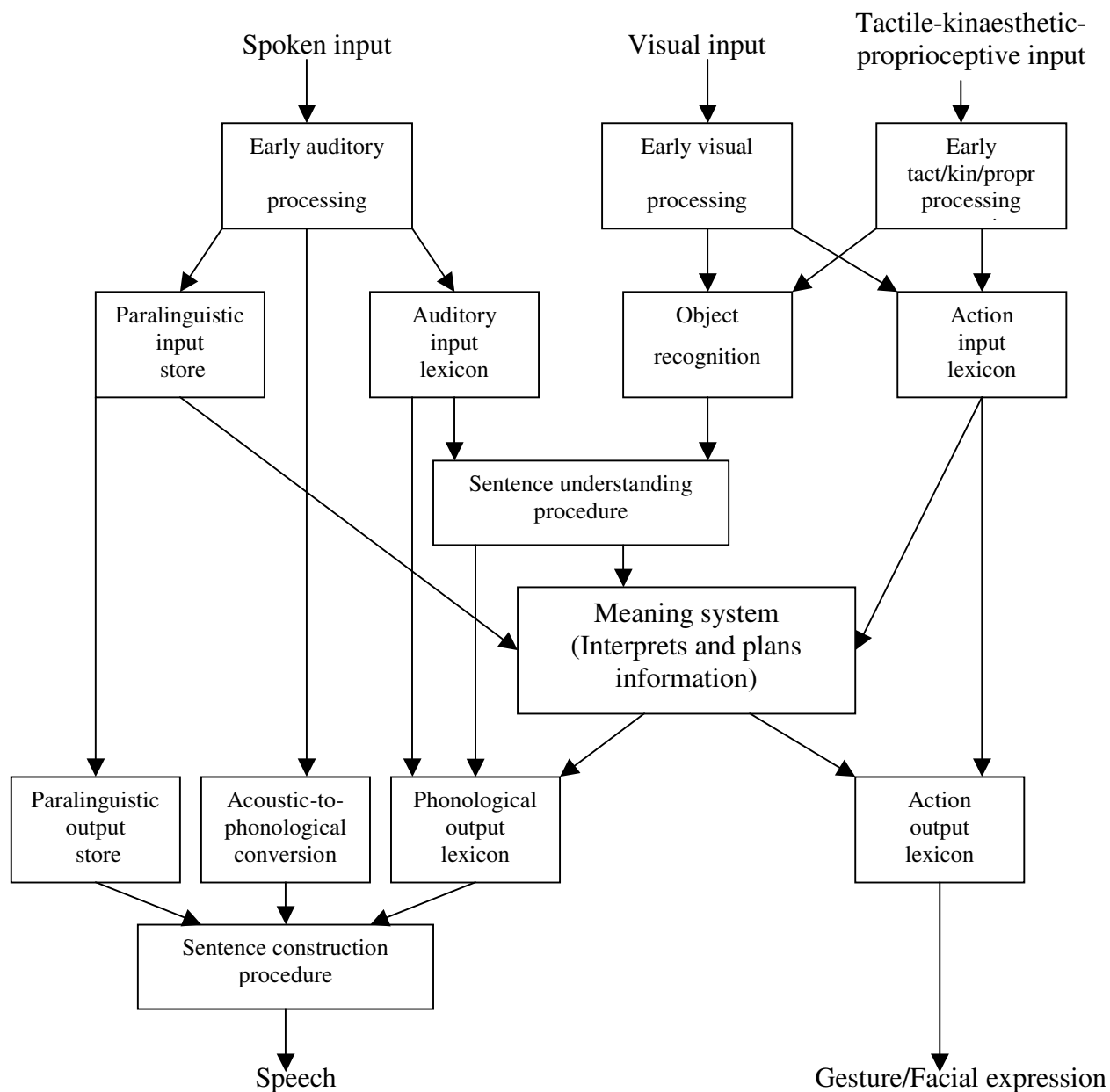
Figure 2.2: Revised processing model accounting for verbal, paralinguistic and non-verbal aspects of communication

