Linguistic Disorders and Pathologies

An International Handbook

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Offprint

Walter de Gruyter · Berlin · New York
1993

67. Language Acquisition and Development in Persons with Mental Retardation

1. Introduction

The American Association on Mental Retardation defines mental retardation in terms of measured intelligence and adaptive behavior. Mentally retarded persons exhibit significantly subaverage performance on standardized general intelligence tests, two or more standard deviations from the mean, associated with significant deficiencies in the ability to meet "the standards of maturation, learning, personal independence, and/or social responsibilities that are expected for his or her age level and cultural group" (Grossman 1983, 11). Language is related to both aspects of this definition. It is common to think of measured intelligence in terms of a small number of information processing activities such as stimulus encoding, memory storage, memory retrieval, metacognitive activities, and reasoning (see Carroll 1976; Sternberg 1984). Persons with mental retardation exhibit deficiencies in virtually all domains of cognitive functioning (see Brooks/Sperber/McCauley 1984; Ellis 1979). To the extent that these abilities are necessary for language acquisition, then we would expect the development of language by mentally retarded persons to be delayed. Language is also important to the adaptive functioning of retarded persons. It is an important tool for taking in knowledge, conceptualizing the world, and thinking. It also gives children a useful method for controlling their environment (Jones/Robson 1979). Therefore, language acquisition and development has been one focus of research conducted with mentally retarded persons (see e.g. Rosenberg 1982; Schiefelbusch/Copeland 1968; Schiefelbusch/Lloyd 1974). This review will highlight this research. I will first review studies that examine the relationship between several components of linguistic performance and mental retardation, then focus on language functioning as it relates to several specific syndromes in mental retardation.

2. Elements of Language Acquisition

2.1. Phonology

Articulation problems are common in mentally retarded persons (see Fawcus/Fawcus 1974; Ingram 1976). In one study, the incidence of articulation disorders ranged from 65 to 95 percent across etiologies (Schlanger/Gottsleben 1957), with the highest incidence reported for Down syndrome individuals.

Dodd (1976) examined consonant errors in 10 mentally retarded children with Down syndrome, 10 retarded children without Down syndrome, and 10 nonretarded children. Groups were approximately matched on mental age (MA) (36 and 48 months) and social background. Mean chronological ages (CAs) were approximately 43 months in the nonretarded sample and 128 months in the retarded samples. Subjects took part in a picture naming task and a lexical imitation task. Despite extensive criticism levied against many of Dodd's procedures (see Rosenberg 1982), some conclusions seem reasonable. In the main articulatory error categories investigated – cluster reduction, production of consonant harmony, and simplification of the phonological system (see Smith 1973) – the Down syndrome subjects made more errors than the other two groups, who did not differ on any of the measures. Also, the Down syndrome subjects' errors did not conform to expectation based on the performance of the other mentally retarded subjects. However, it did not appear that this difference was a qualitative difference in language performance (cf. Rosenberg 1982).

Stoel-Gammon (1980) studied four retarded children with Down syndrome. Mean length of utterances (MLUs) ranged from 1.22 to 2.06 and CAs from 46 to 75 months. Approximately three hours of spontaneous speech were recorded for each child. Her analyses of consonant errors led her to conclude the following. First, the majority of errors made by her subjects were not due to an inability to produce the sounds. Her subjects could produce most of the English phonemes. Second, the errors were regular and predictable from adult forms. Third, the errors were similar to those reported in the speech of nonretarded children of similar MLUs.

To the extent that the findings of these studies generalize to other ability levels and etiologies, it appears that the development of the phonological system of retarded individuals is slower than that of nonretarded individuals. But, there does not appear to be a qualitative difference in phonetic processing.

2.2. Syntax

The development of syntax seems to be particularly difficult for persons with mental retardation. Mentally retarded individuals exhibit deficits in the understanding and production of grammatical structures (Bridges/Smith 1984; Kernan 1990), understanding various transformations (Cromer 1975), and mastering morphological structures (Dever 1972). Several examples are described in this section.

