Journal of Speech and Hearing Research, KAMHI & JOHNSTON, *Volume 25*, 435-445, September 1982

TOWARDS AN UNDERSTANDING OF RETARDED CHILDREN'S LINGUISTIC DEFICIENCIES

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The purpose of this study was to provide a more accurate description of the language performance of retarded children and, by doing so, to understand better how the general mental handicap affects language learning. Subjects were a group of 10 retarded children matched for MA to a group of 10 normal children and 10 language-impaired children. Various syntactic and semantic analyses were performed. The results indicated that the retarded group's language abilities were essentially comparable to those of the normal group, though differences between these groups were found. Notably, the retarded children did not demonstrate the same linguistic deficiencies as the language-impaired children. It was suggested that the MA-inconsistent language behaviors exhibited by the retarded children were quantitative in nature rather than qualitative and as such seemed to reflect deficits in adaptive (i.e., social) and motivational behaviors rather than deficits in linguistic or cognitive abilities.

There is some disagreement in the literature concerning the nature of the language deficiencies exhibited by mentally handicapped persons (Lackner, 1968; Naremore & Dever, 1975; Newfield & Schlanger, 1968). Are these linguistic deficits related to cognitive level, linguistic level (e.g., MLU), or some other variable? Lenneberg (1967) provided the initial stimulus for research in this area by arguing that the language of retarded children differed quantitatively from that of nonretarded children. The quality of retarded children's language, however, was claimed to be relative to mental age (MA). That is, the language development process for the retarded child is the same as it is for the normal child, except that it takes more time.

Lenneberg's "quantitative" view has often been interpreted to be consistent with the strong cognition hypothesis that developments in language are contingent upon developments in cognition. This need not be the case, however, for the language of retarded children could still differ quantitatively from that of normal peers but at the same time be inconsistent with cognitive level. In recent years, researchers (e.g., Bowerman, 1976; Cromer, 1976; Wells, 1980) have proposed that a weak form of the cognition hypothesis, alternatively labeled an *interactionist hypothesis,* best describes the relationship between cognition and language development. This hypothesis acknowledges not only the influence that cognition and language have on each other's development, but also the importance of social factors and specifically linguistic capabilities on language development. The hypothesis predicts that not all retarded children will be affected in the same way by the general mental handicap or cognitive deficit, thus allowing for quantitative as well as qualitative differences in their language.

The literature contains various descriptions of the linguistic systems of retarded children (Coggins, 1979; Duchan & Erickson, 1976; Fowler, Gelman, & Gleitman, 1980; Graham & Graham, 1971; Lackner, 1968; Miller, 1981; Naremore & Dever, 1975; Newfield & Schlanger, 1968; Semmel, Barritt, Bennett, & Perfetti, 1967). The data leave little doubt that retarded children do not demonstrate the same linguistic behaviors as normal children of the same chronological age. In addition, despite varying methodologies, the results of the majority of these studies indicate that retarded children use normal linguistic forms and do not produce highly unusual or bizarre language forms, such as word reversals, novel syntactic constructions, and verb inflections applied to nouns.

This literature has been variously interpreted to support either the quantitative or the qualitative view of the language performance of retarded children. For example, the studies by Lackner (1968) and Graham and Graham (1971) have been used to argue that the development of retarded children's linguistic systems is consistent with MA (quantitative view), whereas those by Newfield and Schlanger (1968) and Semmel et al. (1967) have been used to argue that language learning is delayed over and above the level predicted by MA (qualitative view). As previously indicated, however, MA-inconsistent language behaviors need not be qualitative in nature.

In addition to the lack of agreement about the exact nature of the language differences between retarded and normal children, three other factors have influenced the literature on retarded children's language: (a) the types of language measures used, (b) heterogeneity of the retarded children selected for study, and (c) the way in which language performance was compared to general cognitive level. Each of these factors and the steps taken to deal with them are considered in turn.

0022-4685/82/2503-0435$01.00/0

Types of Language Measures

It is often assumed incorrectly that comparable language performance in one language domain signifies that the language abilities of retarded children are similar to those of younger normal children across all language domains. It might be, however, that the overall language patterns of retarded children are unlike those of any younger normal child. A recent report by Fowler et al. (1980) addressed this point. Phrase structure rules, grammatical morphology, and type-token ratios were examined in four 11-13-year-old Down's syndrome and four MLU-matched 2½-year-old normal children. Although the authors emphasized the similarities between these groups of children, differences were uncovered by all the language measures. The differences suggest that the language level of these retarded children was slightly above that of MLU-matched controls and slightly below the level expected for their MA of 6–7 years.

In the current investigation, descriptive linguistic procedures which measured the development of both the semantic and syntactic systems of retarded children were used. The semantic measures assessed developing propositional complexity, whereas the syntactic procedures assessed knowledge of both base syntactic rules and grammatical morphology. The use of sensitive semantic and syntactic measures provides a more accurate description of the linguistic systems of retarded children than those provided in studies which used gross linguistic measures (e.g., screening tests) and did not assess the development of both the semantic and syntactic systems.

Effects of Subject Selection

The second factor is the heterogeneity of the retarded children studied. Conceivably, the relationship between language learning and the mental handicap is affected by factors such as etiology, severity of the retardation, educational placement, and age. For example, one might predict that a genetically based etiology and severe retardation would adversely affect language learning. Most attempts to find consistent relationships among these variables, however, have met with little success (e.g., Miller, 1981). We were not specifically concerned in this study with the effects these factors have on retarded children's language, so we controlled for their potential influence by selecting a relatively homogeneous group of retarded children. These children were enrolled in one of two EMR public school classrooms and none showed evidence of a genetically based syndrome.

