VERBAL COMMUNICATION IN HETEROGENEOUS AND HOMOGENEOUS DYADS OF RETARDED CHILDREN

by

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ABSTRACT

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Four methods of pairing retarded children were compared in order to determine which of four dyad types would enjoy the greatest success on a verbal communication task. Forty retarded children were divided into high and low levels of verbal ability on the basis of the Peabody Picture Vocabulary Test. Children within each ability group were then assigned to a speaker or listener role, resulting in the formation of the following four groups: Group 1 (High verbal speaker -- high verbal listener), Group 2 (High verbal speaker -- low verbal listener), Group 3 (Low verbal speaker --high verbal listener), Group 4 (Low verbal speaker -- high verbal listener). The speaker was requested to describe a series of small toys to the listener. The listener, given four choices, was requested to point to the toy described by the speaker. Simple and complex tasks were presented. The criteria for simple or complex was determined in the pilot study. Speakers and listeners were allowed full verbal communication but were restricted in their gestural and visual communication by the placement of a plywood screen between the speaker and the listener.

Eight hypotheses related to group assignment and task complexity were tested by a univariate analysis of variance

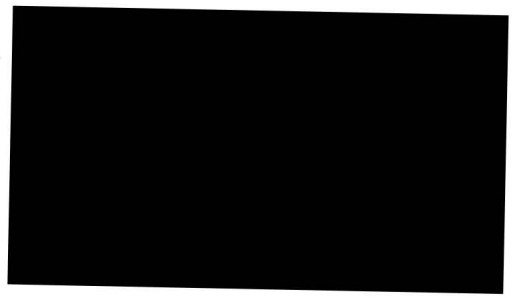
and planned comparisons between individual groups. The dependent variable for this analysis was the number of correct choices by the listener, a measure which was considered to reflect 'dyad success.' In addition to this planned analysis, post hoc analyses were performed on the amount of information in the speaker's messages, and the number of questions asked by the listener's. Results showed no differences in dyad success between the combined homogeneous and combined heterogeneous groups. A comparison of each of the heterogeneous groups (H-L and L-H) with the homogeneous low-level group (L-L) indicated that both of these heterogeneous groups were more successful in verbal communication than was the homogeneous low-level group. Neither heterogeneous group differed significantly in their success rates from the performance shown by the homogeneous high-level group.

On the basis of the 'dyad success' data it was concluded that low-level children enjoy more successful verbal communication in a heterogeneous than in a homogeneous dyad and that the advantages gained by low-level children are justifiable because there is no significant change in success rates between the homogeneous high-level and heterogeneous groups.

Main effects for the speaker information data were non-significant. A significant speaker information x complexity interaction was found, however, reflecting changes in verbal productivity between high and low level speakers across levels of task complexity. No significant differences were found in the

number of listener questions asked across groups.

Limitations of the present design, applications to educational settings and suggestions for future research are discussed.



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OUTLINE

The present report is an investigation of verbal communication in retarded children. Four methods of grouping children according to verbal ability are examined in order to determine the most efficient method for facilitating verbal communication. Forty retarded children were divided into low and high levels of verbal ability and then assigned to either a speaking or listening role. The resulting four groups (High speaker -- high listener [H-H], High speaker -- low listener [H-L], Low speaker -- high listener [L-H], and Low speaker -- low listener [L-L]) were required to verbally communicate information describing a wide range of small toys.

Chapter I provides a brief discussion of the importance of language in the study of mental retardation, the present controversy centering around the concept of integration and the necessity for objective evaluation of verbal behaviour in integrated settings. Previous studies investigating language, integration and communication in dyads of retarded children are reviewed. The paucity of information pertaining to meaningful interactions between retarded children is discussed and the criteria necessary for evaluation of meaningful verbal interactions are presented. Conceptual and experimental hypotheses related to verbal interactions in homogeneous and heterogeneous groups are proposed.

Chapter II outlines the method used in testing a series of hypotheses related to verbal communication in homogeneous and heterogeneous groups.

Chapter III presents the results and outlines which of the eight hypotheses are supported. The results of several post-hoc analyses are also presented.

Chapter IV provides a discussion of the results, limitations of the present investigation, application to educational settings and suggestions for future research.

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To P. C. H., for caring

CHAPTER I

The study of mental retardation has proliferated over the last two decades with language being a variable of considerable interest. This interest seems to stem from our views concerning the interrelatedness of language and intelligence as well as the belief that language in the retarded may be disproportionately impaired in relation to other cognitive and sensori-motor skills (Milgram, 1964). Language is viewed by many as being a means of structuring the input from our environment and allowing symbolic representation of concrete stimuli. As such, it provides access to the communication of both real events and abstract thoughts.

Discovering the most efficient techniques for facilitation of this linguistic communication process has provided a difficult challenge for individuals working with mentally retarded children. The challenge arises from the multitude of factors associated with language including cognitive, social, theoretical and educational issues. A thorough investigation of the many facets of communication should be the first step in determining the most efficient means of facilitating verbal communication and will require the cooperation of educators and researchers in a wide range of fields.

One intriguing method for examining language in the retarded has been the study of communication in pairs of

retarded children. Research into communication between retarded individuals should provide valuable information concerning language in a social setting. It should also provide information relevant to the problem of appropriate integration of the retarded in schools and in the general community.

The question of integration has arisen, largely, out of the normalization movement. The normalization movement, based on the principle of human rights and dignity, holds integration as one of its chief aims. Unfortunately, objective evaluation of verbal interactions in integrated settings has lagged far behind the emotional impetus for the normalization movement. Empirical data resulting from studies of dyadic interactions could provide valuable assistance to those wishing to develop the most effective language programs for retarded children.

This thesis is designed to objectively evaluate linguistic interactions between retarded children of different verbal ability. Although non-verbal communication and social factors are also important components of dyadic interactions, language skills are considered to be the most important tools which can be provided to retarded children in order to assist them in understanding and responding to events in their environment. This investigation is confined, therefore, to verbal communication.

Literature Review

A prodigious amount of literature concerning language in the retarded is presently available. For the purposes of this study, however, the discussion of the literature will be limited to those issues which have some bearing on the question of whether verbal communication is best facilitated by pairing children with peers having similar or different language abilities. Theories of language development, language problems in the retarded, problems of institutionalization, socio-emotional factors and previous research in dyadic communication will only be presented in order to provide a framework for the questions of linguistic communication which this report addresses.

Two Theories of Language Development

Differing theories of language development have affected our views on integration. The behavioural view of language development is based on the assumptions that the child acquires language by being rewarded for imitating the speech patterns of those around him (Mowrer, 1960). Successive approximations of adult speech occur because the parents are believed to reinforce phonetically, grammatically and semantically correct utterances. Incorrect utterances gradually disappear because they are not rewarded. Eventually the source of gratification is considered to shift from parental reinforcement to the child's own appreciation of a correct match between his own and the adult's speech (Staats

and Staats, 1963). The rate of language development is seen to be dependent on the occurrence of reinforcement and the opportunities for modelling which are available in the environment (Osser, 1975). The emphasis which behaviourists place on environmental rather than biological factors is consistent with an integrational approach to education, as changing the method of grouping children is essentially a means of changing their environment.

The nativist view of language development, expressed most clearly by the psycholinguist David McNeill (1966), speaks less favourably for the success of integrated programs in stimulating language development. Language development is considered to be an innate, predetermined process which depends, not on environmental manipulation but on the unravelling of maturational processes. Cazden (1968) has suggested that the linguistic environment of the normal middle-class pre-school child, based primarily on parent-child interactions, may not greatly affect the learning of basic grammatical structures but affect only how the child uses language to express his ideas. Cazden considers the development of intellectual capacities to be a more fruitful method of intervention than environmental change.

Studies on parent-child interactions support the nativists' belief that language acquisition cannot be explained solely on the basis of learning theory. The occurrence of parental reinforcement apparently depends on the

truth value of a child's utterance rather than grammatical accuracy (Brown & Hanlon, 1970). These findings are inconsistent with the behavioural explanation of language development. If, as the behaviourists suggest, verbal behaviour is shaped by parental approval, then one would expect children to learn true but grammatically incorrect utterances. This is not the case.

It is assumed that heterogeneous grouping is a form of environmental manipulation. If language development is dependent on predetermined maturational processes rather than environmental stimulation, how might a successful integration program be explained? For increases in verbal productivity following short-term integration programs, it might be argued by the nativists that the child has merely been given greater opportunity to display already acquired language structures. Regular increases in syntactic complexity as well as increases in the rate of production would be more difficult to explain within the framework of nativist theory. Environmental manipulation through heterogeneous grouping would not be expected to produce increases in the understanding and production of language rules or 'syntax.' A behavioural interpretation would center around the increased rates of reinforcement for appropriate speech in a heterogeneous group. Although this report is not intended to prove or disprove either of these theories, it is important to consider the mechanisms by which change takes place in language intervention programs.

Language Problems in the Retarded

Another controversial issue in the study of language in the retarded centers around the question of whether language problems stem from a 'developmental lag' or from 'qualitative differences.' The term 'developmental lag' refers to language problems in which the structure and types of errors in the child's speech are similar to that of a normal child at a lower stage of development. The term implies that language problems are a manifestation of a general slowing in language acquisition but that language shows a normal pattern of development. If a child of limited verbal ability possesses the linguistic framework for acquiring more complex language skills but is merely delayed in their acquisition then the stimulation provided in a heterogeneous group may be an appropriate therapy.

Evidence supporting the 'developmental lag' hypothesis is based on the findings that word naming, the relative percentages of parts of speech, the comprehension of speech sounds and the grammatical and semantic characteristics of language all show similar patterns of development in the retarded as they do in normal children (Mein, 1961; Lyle, 1961; Bradbury, 1967; and Carlton, 1950) although they may be less specific and lacking in context sensitivity (Lackner, 1968). O'Connor and Hermelin (1963) concluded that the

structure of language used by the retarded resembles that of normal children at a similar mental age.

Other researchers have shown, however, that language deficits in the retarded may be 'qualitative' and stem from sources more specific than a 'developmental lag.' The term 'qualitative difference' in retarded children's speech, refers to situations where development in one area of language ability is impaired in relation to other language abilities. The language profile resulting from qualitative differences may not resemble that of a normal child at an earlier stage of development. For example, a child may have difficulty with sentence structure but not with articulation or vocabulary. These syntactical errors may not be typical of the errors made in early sentence constructions.

Evidence for 'qualitative differences' in retarded speech is drawn from reports that retarded children have specific language problems in figure-ground discrimination (Gibson, 1969), in categorizational abilities (Bruner and Kenny, 1966) cue-selection and attention and ability to transfer learned principles. They may also show encoding and decoding deficits (Zeaman, 1965), prolongation of egocentric speech (Lyle, 1959), irrelevant responses (Lyle, 1961), and deficits in verbal mediation (Luria, 1959). These qualitative differences may be more appropriately treated by a focus on the child's specific deficit than a general change in the environment. Although heterogeneous grouping

appears to provide general rather than specific types of stimulation, it may be that problems in motivation, attention, cue-selection, categorizational abilities and egocentric speech could be dealt with through heterogeneous grouping provided that the children were given communication tasks designed to alleviate one or more of these problems. One might expect that the amount of egocentric speech displayed by a child with lesser verbal ability, for example, would decrease in a heterogeneous group due to the lack of reinforcement from the brighter children. It remains an empirical question, however, whether qualitative language problems would be more effectively treated by remedial programs for the specific deficits in a homogeneous setting or by mixed grouping in a classroom or institution where these problems would not be given specific attention.

