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LINGUISTIC ANALYSIS OF CHILDREN'S SPEECH:
EFFECTS OF STIMULUS MEDIA ON ELICITED SAMPLES

by   613-8301

S. Esther Ahmed

B. A., Instituto del Profesorado San Miguel, Tucumán, Argentina 1965

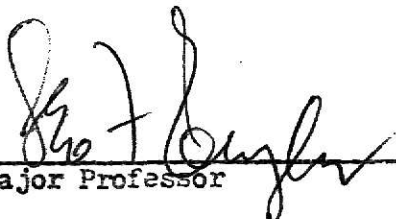A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF ARTS

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KANSAS STATE UNIVERSITY
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Major Professor

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ACKNOWLEDGEMENTS

INTRODUCTION

Recent clinical research has focused on measurement of the structural (linguistic) aspects of handicapped children's language performance (Lee, 1966; Dever and Bauman, 1971; Lee and Canter, 1971; Engler, Hannah, and Longhurst, in press). In evaluating the child's language performance, researchers or clinicians generally elicit a spoken language sample from the child. This sample is analyzed by applying a variety of counting procedures, statistical ratios, or classifying and categorizing the child's utterances. Numbers derived from these analyses are then compared with normative data, if available. Subsequently, various clinical or educational remedial procedures are prescribed to improve the child's language performance.

Among the numerous difficulties with this method of assessing the speech and language of handicapped children is that there is no standard method presently employed for eliciting the language sample from the child. There has been a lack of concern for variables inherent in the elicitation process that may influence the language sample thus obtained. In language assessment for diagnostic purposes, the procedures used to elicit the oral language sample from a specific child are often quite different from those used in the normative study with which the child's results are compared. Often within a research study the experimenter might use different elicitation methodology and yet compare the scores. Lee (1966, p. 322) compared the speech samples of a "normal" and a "language-delayed" child. She

reported that the normal child's speech was elicited while he and his mother played with certain toys, read a book and engaged in conversation. In contrast, the sample from the "language-delayed" child was collected while he and his clinician talked about a picture of a doctor attending a sick child. Further, when scores from different studies are compared, little attention is given to the fact that the samples were elicited using different methodology (Carroll, 1961).

The ideal elicitation methodology is one which controls the relevant situational variables in a way that the procedure results in an optimal and representative language sample from a given child, comparable with other language samples. However, information is not available on which variables are relevant to the elicitation of language samples from handicapped children.

Presently, the majority of oral language samples are elicited by showing the child pictures or toys. There has been little attempt to standardize the stimulus materials used to elicit the sample. In this respect it has been common practice to use pictures cut from books or magazines without adequate descriptions. Barlow and Miner (1969, p. 244) used three sets of pictures for elicitation purposes which were "...judged by university speech pathologists to be of interest to five year old children." Minifie et al., (1963, p. 142) used three sets of pictures. The authors gave adequate information about one set of pictures but with respect to the other two sets it was only reported that they were "...constructed by the examiner and were judged to be of interest to children at both age

levels." Weinberg and Zlatin (1970, p. 420) also failed to give adequate description of stimulus used in elicitation of language samples. They merely reported that "...spontaneous speech was elicited by the presentation of a uniform series of questions, color pictures and puzzles." Moreover, in other research, the stimulus material used was not even mentioned. These procedures make replication of specific studies virtually impossible.

Some attempts towards stimulus material standardization have been reported. Siegel (1962) and Brannon and Murray (1966) used pictures from the Children's Thematic Apperception Test (Bellak and Bellak, 1949); Wilson (1969) used a picture from the Picture Story Language Test (Myklebust, 1965); Engler, Hannah and Longhurst (in press) used pictures from the Adult Thematic Apperception Test (Murray, 1943). Lovitt and Smith (1972) and Longhurst and Schrandt (in press) used pictures from the Peabody Language Development Kit (Dunn and Smith, 1966).