Bridges/Smith (1984) compared the ability of 24 Down syndrome children (mean CA = 11.1 years; verbal comprehension age range 2.5 to 5.2 years) with that of 24 nonretarded children (mean CA = 3.0 years; verbal comprehension age range 2.5 to 5.2 years). Children were required to act out events in eight active and eight passive sentences. Analysis of the relationship between the ability to act out sentences and verbal comprehension age revealed that the Down syndrome and nonretarded children exhibited similar performance curves. However, the performance of the Down syndrome children lagged behind their verbal comprehension age by about one year for active sentences and one-half year for passive sentences.

Kernan (1990) compared the comprehension of syntactically ordered sequence in 14 mentally retarded adults with Down syndrome (mean IQ = 56.0) and 14 without Down syndrome (mean IQ = 56.9). Subjects took part in three tasks. On Task 1, subjects manipulated objects in a sequence visually demonstrated by the experimenter. In Task 2, the visual demonstration was paired with a verbal description of the sequence and subjects were asked to verbally indicate what happened first. In Task 3, only the verbal description was provided. The sequences were either naturally or arbitrarily ordered. Both groups of subjects performed best on Task 1 and worst on Task 3. Although delayed, the retarded subjects' pattern of performance matched that of nonretarded children and adolescents. However, the non-Down syndrome subjects out-performed the Down syndrome subjects on every task and on 36 of the 40 sentences. So, while they performed in similar fashion, the Down syndrome subjects performed at a level below that of the non-Down syndrome subjects.

Abbeduto/Furman/Davies (1989) used the *Test for Reception of Grammar* (Bishop 1982) to examine the relationship between receptive language and cognitive development in individuals with mental retardation. Sixty school age mentally retarded subjects (IQ range 40 to 79) and 60 nonretarded subjects took part, with twenty subjects per group functioning at MA levels of 5, 7, and 9 years. In general, their results indicate that the receptive language of school age retarded children is below expectations based on MA. However, this deficiency did not hold up at every level of MA tested. The retarded subjects who had MAs in the 5 year range were performing at appropriate levels of receptive language, although the authors suggest that this finding may be specific to the test used.

The combined results of these studies are consistent with the general literature. Syntax development follows a similar pattern for retarded and nonretarded persons. However, the development of syntax is seriously delayed, even beyond expectations based on cognitive development. In addition, it appears that this delay may be greater for retarded persons with Down syndrome relative to those of other etiologies (e.g. Evans 1977; Kernan 1990).

2.3. Semantic Processing

Semantic processing is important for many aspects of linguistic competence. In this section I review studies that investigate three of these areas: (1) the understanding of semantic relations associated with the expression of simple sentences, (2) the acquisition of information about word meanings when novel words are presented in context, and (3) the content and organization of lexical memory.

The relative abilities of 12 mentally retarded and 12 nonretarded individuals to understand semantic relationships expressed in various verbal context was studied by Duchan/Erickson (1976). (Twelve language-disordered children also included will not be discussed.) The mentally retarded subjects had CAs of 48 to 93 months, IQs of 50 to 80, and a mean MLU of 1.67. The nonretarded subjects had CAs of 18 to 31 months, and a mean MLU of 1.56. The verbal contexts were telegraphic two-word speech (grammatical morphemes absent), expanded speech (gram-

matical morphemes present), and partially nonsensical speech. The semantic relations included agent-action, action-object, possessive, and locative. There were main effects associated with type of relation and type of utterance, but the mentally retarded and nonretarded subjects did not differ on either dimension. When matched on MLU, retarded and nonretarded children understood the semantic relations expressed in simple sentences in a similar manner. In addition, research has shown that this similarity extends to the analysis of spontaneous speech for subjects matched on MLU (Coggins 1979; Layton/Sharifi 1979).