Comparing Language Performance and Cognitive Level

The most common procedure used to compare language performance with cognitive level has been to match retarded and normal children for MA. However, the use of MA (psychometric tests) as an indicator of general cognitive level has been criticized by Zigler (1969) and Balla and Zigler (1971). Their contention is that a child's general cognitive level includes not only abilities assessed by psychometric tests but abilities assessed by nonstandardized Piagetian-like tasks as well. Zigler also reminds us to consider the influence of motivational and emotional factors in a child's test performance. Given that MA might not provide an accurate indication of a child's general cognitive level, studies finding the language performance of retarded children inconsistent with MA should be interpreted cautiously. Language development might be consistent with general cognitive level but not with MA.

Miller (1981) compared cognitive level, as determined by Piagetian tasks, to language performance in 42 retarded children. Based on a preliminary analysis of the data, he reported considerable differences in the retarded children's patterns of cognitive and language performance. In the most common pattern (35.7%), children exhibited the same cognitive and expressive and receptive syntactic-semantic abilities. Eight other patterns also occurred; in most of these patterns, one or more language abilities were delayed relative to the child's assigned cognitive level (e.g., sensorimotor, preoperational, or operational). Miller's data clearly indicate that cognitive level is not the sole determiner of language performance, and thus support the interactionist hypothesis.

Another way to determine the effects of the mental handicap on language performance is to obtain some measure of cognitive level and match subjects for MLU rather than cognitive level. As noted earlier, Fowler et al. (1980) followed this procedure. Although these authors did not address this issue, their data clearly showed some inconsistency between the retarded children's cognitive and linguistic levels.

In the present investigation the effects of the mental handicap on language performance were evaluated in a somewhat novel way. Using the Arthur adaptation of the LIPS (1952) to assess MA, the language abilities of retarded children were compared both to a group of MA-matched normal children and to a group of MA-matched language-impaired children who had nonverbal performance scores within normal limits. To our knowledge, this three-way matching procedure was used only once before, in a study by Ratusnik and Koenigsknecht (1975). They found that the retarded children demonstrated significantly poorer receptive language abilities than the other two groups and expressive language abilities which were similar to the language-impaired children. Unfortunately, these findings were limited by the fact that the language comparisons were based solely on the performance on a language screening test, *The Northwestern Syntax Screening Test* (Lee, 1969).

In addition to a standardized measure of MA, data from six nonstandardized Piagetian tasks assessing nonlinguistic symbolic and conceptual skills were available for the three groups of children in the present study. These data, reported in a previous study (Kamhi, 1981), indicated that the retarded and normal groups exhibited similar cognitive abilities in these areas. All the retarded and the normal-language subjects demonstrated considerably better performance levels than the language-impaired children, particularly on tasks which involved nonlinguistic symbolic skills, such as the Haptic Recognition task.

The standardized and nonstandardized measures of cognitive level plus the three-way matching procedure improve on the previous methods used to evaluate the influence of the mental handicap on language development. In particular, the inclusion of the language-impaired children enables us to distinguish between linguistic deficits which are due to the general mental handicap and those which are not.

The overall purpose of the present study, then, was to evaluate further the way in which the general mental handicap of retarded children affects language learning. In doing so, we assessed the validity of the interactionist hypothesis and its prediction that there should be some inconsistencies between the language performance of retarded children and their general cognitive level. In addition to determining whether or not these inconsistencies are quantitative or qualitative in nature, we also considered whether or not these children's language learning lags behind other areas of development to such an extent that it constitutes a special deficit, over and above that predicted by the general mental handicap.

Towards these ends, two general research questions were asked:

1. Do retarded and normal children matched for MA have similar syntactic and semantic abilities?
2. Do retarded and language-impaired children matched for MA have similar syntactic and semantic abilities?

Six specific research questions based on the linguistic variables described in the next section were used to address these two general research questions:

1. Does MLU significantly discriminate among groups?
2. Does total *Developmental Sentence Score* (DSS, Lee, 1974) significantly discriminate among groups?
3. Do any of the eight DSS grammatical categories significantly discriminate among groups?
4. Do measures of grammatical marker use significantly discriminate among groups?
5. Do measures of propositional complexity significantly discriminate among groups?
6. Is there a relationship between each group's facility in encoding grammatical markers and the propositional complexity of utterances? If so, is this relationship similar for each group?

METHOD

Subjects

The subjects were three groups of children, 10 in each group, representing retarded, normal-language, and language-impaired children. All subjects were selected from the public school system, preschool centers, and speech-language and hearing centers in southern Indiana. None of the normal-language children had any history of speech, language, or hearing problems, and all performed within normal limits on the *Leiter International Performance Scale*. The retarded children were all enrolled in EMR classrooms. Case histories and teacher reports revealed no evidence of a genetically based syndrome in these children. In addition, no retarded child was enrolled in speech-language therapy at the time of testing or during the year prior to testing.

The language-impaired children were previously diagnosed by a certified speech-language pathologist as having a primary language disorder. These diagnoses were supplemented by test scores from one or more standardized measures of expressive and receptive language, such as the *Carrow Elicited Language Inventory* (Carrow, 1974), the *Northwestern Syntax Screening Test*, (Lee, 1969), and the *Zimmerman Preschool Language Scale* (Zimmerman, 1969). These tests indicated that expressive and receptive language abilities were at least one year delayed in each of these children (see Table 1). Finally, based on clinician reports and case history forms, the language impairment in these children was thought not to be the result of globally depressed intellectual functioning, severe emotional disturbances, hearing loss, or physical defects.