Problems Associated with Institutionalization

Advocates of integration claim that grouping children according to levels of retardation may foster many of the problems which have been associated with institutionalization such as stimulus deprivation and inappropriate modelling experiences for speech and language. "The institutionalized child is surrounded by peers who speak very little or very badly . . . the environment tends to reinforce nonverbal rather than verbal behaviour" (Bryant, 1971, p. 38). The use of jargon speech, gestures, irrelevant verbalization (Lyle,

1961), stereotyped behaviours (Hollis, 1971), and a preference for non-verbal communication have all been associated with institutionalization. A vocabulary and an interaction style may be learned by the institutionalized child which is specific to that setting so that communication outside the institution becomes difficult. Deficits in attention and the inappropriate application of grammatical structures have also been attributed to the lack of training and relevant experiences within the institutional setting (Ross and Ross, 1972).

Heterogeneous grouping within the institution may be a partial solution to the problem. Adult verbal behaviour has been shown to have a higher type/token ratio when interacting with retarded children of greater verbal ability (Siegal & Hawkins, 1964). In a heterogeneous group, under adult supervision, the child with lesser verbal ability may benefit from exposure to interactions between their verbally superior peers and adults. Although heterogeneous grouping within an institution or the integration of institutionalized children into a normal setting appear to be possible solutions to the problems mentioned above, one cannot consider the issue of integration independently of the social factors involved.

Social Factors

Retarded children have been reported to be particularly handicapped in socio-emotional development (Gardner, 1970), a problem which has hindered their assimilation into heterogeneous settings. The reported correlations between IQ and social status in the classroom are not very high, however, ranging from 0.30 to 0.43 (Rosenthal, 1956; Hays, 1951). Kounin (1941) blamed the lack of successful integration in social settings on the retardates' cognitive rigidity. Others argue that motivational rather than cognitive deficits are the cause of the social problem (Green & Ziegler, 1962). Johnson and Kirk (1950) reported that 46% of the retarded children in integrated classes were labelled as 'disliked' compared to only 5% of the normal children in those classes. Educable mentally retarded children (EMR) in integrated programs were more often rejected as potential friends by their class-mates than EMR children in segregated classes (Goodman, Gottlieb & Harrison, 1972; Gottlieb & Budoff, 1973; Gottlieb & Davis, 1973). Reasons given for disliking retarded children do not seem to be directly related to their mental abilities but rather to the inappropriate social actions of the retarded children such as teasing, cheating and bullying. These actions are apparently taken in order to compensate for their intellectual inferiority, suggesting that guidance in more effective coping strategies may be a necessary prerequisite to integration.

Although these reports do not speak favourably for integration, researchers studying retarded children during their assimilation into a regular class report that EMR pupils, after one year of integration, exhibit a higher frequency of appropriate social behaviour than their segregated peers (Gampel, Gottlieb & Harrison, 1974; Gottlieb, Gampel & Budoff, 1975). A similar finding showing latent gains was reported by Gottlieb (1974). Integrated students showed no improvement in the first year but made gains of nearly twelve months in reading and mathematics during the second year of enrollment in the integrated program. More immediate results have also been reported. Gampel, Gottlieb & Harrison (1974) reported that three months after assignment to an integrated class, the EMR children were more similar to normal children in their classroom behaviour than they were to segregated EMR children.

It appears that not all retarded children will enjoy the same degree of success even after several years of integration and that the lack of positive findings in some of the studies discussed above may be attributed to the use of inappropriate criteria for determining whether a child should attend a special (segregated) or a regular class. Budoff and Gottlieb (1976) determined the 'learning aptitude' of the subjects in their study. 'High-able' students were defined as those who, after training with the Raven's matrices achieved an IQ score of 90 regardless of their previous score.

'Low-able' students did not achieve this score even after training. Children were then randomly assigned to a segregated or an integrated setting. No differences were evident in achievement , motivation, cognitive style or teacher's behaviour rating prior to, or two months after, integration. Measures taken at the close of the school year, however, indicated that the children in the integrated setting had more positive attitudes toward school, were less impulsive and displayed fewer aggressive behaviours than children in the segregated setting. 'High-able' students benefitted most from the integrated setting but also performed better than the 'low-able' students regardless of group placement.

Further research designed to identify predictive variables for integrational success would be extremely valuable for the psychological and educational literature. It appears that, given adequate screening methods to select students for integrated programs, gains can be made in social and cognitive skills. There is still little information available regarding the amount and quality of social interactions occurring between retarded children and their peers in integrated settings.

Communication in Dyads

Studies of dyadic communication are one source of information concerning interactions between retarded children. In addition to their contribution to the study of integration, they could make a valuable contribution to the field of

language development as they provide an opportunity to systematically observe language in a social setting. Vygotsky (1962) considered the child's intellectual growth to be contingent upon his mastering the social means of thought, namely language.

Hollis (1965) arbitrarily paired dyads of severely retarded children. The task required that the child assigned to the 'speaking' role inform the listener, seated on the opposite side of a screen, as to which of four trolleys must be pulled in order to deliver a reinforcer to both members of the dyad. Results showed that gestures and gesture-vocal responses were the most effective forms of communication. This predominance of gestural responses is probably a function of the subjects' level of intelligence and may not be found if mildly or moderately retarded children are examined. Success with the task depended more on the speaker's than the listener's performance as the language level of the listener did not affect the number of correct responses and replacing the speaker with the experimenter resulted in an immediate increase in the success rate.

The importance of the speaker's role has also been demonstrated by Glucksberg and Weisberg (1966). Dyads of normal nursery school children, separated by an opaque screen, were required to match nonsense and animal forms. The listener, on the basis of the utterances received from the speaker, attempted to choose an animal or nonsense form

that would match the speaker's. A successful match between the speaker's and the listener's forms resulted in reinforcement for both members. Results showed that speakers consistently used idiosyncratic reference phrases which the listener was unable to utilize in the matching task. The utterances were, however, sufficient to produce a correct match when the speaker was assigned to a listening role and provided with his own phrases. Rosenberg (1972) points out that the speaker may be unable to sample his own responses and a referent may be chosen without examining other alternatives.

A similar pattern of findings can be seen in a study pairing dyads of retarded children showing different language abilities on the Parsons Language Sample (Spradlin, Girardeau & Corte, 1967). Pairs of retarded children with a high-level speaker did better than those with a high-level listener. Again, communication broke down due to the failure of the speaker to provide consistent stimuli and socially conventional responses.

One of the most interesting and comprehensive studies in dyadic communication is that of Rosenberg, Spradlin and Mabel (1963). Institutionalized retardates were assigned to a high or a low language ability group on the basis of their performance on the Parsons Language Sample. Dyads were then formed with children of both similar and different language

abilities. The children were observed while interacting in a free-play setting over a six week interval. Two observers scored their behaviour for: 1)vocalizations which included shrieking, screaming, crying, laughing, and other reflexive noises;[1] 2) commonly learned gestures such as shrugging, waving, pointing; and 3) physical contact such as hitting, hugging and grasping. The children were scored separately in speaker and listener roles. Each dependent variable was subjected to a separate analysis of variance. The response data of the speakers and listeners were also analysed separately. Results showed that there was as much vocalization and gestural activity in the homogeneously low language ability (L-L) groups as there was in the homogeneously high (H-H) language ability groups. In the heterogeneous groups, production of either of these behaviours was negligible. The L-L groups showed the most physical contact. Very little physical contact appeared in the H-H or heterogeneous pairings.

Although there was as much communication between two l o w as there was between two high-level language ability children and little interaction occurred in the heterogeneous groups, we must question the value of crude vocalization and gestural responses. No analysis was made of the quality of

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[1]No attempt was made to discriminate between conventional, intelligible vocalizations and unintelligible, idiosyncratic vocalizations.

the verbal interactions in the various dyads nor was there information available as to the appropriateness of the gestures used. The high levels of communication reported between homogeneous dyads may, in fact, reflect inefficient and uninformative interactions. Some measure of the amount of relevant information conveyed from one dyad member to another is needed. An investigation of the quality of linguistic information shared in dyads of retarded children varying in verbal ability is a necessary step in providing objective information about verbal communication in retarded children.

A study of this sort demands that the communication task be such that the amount of information shared between dyad members can be measured. The communication tasks should provide an adequate sample of the range of linguistic ability representative of both the high and low-level groups. The difficulty of the communication tasks should be such that failure occurs not because of lack of comprehension of instructions but rather because of deficits in communication. Similarly, the tasks must be interesting in order to avoid failure due to lack of motivation. Linguistic communication ability should be the primary measure, which requires that the task minimizes the contribution of attentional, memory and perceptual deficits discussed earlier.

The findings of Rosenberg, Spradlin and Mabel (1961), suggesting that more interaction occurs in homogeneous than heterogeneous groupings, invite the investigation of similar dyad types engaging in verbal communication. A different

pattern of results may be expected when meaningful verbal behaviour rather than crude vocal, gestural or physical behaviour is measured.

Conceptual Hypotheses

Given that communication between homogeneous and heterogeneous pairs of retarded children of low and high language ability is restricted to verbal communication of specific linguistic information representing both levels of ability, the following conceptual hypotheses are proposed:

1) The advantage of homogeneous grouping reported by Rosenberg, Spradlin and Mabel (1963) will not be replicated. The amount of verbal communication occurring in homogeneous dyads will not be significantly different from the amount of verbal communication occurring in heterogeneous groups.

2) The importance of the speaker's role reported by Glucksberg and Weisberg (1966) and Spradlin et al. (1967) will be reflected in greater communication occurring in heterogeneous dyads containing a high-level speaker as compared to homogeneous low-level dyads.

3) Heterogeneous groups containing a high-level listener will not show more verbal communication than homogeneous low-level dyads.

4) A high-level speaker is not expected to engage in less verbal communication when paired with a low-level listener than when paired with a high-level listener.

5) The difference between homogeneous and heterogeneous groups is not expected to change significantly across tasks requiring low or high levels of verbal ability.

6) The advantage of providing a low-level listener with a high-level speaker is expected to be greater on tasks requiring a high level of verbal ability than on tasks requiring a lower level of verbal ability.

7) A high-level listener is expected to be an advantage for dyad success on tasks requiring a high level of verbal activity but not on tasks requiring a low level of verbal ability.

8) A low-level listener is not expected to be a significant disadvantage on tasks requiring a low-level of verbal ability or on tasks requiring a high-level of verbal ability.

Experimental Hypotheses

The following four methods of pairing retarded children will be examined: Group 1) H-H (high verbal ability retarded speaker, high verbal ability retarded listener); Group 2) H-L (high verbal ability retarded speaker, low verbal ability retarded listener); Group 3) L-H (low verbal ability retarded speaker, high verbal ability retarded listener); Group 4) L-L (low verbal ability retarded speaker, low verbal ability retarded listener). When these groups are given communication tasks requiring both low and high levels of verbal ability the following hypotheses are proposed

1) Group H-H and L-L will not be significantly more successful in communicating verbal information than Groups H-L and L-H.

2) Group H-L will be significantly more successful in communicating verbal information than Group L-L.

3) Group L-H will not be significantly more successful in communicating verbal information than Group L-L.

4) Group H-H will not be significantly more successful in communicating verbal information than Group H-L.

5) The difference between Groups H-H, L-L and Groups H-L, L-H will not change as a function of task complexity, revealing a non-significant interaction.