A recent study examined the 'fast mapping' ability of mentally retarded children and MA-matched nonretarded children (Chapman/Kay-Raining Bird/Schwartz 1990). Fast mapping refers to the ability to acquire information about novel word meanings after limited exposure (usually once or twice) to the word in linguistic and event contexts. Subjects were 48 retarded individuals with Down syndrome (mean CA = 12.54 years; mean MA = 4.58 years) and 48 nonretarded children (mean CA = 4.16 years; mean MA = 4.71 years). They were approximately equal on vocabulatory comprehension, syntax comprehension, and expressive vocabulary. The subjects with Down syndrome exhibited an expressive language deficiency as evidenced by a fewer number of words, fewer different words, lower percent of complete and intelligible utterances, and a smaller MLU observed in a 12 minute narrative. In the exposure task, children were asked to hide objects that included an object with a novel referent ('koob'). Various tests of comprehension and production followed. There were no significant differences in the ability of Down syndrome and nonretarded children to: (1) infer that the object and novel referent were connected (i. e., they were willing to hide the object being referred to with the novel word), (2) comprehend the novel referent after one exposure, (3) recall where the novel object was hidden, and (4) produce the novel referent correctly when asked. Thus, the Down syndrome subjects exhibit fast mapping skills that were similar to expectations based on MA and exceeded expectations based on expressive language abilities.

The nature and organization of semantic memory has been the focus of a number of studies (e. g. Davies/Sperber/McCauley 1981; Merrill 1985; Sperber/Davies/Merrill/McCauley 1982; Sperber/Ragain/McCauley 1976). Sperber et al. (1976; Experiment 1) examined the availability of category information to retarded adolescents (mean IQ = 60; mean CA = 16.3 years; mean MA = 7.25 years) using a semantic priming procedure. In their version of the task, subjects labeled pictures of objects. Pictures were presented in successive pairs in which the objects were either categorically related to each other (e. g. dog-cow) or not related to each other (e. g. table-cow). When a picture is preceded by a picture of a categorically related object, the time to name the second picture of the pair is reduced. This 'priming effect' is assumed to reflect knowledge of the categorical relationship expressed in the two pictures (that of 'animalness' in the above example). In several studies, the magnitude of semantic priming exhibited by mentally retarded individuals has been found to be similar to that of nonretarded individuals (Davies et al. 1981; Sperber et al. 1976; 1982). The most detailed analysis of semantic priming indicates that the magnitude of the priming effect, and by inference knowledge of category relationships, is more related to MA than to CA (Sperber et al. 1982). But, even though mentally retarded individuals exhibit a knowledge of these category relationships, they often fail to access and use that information when it is prudent to do so (Sperber et al. 1976; Experiment 2), and when they do, they retrieve it less efficiently than do nonretarded persons (Sperber et al. 1982). It has been suggested that this latter result may be due to some general deficit in attentional processing (see Merrill 1985; Sperber/McCauley 1984).

The research findings across these three aspects of semantic processing are consistent with those reported for phonetic and syntactic differences of retarded and nonretarded individuals. Semantic development follows the same general pattern, albeit delayed, for mentally retarded and normally developing individuals.

2.4. Communication Skills

It is known that mothers of nonretarded children adjust their speech to the level of their children (cf. Snow 1977). Several studies have been conducted to determine whether mothers of mentally retarded children also adjust their level of speech in this fashion (e. g. Cunningham/Reuler/Blackwell/Deck 1981; Peterson/Sherrod 1982; Rondal 1978). One intent of these studies was to determine if lower

quality verbal interactions between mothers and retarded children may inhibit their children's language development. However, when subjects are matched on MLU, mothers of retarded and nonretarded children are similar on most syntactic, semantic, and pragmatic features of language (see e. g. Rondal 1978). The few longitudinal investigations that have been conducted also suggest that the adjustments in speech that mothers do make to their retarded children are systematically related to changes in the children's language and general level of cognitive functioning (e. g. Mauer/Sherrod 1987; McConkey/Martin 1984).