Only recently have the effects of various stimulus materials on the oral language sample been questioned and systematically investigated. Cowan et al., (1967) studied variation in mean length of response (MLR) as a function of stimulus, experimenter and subject. The authors report significant differences in MLR among ten pictures presented to individual children. It was found that a picture containing a large number of objects elicited the lowest MLR; however, the number of objects in other pictures was uncorrelated with MLR. Strandberg (1969), on the other hand, found no significant differences in the oral language samples from individual toys within

a set or individual pictures within a set. McCarthy (1954) reported that with younger children a picture having one central object was better than multi-object pictures; however, Mintun (1968) suggested that photographs displaying single objects may have a restrictive influence on educable mentally retarded subjects' verbal behavior. Strandberg and Griffith (1969) suggested the same with respect to normal children.

The purpose of the present report was to analyze the effects of a selected stimulus material in evoking verbal responses from mentally retarded children at two levels. Specifically we compared the use of single object versus multi-object pictures selected from the Peabody Language Development Kit (Level 2) to elicit language samples. The study was designed to answer whether there are differences in language samples elicited with single versus multi-object pictures. Further, it was designed to test whether the use of the two sets of stimulus materials would interact with the level of the child. It was hoped that the information derived from this research would be applied to the development of a standardized method of eliciting oral language samples from handicapped children.

METHOD

Subjects

Thirty-two mentally retarded residents of Parsons State Hospital and Training Center (PSHTC) between the chronological ages of 10 and 18 years, with an over-all average age of 14 years 4 months,

served as subjects. They were divided into two equal groups of sixteen, on the basis of their measured intelligence and adaptive behavior (MI-AB) levels (Heber, 1959). Group I consisted of children who had been classified by the Psychology Department at PSHTC as MI-AB level I, which corresponds roughly with traditional definitions of educable mentally retarded. Group III consisted of children who had been classified as MI-AB level III, which corresponds roughly with traditional definitions of trainable mentally retarded. Members of each group were then randomly assigned to each of two treatments (single versus multi-object pictures) and the two level groups (I and III).

Any subject exhibiting gross neuromotor disabilities, a hearing disorder, misarticulation of /-s, -z, -ɨz/ or speech so unintelligible that it would have seriously impeded later transcription, was excluded.

Stimulus Materials

Two sets of stimulus materials were used. Set 1 consisted of eight, multi-colored pictures of single objects, (B-56; T-4, 28; U-8, 15, 19; V-10), from the Peabody Language Development Kit (Level 2), (Dunn and Smith, 1966). Set 2 also consisted of eight, multi-colored pictures of multi-objects, (W-1, 2, 3, 4, 5, 6, 11 and 12) from the Peabody Language Development Kit (Level 2), (Dunn and Smith, 1966). Table 1 shows the assignment of stimulus picture sets to MI-AB level groups.

Table 1

Assignment of subjects to MI-AB level groups
(I and III) and stimulus material treatment
groups (Set 1, single object stimulus pictures
and Set 2, multi-object stimulus pictures).

Treatment

	Set 1 Single-object	Set 2 Multi-object
Group I	I_1 8 subjects	I_2 8 subjects
Group III	III_1 8 subjects	III_2 8 subjects

Experimental Facility

Language samples were collected in laboratory space located
at the Parsons Research Center of PSHTC. The experimental room was
free of distracting visual or auditory stimuli and contained a table,
two chairs, a microphone, a remote control slide projector, and slides
of the stimulus pictures. The tape recorder (Wollensak, 1520ss),
equipped with a remote control, was located in an adjacent control
room.

Procedure

Each subject was brought individually to the experimental room by the same examiner, seated at the table, and instructed:

> We are going to play a game. I will show
>
> you a picture and you are to tell me all
>
> you can about the picture. Don't just name
>
> the things in the picture but try to string
>
> words together. Let's practice the game now.