2.3.2.1   Additional components

While most psycholinguistic models focus on the phonological and orthographic routes, Raymer and Gonzalez Rothi (2000) in addition include routes for object and gestural recognition, with the object recognition system and action input lexicon occurring at the same level as the auditory input lexicon. At the level of the phonological output lexicon they include an action output lexicon, from which information would be converted into

gesture/pantomime (Raymer & Gonzalez Rothi, 2000). Inclusion of these additional routes would appear important to any model aimed at understanding a disorder such as PDD, as visual processing and gesture (non-verbal communication) have been shown to play such an important role in this population. However, additional expansions of this model - the understanding and expression of grammar and pragmatic skills, such as paralinguistic aspects - would need to be included before it could adequately be applied to the communication difficulties seen in PDD.

With regard to the understanding of syntax, Bishop (1999) suggests that sentence interpretation (mainly syntactical) occurs after word recognition (the auditory input lexicon) has been accessed. Once sentence processing has taken place, deeper semantic processing occurs, which involves inferencing the speaker's intention and taking context and general knowledge into account (Bishop, 1999). Bishop (1999) suggests that this is not just a bottom-up process but that context and general knowledge affect sentence interpretation, as well as the understanding of word meanings. In the revised model, sentence interpretation is referred to as the sentence understanding procedure and occurs between the auditory input lexicon and the semantic/meaning system.

With regard to the expression of syntax, an adaptation of Parisi's (1987) model and an addition of this adaptation to the above model would appear useful. According to Parisi (1987) grammatical expression takes place by means of the sentence construction procedure, which draws on both the phonological output lexicon and knowledge store, which would appear to be the semantic system as it is the memory of the person's knowledge about the world. The communication between the phonological output lexicon and knowledge stores appears to consist of both top-down and bottom-up processes. The knowledge store is drawn on in order to express the appropriate content that needs to be expressed in a sentence. The phonological output lexicon is drawn on in order to select appropriate words to express the sentence's meaning. In the sentence construction procedure, the sequential ordering of these words takes place in order to put together an appropriate sentence for the content (Parisi, 1987). Disruption of the sentence construction procedure would result in expressive language which is different from normal language in its syntactic constructions (Parisi, 1987). For more detail of what takes place in the sentence construction procedure, refer to Parisi (1987).

In terms of paralinguistics it would appear that at the level of the auditory input lexicon a paralinguistic input store should occur. The purpose of this paralinguistic store would be to recognise the suprasegmental features of speech. This paralinguistic input store would then access the semantic system, although it could bypass it and go directly to the paralinguistic output store, which is a likely happening when we repeat the intonation of something without attaching meaning to the intonation pattern.

With regard to the understanding and expression of gestures and facial expression, it would appear that the action input lexicon would store the recognition of these, for example, a smile signifies happiness. However, this needs to access the semantic system in order to take context into account. The expression of gestures and facial expression takes place through the action output lexicon, which converts this information into the non-verbal aspects of communication, such as gestures, facial expression, etc. If the semantic system is not first accessed, one might get inappropriate gestures and facial expressions in context, or echopraxia, which is a type of echolalia for gesture, where actions are mimicked without regard for their meaning (Williams, Whiten, Suddendorf, & Perrett, 2001a). This route, going directly from the action input lexicon to the action output lexicon, would appear to be used for imitating actions.

With regard to object processing this model needs to take into account that objects can be recognised by both visual and/or tactile-kinaesthetic-proprioceptive input. In the same way information to the action input lexicon, may be visual or consist of tactile-kinaesthetic proprioceptive information.

The orthographic reading routes have not been included in this revised model for the sake of preserving simplicity, and as reading is not a focus of the present study. However, it must be pointed out that reading processing could occur in the same way as was demonstrated in the first model.

In order to understand how pragmatic aspects, particularly aspects of verbal pragmatics, fit into this model, the structure of the semantic system needs to be looked at further. This will be discussed below.

2.3.2.2   The structure of the semantic system

Another important adaptation from the initial model presented is that in the revised model the semantic/cognitive system has been termed the meaning system (explained below), which is involved with both interpreting and higher level planning of information. Here meaning would consist of both semantic and pragmatic meaning.