In spite of the similarities in the communication styles exhibited by mothers of retarded and nonretarded children, some important differences exist. Mothers of retarded children are more dominant and directive in their communicative style and generally less responsive to the communicative behavior of their children (Cunningham et al. 1981; Mahoney/Robenalt 1986). But, this difference in style may be related to the communicative responsiveness of the retarded children (Jones 1977; Mahoney/Robenalt 1986; Mauer/Sherrod 1987). Mentally retarded children are generally less active communicators, do not initiate communication as frequently, and exhibit poor timing in turn-taking interactions with their mothers than developmentally matched nonretarded children (Fischer 1987; Jones 1977). However, with mentally retarded children who are more active and responsive in their own communication styles, mothers are much more responsive and less dominant and directive (Mahoney 1988; Mahoney/Robenalt 1986). Whether such differences in communication style impact upon the language development of their children is a current topic of investigation (Hoff-Ginsberg 1986; Yoder 1989; Yoder/Kaiser 1989).

Researchers have also investigated general communication skills of mentally retarded children and adults. The results of most studies suggest that functional communication skills of mentally retarded persons are at least on par with and may exceed expectations based on measured verbal abilities (e. g. Abbeduto/Rosenberg 1980; Bedrosian/Prutting 1978; Coggins/Stoel-Gammon 1982; Leifer/Lewis 1984; Price-Williams/Sabsay 1979).

Leifer/Lewis (1984) compared the conversational response skills of one group of nonretarded subjects (mean CA = 20.8 months; mean MLU = 1.25) with a group of retarded subjects matched on CA (mean CA = 20.5 months) but not on linguistic ability (MLU = 0), and with a group of retarded subjects matched on MLU (mean MLU = 1.12) but not on CA (mean CA = 4.0). Children were taped in free play interactions with mothers. Children's responses (verbal and nonverbal) were coded as appropriate if the response matched the pragmatic intent of mothers' questions, inappropriate if they did not, and indeterminate if they were unclear. The CA-matched retarded subjects were seriously deficient in their ability to appropriately respond to mothers' questions, whereas the MA-matched retarded subjects exhibited greater conversational response skills than the nonretarded subjects.

Bedrosian/Prutting (1978) examined the communicative competence of mentally retarded adults in four conversational settings: conversations with a speech-language pathologist, with peers, with parent/guardian, and with a six-year-old nonretarded boy. The subjects were three males and one female (CAs 23–28 years; IQs 29–39). The researchers recorded conversations in each setting over a three month period. They were primarily interested in the conversational relationships of the mentally retarded in terms of the dimensions of dominance-submission and control across the various settings. Only one of the subjects ever assumed the dominant position in the conversations and was only able to do so in conversations with peers and the child. With respect to control, the authors found that the retarded individuals generally used similar types of control to those used by nonretarded adults. However, it was also noted that there were individual differences in the types and frequencies of control used by the retarded adults. Finally, all of the subjects were able to use requests for restatement to signal when a communication breakdown had occurred.

Price-Williams/Sabsay (1979) recorded conversational interactions of nine institutionalized Down syndrome men (CA = 29 to 49 years; IQ = 17 to 26). Their communicative activities were reported to be very effective. In summarizing 15 hours of recorded conversations between the subjects and each other and the subjects and members of the hospital staff, the authors reported a wide range of communicative skills exhibited by their subject including, for example, greeting exchanges, appropriate turn-taking behaviors, and effective linguistic and nonlinguistic

strategies for securing the attention of their intended listener. Their subjects were also able to modify conversational styles to prevent and correct failures in communication.

These selected studies reveal a general asymmetry between communicative competence and linguistic competence for mentally retarded persons. Communicative competence appears to be greater than expected based on linguistic competence. However, recent data suggests that this advantage may not extend to all aspects of communication. Mundy/Sigman/Kasari/Yirmiya (1988) found that young children with Down syndrome exhibited nonverbal social interaction skills that exceeded their measured MAs, but were deficient relative to MAs in making nonverbal requests for objects or assistance with objects. It may be important to try to evaluate patterns of strengths and weakness in the communicative competence of mentally retarded persons.