Depending on the treatment group, the subject was then presented with two appropriate pictures and allowed to describe them any way he wished. The examiner vaguely approved and encouraged the subject to, "Talk about the pictures rather than just name them".

After this brief pretraining period, the examiner presented to the subject, the eight remaining pictures in a random order. The examiner offered no prompting, such as "Can you tell me more?", and did not ask any questions. He attempted to be vaguely approving but most of the time he remained silent.

Initial Protocol Preparation

After language samples from all subjects had been collected, typewritten transcripts were prepared from the tape recordings according to procedures described by Siegel (1963). (See Appendix A.)

Segmentation

The protocols were first segmented into utterances following the procedures of Engler, Hannah, and Longhurst (in press).

An utterance was defined as a unit of spoken language preceded and followed by perceived pause (Engler and Hannah, 1967).

Final Protocol Preparation

The middle 50 utterances from the protocol of each subject were selected for the mean length of utterance (MLU) measure. These 50 utterances were retyped into a final protocol containing one utterance per line and the lines were numbered.

Following the suggested procedures by Griffith and Miner (1969) for the length complexity index (LCI) measure, the first ten utterances were excluded. The next 15 sentences were then selected from the protocol of each child. These sentences were retyped into a final protocol and each sentence was numbered. The segmentation of the 15 sentences was done according to procedure by Miner (1969) with certain modifications. (See Appendix B.)

Linguistic Analyses

Four linguistic analyses were computed from the final protocols. These were the total number of words (TNW) in each protocol, mean length of 50 utterances (MLU), Carroll type token-ratio (CTTR), and a length complexity index (LCI) score.

The TNW measure was viewed as a quantitative index of a subject's total output in response to the stimulus pictures.

The MLU measure has long been used as a qualitative measure of language and before the development of LCI was described as the best single index of language development (McCarthy, 1954).

The TTR measure, a relationship between types (the number of unique words in a given sample), and tokens (the total number of words in the sample) has long been used as a feature of vocabulary quality and diversity (Johnson, 1944; Simmons, 1962; Siegel, 1967; Cartwright, 1968; Longhurst and Siegel, in press). The standard or traditional TTR has the disadvantage of being dependent on the size of the language sample in words, thus making it impossible to compare TTR's computed on samples of different sizes. Carroll (1964, p. 54) has formulated a TTR which "...is approximately independent of sample size". The formula for the Carroll type-token ratio (CTTR) is expressed, $CTTR = types/\sqrt{2 \times tokens}$. This latter statistic (CTTR) was chosen for the present experiment because different sample sizes in words were obtained.

The LCI index is a qualitative measure designed to make a composite analysis of sentence length and sentence complexity (Miner, 1969; Barlow and Miner, 1969; Griffith and Miner, 1969). Sentence length and complexity are considered together according to a numeric weighting system. LCI score is the sum of noun phrase (NP) points plus verb phrase (VP) points plus additional points (AP) for each sentence divided by the number of sentences (NS). Written as a formula, $LCI = NP + VP + AP/NS$. LCI has been found to be a sensitive measure of grammatical quality (Mintun, 1968; Longhurst, Odom and Boatman, 1972; Longhurst and Schrandt, in press).

RESULTS

Means for the four language measures used to analyse the final protocols are presented in Table 1.

A series of two-factor analysis of variance (Treatment x Group) (Winer, 1962) was used to analyse the differences among these means. The results of these analyses are summarized in Table 2.

The treatment means for the TNW ($F = 5.52$, 1/28df, $p < .05$), ICI ($F = 4.93$, 1/28df, $p < .05$), and CTTR ($F = 10.52$, 1/28df, $p < .01$) measures were significantly different. Although the MLU means were different in the expected direction, the difference was not significant.