TABLE 1. Standardized test scores for language-impaired subjects.

Instrument	*Score*	*Subjects*
Northwestern Syntax Screening Test	below 10%	1, 7
Carrow Elicited Language Inventory	below 1%	2, 3, 5, 9
Zimmerman Preschool Language Scale	2:10 3:0	4 (MA 4:9) 6 (MA 4:10)
Developmental Sentence Scoring	below 10%	8, 10

The three groups of children were matched for MA based on their performance on the Leiter. Subjects from the three groups were individually matched for MA, so that the difference between each subject pair in a triplet did not exceed ±3 months, which is the difference that passing or failing one more task on the Leiter would make. The means and standard deviations for each group's IQ, CA, and MA are shown below in Table 2. It

TABLE 2. Group means and standard deviations (*SD*) for chronological age (CA), mental age (MA), and IQ.

	MA (months)		*CA (months)*		*IQ*	
Group	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Retarded	62.4	6.46	99.4	7.58	63.1	8.18
Normal	61.1	5.58	58.3	3.20	104.5	9.54
Language-impaired	60.6	6.45	59.3	6.01	104.3	10.34

should be noted from this table that the normal and language-impaired children were well within normal limits for nonverbal MA.

Sampling Procedures

Spontaneous language samples were obtained from each child in three situational contexts: (a) while playing with a Sesame Street house, (b) while viewing a children's picture book of stories, and (c) while performing various cognitive tasks. From each child's corpus, a sample of approximately 100 utterances reflecting base syntactic relations was designated for linguistic analysis according to the following selectional and segmentation criteria:

1. One-word utterances and simple labeling responses were excluded.
2. Elliptical question responses not containing a surface subject and predicate were excluded.
3. One utterance repetition was permitted if the two identical utterances were not spoken consecutively.
4. Compound sentences were treated as one utterance if they were marked as such by intonation, but only one clause-conjoining *and* was permitted per utterance.

These criteria were also used in the computation of MLU values.

Some discrepancies arose in the samples obtained from the three groups of children. In particular, the retarded children's samples generally contained a higher proportion of language elicited from the story-telling condition than from the other two elicitation conditions. In contrast, the normal and language-impaired children's samples typically contained higher proportions of language from the other two conditions than from the story-telling condition.

Syntactic Measures

Two approaches were used to assess the syntactic maturity of children's utterances, the *Developmental Sentence Scoring* (DSS) procedure (Lee, 1974) and nonstandard measures of grammatical marker use. The DSS procedure is derived from a cross-sectional study of 200 children between the ages of 2 and 7 and provides a standardized quantitative measure of the syntactic complexity of children's sentence structure. The DSS was standardized on samples of 50 utterances, so the same number of utterances was used in our DSS analyses. The 50 utterances were selected from both the play and story-telling contexts, while meeting the usual constraint of consecutiveness. Note that for the retarded children, essentially all the language they produced during the freeplay context was included in the 50 utterances used for the DSS analyses.

In addition to the total DSS scores, three other types of DSS-related measures were calculated for each of the eight grammatical categories (indefinite pronouns, personal pronouns, main verbs, secondary verbs, negatives, conjunctions, interrogative reversals, and Wh questions). The first measure, *total weighted score* (TWS), was obtained by summing all the weighted scores per grammatical category. The second measure, *mean weighted score* (MWS), equalled the average weighted score value for each grammatical category. For example, a child who produced 15 Level 3 indefinite pronouns and two Level 7 indefinite pronouns would obtain a TWS of 59 ($15 \times 3 + 2 \times 7$) and a MWS of 3.47 (59/17). The third measure reflected the proportion of errors made by the children in their attempts to use members of each grammatical category. For example, a child might err 20% of the time in attempting to produce grammatically correct main verb structures.

The DSS procedure is designed to provide a global estimate of children's language abilities in ways that reflect both the ideational complexity of utterances and the surface forms used to express these ideas. Because one of the goals of our study was to make comparisons across linguistic domains, a more selective and different measure of surface grammaticality was needed to supplement the DSS procedure. The forms we chose to examine were a group of grammatical markers which have obligatory contexts and can differentiate between grammatical and nongrammatical utterances at any given level of ideational or propositional complexity. These forms included noun and verb inflections, the auxiliary system (excluding modals), the copula *to be,* infinitive markers (excluding the reduced catenative forms), and the complementizer *that*.

Two measures were calculated, a *Grammatical Marker Need Index* (GMN) and a *Grammatical Marker Error Index* (GME). The GMN was derived by dividing the total number of obligatory contexts for grammatical markers by the number of surface sentences in the sample. This index indicated the average number of grammatical markers required per utterance. The GME simply reflected the proportion of errors a child made producing these forms. These two measures both made use of the larger 100-utterance sample rather than the smaller DSS sample. The unit *surface sentence* essentially corresponded to that of the utterance; it is defined more completely in the next section.