6) The difference between Group H-L and L-L will increase as a function of task complexity revealing a significant interaction.

7) The difference between Group L-L and L-H will increase as a function of task complexity, revealing a significant interaction.

8) The difference between Group H-H and H-L will not change as a function of task complexity, revealing a non-significant interaction.

The Pilot Study

In a pilot study, McNaughton-Harrison (1976) measured meaningful verbal interactions at two levels of complexity in four pairs of retarded children. The children were assigned

to a high or low-level group on the basis of the Peabody Picture Vocabulary Test (PPVT) before the following four dyads were formed: H-H, H-L, L-H, and L-L. Members of each dyad were seated on opposite sides of a wooden screen in order to prevent gestural communication. The child assigned to the speaking role was asked to describe, for the listener, either a simple one-object scene or a complex two-object scene.[2] Listeners were required to find the scene described by the speaker from amongst four choices, only one of which was identical to the speaker's scene. The speaker was unable to see the scenes assigned to the listener. Both speaker descriptions and listener identifications were scored according to a pass/fail system. One point was awarded for completely correct descriptions. Zero points were awarded for partially complete or incorrect utterances. Due to the 'ceiling effects,' no differences could be found between groups. In addition to the problem of ceiling effects, it was also apparent that, unless speakers were allowed to examine the listener's choices, they had no indication as to the specificity of the description required. After considering the problems in this pilot study, the following experiment was designed.

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[2]See Appendix A for a more detailed description of the pilot study.

CHAPTER II

Method

Subjects

The Peabody Picture Vocabulary Test (PPVT) and a measure of word fluency were administered to trainable and educable mentally retarded children who were between eight and sixteen years of age. The children were drawn from two schools for the retarded and were a mixed group, diagnostically. A measure of word fluency was included because the PPVT samples receptive language abilities only. Word fluency was assessed by asking each child to name as many types of food, boys' names, animals and words beginning with the letter 'K' as was possible within the time limit. A sixty-second time limit was allowed for each category. Three examples were given for each category before timing began.

Subjects were then assigned to a high or low-level group on the basis of the PPVT. Twenty children having PPVT IQs between 23 and 44 were assigned to the low-level group. Twenty children having IQs between 53 and 76[3] were assigned to the high-level group. Although PPVT IQ was the only criterion for group placement, a correlation of 0.51 between

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[3]Due to illness and a limited subject pool, one child having an IQ of 46 was later included in the high-level group.

PPVT IQ and word fluency indicated that receptive and productive language abilities were at least moderately related in this group.

The high and low-level groups were further divided so that half of the children within each of these groups were assigned to a partner from the same group (homogeneous grouping). The other half of the children in each group were assigned a partner from the opposite group (heterogeneous grouping). Four groups, having ten subjects each were thus formed as follows: Group 1) High-level speaker and high-level listener (H-H); Group 2) High-level speaker and low-level listener (H-L); Group 3) Low-level speaker and high-level listener (L-L).

An attempt was made to match pairs for age as it was suspected that large age differences between dyad members may result in less cooperation than would be expected for children from the same chronological age group. The mean age for subjects in the four groups is shown in Table 1. Individual age, IQ, word fluency scores and sex of subjects is given in Appendix B. The average age of the low-level subjects was slightly lower than for high-level subjects but an analysis of variance showed no significance for these age differences between groups (See Table 1).

Two similar analyses were performed on the IQ data in the high and in the low-level groups to determine whether the average IQ of a high-level subject, for example, changed as a function of group placement. Non-significant differences

TABLE 1

SEX, MEAN AGE, PPVT IQ, AND
WORD FLUENCY (W.F.) SCORES

GROUP H-H

Speakers (H)	Listeners (H)
$\bar{X}$ age = 156.8 mos.	$\bar{X}$ age = 154.0 mos.
$\bar{X}$ IQ = 62.0	$\bar{X}$ IQ = 62.6
$\bar{X}$ W.F. = 30.6	$\bar{X}$ W.F. = 35.6
M = 4 F = 1	M = 4 F = 1

GROUP H-L

Speakers (H)	Listeners (L)
$\bar{X}$ age = 165.2	$\bar{X}$ age = 158.6
$\bar{X}$ IQ = 64.6	$\bar{X}$ IQ = 34
$\bar{X}$ W.F. = 41	$\bar{X}$ W.F. = 24.8
M = 1 F = 4	M = 3 F = 2

GROUP L-H

Speakers (L)	Listeners (H)
$\bar{X}$ age = 160.0	$\bar{X}$ age = 157.2
$\bar{X}$ IQ = 34.6	$\bar{X}$ IQ = 62.0
$\bar{X}$ W.F. = 20.2	$\bar{X}$ W.F. = 35.4
M = 1 F = 4	M = 4 F = 1

GROUP L-L

Speakers (L)	Listeners (L)
$\bar{X}$ age = 138.6	$\bar{X}$ age = 132.6
$\bar{X}$ IQ = 30.4	$\bar{X}$ IQ = 39.2
$\bar{X}$ W.F. = 16	$\bar{X}$ W.F. = 18.2
M = 1 F = 4	M = 3 F = 2

TABLE 1 (Cont.)

ANALYSIS OF VARIANCE FOR IQ OF LOW-LEVEL SUBJECTS FOLLOWING GROUP PLACEMENT

Source	DF	SS	MS	F	P	Percentage of Variance
IQ	3	253.20	84.40	2.285	0.118	29.99
Error	16	590.80	36.92			
Total	19	844.00				

ANALYSIS OF VARIANCE FOR IQ OF HIGH-LEVEL SUBJECTS FOLLOWING GROUP PLACEMENT

Source	DF	SS	MS	F	P	Percentage of Variance
IQ	3	48.4	16.13	0.1811	0.908	3.23
Error	16	1425.6	89.10			
Total	19	1474.0				

ANALYSIS OF VARIANCE FOR AGE OF ALL SUBJECTS FOLLOWING GROUP PLACEMENT

Source	DF	SS	MS	F	P	Percentage of Variance
Age	7	3166.37	452.33	0.869	0.541	15.980
Error	32	16648.00	520.25			
Total	39	19814.37				

ANALYSIS OF VARIANCE FOR AGE DIFFERENCES BETWEEN LOW AND HIGH LEVEL SUBJECTS

Source	DF	SS	MS	F	P	Percentage of Variance
Age	1	1177.22	1177.22	2.084	0.157	5.198
Error	38	21467.15	564.92			
Total	39	22644.37				

in IQ scores across groups were found for both high and low-level groups indicating that, within ability levels, IQ did not change as a function of group placement. The average IQ difference for dyad members in the homogeneous groups were: Group H-H = 0.6 IQ points, Group L-L = 10 IQ points, with the difference for individual pairs ranging from 5 to 13 points (See Appendix B). The average differences in IQ scores between dyad members in the heterogeneous groups were : Group H-L = 30.4 IQ points; Group L-H = 27.4 IQ points with the difference for individual pairs ranging from 13 to 44 points. It is acknowledged that a greater difference in IQ scores was found for homogeneous group L-L than for homogeneous group H-H and that one dyad from a homogeneous and one dyad from a heterogeneous group each had an IQ difference of 13 points. Greater distinction between homogeneous and heterogeneous groups would have been desirable but due to illness and withdrawal of children from the school, substitutes had to be made late in the study, disallowing the rearrangement of groups to achieve a better match for IQ.

Apparatus

Sixty small toys were used as stimulus items. Three-dimensional objects rather than two-dimensional pictures were used to avoid problems of discrimination and to help maintain interest in the task. The items used in the composition of each scene are listed in Table 2. The items were

TABLE 2

OBJECTS USED IN COMPOSING THE SCENES
ASSIGNED TO SPEAKERS AND LISTENERS

Session 1

	Speaker scene	Listener choices
SIMPLE	Big* White Dog*	1. Same 2. Small White Dog 3. Big Green Horse 4. Small Green Horse
	White Car	1. Same 2. White Dog 3. Red Car 4. Red Dog
	Big Blue Fork	1. Same 2. Blue Plate 3. Red Fork 4. Red Plate
	Big Yellow Table	1. Same 2. Small Yellow Table 3. Big Blue Chair 4. Small Blue Chair
	Green Spoon	1. Same 2. Green Boat 3. Red Spoon 4. Red Boat
COMPLEX	Man Sitting on Chair	1. Same 2. Man sitting on bed 3. Lady sitting on chair 4. Man sitting beside chair
	Lady Lying on Bed	1. Same 2. Man lying on bed 3. Lady lying on bed 4. Lady sitting on chair
	Dog Under Table	1. Same 2. Boy sitting under table 3. Dog on Table 4. Dog Under Chair

*relevant information components are underlined

TABLE 2 (Cont.)

	Speaker scene	Listener choices
	Lady Standing Behind Stove	1. Same 2. Man Standing Behind Stove 3. Lady Standing Beside Stove 4. Lady Standing Behind Table
	Girl Sitting on Sink	1. Same 2. Dog on Sink 3. Girl Sitting Beside Sink 4. Girl on Bed

Session 2

	Speaker scene	Listener choices
S I M P L E	Small White Dog	1. Same 2. Big White Dog 3. Big Yellow Table 4. Small Yellow Table
	Big Blue Plate	1. Same 2. Blue Boat 3. Green Plate 4. Green Boat
	Big Blue Chair	1. Same 2. Small Blue Chair 3. Big Green Plate 4. Small Green Plate
	Blue Table	1. Smae 2. Blue Chair 3. Yellow Table 4. Yellow Chair
	Green Knife	1. Same 2. Green Car 3. Blue Knife 4. Blue Car
C O M P L E X	Man Standing Behind Sink	1. Same 2. Lady Standing Behind Sink 3. Man Standing Beside Sink 4. Man Standing Behind Table

Speaker scene	Listener choices
Man Lying Beside Bed	1. Same 2. Lady Lying Beside Bed 3. Man Lying On Bed 4. Man Sitting on Chair
Boy Sitting on Car	1. Same 2. Dog on Car 3. Boy Sitting Beside Car 4. Boy Sitting in Boat
Dog Behind Boat	1. Same 2. Bird Behind Boat 3. Dog in Boat 4. Dog on Bed
Man on Horse	1. Same 2. Dog on Horse 3. Man Behind Horse 4. Man on Boat

Session 3

SIMPLE

Speaker scene	Listener choices
Small Yellow Table	1. Same 2. Big Yellow Table 3. Big White Dog 4. Small White Dog
Small Blue Plate	1. Same 2. Big Blue Plate 3. Small Green Horse 4. Big Green Horse
Green Cup	1. Same 2. Green Car 3. Red Cup 4. Red Car
Small Blue Fork	1. Same 2. Big Blue Fork 3. Small Yellow Ball 4. Big Yellow Ball
Big Green Horse	1. Same 2. Small Green Horse 3. Big Yellow Table 4. Small Yellow Table

TABLE 2 (Cont.)

	Speaker scene	Listener choices
C	Dog in Front of Car	1. Same
O		2. Boy on front of car
M		3. Dog on car
P		4. Dog in front of boat
L	Boy in boat	1. Same
E		2. Dog in boat
X		3. Boy behind boat
		4. Boy on car
	Lady Sitting Beside Boy	1. Same
		2. Lady in front of boy
		3. Lady sitting beside dog
		4. Dog sitting beside boy
	Horse behind Car	1. Same
		2. Bird behind car
		3. Horse on car
		4. Horse behind bird
	Dog Under Horse	1. Same
		2. Bird under horse
		3. Bog on horse
		4. Dog under table

chosen on the basis of their familiarity and recognizability. Identical objects were needed for speaker and listener scenes which limited the choice of items available in most toy stores. The choice of objects was further limited by the necessity of choosing a number of objects which varied in size or colour. Many of the objects chosen for the simple task were painted to allow adjectives of colour to be included in the descriptions.