In the literature the term semantics appears to be used in different ways and there does not seem to be consensus on what comprises semantics. The cognitive neuropsychology literature appears to use the term semantics in a broad sense, using it to refer to a person's knowledge base (Warrington & McCarthy, 1994). The semantic system has been said to specify the type of knowledge that is required for decisions to be made regarding the functional and associative characteristics of things (Riddoch, Humphreys, Coltheart, & Funnell, 1988). Semantics has been referred to as the relationship between 'linguistic signs' and the world, and in a more general sense as the relationship between any object or event (not only linguistic) and a person's general knowledge of these objects and events (Caramazza, Hillis, Rap, & Romani, 1990).

The linguistic literature refers to semantics in a narrower sense. However, even within this body of literature there appears to be differences of opinion as to what comprises semantics. Some authors see semantics as referring to only sentence meaning and would refer to discourse meanings as pragmatics (Craig, 1983). In this narrower sense of semantics, semantics is seen to comprise lexical and relational semantics (Landells, 1989). While relational semantics studies the meaning of words in different contexts, context here refers to linguistic context (the syntagmatic relationship between semantic elements) (Landells, 1989). Other authors appear to include situational context and non-literal meaning (such as idioms, metaphors, jokes, riddles and proverbs) in semantics (Lund & Duchan, 1988).

Furthermore, the distinction between semantics and pragmatics is not clear (Crystal, 1998). As with semantics it seems that both a broad and narrow view of pragmatics can take place. In its narrow sense pragmatics is seen as an additional component of language to semantics, syntax, morphology and phonology (Craig, 1995; McTear & Conti-Ramsden, 1989). In its broader sense pragmatics is seen as involving the integration of linguistic forms and discourse functions; and the integration of knowledge (Craig, 1995; McTear & Conti-

Ramsden, 1989). It does, however, appear to be accepted that pragmatics consists of the meaning of language in social context (Craig, 1995).

Leinonen and Kerbel (1999) use relevance theory to distinguish between semantics and pragmatics. They argue that aspects of semantics such as ambiguity, ellipsis and pronouns, should actually fall within the domain of pragmatics. According to relevance theory, information is most relevant if it interacts with previous knowledge and/or contextual information to allow for the least possible processing effort (Leinonen & Kerbel, 1999). This would suggest that the area of pragmatics would fall under the use of the semantic system in its broad sense. Rather than being called the semantic system, this system might better be referred to as the "meaning system"; while the distinction between semantics and pragmatics is blurred, it is accepted that both semantics and pragmatics are concerned with meaning. The meaning system would be concerned with both the use of linguistic and situational contexts and the integration of language. Dore (1978, in McLaughlin, 1998) differentiates propositional content (semantics) from illocutionary function (intended effect - pragmatics). The meaning system would, therefore, appear to consist of both the propositional content (semantics) and intent of the message, and use of situational context (pragmatics). The meaning system, therefore, appears to consist of propositional content; illocutionary function/context; discourse formulation; and then propositional expressive content.

In the cognitive neuropsychology literature there is debate as to whether the semantic system or meaning system is unitary, being accessed through different modalities, or whether it is multi-component. There are two general theories regarding the semantic system - one of unitary semantics and one of modality-specific semantics (Raymer & Gonzalez Rothi, 2000). The unitary view of the semantic system sees the semantic system as modality non-specific. This semantic system receives input from a number of different modalities (Raymer & Gonzalez Rothi, 2000). There is neuropsychological evidence to support the view of a unitary semantic system. The left posterior temporo-parietal regions, inferior temporal regions and left inferior frontal cortex, including the pre-frontal cortex have all been found to be important in semantic processing (Raymer & Gonzalez Rothi, 2000). Some studies have also suggested that right frontal, parietal and temporal cortices are involved in semantic processing (Raymer & Gonzalez Rothi, 2000). A complex network of brain regions, therefore, appears to underlie semantic processing (Raymer & Gonzalez Rothi, 2000).