Semantic Measures

Our semantic assessment tools were derived from the framework of generative semantics as formulated by Parisi and Antinucci (1976). This method of linguistic analysis begins with the underlying propositional meaning of an utterance rather than with its surface form. *Propositions* are judgments about the states of objects or the happenings and relationships between objects. Propositions are thus idea units composed of two parts: The judgment—or predicate—and one or more objects—or *arguments*. Predicates inherently involve different numbers of arguments, depending on their meanings. The predicate *big,* for example, is an attributive judgment about a single object, whereas the predicate *on* is a spatial judgment about the relationship between two objects. Meaning also determines the specific nature of the arguments. Some predicates concern ideas and events; others concern things. The predicate *again*, for example, involves only one argument, but that argument is an event and hence is itself a proposition. Individual propositional judgments can thus be combined into larger networks of thought.

Once one proposition in a network is designated as the focal point or *nucleus*, other types of predicates may be defined according to their distinct hierarchical relationships to the nuclear proposition. Three general types of "nonnuclear" propositions are possible:

1. *Adverbial* propositions, which take the entire nuclear proposition as one of their arguments (e.g., "She ate lunch *in* the kitchen").
2. *Embedded* propositions, which function as arguments of the nucleus (e.g., "I told John to *play* tennis").
3. *Associated* propositions, which have an argument that is also an argument of some other proposition in the network (e.g., "The *red* moped is coming").

Propositions relate to sentences in complex ways. Although we can express propositional judgments in language, there are few one-to-one relationships between parts of propositions and specific syntactic units. Predicates, for example, may be expressed via many form classes: prepositions, adverbs, main verbs, embedded verbs, adjectives, modal verbs, or conjunctions. Likewise, the length of surface sentences has no direct relationship to their underlying propositional structure. "John read the book again" and "The soup needs salt" each have five surface morphemes (using child language research conventions), but the first sentence encodes two propositions and the second, only one. The task of the speaker is to formulate sentences which make ideas and the relationships between them both clear and pertinent to the listener. It should be clear from the examples cited above that the same underlying propositional network may yield different sentences, depending on the needed emphasis of a particular moment. A full technical treatment of propositional analysis lies beyond the scope of this report, but this brief review should explain our primary semantic variables.

Two types of semantic measures were actually calculated. First, for each 100-utterance sample, a *Propositional Complexity Index* (PCI), which reflected the mean number of nonnuclear propositions per surface sentence, was calculated. This measure indicated the number of propositional judgments that each child typically combined or conflated into a single utterance. Although we were not concerned with the particular syntactic structure of utterances, we were interested in the child's ability to use some sort of syntactic "glue" to join propositions. The conjunction *and*, though it may serve this purpose, does so with such a total lack of syntactic constraint that we decided to separate all clauses linked by *and* and treat them as independent utterances. With this one exception, the unit *surface sentence* corresponded to the unit utterance.

For the second type of semantic measure, we determined the distribution of nonnuclear propositions across the three major types of network relations—adverbial, embedded, and associated relations—again as a function of the surface sentence unit. For both semantic analyses, the finite verb (the one marked for tense) was assumed to be the nucleus.

Reliability

All samples were assigned DSS-weighted scores by two independent judges, the first author and a psychometrist who had prior experience with this measure. Interjudge agreement for each sample ranged from 93.5% to 96.4%. Disagreements were resolved through discussion or by correspondence with Lee.

A reliability measure for the *Propositional Complexity Index* was obtained through the independent coding of three samples by each of the authors. Interjudge agreement for the required 572 decision points was 93.7%. Disagreements were again resolved by discussion.

Finally, a trained graduate student in speech-language pathology compared the original transcriptions and scoring of the grammatical marker measures on one sample from each group of children. The student found agreement on 93.7% of the words transcribed and 94.8% on scoring of the grammatical markers.

RESULTS

Utterance Length

The first analysis looked at differences in utterance length across the three groups. A one-way analysis of variance indicated significant differences in the three groups' utterance lengths, as indicated by MLU: $F(2, 27) = 24.24$, $p < .001$ (EMR = 7.78, normal = 6.40, language-impaired = 4.82). A Scheffe post hoc analysis ($p < .05$) revealed significant differences in favor of the retarded group over both the normal and language-impaired groups.

Any one of several factors could have led to the longer utterances produced by the retarded children, including the increased use of grammatical markers, propositions, and/or words not in these domains such as intensifiers and prepositional phrases. The importance of the first two of these factors was addressed in the presentation of the grammatical marker indices and propositional measures.

DSS Analyses

The first DSS-related analysis compared the composite DSS total scores of the three groups. A one-way analysis of variance indicated significant differences among groups: $F(2, 27) = 28.46$, $p < .01$. The Scheffe multiple comparison procedure found that both the retarded and normal groups obtained significantly higher DSS total scores than the language-impaired group. The composite DSS scores can be seen in Table 3. They are listed with

TABLE 3. Total and mean weighted scores (TWS, MWS) for each DSS category and for DSS total score by group.

Group		*DSS (Total score)*	*IP*	*PP*	*MV*	*SV*	*NEG*	*CON*	*IR*	*WH*	*SP*
TWS											
Retarded	Mean		42.6	103.7	111.1	24.4	15.0	65.5	6.6	3.9	38.4
	SD		21.3	26.9	25.6	15.3	10.0	34.2	8.4	7.6	6.4
Normal	Mean		63.2	80.5	115.3	30.8	30.1	62.2	28.6	18.0	41.6
	SD		25.0	17.2	19.3	17.9	20.2	28.8	19.1	8.7	3.6
Language-impaired	Mean		42.7	65.2	44.8	12.1	11.6	15.0	4.4	9.9	16.0
	SD		20.6	25.8	20.6	8.0	10.8	14.8	7.7	10.6	3.8
MWS											
Retarded	Mean	8.24	1.73	1.86	1.91	3.99	5.27	4.03	2.71	1.00	
	SD	1.68	.34	.21	.24	1.17	1.14	.85	2.94	1.33	
Normal	Mean	9.47	1.87	1.62	2.10	3.56	4.30	5.69	3.86	2.96	
	SD	1.85	.33	.22	.29	1.10	1.79	1.12	1.43	.88	
Language-impaired	Mean	4.43	1.84	1.76	1.95	2.81	3.72	3.39	1.10	2.22	
	SD	1.01	.35	.22	.58	.78	2.05	2.73	1.02	1.41	