The toys were used to create either simple or complex tasks. The criteria for 'simple' and 'complex' were determined in the pilot study (See Appendix A). Simple items involved one object requiring a description based on a noun and an adjective of colour or size. Eight objects varied according to size and seven objects varied according to colour. Complex scenes involved two objects and required a description involving two nouns and a preposition.

The preposition 'on' was required in the description of the complex scenes more often than the prepositions 'behind,' 'beside,' 'in front,' or 'under' because pilot subjects had greater difficulty with the latter prepositions. Equal representation of all five prepositions would have made the complex tasks too difficult. The purpose of providing complex tasks was to structure the interactions so that speakers and listeners would be required to use language at a level of complexity which was representative of the verbal abilities of high-level subjects. Prepositions other than

'on' were randomly interspersed throughout the task in order to reduce the response bias for scenes requiring the preposition 'on.' In total, six 'on,' two 'under,' four 'behind,' two 'beside,' and one 'in front of' prepositions were required in the descriptions of the fifteen complex scenes.

For every simple or complex scene, four similar scenes were composed. These four scenes were designed to provide the listener with four alternatives to choose from when identifying the scene described by the speaker. One of these four scenes were identical to that of the speaker's. The remaining three scenes varied systematically according to a noun, adjective or preposition. In the simple scenes, for example, where the speaker was provided with an object requiring the description 'Big dog,' the listener's choices would include: a) Big dog, b) Small dog, c) Big plate, and d) Small plate. Here, the adjective of size was required. Provision of a correct noun alone or a correct adjective alone would still leave the listener with two possible choices. Examples of complex scenes and the choices shown to the listeners are presented in Table 2.

Two small tables, a cardboard platform divided into four squares, a plywood screen and tape-recorder were also used.

Procedure

Following the administration of the PPVT and word fluency tests, each subject was shown all of the stimulus items in order to insure familiarity with the items. The experimenter (E) named each of the objects and the subject was asked to point to the described object. Adjectives of both colour and size were included in E's descriptions (e.g. Big white dog). Items which any subject could not identify were eliminated.

On a subsequent occasion, each pair of subjects was taken to a quiet room where they were again shown and asked to point to the stimulus items described by E. This second description and identification session was included to ensure that all of the subjects retained their familiarity with the stimulus items. A few subjects were not able to identify objects which they had been able to recognize on the previous occasion. With coaching, however, most subjects were able to correctly identify colours, sizes and objects. Testing was not initiated until the child was able to provide three consecutively correct identifications of the items. One subject was unable to do this and was excluded from the study and an appropriate replacement was made. Although subjects were required to merely point to the objects, they were asked to produce correct colour descriptions for each of the colours used in the simple scenes (red, green, yellow, blue, and white). This check on colour but not object

naming was included because there are fewer colour names and alternative descriptions for colours than there are for the objects. Provision of an incorrect colour name would be more misleading to the listener than an incorrect object name. A 'Green dog,' for example, was correctly described as a 'Green puppy,' a 'Green poochie,' and a 'Green bow-wow.' It could not be adequately described as a 'Red bow-wow.' E did not correct descriptions of the object names because the subject's own choice of words was of interest. Incorrect colour names were corrected during this pretest procedure.

Once it was determined that the subjects were familiar with the items, they were seated opposite one another at two small tables. A wooden screen was placed between the tables so that a subject was unable to see either his partner or the materials placed in front of his partner. A microphone was attached to the top of the wooden screen in order to obtain a recording of the interactions for further analyses.

Five scenes were then placed simultaneously in front of the subject assigned to the speaking role. The four scenes comprising the listener's choices were elevated on a cardboard platform while the speaker's scene was placed on the level of the table directly in front of the speaker. Thus, the speaker was able to examine all of the scenes including a) the scene to be described, b) the scenes which comprised the listener's choices. The speaker was allowed twenty seconds to view all five scenes in order to give him

some indication as to the specificity of the message which should be given to the listener. While E pointed to each of the five scenes in turn, the speaker was told to "Look at everything. This is what you have. I will show these to _____. Look carefully so you know what is good to tell _____. Have a good look!" Following the twenty second viewing period the cardboard platform used to display the four listener choices was removed from the speaker's table and placed on the table in front of the listener. The task was then explained to both S in the following manner: "We are going to play a guessing game. You can talk to each other. You can ask your friend questions. You must not peek. You must not show what you have." The listener was then told: "Listen carefully, _____ will tell you what he has. You must find the same thing on your side. Point to the one _____ tells you about. Only point to one. You can ask questions but no peeking." Immediately before the task was started the speaker was told to "Tell _____ what you have. Tell him/her all about it."

Full instructions were given at the outset of each of the three sessions which occurred on separate days. Five simple and five complex tasks were administered during each session. Prior to the administration of each of the ten individual tasks items comprising a session, the listener was told to "Listen carefully _____ will tell you what he has. Point to the one he/she tells you about." The speaker was told to "Tell _____ what you have. Tell him/her all

about it." While the interaction was occurring E fixated on the score sheet in order to avoid providing the listener with cues by the direction of her gaze. The utterances of both speaker and listener were recorded on tape and in writing at the time of the interaction. In a few cases it was impossible to complete a verbatim written record at the time of the interaction. Adjectives, nouns and prepositions were recorded in writing for all interactions, however. The taped recordings were used as a check on the written records.

Five simple sample tasks were given first. These sample tasks were not scored. Experimental tasks were not administered unless the dyad was able to complete two consecutive sample tasks correctly. If the speaker failed to correctly identify the matched item, E, holding both items in view of the subjects, described each saying, "These are different. They are not the same. This is not right." E then provided the correct description, identified the matched item and held the identical items in view of both subjects repeating the description needed for both items, for example "This is a big dog and this is a big dog, they are the same." If the interaction resulted in a successful match, E, smiling at both subjects and holding the objects in view, described each item but added, "Very good, now you've got it, these are the same. That's right."

Following presentation of the five simple experimental tasks, five sample complex tasks and five experimental complex tasks were administered in the same fashion. No sample tasks

were administered before either the simple or complex experimental sessions on the second and third day. Five simple and five complex tasks were administered in each session. In total, each dyad received five simple sample, five complex sample, fifteen simple experimental and fifteen complex experimental tasks. The tasks were administered on three different days in order to avoid fatigue and to obtain a reliable sample of the children's performance. In most cases, all three sessions were completed within one week. A few sessions were spaced over a time period longer than one week because of illness and vacations. No sessions were spaced over a period longer than three weeks.

Scoring

The results were scored according to the following criteria: 1) the success of the listener in identifying the matched item correctly or 'dyad success,' 2) the number of correct units of relevant information in the speaker's total message,[4] 3) the number of questions asked by the listener, and 4) the parts of speech correctly provided by the speaker (noun, adjective, and preposition).

Dyad Success - One point was awarded for a correct match

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[4]The 'total message' was considered to be cumulative in that a piece of information spontaneously produced in the speaker's first utterance was included in the 'final message' along with information produced in response to a listener's question. Redundant information was not included in the 'total message.'

between speaker and listener scores. No points were awarded for an incorrect match.

Speaker information - A correct speaker message on the simple tasks received a maximum of two points. One point was awarded for provision of a correct noun and one point for the correct adjective. A noun or adjective was considered to be correct if it allowed the listener to discriminate the correct object from amongst the alternatives. For example, a speaker who, in describing a small dog, provided the message "a baby lamb" when the alternatives were a) the same, b) big dog, c) small table, and d) big table would be given two points as 'lamb' is a sufficient discriminator for dog/table and 'baby' is sufficient for big/small. "White dog" would be given one point for the correct noun but not the adjective as the objects, in this task, vary in size not in colour.

A correct speaker message on the complex tasks received a maximum of three points. One point was awarded for each of the nouns in these two-object scenes. The third point was awarded for a preposition correctly describing the relationship between the two objects. Again, descriptions were considered to be correct if there was sufficient information provided to allow the listener to discriminate the matched item from amongst the alternatives provided.

The scores for simple and complex tasks were both totalled across three sessions. The simple item score represented the total correct out of thirty. The total for the

complex items represented the total correct out of forty-five. The complex item total was subsequently divided by 2/3 so that it would be comparable with the simple-item score.

Listener's questions - A separate measure was taken of the number of questions asked by the listener in order to determine the listener's contribution to the interaction. Originally questions were scored as either relevant or irrelevant but because of the small number of irrelevant questions and the difficulties involved in creating a reliable scoring system, the 'total number of questions' was used.

Parts of Speech - A record was kept of which parts of speech appeared in the speaker's final message. Only the nouns, adjectives or prepositions required in the descriptions were of interest.

The written record of the interaction was compared with the taped recordings. The written record was considered to be the most reliable of the two records because articulatory problems often made it difficult to understand the children's speech on the basis of the tape alone. The children were not as difficult to understand at the time of the interaction. A final transcript was prepared on the basis of the tapes and written records. Although it is possible that a bias may have been introduced by having E prepare the final transcript, this bias was considered to be very minimal.

An independent observer scored a random sample of fifty interactions from the final transcript. The agreement between two scorers was 94%. This was considered to be a satisfactory indication of inter-scorer reliability.

Specific Predictions

As only the 'dyad success' data were related to the main hypotheses, this was the dependent variable used in the analysis. The additional data were collected in order to allow a more detailed discussion of the success data. The specific predictions listed below were tested by comparisons involving orthogonal polynomials (See Table 3).

Prediction 1 - For dyad success scores collapsed across two levels of complexity, no significant differences are expected when Groups H-H, L-L are compared with Groups H-L, L-H (See Equation 1).

Prediction 2 - For dyad success scores collapsed across two levels of complexity, Group H-L is expected to show a significantly higher score than Group L-L. This difference is expected to be significant at $p<0.05$.

Prediction 3 - For dyad success scores collapsed across two levels of complexity, no significant difference is expected when Group L-H is compared with Group L-L.

TABLE 3

EQUATIONS USED FOR TESTING SPECIFIC PREDICTIONS THROUGH THE USE OF ORTHOGONAL POLYNOMIALS

Equation 1

$$SS_A comp = \frac{[\Sigma(ci)\ (Ai)]^2}{bs[\Sigma(ci)^2]}$$

df = 1

error term = $MS_{S/A}$

Equation 2

$$SSAcompxB = \frac{\Sigma[\ \Sigma(ci)\ (ABij)]^2}{s[\ \Sigma(ci)^2]} - SSAcomp$$

df = b-1

error term = $MS_{S/AB}$

A = sums collapsed across B

AB= non-collapsed group sums

c = polynomials

s = subjects

b = levels of Factor B

Prediction 4 - For dyad success scores collapsed across two levels of complexity, no significant difference is expected when Group H-H is compared with Group H-L.

Prediction 5 - For dyad success scores across two levels of complexity, the difference between Groups H-H, L-L and Groups H-L, L-H is not expected to be greater on complex than on simple tasks. A comparison of these groups across levels of complexity will, therefore, reveal a non-significant interaction (See Equation 2).