3. Specific Syndromes

Persons with mental retardation are not a homogeneous group. Mental retardation is the result of a variety of etiologies. All of these conditions do not lead to identical patterns of cognitive performance. Therefore, some discussion of how language differences manifest themselves in specific syndromes resulting in mental retardation is important. In this section I consider three syndromes: Down syndrome, fragile-X syndrome, and Williams syndrome.

3.1. Down Syndrome

Down syndrome is a chromosomal abnormality resulting from the presence of extra chromosomic material in the body (from chromosome 21). The maximum level of cognitive functioning expected for most is an MA of approximately 4–5 years. Down syndrome individuals also exhibit physical symptoms that may be associated with defective speech. Abnormalities include a larynx located too high in the neck, an edematous tongue that groves improperly for several speech sounds and is impaired in motility, and undersized mouth cavity, a protruding tongue, and hypotonia of the speech muscles (Benda 1949; Buddenhagen 1971). They also exhibit a high incidence of auditory problems, the major cause of which is otitis media (Balkany 1980).

Language development, although delayed, is quite similar for Down syndrome and normally developing children. Menn (1985) has reported that phonological development is seriously delayed in individuals with Down syndrome. However, the sequence of development parallels that of normal children. Share (1975) observed a one-year delay in the onset of meaningful one-word utterances, but the number of words that could be understood and used was comparable to MA matched nonretarded children (Mein/O'Connor 1960). When they begin to combine two and three words in an utterance, they understand the same relational meanings as normally developing children matched on MLU (Layton/Sharifi 1979). A conclusion of many reviews is that there is no compelling evidence of qualitative differences in language development between Down syndrome and normally developing children (Bloom/Lahey 1978; Kiernen 1985; Rosenberg 1982).

Despite similarities in the acquisition of language by children with and without Down syndrome, there is a growing belief that the conclusion of language delay without deviance is not entirely correct and may be misleading (see Fowler 1990; Rondal 1988). Fowler (1990) argues for a specific syntactic deficit associated with Down syndrome, and points to a literature that indicates deficits in syntax that far exceed expectations based on general cognitive functioning (e. g. Thompson 1963; Wisniewski/Miezejeski/Hill 1988). Even in the domain of communication there appear to be asynchronies with respect to different aspects of the communication system. Lexical difficulties are less severe than syntactic difficulties (Evans 1977; Hartley 1982) and functional communication skills are often much greater than verbal ability (e. g. Coggins/Carpenter/Owings 1983; Scherer/Owings 1984).

Fowler suggests that while general descriptions of language may be similar for retarded persons with and without Down syndrome, the reasons for their language delays may not be. Non-Down syndrome individuals may be limited by general intellectual ability. Down syndrome individuals may be limited by a specific language deficit (cf. Fowler 1990).

3.2. Williams Syndrome

Williams syndrome is a rare metabolic disorder associated with moderate to severe mental retardation (Williams/Barrett-Boyes/Lowe 1961). Features of the syndrome include a narrowing of the aorta, and an unu-

sual facial structure consisting of a stellate or 'starlike' pattern in the iris, medial eyebrow flare, an upturned nose, and thick lips with an open mouth posture (Jones/Smith 1975). However, despite impairments in intellectual functioning, delays in attaining motor milestones, and early delays in language development (Thal/Bates/Bellugi 1988), older individuals with Williams syndrome exhibit a surprising facility with linguistic processing (Bellugi/Marks/Bihrle/Sabo 1988) and verbal IQ scores significantly greater than performance IQ scores (Udwin/Yule/Martin 1986).

Bellugi et al. (1988) report on three Williams syndrome children. Their CAs were 11, 15, and 16 years, and full scale IQ scores were approximataly 50. They could not perform tasks that would have placed them in Piaget's stage of concrete operations. They appeared particularly deviant on tests of spatial cognition. Their scores were low on tasks of spatial orientation, spatial arrangement, and drawing. However, they were able to quickly and accurately recognize and discriminate unfamiliar faces. So, even within the visual/spatial domain some aspects of cognition were less deviant than expected.