Note. IP = indefinite pronouns, PP = personal pronouns, MV = main verbs, SV = secondary verbs, NEG = negatives, CON = conjunctions, IR = interrogative reversals, Wh = Wh questions, and SP = sentence point.

the mean weighted scores (MWSs) since they represent the average total weighted score (TWS) per utterance.

The next set of analyses attempted to identify the specific DSS grammatical categories which contributed to the group differences found in total DSS scores. Table 3 presents the group means for TWS and MWS for each of the eight DSS categories. The TWS for sentence point (SP) is also displayed. Recall that TWS is the sum of all the weighted values earned within a category, and MWS indicates the average developmental level of forms correctly produced.

The TWSs and MWSs obtained by the three groups were compared using analyses of variance and the Scheffe multiple comparison procedure. Group performance for each hypothesis, one involving TWS and the other MWS, was tested at $p = .09$, such that each of the nine one-way analyses of variance per variable were tested at an alpha level of .01. Post hoc comparisons were made at the .05 significance level. These analyses are presented in Tables 4 and 5.

As can be seen in Table 4, six of the TWS comparisons reached significance among groups: personal pronouns, main verbs, conjunctions, interrogative reversals, Wh questions, and sentence point. From Table 5, it is clear that the majority of these differences point to the more advanced linguistic skills of the normal and retarded children over the language-impaired children.

The comparisons of MWSs indicated only three differences among groups at the .01 level: conjunctions, interrogative reversals, and Wh questions. The Scheffe procedure indicated that the normal group obtained sig-

TABLE 4. *F* ratios and significance levels for DSS variables.

	TWS		*MWS*	
Variable	*F ratio*	*significance*	*F ratio*	*significance*
Indefinite pronouns	2.81	.078	.73	NS[a]
Personal pronouns	6.69	.004*	.89	NS
Main verbs	32.28	.001**	.85	NS
Secondary verbs	4.48	.021	2.92	NS
Negatives	5.00	.014	1.90	NS
Conjunctions	10.78	.001**	5.02	.007*
Interrogative reversals	10.88	.001**	5.23	.005*
Wh questions	6.13	.006*	5.86	.002*
Sentence point	84.08	.001**		

[a]NS ($p > .10$).
*$p < .01$.
**$p < .001$.

TABLE 5. Group differences as revealed by the Scheffe multiple comparison procedure for 13 DSS-related variables ($p < .05$).

Variable	*Group performance*
DSS total score	Retarded, normal > language-impaired
Indefinite pronouns (TWS)	No difference
Personal pronouns (TWS)	Retarded > language-impaired
Main verbs (TWS)	Retarded, normal > language-impaired
Secondary verbs (TWS)	No difference
Negatives (TWS)	No difference
Conjunctions (TWS)	Retarded, normal > language-impaired
Conjunctions (MWS)	Normal > retarded, language-impaired
Interrogative reversals (TWS)	Normal > retarded, language-impaired
Interrogative reversals (MWS)	Normal > language-impaired
Wh questions (TWS)	Normal > retarded
Wh questions (MWS)	Normal > retarded
Sentence point	Retarded, normal > language-impaired

nificantly higher MWSs than both the retarded and language-impaired groups for conjunctions. The normal group also achieved significantly higher MWS values than the language-impaired group for interrogative reversals and higher MWS values than the retarded group for Wh questions.

Retarded versus normal groups. The analyses presented thus far indicate that the retarded and normal groups were functioning at essentially the same linguistic level. The data do indicate, however, two areas where the retarded children performed more poorly than the normal children: questioning behavior and the use of conjunctions. First, look at the retarded children's question behavior. The previous analyses revealed that the retarded group obtained significantly lower TWSs than the normal group for the two grammatical categories, interrogative reversals and Wh questions. There are three possible reasons for differences in TWS values, however, including (a) the developmental level of forms successfully produced (MWS), (b) the frequency with which the forms were produced, and (c) the number of errors made.

The analyses of developmental level of forms (MWS) indicated significant differences in the type of Wh questions produced by retarded and normal children but not in the type of interrogative reversals produced. As seen in Table 5, the difference was in favor of the normal children. The meaning of this finding is obscured, however, by the observation that some retarded children did not pose any Wh questions. These children had zero entries for TWSs and MWSs, thus artificially deflating the MWS values. Note that the lowest MWS possible according to DSS scoring conventions is 2, not 0. When the retarded children who produced no Wh questions were omitted from the analysis, the difference in MWS values was no longer significant. It seems unlikely, therefore, that the TWS differences in the two question-related DSS categories were caused by discrepancies in the developmental level of the questions produced by the retarded and normal children.

The second possible reason for the differing TWS values was the frequency with which forms were produced. In Table 6, frequency values and proportion of errors made are given for all of the DSS categories for which significant among-group differences were found. Focusing attention on the two question categories, note that the normal children and even the language-impaired children produced considerably more question forms than the retarded children. A t test indicated that the difference between the retarded and normal groups was significant for both question categories at the .01 level: interrogative reversals, $t(9) = 3.89$, $p < .01$; and Wh questions, $t(9) = 3.88$, $p < .01$.