Prediction 6 - For dyad success scores across two levels of complexity, the difference between Group H-L and Group L-L is expected to be greater on complex than on simple tasks. A comparison of these two groups across levels of task complexity will reveal an interaction which is significant at $p<0.05$.

Prediction 7 - For dyad success scores across two levels of complexity, the difference between Group L-H and L-L is expected to be greater on complex than on simple tasks. A comparison of these two groups across levels of task complexity will reveal an interaction significant at $p<0.05$.

Prediction 8 - For dyad success scores across two levels of complexity, no change is expected in the difference between Group H-H and H-L. A comparison of these two groups will reveal a non-significant interaction.

The number of orthogonal (independent) comparisons that can be conducted is normally determined by the degrees of freedom for the source of variance. It is acknowledged that the comparisons made in the above predictions were not mutually orthogonal and therefore involved redundant information which may increase the probability of a Type I error. Because they are planned and not post-hoc comparisons, however, the critical feature is their a priori nature, not their independence (Keppel, 1973).

CHAPTER III

Results

Dyad Success

The dyad success data was subjected to a 4 x 2 analysis of variance with four groups and two repeated measures across two levels of complexity. The independent variables used were: Factor A, Groups - 1) H-H, 2) H-L, 3) L-H, 4) L-L and Factor B, Complexity - 1) Simple, 2) Complex. The specific a priori hypotheses were tested with Equations 1 and 2 (See Table 4).

The analysis of variance for the dyad success data revealed a marginally significant F value of 0.059 for the Groups factor but non-significant F values for the Complexity factor and the Groups x Complexity interaction ($p = 0.139$ and $p = 0.430$, respectively). Planned comparisons revealed the following results.

Hypothesis 1 (H-H, L-L . . . H-L, L-H) - As predicted, no significant differences were found between the two homogeneous and the two heterogeneous groups ($p<0.25$). The superiority shown for Group H-H was balanced by the poor performance shown by Group L-L.

Hypothesis 2 (H-L . . . L-L) - As predicted, a significant difference was found between groups H-L and L-L ($p<0.01$). A high-level speaker was shown to be a significant

TABLE 4

MEANS TABLE FOR 'DYAD SUCCESS' DATA

		H-H	H-L	L-H	L-L	Mean Total
MEAN	Simple	12.0	11.0	12.2	8.0	10.8
	Complex	11.8	11.2	10.0	6.8	10.0
	Mean Total	11.9	11.1	11.1	7.4	
STANDARD DEVIATION	Simple	2.6	2.9	3.4	1.9	
	Complex	5.4	2.0	4.1	2.0	

ANALYSIS OF VARIANCE FOR LISTENER SUCCESS DATA

Source	DF	SS	MS	F	P
Group	3	122.28	40.76	3.05	0.059
Error	16	213.60	13.35		
Level	1	7.23	7.22	2.42	0.14
Group x Level	3	8.66	2.89	0.97	0.43
Error	16	47.60	2.97		
Total	39	399.37	10.24		

advantage to a low-level listener.

Hypothesis 3 (L-H . . . L-L) - Hypothesis 3 was not supported. A significant difference was found between Groups L-H and L-L. The mean difference between these two groups is identical to the difference found between Groups H-L and L-L in Hypothesis 2 ($p<0.01$). Apparently, a high-level listener is as much of an advantage as a high-level speaker.

Hypothesis 4 (H-H . . . H-L) - As predicted, no significant differences were found between groups H-H and H-L. A low-level listener does not appear to be a significant detriment to a high-level speaker. Although no formal hypothesis was made concerning the comparison of Groups H-H and L-H it is interesting to note that the difference between these two groups is identical to the difference shown in Hypothesis 4. A low-level speaker did not significantly hinder the performance of the heterogeneous dyad relative to the homogeneous high-level dyad.

Hypothesis 5 (H-H, L-L . . . H-L, L-H x Complexity) - As predicted, the non-significant difference between the two homogeneous and the two heterogeneous groups did not change across levels of the Complexity factor.

Hypothesis 6 (H-L . . . L-L x Complexity) - Hypothesis 6 was not supported. The difference between Groups H-L and L-L did not increase significantly as a function of task complexity. A high-level speaker was not a greater advantage

advantage on the complex tasks than on the simple tasks.

Hypothesis 7 (L-H . . . L-L x Complexity) - Hypothesis 7 was not supported. The difference between Groups L-H and L-L did not increase as a function of task complexity. A high-level listener was not a greater advantage on the complex than on the simple tasks.

Hypothesis 8 (H-H . . . H-L x Complexity) - As predicted, the difference between Group H-H and H-L did not change across levels of complexity. A low-level listener did not decrease the performance rate of the heterogeneous group relative to the high-level homogeneous group on either the simple or complex tasks.

A limited number of post-hoc comparisons using Dunn's test were performed. None of the remaining comparisons between groups yielded a significant difference which exceeded the Dunn Critical Range. Apparently, the p value of 0.059 shown in the analysis of variance was largely a result of the differences between Group L-L and the remaining three groups (H-H, H-L, L-H).

Additional Analyses

Three sets of data were investigated in addition to the main analysis of the dyad success data: the amount of information produced by the speaker, the number of questions asked by listeners and the parts of speech which were provided in the speaker's message. An analysis of variance was performed on the speaker information data and the number of

TABLE 5

DYAD SUCCESS - A COMPARISON BETWEEN MEANS USING DUNN'S TEST

$$CR\ DUNN = d(14,16)\sqrt{2(5)13.35} = 3.48(11.5) = 39.02$$

Critical Range = 39.02

	A1	A2	A3	A4	A1'	A2'	A3'	A4'
		Simple				Complex		
A1		15	1	20	1	x	x	x
A2			6	15	x	1	x	x
A3				21	x	x	11	x
A4					x	x	x	6
A1'						3	9	25
A2'							6	22
A3'								16
A4'								

x = non-meaningful comparison

questions. These were secondary, post-hoc analyses. The scores were not independent of the dyad success scores. A p value of at least 0.01 was considered to be necessary before a result would be considered as significant.

The analysis of variance for the speaker information data revealed no significant main effects for Groups ($p = 0.40$) or Complexity ($p = 0.19$) but a significant Group x Complexity interaction ($p = 0.001$). Table 6 indicates that low-level speakers had greater difficulty with complex than simple tasks as compared to high-level speakers. This finding is especially true of the speakers in Group L-H. This interaction is not surprising in view of the fact that complex items were defined as those items which 75% of the high-level and 25 percent of the low-level pilot subjects could describe and identify correctly.

The total number of questions asked across groups and across levels is shown in Table 8. An analysis of variance for this data revealed no significant differences across groups or across levels. Analyses of differences between groups using Scheffe's test also revealed no significant differences between individual groups at either level of complexity. The high degree of variability in the number of questions asked by listeners probably contributed to the lack of significant differences (See Appendix C).

An examination of the parts of speech missing from the speaker's message indicates that prepositions were most

TABLE 6

MEANS TABLE FOR AMOUNT OF SPEAKER INFORMATION

	H-H	H-L	L-H	L-L	MEAN TOTAL
Simple	25.4	24.2	23.0	19.2	22.9
Complex	24.8	26.6	19.2	16.2	21.7
Mean Total	25.1	25.4	21.1	17.7	

ANALYSIS OF VARIANCE FOR SPEAKER INFORMATION

SOURCE	DF	SS	MS	F	P
Group	3	153.80	51.267	1.046	0.40
Error	16	783.6	48.97		
Level	1	4.90	4.90	1.866	0.19
Group x Level	3	104.10	34.70	13.22	0.001
Total	39	1088.40	27.90		

frequently missing from the messages, followed by adjectives and nouns (See Table 7).

TABLE 7

PERCENTAGE OF NOUNS, ADJECTIVES AND PREPOSITIONS MISSING FROM SPEAKER MESSAGES

	Group H-H		Group H-L		Group L-H		Group L-L	
	N	A	N	A	N	A	N	A
Simple	0.04	28	0.01	33	0.09	41	29	71
	N	P	N	P	N	P	N	P
Complex	0.03	39	0.02	24	23	63	25	88

Mean percentage of missing nouns = 0.12

Mean percentage of missing adjectives = 43.2

Mean percentage of missing prepositions = 53.5

CHAPTER IV

Discussion

Homogeneous versus Heterogeneous Grouping

The lack of significant differences between the combined homogeneous and the combined heterogeneous groups suggests that one cannot properly discuss homogeneous or heterogeneous grouping without reference to the specific type of group involved. Although high-level children performed very well in a homogeneous dyad, low-level children showed the least amount of communication in this type of dyad.

This result is in disagreement with the findings of Rosenberg, Spradlin and Mabel (1961). In that study more interaction was found in homogeneous than heterogeneous groups regardless of the ability level of the subjects. Although low-level children in their homogeneous dyads engaged in a substantial amount of crude vocalization, gestures and physical contact, the amount of linguistic information shared between low-level subjects may have been negligible. Findings of Copeland (1960) further suggest that low-level retarded children may engage in frequent but meaningless vocalizations. Low-level children in Copeland's study vocalized more than high-level children regardless of the type of feedback given.

It is suggested that the discrepancy in the findings between this study and that of Rosenberg, Spradlin and Mabel's does not stem from differences in the verbal as opposed to the non-verbal measures. The differing results are more likely a result of the emphasis on measurement of the information components in interactions between two retarded children in the present study. Rosenberg et al (1961) did not measure the amount of information transpiring in the gestures, vocalizations or physical contact of their subjects.

A study similar to the present but restricting interactions to non-verbal forms of communication and assessing their information value will be necessary before a clear statement can be made concerning the amount of information transfer enjoyed by retarded children engaging in non-verbal communication.

The Role of the Speaker

Dyads containing a high-level speaker and a low-level listener were more successful in the matching tasks than similar dyads having a low-level speaker. The superiority in dyad success of Group H-L over Group L-L was not based on the listener's contributions in the form of questions. On the average, more questions were asked in Group L-L than Group H-L (See Table 8). In addition, no significant differences could be found between these two groups in the amount of speaker information produced although the mean

TABLE 8

TOTAL NUMBER OF QUESTIONS ASKED BY LISTENERS

	H-H	H-L	L-H	L-L	$\bar{X}$ Total
Simple	30	11	43	7	22.7
Complex	16	2	26	16	10
Mean Total	23	6.5	34.5	11.5	

Total number of questions asked by low-level listeners = 18

Total number of questions asked by high-level listeners = 57.5

Total number of questions asked by listeners assembled with low-level speakers = 46.0

Total number of questions asked by listeners assembled with high-level speakers = 29.5

ANALYSIS OF VARIANCE FOR LISTENERS QUESTIONS

Source	DF	SS	MS	F	P
Group	3	404.90	134.96	1.87	0.175
Error Term	16	1153.0	72.06		
Level	1	0.00	0.00	0.00	1.00
Group x Level	3	48.6	16.20	0.86	0.48
Error Term	16	301.4	18.83		
Total	39	1907.9	48.92		

difference was in the expected direction of greater information for high-level speakers (See Table 6). Table 7 reflects the changes in speaker productivity between Group H-L and L-L. A substantial difference in percentage of nouns missing indicates that listeners in Group L-L did, in fact, receive a less informative message.

The lack of significant differences between groups in the amount of speaker information was probably a result of the high degree of within-cell variability (See Table 9). It is speculated that this variability is partially a function of the wide range of IQ and word fluency scores within each language ability level. A larger subject pool would be necessary in order to avoid this wide range of scores. Dependent variables designed to measure the specific linguistic components of the interaction may also allow greater sensibility in detecting changes in interactions across groups.