There were significant differences between the two MI-AB level groups on the MLU ($F = 7.28$, 1/28df, $p < .05$), ICI ($F = 6.27$, 1/28df, $p < .05$) and the CTTR ($F = 14.95$, 1/28df, $p < .01$) measures. The difference between the TNW means, although the differences were in the expected direction, was not significant.

As can be observed from Table 2, there was no significant interaction between treatment and group means on any of the four linguistic measures.

Table 1

Summary of means for the four measures; total number of words (TNW), mean length of utterance (MLU), length complexity index (LCI) and Carroll type-token ratio (CTTR), for the two MI–AB level Groups (I and III) in response to single object versus multi-object pictures.

Group	a. TNW		b. MLU		c. LCI		d. CTTR	
	Single	Multi	Single	Multi	Single	Multi	Single	Multi
I	304	418	3.98	3.77	5.19	6.17	4.62	5.56
III	208	346	2.74	3.59	3.59	5.03	3.51	4.44

Table 2

Mean squares from the analysis of variance tables for the four measures, total number of words (TNW), mean length of utterance (MLU), length complexity index (LCI), and Carroll type-token ratio (CTTR).

Source	Degrees of freedom	a. TNW mean square	b. MLU mean square	c. LCI mean square	d. CTTR mean square
Treatment	1	126002.00*	.83	11.79*	7.03**
Group	1	56448.00	3.99*	14.99*	9.99**
T x G	1	1152.00	2.28	.41	.00
Error	28	22807.75	.55	2.39	.67
Total	31	---	---	---	---

*p < .05
**p < .01

DISCUSSION

This study was concerned with the analysis of a selected stimulus media, single object versus multi-object pictures, used for eliciting verbal language samples. The examiner and the verbal directions given to the subjects remained constant throughout the study. The subjects were thirty-two mentally retarded individuals divided into two MI-AB level groups (I and III) each of which consisted of 16 subjects. The resulting language samples were then subjected to four language measures: the total number of words (TNW), the mean length of utterance (MLU), the length complexity index (LCI), and the Carroll type-token ratio (CTTR).

The means for the four linguistic measurers were evaluated and the differences among them were analysed using analysis of variance. From the results of the analysis of variance it was concluded that the two treatments (single object versus multi-object pictures) were different. Treatment 2 yielded consistently larger scores and they were statistically significant for three of the four measures employed (TNW, LCI, and CTTR). For the MLU measure, treatment 2 did not yield a statistically significant difference. However, since it did yield a larger score, the results for this particular measure are in agreement with the scores of the other three measures.

Regarding the MI-AB level groups (I and III), the results showed that the differences between the two were also significant for three of the four measures used (MLU, LCI, and CTTR). Although Group I yielded larger scores for the TNW measure, this difference was not statistically significant. Nevertheless, these scores were

in the expected directions and hence in agreement with the other
three measures used.

There was no interaction between treatment and group for
any of the four measures employed. McCarthy (1954) had suggested
that a single object picture was more suitable for the younger
"normal" subject. Based on her findings, it was assumed that in
the present study the same might be true for the "lower level" chil-
dren (MI-AB level group III, roughly classified as trainable mentally
retarded). On the other hand, Mintun (1968) had suggested that
single object pictures might have a restrictive influence on the
verbal behavior of her subjects who were classified as "educable
mentally retardates" (roughly the same as the subjects of MI-AB level
group I for the present study). Strandberg and Griffith (1969) also
suggested the same with respect to "normal" pre-school children.
Therefore, it was assumed that single object pictures would be more
suitable for the "lower level" subjects and that multi-object pictures
would be more suitable for the "higher level" subjects. This was
not the case however. Both Groups responded better with treatment 2,
regardless of their level, suggesting that, if pictures are to be used
as the media for elicitation of verbal samples from handicapped
children at both levels, multi-object pictures should be used.

Previous studies (Johnson, 1944; Simmons, 1962; Siegel,
1967; Cartwright, 1968; Longhurst and Siegel, in press) have shown
that TTR is a particularly sensitive measure. The present report
supports this conclusion.