The most striking aspect of the cognitive performance of these children was their facility with language. Bellugi et al. report vocabularies that far exceed MA expectations (age-equivalent scores of 9.0 to 11.7 years) and MLUs ranging from 8.6 to 13.1. Down syndrome individuals of similar MAs exhibited MLUs of 3.0 to 3.5. Bellugi et al. describe the expressive language of older Williams syndrome children as "complex in terms of morphological and syntactic structures including full passives, embedded relative clauses, a range of conditionals and multiple endings" (Bellugi/Marks/Bihrle/Sabo 1988, 183). On tests of grammatical comprehension, the children consistently performed at levels that exceeded MA expectations, and exhibited a high degree of metalinguistic ability in making judgements of grammaticality.

Research on individuals with Williams syndrome is relatively new. A longitudinal profile of the acquisition and development of language in these individuals should prove interesting.

3.3. Fragile-X Syndrome

Fragile X syndrome is a recently identified chromosome abnormality that primarily affects males. Most males affected with fragile X syndrome exhibit a large head circumference in infancy, long ears, a large lower jaw, and testicular enlargement in postpubertal males (Sutherland/Ashforth 1979; Turner/Frost 1980). The majority function in the moderately retarded range, although retardation can be severe. Females may be affected, but the degree of their retardation is often less severe.

Paul/Cohen/Breg et al. (1984) reported on three adolescents with fragile X syndrome. They had CAs of 13.75, 10.5, and 10 years and nonverbal IQs of 40, 50, and 70. MAs were 5.5, 5.25, and 7 years. Subjects were given a battery of speech and language evaluations, including an analysis of spontaneous speech. All children exhibited poorer performance on tests of productive syntax than on tests of receptive language, difficulties in articulation when using connected speech despite performing well on single words in tests of articulation, and poor vocal imitation performance.

Sudhalter/Cohen/Silverman/Wolf-Schein (1990) compared the linguistic performance of 9 retarded males with Down syndrome (mean CA = 13.9), 12 with fragile X syndrome (mean CA = 15.65), and 12 with autism unrelated to fragile X (mean CA = 11.75). Mean scores on the Vineland Adaptive Behavior scale ranged from 50.75 to 56.33 across groups. Communication domain age equivalent scores ranged from 5.33 to 5.88. Socialization age equivalent scores were 8.34 for the Down syndrome, 6.15 for the fragile X, and 3.80 for the autistic subjects. Subjects were videotaped in a 30 minute session that consisted of 10 minutes of free play, 10 minutes of interaction with a familar adult, and 10 minutes of interaction with an unfamiliar adult. The males affected by fragile X exhibited language that was different from both the Down syndrome and the autistic individuals. The fragile X subjects engaged in more deviant language than the Down syndrome subjects, and the deviant language of the fragile X subjects was distinctly different from the language of the autistic subjects.

Wolf-Schein/Sudhalter/Cohen et al. (1987) also reported that subjects with fragile X exhibited more jargon, echolalia, and perseveration in their speech than did subjects with Down syndrome. However, it is not clear from these data whether this is a pattern of deviance that is specific to fragile X syndrome or simply a pattern that distinguishes it from Down syndrome. A comparison with other etiologies will be required before this issue can be resolved.

4. Summary

The research discussed here indicates that mentally retarded individuals exhibit serious deficiencies in the development of language in general, with the most severe difficulties associated with the development of syntax. However, it is clear that many persons with mental retardation exhibit very effective general communication skills. There is currently some debate as to whether or not individuals whose retardation is the result of different etiologies also exhibit diverse patterns of language development. It may be informative to examine specific patterns of language deficits as they relate to specific syndromes that result in mental retardation. But it is important to recognize that searching for language characteristics that are specific to every syndrome that results in mental retardation may not be fruitful given the variability of language skills observed both within and across etiologies (Rondal 1988).

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