An additional consideration in explaining the difference between Group H-L and L-L is that the greater language stimulation offered in the heterogeneous group may be operating to increase the attention and efficiency of the low-level subjects. Informal observation indicated that listeners in Group L-L often made an incorrect selection despite being given an adequate message due to the frustration and boredom resulting from a low success rate on these tasks.

TABLE 9

MEANS AND STANDARD DEVIATIONS FOR SPEAKER DATA

		H-H	H-L	L-H	L-L
Simple	MEAN	25.4	24.2	23.0	19.2
	STANDARD DEVIATION	4.7	4.2	7.5	3.9
Complex	MEAN	24.8	26.6	19.2	16.2
	STANDARD DEVIATION	2.6	1.7	9.2	2.4

The Role of the Listener

The significant advantage of providing a low-level speaker with a high-level listener was nor reported in previous research because these studies had limited the input from the listeners to the dyadic interaction (Hollis, 1965; Glucksberg, 1966; Spradlin et al, 1967). The lack of significant differences between groups in the number of questions asked by listeners in this study is puzzling. It had been expected that the listener's most important contribution to the interaction would be the asking of questions. An examination of the raw data indicates that there was a high degree of variability in the groups in terms of the number of questions asked by listeners (See Appendix C). For example, two subjects in Group H-H asked no questions while one subject asked as many as twenty-six questions. This variability adds to the error rate, decreasing the chance of a significant result. Reminding subjects to ask questions before the administration of every task item might have helped to reduce this variability.

Regardless of the possible reasons for the lack of significant findings for listener questions, it cannot be concluded that Group L-H was more successful in communicating information than Group L-L because of the listener's contribution in the form of questions. It is speculated that the advantage of providing a low-level speaker with a high-level listener might be due to both the greater noun information received by listeners in the L-H group and the high level listener's ability to make use of partially incorrect

messages. Further research designed to determine retarded children's ability to deal with partially incorrect speech as well as their ability to develop questioning skills will be necessary before the advantage of a high-level listener can be adequately explained.

Concepts drawn from Luria (1966) and Bygotsky (1962) may be helpful in appreciating the possible advantages of a high-level listener. A listener who poses the question "Big or small?" may be, in Luria's terms, allowing the slower child to circumvent his poorly developed 'inner language' processes. The speaker need not rely on his own verbal association abilities necessary for the production of a relational expression. Similarly, Vygotsky (1962) considers the adults most important role to be the promotion of the child's cognitive development through demarcation of the relevant dimensions of experience. A high-level child is demarcating, through questioning, the relevant dimensions of the task.

Task Complexity

Differences between groups on the dyad success measures did not change across levels of task complexity. A significant Speaker Information x Complexity interaction indicated that the speaker's production of information did change as a function of task complexity. Given this change in speaker productivity, why did an interaction effect not appear for the dyad success data? Tables 4 and 6 indicate that Group L-L showed the same performance pattern for the

'success' and the 'speaker' data. In both cases, a drop in performance, relative to the other groups, was shown. In both cases, a slight drop in performance was shown across levels of complexity. Group L-H, on the other hand, showed a different pattern of performance on the 'success' and the 'speaker' data. On the success data, little difference was shown between Group L-H and Groups H-H and H-L at either level of complexity. On the speaker data, although little discrepancy was shown across Groups H-H, H-L and L-H on the imple tasks, a large difference was shown between Groups L-H and Groups H-H and H-L on the complex tasks. Why then, is there not a corresponding drop in the dyad success score? Considering that dyad success is a composite measure of both speaker and listener performance, the listener's performance must be operating to mask the reduced speaker performance, especially on complex tasks. A possible explanation for this masking effect may be again that a high-level listener is able to utilize the information available in partially correct messages more effectively than a low-level listener. Thus, although the speaker may have produced less information, the high-level listener was able to use the limited information available. If both nouns were given, for example, the choices would be limited to two scenes. One of these scenes would be the correct match while the other would involve both nouns but a different preposition. A listener, attending to the nouns provided by the speaker, would produce, by chance, a

match on fifty percent of these tasks. Although the same situation would apply when partially correct messages were provided on the simple tasks, complete information was provided more frequently, thus eliminating the need for 'good guesses' on the part of the listener. An additional consideration regarding high-level listener's ability to perform a correct match on complex tasks despite relatively poor speaker performance is that there may have been a possible response bias for correct responses on these tasks. Scenes requiring descriptions using the preposition 'on' occurred more frequently than other prepositions. A corresponding response bias was not present on the simple tasks. A high-level listener may have been better able to take advantage of the response bias, thus masking the decrease in speaker information.

Although the complexity factor was included in order to provide tasks which represent the language abilities of both high and low-level subjects, informal observations suggest that the nature of the difficulties changed across levels to include both language and conceptual problems. On the simple tasks, the greatest difficulty appeared to be conceptual rather than linguistic. Subjects were required to deal not only with descriptions of concrete stimuli but also with abstract relational concepts such as 'bigger' and 'smaller.' Similarly, in tasks involving a noun and an adjective of colour, the subject was required to describe or

respond to both the concrete stimulus (noun) and a property of the stimulus (colour).

The prepositional tasks presented both conceptual and linguistic problems. Although both high and low-level subjects often had difficulty appreciating the abstract prepositional relationship between two objects, subjects who were aware of the importance of providing a preposition also had difficulty in selecting the correct preposition. This linguistic problem was not evident on the simple tasks. Subjects who provided an adjective, usually provided a correct one.

Egocentricity

It would be interesting to determine the contribution of egocentric thinking to the communication process. Werner and Kaplan (1963) report that in the younger and in the retarded child, the distinction between inner and external speech is relatively slight but that the differentiation between inner and external speech becomes progressively more marked with age and increases in IQ. The retarded child may, therefore, not realize that he has not externalized his thought processes to an extent which is sufficient for meaningful communication in the dyad. Speakers in the present study who failed to spontaneously provide an adjective were often able to do so when questioned, suggesting that communication breakdowns may result from egocentric thinking as

much as from pure language deficits. When shown the mismatch resulting from their failure to provide a complete message, these speakers seemed unable to appreciate that it was their inadequacy which resulted in the failure to match items. It may be that more dramatic differences would be found if children were divided into high and low levels of egocentricity rather than verbal ability although the two are probably related.

Limitations of the Present Study

The Complexity Factor

Although non-significant differences were found for the Complexity factor in both the dyad success and speaker information data, it can not be concluded that interaction styles do not change as a function of language complexity nor should it be concluded that these results can be generalized to a wider range of language abilities. A replication of the present study using different criteria for task complexity is necessary. Speech samples from both high and low-level subjects in free-play settings could provide the basis for the formation of target (speaker)scenes rather than using pre-determined scenes created by the experimenter. Although this method would allow less control over the linguistic components needed for description of the scenes, it should more accurately represent the verbal abilities and interests of the subjects.

Exclusion of Social Variables and Non-Verbal Communication

This study deliberately excluded social variables and non-verbal communication, two highly important factors in the applied non-experimental setting. It is acknowledged that either of these factors may be more important than verbal behaviour in determining the frequency and quality of interactions occurring in an integrated setting. Meile (1970) reported that similarity in personal and social characteristics facilitated group membership. Further support for the importance of social rather than intellectual skills comes from Dentler and Mackler (1962) who reported that although group structure initially depends on IQ, sociometric status was increasingly associated with conformity. Educators preparing retarded children for an integrated setting, may wish to focus on social as well as verbal abilities.

The Setting

Although subjects were encouraged to interact freely during the experiment, it is unlikely that the children's interaction style was typical of the spontaneous interactions occurring between retarded children. Many dyads lapsed into a 'teacher-student' relationship despite the fact that they were encouraged to cooperate in the communication task by the instruction that they could 'talk and ask questions.' The speaker, apparently perceived as having greater status, often took charge of the sessions and criticized the listener for mismatches which were the result of insufficient speaker

information. The listener often remained passive despite the obvious inadequacy of the speaker's performance. Elaboration and repetition of instructions to the listener may be one solution to this problem. Increasing the number of trials may also help the subjects to adopt a less rigid and sterile interaction style and become more comfortable in the experimental setting.

Limited Number of Trials

Increasing the number of trials from the three sessions offered in the present study would allow for analysis of learning effects, providing information pertinent to the development of language learning and communication strategies in integrated settings. Comments on the validity of a behavioural or nativist approach to language development await investigation of changes in language structure following interaction during longer periods in heterogeneous or homogeneous groupings.

The Subject Pool

The small number of subjects used in the present study limited the number of variables which could be investigated as well as the number of subjects which could be included within a narrow range of age and IQ. It should also be noted that the subjects in this study were drawn from schools for the retarded which grouped their children in a fairly heterogeneous fashion. The children were grouped in the classrooms according to age rather than IQ although the method

of grouping was not well defined. The different classes interacted in many outings and sports events. During recess and lunch hour the children had the opportunity to interact with children from other classes but they appeared to prefer to interact with children from their own class. A different pattern of results may have been found had the subjects been drawn from schools exercising greater segregation.

Data Analysis and Criteria for Classification

The PPVT was a fairly simple method for assigning children to high and low language ability groups. Measurement of the syntactic, semantic and social aspects of language would provide a more comprehensive assessment of the child's linguistic and communication abilities.

Finally, the linguistic analysis was very simple. A multivariate study investigating variables such as the grammatical components of the verbal interactions, the types of errors made by the listener, learning effects and measures of cooperation and motivation would allow a more comprehensive investigation of language behaviour in pairs of retarded children.

General Conclusions and Applications to an Educational Setting

Given the above limitations, the following conclusions favour heterogeneous grouping in settings where two retarded children are given specific verbal information to communicate

and where the language complexity needed to communicate the information is within the range of language abilities represented by both high and low-level groups:

1) low-level children gain more useful information from their peers in a heterogeneous than in a homogeneous group.

2) inclusion of low-level children in a heterogeneous groups has not been shown to significantly decrease the rate of successful communication as compared to the performance found in homogeneous high-level groups.

It is possible that high-level children may show a significantly higher rate of communication in homogeneous as compared to heterogeneous groups, when the communication task requires acquisition of new language skills rather than practice in already acquired language skills. The present study provided complex tasks which were intended to be a challenge to the low but not to the high-level subjects. Inclusion of tasks which also challenged the high-level subjects may reveal a pattern of results suggesting that heterogeneous grouping is advantageous only for the low-level subjects.

It is suggested that, because of the formal nature of the communication tasks in the present study, these results will generalize better to a classroom setting where two children are given a specific problem to solve verbally than to a free-play setting. The reported advantages of heterogeneous grouping might be developed in a formal manner by teaching the children to pose relevant questions and provide

relevant information while in heterogeneous dyads. The demands normally placed on the classroom teacher to provide information and pose relevant questions could be satisfied by the students themselves when they are placed in heterogeneous dyads.

Although it had been predicted, on the basis of previous research, that the most effective means of heterogeneous grouping would be to place the more verbal child in the role of the 'speaker' or 'explainer' results from the present study indicate that the opposite method of heterogeneous grouping is an equally effective means of facilitating communication. A desirable method of teaching language skills may be then, to place children in H-L dyads where the teacher's role would be to provide guidance in the description of materials and the posing of questions. The high-level child would receive practice in verbal description. The low-level child would not only be provided with an opportunity for modeling more appropriate speech but would also learn to pose relevant questions. Once this dyad was able to communicate successfully, the dyad roles might be reversed. Here, the demands on the teacher should be reduced because the high-level subjects, already familiar with the task, could pose questions which would help the low-level child to produce an appropriate verbal description.