With respect to the MLU, the examiner felt that this measure

may not be particularly suitable for the evaluation of the verbal output of handicapped subjects. The segmentation procedure for this measure based on "breath pause", was not appropriate since several protocols revealed pauses at instances where the "normal"subject would have probably not paused. Further, these subjects seemed to have an uncommon intonation pattern. More research in these areas would be helpful.

Although the LCI measure required considerable more time, intuition and some linguistic background on the part of the examiner, it was considered a good measure. Particularly commendable was the concern of this measure with the "deep structure" aspect of the subject's language. However, more explicit instructions are needed for the division of sentences than those given in the manual (Miner, 1969). For this study a set of rules was established. (See Appendix B). These rules were applied in a consistent manner throughout the study and the results of the analysis of variance support this claim. Clarification is also needed with reference to negatives. It is very difficult to determine the difference in the level of complexity of the examples given with respect to "can't" (see page 232). For this study two levels of negation were considered. (See Appendix B). Mintun (1968) had raised similar questions related to this measure. However, she failed to mention how she accounted for these difficulties. Finally, the examiner of this study also found some inconsistencies (not mentioned by Mintun) regarding the scoring of possessives and third person singular. On page 230 it is found that "her" has been given a score of 2 points. However, on page 234, in sentence number

4, "in _our_ friends", "our" is given only 1 point. Again, on page 231 "He _gets_ it", "gets" receives 1 point but on page 232 "jumps" receives 2 points. For this study third person singular verbs were scored as 1 point. The idea was not to penalize a child for dialectal differences (e. g. "she don't care").

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APPENDIX A

Directions for Protocol Typing

1. Type the transcripts in the predetermined random order.

2. Differentiate verbalizations of the adult from those of the child by placing the identifying symbol (a) in the margin for adult verbalizations and (c) for remarks made by the child.

3. Do not use capitals (except for proper names or for the pronoun 'I'), commas, question marks, or any other form of punctuation in preparing these transcripts. Use apostrophes, however, to indicate a contraction or to indicate possession.

4. Some of the remarks made by either the child or the adult will be completely or partially incomprehensible. If a response is either partially or completely incomprehensible, exclude it from the transcript.

5. Sometimes the adult or the child will make some non-communicative noises during the session. For example, the adult may say, 'The dog goes bow-wow and the lion goes grr.' If, as in the above remark, the noise is an integral part of the response, type it in. If, however, the noise is not essential, omit it. For example, the child may say, 'Bow-wow, here comes the dog.' In this instance omit the expression 'bow-wow.'

6. Interjections such as 'uh,' 'er,' should be omitted except when they are used as words.

7. If the speaker starts but does not finish a word and you are quite sure what he is going to say, include the word, but place

it between parentheses.

8. Include repeated words in the transcript.

APPENDIX B

Segmentation and scoring procedures for the length com-
plexity index measure (LCI) was done according to Miner (1969) with
the following modifications:

1. Pauses and terminal junctures (rising, fading and sustained)
   were specially considered while segmenting utterances into
   sentences.

2. Generally, if an utterance ended with a pause accompanied by
   a rising or fading juncture, then that utterance was considered
   as one sentence.

3. If there were two utterances and the first of these ended with
   a slight pause along with a sustained juncture, then the two
   utterances were considered as one sentence; on the other hand,
   if the pause was long, then the two utterances were considered
   as two separate sentences.

4. Regarding the scoring of negative statements the following criteria
   were met:

   (a) Score as 1 point when negative element appears at the begin-
       ning of the sentence.

   (b) Score as 2 points when negative element appears within the
       sentence (with or without an auxiliary verb).

5. All pronouns serving a possessive function were scored as 1
   point.

APPENDIX C

Prototypes of Criteria for Counting Words

1. All contractions, whether negative or affirmative, are to be considered two words (or more). Thus, contractions in expressions such as I'm, can't, won't, he's, John's talking now, etc., count as two words. Combinations such as gonna or hadda are counted as two words.