2.3.2.3   <u>Bottom-up and top-down processes</u>

Bishop (1999) stresses that a model such as this cannot consist of only bottom-up processing as strong interactions exist between language levels, with there being a significant role of top-down influences. For example, word learning is influenced by 'syntactic bootstrapping', so that syntactic understanding (or the sentence understanding procedure) is used to help establish the meaning of a novel word by taking its grammatical context into account (Bishop, 1999). In this model, while arrows represent the main direction of informational processing flow, it must be acknowledged that later processes have an influence on earlier processes to varying degrees. In addition to top-down processing occurring between the sentence understanding procedure and the auditory lexicon, top-down processing would also appear to occur between the meaning system and prior and later modules with which it is connected.

2.3.2.4   <u>Modular versus central processes</u>

According to Fodor's (1983, as cited by Bishop, 1999) description of modular systems, all aspects of this model would consist of modules, except the meaning system which would consist of a central process. This would appear partly to be due to the modules being modality specific, while the meaning system would appear to involve processing information from many modalities. Modular processes are more automatic, while central processes are more controlled (Bishop, 1999).

2.3.2.5   <u>Processing with or without the meaning system</u>

As the focus of communication should be meaning, the main route of processing for auditory, visual and tactile-kinaesthetic-proprioceptive information should be through the meaning system. However, other routes will sometimes be used. This would mainly occur when imitating without taking into account the meaning. For example, imitating the intonation of a sentence may take place via the paralinguistic input store to paralinguistic output store. Imitating a list of words or what is heard may occur via the auditory input lexicon to phonological output lexicons or from auditory information to the acoustic-to-phonological conversion module if the words are not recognisable (for example, imitating words from

another language). Imitating actions would occur from the action input lexicon to the action output lexicon.

2.3.3   The communication characteristics of PDD according to this model

We now turn to how this model helps us to understand better the communication characteristics seen in HFPDD. If we consider the different communication difficulties outlined earlier, we can consider where the breakdown on this model may occur. Each of these communication difficulties and the possible breakdown are listed below:

- Comprehension difficulties – Comprehension difficulties could occur due to problems in the auditory input lexicon or processes that occur prior to this, problems in the sentence understanding procedure or problems in the meaning system.

- Difficulties with expressive semantics – Difficulties with expressive semantics could be due to difficulties with the meaning system or due to difficulties with the phonological output lexicon.

- Echolalia – The echolalia and better rote than semantic memory noted in PDD may be due to the individual bypassing the semantic system and using the lexical or sub-lexical repetition routes. This would suggest difficulty in the semantic system.

- Grammatical difficulties – The grammatical difficulties noted could either be due to difficulties with the sentence construction procedure or due to difficulties in the meaning/semantic system if the grammatical difficulties are due to difficulty with the conceptual aspects of grammar.

- Narrative difficulties – The narrative difficulties noted could be due to more structural language difficulties, possibly resulting from problems with the phonological output lexicon and sentence construction procedure. They, however, also could be due to difficulty with more central processes such as the meaning/semantic system or processes related to this.

- Pragmatic difficulties – As pragmatics involves the use of language in social context and difficulty at the level of the meaning system results in impairments using context, it would appear that the pragmatic deficits seen are possibly related to difficulty in the meaning system. Difficulty with paralinguistics and non-verbal

communication would suggest that possibly children with PDD process and use paralinguistic and non-verbal communication without accessing the meaning system, resulting in oddities in their understanding and use of these. Furthermore, the gestalt language learning style reported in PDD, which often results in verbal oddities in their language, would also appear to be due to them not accessing the semantic system, but rather using the lexical (from the auditory input lexicon to phonological output lexicon) or sub-lexical (via the acoustic-to-phonological conversation system) repetition routes.

- <u>Reading</u> – Hyperlexia, without good comprehension, and difficulty taking context into account when reading noted in some children with PDD, would appear to suggest use of the lexical and sub-lexical reading routes. This would seem to suggest difficulty at the level of the meaning system.