This heterogeneous dyadic method of instruction may be more effective than traditional homogeneously grouped classes where the primary focus on classroom interaction is

between student and teacher. The dyadic method of instruction would have the following advantages:

1) children could be taught to not only acquire a greater vocabulary but also learn to attend to important features of the environment and to develop more abstract categorizational abilities through the posing of questions concerning size, shape, class membership, relative positioning, etc.

2) low-level children would have a more appropriate peer model in a heterogeneous than in a homogeneous setting. Strichart (1974), in reviewing imitation among retarded children concluded that imitation occurs most often under conditions where a non-competent observer is asked to imitate a competent model. Low-level children would, therefore, be expected to show the greatest benefit from modeling in a heterogeneous setting.

3) the dyad partner could provide feedback more quickly than is possible in a traditional setting where the teacher is the only source of feedback.

4) the classroom teacher's time could be diverted from group instruction to lesson planning and corrective feedback for the dyads.

5) heterogeneous grouping in a structured setting may encourage greater heterogeneous interaction in a free-play setting.

Suggestions for Future Research

A number of modifications of the present study have been discussed above. In addition to inclusion of these modifications in future research projects, determination of the optimal difference in verbal ability for heterogeneous groups would be an important research question. Before advocating heterogeneous grouping we must be able to answer the question, "How different should the children be?"

An investigation of non-verbal communication employing a design similar to that used in the present study would also be of interest. Dyad members could be separated by a sound-proof glass wall rather than a plywood screen. Pantomime or gestural activity could be substituted for verbal activity in communicating information pertaining to the target scenes.

Comparison of the traditional, segregated and the dyadic grouping approach discussed above raises many questions for future research. Considering the controversy presently centering around the question of retarded children's ability to enjoy social success in an integrated setting, social interaction would be an important variable to include in future research. Although Goodman, Gottlieb and Harrison, 1976, reported positive changes in attitude and school performance for 'high-able' students following integration, no measure of social interaction was included in that study. A measure of the frequency and quality of interactions occurring between

the normal and retarded children would be helpful in assessing the social impact of integration on the children involved. A child's 'social-interaction potential' may be more valuable in predicting success than his or her 'academic-learning potential.' If high-level subjects refuse to cooperate with or ridicule the slower children, the probability for success in an integrated setting will be low.

Pre- and post-measurement of spontaneous interactions in a free-play setting may be a useful means of testing for generalization of the classroom behaviour and attitudes reported by Goodman et al (1976). A comparison of language abilities following either an integrated free-play program or the formal classroom program discussed above would be helpful in determining whether language skills are acquired more quickly in an informal, free-play setting or a structured, classroom setting.

Perhaps the most valuable extension of the present study would be the inclusion of normal children. Information regarding interactions between retarded and normal children would allow greater generalization of the present results and be more in keeping with the ultimate goal of normalization.

Although efficacy studies have failed to demonstrate that special, segregated classes provide an education which is superior to regular class placement (Budoff & Gottlieb, 1976) it cannot be concluded that total integration is the most efficient means of developing verbal skills in the

retarded. It is likely that certain degrees of integration, with certain differences in ability between children, stressing some types of interactions will benefit some children. The questions of what form and degree of integration, what degree of difference in ability, which types of interactions and which children will be most successful provide a challenge for future researchers.

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APPENDIX A

The Pilot Study

Prior to the experiment, a pilot study involving eight subjects was performed. The pilot subjects were drawn from the same subject pool but were either slightly older or younger than experimental subjects in order to avoid draining an already limited subject pool.

The pilot study was similar to the main experiment except for the following:

1) Pilot subjects were shown a wider range of toys than were the experimental subjects. Items which a pilot subject could not describe and identify were eliminated. In addition to a display of the individual items, objects were also shown in combination to create scenes of varying complexity. Scenes ranging from two to six object combinations were shown to the pilot subjects. On the basis of their descriptions it was determined that the maximum level of difficulty could be obtained with two objects. The objects were then displayed in various two object combinations until twenty scenes satisfying the criteria for complex scenes were determined. Scenes which $\frac{1}{4}$ of the low-level subjects and 3/4 of the high-level subjects could describe and identify were considered to be complex. Noun description of one-object scenes were found to be too simple. The objects were again displayed but, on this second occasion, the children were

required to give an appropriate adjective. Items varying in colour were displayed together as were objects varying in size (big and small). Twenty items were then chosen which satisfied the criteria for simple scenes. Scenes which 4/4 of the high-level subjects and 3/4 of the low-level subjects could describe and identify were considered to be simple.

2) A video tape demonstration of the tasks was presented prior to initiation of the communication tasks. Graduate students played the role of speaker and listener. The graduate students were instructed as to the type of errors they should make so that E had the opportunity of correcting these errors in the demonstration. A demonstration of this sort was not used in the main experiment because the pilot subjects paid little attention to the videotape. Sample tasks were found to be more effective means of demonstration.

3) Speaker messages were scored according to a pass/fail system in order to simplify the analysis. One point was awarded for a completely correct message and no point was awarded for a partially correct message. A two and three point scoring system was adopted in the main study to avoid ceiling effects and to provide a more sensitive measure of speaker productivity.

4) Speakers were not shown the items seen by the listener. This made it difficult for speakers to determine the amount of specificity needed in their messages. It also made it difficult to score because an utterance could not be considered

as 'adequate given the alternatives,' but required a more rigid scoring system. Speakers in the main study were given the opportunity to view the listener's alternatives to provide them with some notion as to the specificity of description needed and to allow a more flexible scoring system (i.e. sufficient to discriminate amongst the alternatives rather than most common noun).

5) The listener items varied randomly rather than being variations on the noun-adjective or noun-preposition-noun phrase. Systematic variations were provided in the main study so that provision of a one point message in the simple tasks would leave two choices. In the complex tasks, a one point message would leave the listener with at least three choices, a two point message would leave the listener with at least two choices.

6) Concrete reinforcers were used at the end of each session in addition to the immediate social reinforcers. Concrete reinforcers were not included in the main study because they did not appear to increase the performance rate.

Due to the operation of ceiling effects, the pilot data was not formally analysed.

APPENDIX B

INDIVIDUAL AGE(MONTHS), PPVT IQ,

WORD FLUENCY SCORES AND SEX

Speaker

	H-H					H-L					L-H					L-L				
	Dyad					Dyad					Dyad					Dyad				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Age	190	166	183	141	104	177	162	183	162	142	189	163	188	137	123	108	140	146	139	160
IQ	71	62	57	54	66	68	66	70	66	53	27	27	38	43	38	34	27	32	26	36
W.F.	23	41	22	27	35	15	38	36	48	68	14	17	25	20	25	14	8	22	20	16
Sex	F	M	M	M	M	M	F	F	F	F	F	F	F	F	M	F	F	F	M	F

APPENDIX B
(Cont.)

INDIVIDUAL AGE (MONTHS), PPVT IQ,

WORD FLUENCY SCORES AND SEX

Listener

	H-H					H-L					L-H					L-L				
	Dyad					Dyad					Dyad					Dyad				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Age	177	172	159	140	122	171	152	184	152	134	190	141	181	139	135	108	127	145	137	146
IQ	76	56	63	66	52	24	38	30	38	40	63	46	60	73	68	40	36	43	39	44
W.F.	67	32	10	19	50	29	25	33	26	11	33	22	45	40	37	17	17	19	12	26
Sex	F	M	M	M	M	F	M	F	M	M	M	M	M	F	M	M	M	F	F	M

APPENDIX C

RAW DATA FOR SPEAKER INFORMATION, DYAD SUCCESS, NUMBER OF QUESTIONS AND PARTS OF SPEECH INCLUDED IN THE SPEAKER'S MESSAGE

SIMPLE

GROUP H-L

	Speaker Info.					Dyad Success					Number of Questions					Parts of Speech				
Dyad No.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	1	1	1	2	1	1	1	0	1	1	0	0	0	0	0	N-	N-	N-	NA	N-
2	1	2	2	2	1	1	1	1	1	1	0	0	0	0	0	N-	NA	NA	NA	N-
3	1	1	2	2	1	0	0	1	1	0	0	2	0	0	0	N-	N-	NA	NA	-A
4	1	1	2	1	2	1	1	1	1	1	0	1	0	0	0	N-	N-	NA	N-	NA
5	1	2	2	2	2	1	1	1	1	0	0	2	0	0	0	-A	NA	NA	NA	NA
6	1	2	1	1	2	1	1	1	0	1	0	1	0	0	0	N-	NA	N-	N-	NA
7	2	2	1	2	2	1	1	1	1	0	0	0	0	0	0	NA	NA	NA	NA	NA
8	1	2	1	2	2	1	1	1	1	0	0	0	0	0	0	N-	NA	N-	NA	NA
9	2	2	1	2	2	1	1	1	1	0	0	1	0	0	0	NA	NA	N-	NA	NA
10	1	2	1	2	2	0	1	1	1	0	2	0	0	0	0	-A	NA	NA	NA	NA
11	0	2	1	2	1	1	1	0	0	0	0	0	0	0	0	N-	NA	N-	NA	N-
12	1	1	1	2	2	0	1	0	1	1	0	0	0	0	0	N-	N-	NA	NA	NA
13	2	2	2	2	2	1	1	1	1	1	0	0	0	0	0	NA	NA	NA	NA	NA
14	1	1	2	2	2	0	1	1	1	0	0	1	0	0	0	N-	NA	NA	NA	NA
15	1	1	2	2	2	1	0	1	1	0	0	1	0	0	0	N-	NA	NA	NA	NA

COMPLEX

GROUP H-L

	Speaker Info					Dyad Success					Number of Questions					Parts of Speech				
Dyad No.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	3	2	3	3	3	1	1	1	1	0	0	0	0	0		NPN	N-N	NPN	NPN	
2	1	2	3	3	3	0	1	1	1	1	0	0	0	0		N--	N-N	NPN	NPN	
3	1	3	3	3	3	1	0	1	1	0	0	0	0	0		N--	NPN	NPN	NPN	
4	2	3	2	2	2	1	1	1	0	1	0	0	0	0		N-N	NPN	N-N	-PN	
5	3	3	3	3	3	1	1	1	1	0	0	0	0	0		NPN	NPN	NPN	NPN	
6	2	3	2	3	2	0	1	1	1	0	0	0	0	0		N-N	NPN	N-N	NPN	
7	3	3	3	3	3	0	1	1	0	0	0	0	0	0		NPN	NPN	NPN	NPN	
8	3	3	3	3	3	1	1	1	1	1	0	0	0	0		NPN	NPN	NPN	NPN	
9	3	3	2	2	2	1	1	0	0	0	0	0	0	0		NPN	NPN	N-N	N-N	
10	3	3	3	3	3	1	1	1	1	1	0	0	0	1		NPN	NPN	NPN	NPN	
11	2	3	3	3	2	0	0	1	1	1	0	0	0	0		N-N	NPN	NPN	NPN	
12	3	3	3	3	3	1	1	1	1	0	0	0	0	0		NPN	NPN	NPN	NPN	
13	3	3	3	3	2	1	1	0	0	1	0	0	0	0		NPN	NPN	NPN	NPN	
14	2	3	2	3	3	1	1	1	1	1	0	0	0	0		N-N	NPN	N-N	NPN	
15	2	3	3	3	3	1	1	1	1	1	0	0	0	0		N-N	NPN	NPN	NPN	