The third factor which could have influenced TWS values was the number of errors made. Table 6 indicates some difference in the number of errors made by retarded and normal children producing interrogative reversals. However, the small number of interrogative reversals attempted by the retarded children makes this finding difficult to interpret. Clearly, the lower TWSs the retarded children obtained on the two question-related DSS categories were due mostly to the minimal number of questions they asked.

TABLE 6. Frequency of production and percentage of errors for seven DSS categories according to group.

Group	*PP*	*MV*	*SV*	*NEG*	*CON*	*IR*	*WH*
Retarded							
Frequency	559	656	65	36	158	20	14
% Error	.5	12.2	0	12.7	0	22.7	0
Normal							
Frequency	498	598	82	71	107	92	59
% Error	.8	7.7	0	8.5	.9	14.1	0
Language-impaired							
Frequency	415	521	57	53	36	50	36
% Error	12.3	55.1	26.3	49.4	5.6	60.1	5.6

Note. PP = personal pronouns, MV = main verbs, SV = secondary verbs, NEG = negatives, CON = conjunctions, IR = interrogative reversals, and WH = Wh questions.

The other difference found between the normal and retarded children was the significantly higher MWSs obtained by the normal group for the conjunction category. This discrepancy in MWS values indicates that the similar TWSs obtained by the two groups were misleading. In examining the actual conjunctions produced, we found that nearly one-half of those produced by the normal group were from Level 8, the highest level possible (e.g., conjunctive adverbs, such as *when, where,* and *before*). In contrast, more than 80% of the conjunctions produced by the retarded group were at Level 3, and consisted of *and,* the earliest emerging conjunction. This difference in the developmental level of conjunctions produced was compensated for by a difference in frequency of use, the retarded group using more conjunctions than the normal group. These complementary differences yielded the total score (TWS) equivalence found.

Retarded versus language-impaired groups. The initial analyses indicated clearly that both the retarded and normal groups were functioning at a higher linguistic level than the language-impaired group. It is important, however, to determine whether differences in the developmental levels, frequency, and/or errors caused the significantly lower TWSs obtained by the language-impaired children.

The analysis of MWSs suggests that it was not differences in the developmental level of forms which led to the relatively low TWSs achieved by the language-impaired children. As seen in Table 6, differences in the frequency with which forms were produced did exist, however. Confining our comparison here to the retarded and language-impaired groups, we find that the largest frequency discrepancy involved the production of conjunctions. Retarded children produced significantly more utterances containing conjunctions than language-impaired children: $t(9) = 4.35$, $p < .01$. No other differences in frequency reached significance. Interestingly, the only frequency discrepancy in favor of the language-impaired children involved the two question-related categories.

The final factor which could have influenced TWS values was the number of errors made. In examining Table 6, it should be apparent that this factor more than any other caused the significantly lower TWS values obtained by the language-impaired group. The language-impaired children made significantly more errors than the retarded children in attempting to encode main verbs [$t(9) = 7.70$, $p < .001$], secondary verbs [$t(9) = 4.06$, $p < .01$], negatives [$t(9) = 2.93$, $p < .01$], and interrogative reversals [$t(5) = 3.15$, $p < .025$]. The degrees of freedom were lower for interrogative reversals because some children never attempted these constructions. The considerable difficulty encountered by language-impaired children in encoding various syntactic structures seems to be an important criterion for differentiating these children's linguistic abilities from those of retarded children. The exact nature of the forms with which language-impaired children experience difficulty is seen below.

Grammatical Marker Indices

As previously noted, the grammatical marker indices were motivated by a desire to focus more narrowly on formal syntactic knowledge in ways which could eventually be contrasted with propositional complexity. Two composite measures were calculated: the *Grammatical Marker Need Index* (GMN), reflecting the frequency with which grammatical markers (noun and verb inflections, the auxiliary system, phonologically distinct infinitive segments, and the complementizer *that*) were required by a child's utterances; and the *Grammatical Marker Error Index* (GME), a measure of the proportion of errors made on these forms. Table 7 presents the mean values for these two measures according to group.

Comparisons of the mean values for these measures using one-way analysis-of-variance procedures revealed significant differences among groups for both GMN and GME: $F(2, 27) = 12.04$, $p < .001$; and $F(2, 27) = 64.14$, $p < .001$. The Scheffe analysis indicated that the retarded

TABLE 7. Means and standard deviations for grammatical marker indices and the propositional complexity index (PCI).

Group	*GMN*	*GME*	*PCI*
Retarded			
Mean	1.39	10.25	.99
SD	.17	10.98	.22
Normal			
Mean	1.12	6.36	1.19
SD	.12	3.47	.20
Language-impaired			
Mean	1.05	48.87	.63
SD	.19	11.43	.15

Note. GMN = *Grammatical Marker Need Index* and GME = *Grammatical Marker Error Index.*

group obtained significantly higher GMN values than the other two groups ($p < .05$), indicating that their utterances typically contained more obligatory contexts for grammatical markers than those produced by the other children. As expected, the language-impaired group made significantly more errors producing grammatical markers than both the retarded and normal groups. Even the two retarded children who had the most difficulty encoding these forms correctly made fewer errors than the language-impaired child who performed best. These findings clearly demonstrate that retarded children do not suffer from the same linguistic deficits as do language-impaired children.