The one aspect that appears possibly to be affected in all the communication problems described above is difficulty at the level of the meaning system. It would appear that obtaining further information on the communication profiles of children with HFPDD and comparing them to another group of children with a different communication difficulty such as SLI would assist in determining where in this model the primary breakdown is likely to be.

2.3.4   <u>Considerations regarding interpreting developmental language difficulties using psycholinguistic models</u>

Bishop (1999) cautions about using a static, analytical framework for analysing impairments occurring within a developmental system. In developmental disorders the pattern of impairment may change over time, so that dissociations seen between components at a particular point in time may be misleading. It would appear, then, that when carrying out a study such as this one, one would need to look not only at the data obtained but also see this within the framework of what is already known about the disorder, taking into account that in a group study such as this, the disorder is only being viewed at one point in time.

Another caution is that due to the influence of top-down processes, it is often difficult to establish the direction of causation when deficits are seen (Bishop, 1999). For example, in this model expressive grammatical difficulties may be due to problems at the level of the sentence construction procedure, but may also be due to retrieval difficulties at the level of

the phonological output lexicon or due to conceptual grammatical difficulties (for example, difficulty with tense) resulting from problems at the level of the meaning system. One possible way to overcome this would be to compare two groups of children with different communication difficulties, hoping that the different manifestations of their different communication difficulties will provide insights into the different levels of possible breakdown.

Bishop (1999) cautions about interpreting differential deficit in studies, as the tests used may not always be easily comparable. Again comparing the research group to another group with communication difficulties as well as a typically developing group may be helpful. However, this caution does need to be taken into account in interpreting the results of the current study.

Another caution regarding the use of these models with developmental disorders is that in a developmental disorder an impairment at a particular stage of processing may affect all the processes occurring after this stage, unlike in acquired language difficulties in adults where it is easier to localize the impairment (Bishop, 1999). This would need to be taken into account in interpreting any communication difficulties in relation to this model.

A further caution is that models such as this focus on representational rather than processing deficits (Bishop, 1999). A child's ability to carry out a task may be affected by processing limitations, such as slow work speed, difficulty with resource allocation, difficulty coping with the rate of presentation, etc. It would appear that this could possibly be overcome by using a range of measures to assess a particular variable. Comparing the child's language results with their results on measure of cognitive processing would assist in determining whether aspects such as attention, memory etc. are affecting their performance. Used in this way, this may help to provide further insight into where in terms of a language processing model the primary difficulty is occurring.

Bishop (1999) stresses that despite the difficulties in applying cognitive neuropsychology to language impairment, we should continue to strive to understand psycholinguistic processes underlying different communication disorders. However, some methodological adaptations may need to be made. It would appear that in the present study comparing HFPDD to another group with a better understood impairment, i.e. SLI, as well as comparing communication difficulties to underlying cognitive and theory of mind difficulties may assist in this

endeavour. The following two chapters consist of a scrutiny of the cognitive processing and theory of mind accounts of the difficulties in PDD.

2.4   **SUMMARY AND CONCLUDING COMMENTS**

While much is known about the communication characteristics of PDD, there are still many unanswered questions regarding the exact nature of the communication difficulties seen in this population. For example, the exact nature of the comprehension difficulties noted is not understood. Furthermore, it is not known whether semantic difficulties increase with tasks tapping greater depths of meaning, nor whether the grammatical impairments noted are primary grammatical impairments or secondary to other processing aspects. It is also not known whether the narrative difficulties that have been noted in PDD are specific to this population. Moreover, a better understanding of how the pragmatic difficulties noted relate to these other communication difficulties is required.

It appears that there has been little attempt to understand the communication difficulties in PDD in terms of models of language processing. In this chapter, a processing model accounting for the verbal, paralinguistic and non-verbal aspects of communication is proposed in an attempt to understand better the communication characteristics of this disorder. In particular, how certain communication difficulties seen in children with PDD link to particular cognitive processing and theory of mind difficulties in this population appears to require further investigation. The next two chapters focus on the cognitive processing and theory of mind characteristics of PDD, in order to gain a better understanding of how these may link to the communication characteristics of this disorder.