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GROUP L-H

	Speaker Info.					Dyad Success					Number of Questions					Parts of Speech				
Dyad No.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	1	1	2	1	1	0	0	1	1	1	4	0	1	1	0	N-	N-	NA	N-	N-
2	2	1	2	2	1	1	0	1	1	0	3	0	1	0	0	NA	N-	NA	NA	N-
3	2	1	2	2	1	1	0	1	1	1	3	0	1	0	0	NA	N-	NA	NA	N-
4	2	0	2	1	1	1	1	1	1	1	3	0	1	0	1	NA	--	NA	N-	N-
5	2	1	2	2	1	1	1	1	1	1	2	0	1	0	0	NA	-A	NA	NA	N-
6	2	1	2	1	1	1	0	1	1	0	1	0	0	0	0	NA	N-	NA	N-	N-
7	2	1	2	2	1	1	1	1	1	0	4	0	0	0	0	NA	N-	NA	NA	N-
8	2	1	2	1	1	1	1	1	1	0	1	0	1	0	0	NA	N-	NA	N-	N-
9	2	1	2	2	1	1	0	1	1	0	1	0	0	0	0	NA	N-	NA	NA	N-
10	2	2	2	2	1	1	1	1	1	1	1	0	0	0	0	NA	NA	NA	NA	N-
11	2	1	2	2	1	1	1	1	1	0	1	0	0	1	0	NA	N-	NA	NA	N-
12	2	1	2	2	1	1	0	1	1	1	1	0	0	1	0	NA	N-	NA	NA	N-
13	2	1	2	2	1	1	1	1	1	0	0	0	0	2	0	NA	-A	NA	NA	N-
14	2	1	2	2	2	1	1	1	1	1	1	0	0	2	1	NA	N-	NA	NA	NA
15	2	0	2	2	1	1	1	1	1	1	1	0	0	1	0	NA	--	NA	NA	N-

COMPLEX

GROUP L-H

	Speaker Info.					Dyad Success					Number of Questions					Parts of Speech				
Dyad No.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	3	1	3	3	1	1	1	1	1	1	1	0	0	0	0	NPN	N--	NPN	NPN	N--
2	3	1	3	3	1	1	1	1	1	1	2	0	0	0	0	NPN	N--	NPN	NPN	N--
3	2	1	3	3	1	0	0	1	1	0	0	0	1	0	0	N-N	N--	NPN	NPN	N--
4	2	1	2	2	1	1	0	1	1	1	0	0	0	0	1	N-N	N--	N-N	N-N	N--
5	3	1	3	3	1	1	0	1	1	0	1	0	0	1	0	NPN	N--	NPN	NPN	N--
6	2	1	2	2	1	1	0	0	1	1	1	0	0	0	0	N-N	N--	N-N	N-N	N--
7	2	3	3	3	1	0	0	1	1	0	3	0	0	0	0	N-N	NPN	NPN	NPN	N--
8	3	0	3	2	1	1	0	1	1	1	1	0	0	1	0	NPN	---	-PN	N-N	N--
9	2	1	2	2	1	0	0	1	1	0	0	0	0	0	0	N-N	N--	N-N	N-N	N--
10	3	0	3	3	1	1	1	1	1	1	0	0	0	1	0	NPN	---	NPN	NPN	N--
11	2	0	3	2	1	1	0	1	1	0	2	0	0	0	0	N-N	---	NPN	N-N	N--
12	3	0	3	3	1	1	0	1	1	1	0	0	0	0	2	NPN	---	NPN	NPN	N--
13	1	0	3	2	2	1	0	0	1	0	3	0	0	0	1	--N	---	NPN	N-N	N-N
14	2	0	3	2	2	0	0	1	0	0	1	0	0	1	0	N-N	---	NPN	N-N	N-N
15	3	1	3	3	2	1	1	1	1	1	0	0	2	0	0	NPN	N--	NPN	NPN	N-N

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GROUP L-L

	Speaker Info.					Dyad Success					Number of Questions					Parts of Speech				
Dyad No.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	1	1	1	0	1	0	1	1	0	0	0	1	0	0	0	N-	N-	N-	--	N
2	2	1	1	1	1	1	0	0	1	0	0	1	0	0	0	NA	N-	N	N	N
3	2	1	1	1	2	1	1	0	1	0	0	1	0	0	0	NA	N-	N	N	NA
4	1	1	1	0	1	0	1	1	0	0	0	0	0	0	0	N-	N-	N	--	N
5	2	1	2	1	2	1	0	1	1	1	0	0	0	0	0	NA	N-	NA	N	NA
6	1	0	1	1	1	0	0	0	0	1	0	0	0	0	0	N-	N-	N	N	N
7	2	2	1	2	2	1	1	0	1	1	0	1	0	0	0	NA	NA	N	NA	NA
8	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	N-	N-	N	N	N
9	2	2	1	0	2	0	0	0	0	0	0	2	0	0	0	NA	NA	N	N	NA
10	2	1	1	1	2	1	1	0	1	1	0	0	0	0	0	NA	NA	N	N	NA
11	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0	N-	N-	N	N	N
12	2	1	1	1	2	1	1	0	0	1	0	1	0	0	0	NA	N-	N	N	NA
13	2	2	2	2	2	1	1	1	0	1	0	0	0	0	0	NA	NA	N	NA	NA
14	1	1	1	1	1	0	0	0	0	0	0	1	0	0	0	N-	NA	N	N	N
15	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	N-	N-	N	N	N

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GROUP L-L

	Speaker Info.					Dyad Success					Number of Questions					Parts of Speech				
Dyad No.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	3	1	1	1	1	0	0	1	1	0	0	1	0	0	0	NPN	N	N	N	N
2	2	3	1	0	2	1	1	1	0	0	0	1	0	0	0	N-N	NPN	N	-	NP
3	2	2	1	1	2	0	0	0	1	0	0	0	0	0	0	N-N	N-N	N	-	N-N
4	2	2	1	1	1	1	1	0	0	0	0	1	0	0	0	N-N	N-N	N	N	N
5	3	2	1	1	1	1	0	0	0	0	0	1	0	0	0	NPN	N-N	N	N	N
6	0	2	2	2	1	0	1	1	0	1	0	0	0	0	0	---	N-N	N-N	NN	N
7	3	2	1	1	1	1	0	0	1	0	0	1	0	0	0	NPN	N-N	P	N	N
8	1	1	1	2	1	0	0	1	0	1	0	2	0	0	0	-N	-N	N	NN	N
9	2	1	1	2	2	1	1	0	0	0	0	2	0	0	0	N-N	-N	N	NN	N-N
10	3	2	2	2	2	1	1	1	0	1	0	1	0	0	0	NPN	N-N	N	NN	N-N
11	2	1	1	2	2	0	0	0	0	0	0	0	0	0	0	N-N	N-	N	NN	N-N
12	1	1	1	1	2	0	0	1	1	0	0	1	1	0	0	-N	N--	N	N	N-N
13	2	0	2	2	2	1	0	1	0	0	0	1	1	0	0	N-N	---	NN	NN	N-N
14	2	1	2	2	2	1	0	1	1	1	0	0	1	0	0	N-N	N--	NN	NN	N-N
15	2	1	3	2	3	1	0	1	1	1	0	3	2	0	0	N-N	N--	NPN	NN	NPN

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GROUP H-H

	Speaker Info.					Dyad Success					Number of Questions					Parts of Speech				
Dyad No.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	2	1	1	1	1	1	1	1	1	1	0	2	0	0	0	NA	N-	N-	N-	N-
2	2	2	2	2	1	1	1	0	1	0	0	3	0	0	0	NA	N-	NA	NA	N-
3	2	2	2	2	1	1	1	1	1	1	0	2	0	0	0	NA	NA	NA	NA	-A
4	1	2	1	1	1	0	1	1	0	0	0	1	0	0	0	N-	NA	N-	N-	N-
5	2	2	2	2	2	1	1	1	1	1	0	1	0	0	0	NA	NA	NA	NA	NA
6	2	2	1	1	1	1	1	1	1	0	0	2	0	0	0	NA	NA	N-	N-	N-
7	2	2	1	2	1	1	1	1	0	0	0	2	0	0	0	NA	NA	N-	NA	N-
8	1	2	2	1	1	0	1	1	0	0	0	2	0	0	1	N-	NA	NA	N-	N-
9	2	2	2	2	1	1	1	1	1	0	0	1	0	0	0	NA	NA	NA	NA	-A
10	2	2	2	2	2	1	1	1	1	1	0	1	0	0	1	NA	NA	NA	N-	NA
11	2	1	1	1	2	1	1	1	0	1	0	3	0	0	0	NA	NA	NA	N-	NA
12	2	1	1	2	2	1	1	1	1	1	0	2	0	0	0	NA	NA	NA	NA	NA
13	2	1	1	2	2	1	1	1	1	0	0	1	0	0	1	NA	NA	NA	NA	NA
14	2	1	1	2	1	1	1	1	1	1	0	1	0	0	0	NA	NA	N-	NA	-A
15	2	1	0	2	2	1	1	0	1	1	0	2	0	0	0	NA	NA	N-	NA	NA

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GROUP H-H

Dyad No.	Speaker Info.					Dyad Success					Number of Questions					Parts of Speech				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	3	3	3	3	3	1	1	1	0	1	0	0	0	0	0	NPN	NPN	NPN	NPN	NPN
2	3	3	2	2	2	1	1	1	0	1	0	0	0	0	0	NPN	NPN	N-N	N-N	N-N
3	3	3	2	3	3	1	1	0	1	1	0	1	0	0	0	NPN	NPN	N-N	NPN	NPN
4	2	2	3	1	2	1	1	1	0	1	0	1	0	0	0	N-N	N-N	NPN	N--	N-N
5	3	3	3	3	3	1	1	1	1	1	0	1	0	0	2	NPN	NPN	NPN	NPN	NPN
6	3	2	3	2	2	0	1	0	0	1	0	1	0	0	0	NPN	N-N	NPN	N-N	N-N
7	3	3	3	3	2	1	1	1	1	0	0	1	0	0	0	NPN	NPN	NPN	NPN	N-N
8	3	3	3	1	2	1	1	0	1	1	0	0	0	0	2	NPN	NPN	NPN	--N	-PN
9	2	3	3	2	2	1	1	1	0	1	0	1	0	0	1	N-N	NPN	NPN	N-N	N-N
10	3	3	2	3	1	1	1	1	0	1	0	0	0	0	1	NPN	NPN	N-N	NPN	--N
11	3	3	2	3	2	1	1	1	1	0	0	1	0	0	0	NPN	NPN	N-N	NPN	N-N
12	3	3	2	3	1	1	1	0	0	0	0	0	0	0	0	NPN	NPN	N-N	NPN	--N
13	3	2	2	2	2	1	0	1	0	1	0	1	0	0	0	NPN	N-N	N-N	N-N	N-N
14	3	2	2	3	2	0	1	1	1	1	0	1	0	0	0	NPN	N-N	N-N	NPN	N-N
15	3	2	3	3	3	1	1	1	1	1	0	1	0	0	0	NPN	N-N	NPN	NPN	NPN

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Verbal Communication in Heterogeneous and Homogeneous Dyads of Retarded Children

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