It appears that the longer utterances produced by retarded children were due in part at least to their relatively frequent use of grammatical markers—forms which do receive morpheme credit.

Semantic Analysis

Our final analyses were designed to investigate the propositional, or ideational, complexity underlying children's utterances and the relationship between propositional complexity and children's facility in encoding grammatical markers. The first comparison utilized the *Propositional Complexity Index* (PCI), a composite measure indicating the average number of nonnuclear propositions incorporated into an utterance. These values are presented in Table 7. A one-way analysis of variance revealed significant differences among groups: $F(2, 27) = 21.71$, $p < .001$. The language-impaired children were found to produce significantly fewer propositions per utterance than both the retarded and normal children (Scheffe, $p < .05$). The difference between the retarded and normal groups was not significant at the .05 level ($p = .08$).

The second analysis investigated the proportion of nonnuclear propositions produced in each structural category—adverbial, embedded, and associated network relations. The alpha level for the three comparisons was set at .03, so that each one was tested at the .01 level. Significant differences among the three groups were found for the categories of adverbial and embedded propositions: $F(2, 27) = 11.01$, $p < .001$; and $F(2, 27) = 12.69$, $p < .001$. The Scheffe procedure indicated that the language-impaired group encoded significantly fewer propositions in these two categories than the other two groups ($p < .05$). Though we found no significant differences in the number of nonnuclear propositions produced by retarded and normal children for any of the three structural categories, we noted that the normal children encoded considerably more adverbials (in particular, negatives) and embedded propositions.

The final comparison involving the measures of propositional complexity looked at the relationship between children's facility in producing grammatical markers, as reflected by GME scores, and developing semantic complexity, as indicated by PCI. Pearson product-moment correlation coefficients were calculated between each group's GME and PCI scores. We would expect an inverse relationship to be obtained between these two measures. That is, children who make fewer grammatical marker errors should produce more propositionally complex sentences. This was in fact the direction of the relationship for the retarded ($r = -.68$) and normal ($r = -.56$) groups. The direction of the relationship was reversed, however, for the language-impaired group ($r = .57$), indicating that those children who had greater facility encoding grammatical markers produced propositionally simple sentences, and vice versa. These coefficients were all significant at the .05 level. The rather dramatic differences revealed by these coefficients between the language-impaired group and the other two groups illustrate strongly the dissimilarity between the linguistic systems of the children in these groups.

The analyses of the propositional complexity of each group's utterances indicate clearly that the additional length of the retarded children's utterances was not caused by a relatively high number of propositionally complex sentences. It thus seems likely that the retarded children's more prolific use of grammatical markers was primarily responsible for the differences in utterance length.

Post Hoc Analysis

One post hoc analysis was performed to determine whether the retarded group's greater use of grammatical markers was reflected in the encoding of sentences in the progressive aspect. Frequent use of progressive-aspect sentences inflates the GMN index because such sentences contain at least two grammatical markers, the auxiliary form and the progressive marker *-ing*. A one-way analysis of variance revealed significant among-group differences [$F(2, 27) = 6.3, p < .01$], whereas the Scheffe multiple comparison procedure indicated that the normal group produced significantly fewer progressive-aspect constructions than both the retarded and language-impaired groups.

DISCUSSION

The results of the syntactic and semantic analyses suggest that the naive observer probably would not notice any differences between the language of retarded and normal children whose MAs were around 5:0 years. This observer would, however, notice differences between the language of retarded and language-impaired children. The language-impaired children evidenced particular difficulty encoding grammatical markers correctly and produced structurally simple utterances shorter in length and propositionally less complex than those produced by the retarded children. In contrast, the retarded and normal children used similar syntactic constructions, expressed the same propositional relations, and evidenced little difficulty encoding grammatical markers. The analyses did, however, reveal three differences in the language of these two groups that were significant: The retarded children posed significantly fewer questions, produced significantly more sentences conjoined by *and*, and produced significantly more sentences in the progressive aspect. In addition, the retarded children had a nonsignificant tendency to use propositionally less complex sentences than the normal group.

Before reaching any conclusions about the nature of these differences, the possibility that they resulted from discrepancies in sampling conditions must be considered. Recall that the language-impaired children were tested in speech and hearing centers, an environment as formal if not more formal than the classroom setting in which the retarded children were tested. Since the language-impaired children asked twice as many questions as the retarded children, this suggests that the testing environment was at best only partially responsible for the retarded children's dearth of questions. Perhaps questions were not encouraged by the classroom teachers of the retarded children, and this "classroom behavior" carried over to the testing sessions. Another alternative is that these children were simply less inquisitive than their normal and language-impaired counterparts. Recent studies have in fact found retarded children poorer in all aspects of interrogative strategies (recognition, formulation, and integration) in comparison to MA-matched normal peers (Borys, 1979; Denney, 1974).

In considering whether or not the sampling conditions contributed to the differences in grammatical structure between the retarded and normal groups, recall that the retarded children produced a higher proportion of utterances in the story-telling condition than the other two groups. The stories, one could reasonably argue, were particularly conducive to the production of sentences in the progressive aspect linked by the conjunction *and*. These sentences were also likely to contain simple propositional structures. The retarded children's frequent production of such sentences probably accounted for most of the differences between their language and that of the normal group. Of importance, then, is why the language samples of the retarded children contained a particularly high proportion of utterances from the story-telling condition. One reason is that the normal children usually digressed while telling a story. They often spent as much time talking about related personal experiences as they did telling the story. Another reason is that the normal children took full advantage of the other two sampling conditions. The relatively continuous stream of speech from the normal children, irrespective of the stimuli presented, reduced the proportion of language obtained from the story-telling condition. Moreover, even when the normal children related the stories, they used much more diversified constructions than did the retarded children. It seems apparent that the retarded children's less diversified verbalizations contributed to the MA-inconsistent language revealed in this study. The sampling discrepancies and resultant MA-inconsistent language, however, seem to be a manifestation of some underlying differences in behavior—differences which are not specific to language.

The data suggest that the MA-inconsistent language behaviors observed in the retarded children were probably not the result of specific deficits in linguistic capabilities. The retarded children clearly did not have a linguistic deficit over and above the general mental handicap. Their overall language performance was not only essentially comparable to that of the normal children, it was also significantly superior to that of the language-impaired group. The difficulties encountered by the language-impaired children in learning the linguistic system were simply not present in the retarded children. In particular, the retarded children had little trouble encoding grammatical markers, forms which gave the language-impaired children considerable difficulty. They apparently came equipped to the language learning task with the requisite neurological structures, processing strategies, and symbolic abilities to learn even the most formal grammatical devices.

Less clear is the contribution of cognitive deficits to the retarded children's MA-inconsistent language behaviors. One could argue that the infrequent number of questions and the greater proportion of sentences in the progressive aspect linked by *and* were due in part to cognitive deficiencies. For example, maybe other conjunctions (e.g., *so, when, because*) were not used frequently because the retarded children were not familiar with the concepts underlying these conjunctions. There are reasons to believe, however, that cognitive deficiencies were not primarily responsible for the MA-inconsistent language behaviors observed in this study. First, when the individual subject data for conjunction production are considered, seven of the retarded children were found to produce conjunctions such as *how, why, because,* and *so.* Only two children did not produce either *why* or *because.* Second, all 10 retarded children had instances of past tense sentences, indicating that their propensity to use present tense progressive aspect sentences did not reflect a limited temporal focus on the here and now. Third, as previously noted, the retarded children in this study demonstrated nonlinguistic symbolic and conceptual abilities similar to those of their MA-matched peers (Kamhi, 1981). The MA-inconsistent language behaviors uncovered thus were primarily differences in the frequency with which retarded and normal children produced certain forms. As such, these inconsistencies were quantitative in nature rather than qualitative. This does not necessarily mean that cognitive abilities had no influence on the retarded children's language performance. Indeed, these abilities probably played a significant role in enabling these children to demonstrate linguistic skills which were essentially comparable to those of MA-matched normal children.

If neither linguistic nor cognitive deficits led to the MA-inconsistent language behaviors of the retarded children, then what did? We suggest that deficient social (more generally, adaptive) and motivational behaviors were primarily responsible for these MA-inconsistent language behaviors. The way in which retardation affects the development of human adaptive behaviors has been well documented in the literature (Farber, 1968; Grossman, 1973). Adaptive behaviors range from self-help/self-care repertoires to more complex skills associated with attaining effective interaction with people in the environment (McLean & Snyder-McLean, 1980). In addition, Zigler (1969) has found that retarded individuals demonstrate different motivational and emotional behaviors from the nonretarded. Although the effects of these behaviors on language were not specifically tested in this study, it is easy to see how deficiencies in these areas could cause the MA-inconsistent language exhibited by the retarded children. For example, motivational factors which make the retarded children less inclined to take risks and use novel strategies could explain the relative lack of diversity in their syntactic constructions. Similarly, deficiencies in adaptive skills could account for the absence of verbalizations relating personal experiences, the less frequent language during the free-play and cognitive tasks, and the paucity of questions in their speech.

The data in this study support the interactionist hypothesis and its prediction that there should be some inconsistencies between the language performance of retarded children and their general cognitive level. These inconsistencies, it was suggested, seemed to be the result of deficits in adaptive and motivational behaviors rather than deficits in linguistic or cognitive abilities. Not to be overlooked, however, is the finding that the overall linguistic complexity of the retarded children's language was consistent with their general cognitive level, as measured by MA and the nonstandardized tasks of nonlinguistic symbolic and conceptual development. The cognitive level of these children seemed to influence the qualitative aspects of their language—that is, the general level of syntactic and semantic complexity in their language—whereas noncognitive factors such as adaptive and motivational behaviors seemed to influence the quantitative aspects of their language—that is, the frequency with which various structures occurred.

Though attractive in its explanatory power, this interpretation of retarded children's language performance can be accurate only when cognitive and language level are relatively equivalent. Several studies have shown, however, that cognitive level, or MA, and language performance are sometimes not equivalent in these children (Fowler et al., 1980; Miller, 1981). In the majority of instances, language performance is found to be poorer than cognitive level or MA. Rather than attributing these cognitive- or MA-inconsistent language behaviors to adaptive and motivational deficits, one might more appropriately attribute them to deficits in specific linguistic capabilities or deficits in language-related cognitive abilities, such as symbolic or auditory processing skills. In short, it should be apparent that the language performance of retarded children is influenced by linguistic, cognitive, adaptive, and motivational factors, just as normal children's language is influenced by these factors. In this study, we made some suggestions regarding the specific influence these factors might have had on certain characteristics of retarded children's language. Future research should attempt to distinguish further the effects these factors have on these children's language performance.

ACKNOWLEDGMENTS

This research was based on the first author's dissertation under the direction of the second author at Indiana University. The authors wish to thank Dorothy Saltzman and Kathryn Smith for their help in data reduction.

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Received February 26, 1981
Accepted August 7, 1981

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