2. Expressions of affirmation (yes, yeah, uh huh), of negation (no, nope, nah, uh uh), of interrogation (what, huh), or of exclamation (opps, hey, wow) count as one word.

3. Hyphenated words and compound nouns which seem to function as single words are counted as one word each. For example:

Betty Lou	one word
Betty Lou Smith	two words
high school	one word
2-south-3	one word

4. Exclamations which tend to occur as a unit are counted as one word. For example: darn it; doggone it; oh boy; gee whiz one word each.

5. Where the child is counting or is spelling, each unit (number or letter) counts as a separate word.

6. Descriptive noises such as meow-meow, grr, or bow-wow are counted as single words.

APPENDIX D

Criteria for Counting Number of Unique Words in a Sample

Follow the same criteria used for counting the total number of words, with the following additions:

1. Words such as 'em' and 'cause' are counted as their whole counterparts, 'them' and 'because.'

2. Words which end with different inflections (plural, past tense, etc.) are counted as unique words although their root words may be the same.

Table of means for the MI-AB level groups
(I and III) in response to single object
pictures for the four measures; total num-
ber of words (TNW), mean length of utter-
ance (MLU), length complexity index (LCI),
and Carroll type-token ratio (CTTR).

Level group	Subject number	TNW	MLU	LCI	CTTR
I	1	386	4.88	5.39	4.53
	2	244	3.80	5.06	3.75
	3	239	3.42	6.06	4.75
	4	284	3.60	4.46	4.92
	5	491	4.74	6.33	5.25
	6	291	3.72	5.40	5.10
	7	236	4.60	5.46	4.40
	8	268	3.08	3.33	4.23
III	1	81	1.97	2.33	4.39
	2	447	4.36	4.06	4.24
	3	103	3.32	2.66	1.26
	4	357	2.02	7.07	4.76
	5	109	2.04	2.20	3.81
	6	106	2.00	2.40	2.40
	7	338	3.50	5.33	2.89
	8	130	2.71	2.67	4.40

Table of means for the MI-AB level groups
(I and III) in response to multi-object pic-
tures for the four measures; total number of
words (TNW), mean length of utterance (MLU),
length complexity index (LCI), and Carroll
type-token ratio (CTTR).

Level group	Subject number	TNW	MLU	LCI	CTTR
I	1	277	2.66	3.13	4.96
	2	442	3.54	6.26	4.86
	3	693	3.14	7.60	5.56
	4	188	3.76	4.33	5.61
	5	389	4.16	7.60	6.83
	6	542	4.00	7.66	5.48
	7	280	4.24	5.53	5.95
	8	536	4.64	7.27	5.28
III	1	317	4.36	7.06	4.08
	2	255	3.46	4.20	5.04
	3	275	4.14	5.79	3.95
	4	167	3.16	2.87	3.77
	5	290	3.24	4.40	4.52
	6	270	2.22	3.13	3.53
	7	437	4.26	6.06	5.44
	8	760	3.92	6.74	5.15

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1973

ABSTRACT

The purpose of the present report was to analyse the effects of a selected stimulus media, single object versus multi-object pictures from the Peabody Language Development Kit (Level 2) to elicit speech samples from children. This research was justified by the crucial need of the language researcher and clinician for a standardized methodology in language elicitation. There has been a lack of concern for variables inherent in the elicitation process. The majority of oral language samples are elicited by showing the child pictures or toys. However, there has been little attempt to standardize the stimulus materials used to elicit the language samples. Conflicting opinions exist in the literature as to whether single object or multi-object pictures are more suitable for elicitation purposes. This report was designed to analyse the effects of this selected stimulus media in evoking verbal responses from 32 mentally retarded children at two MI-AB level groups (I and III). Further it was designed to test whether the use of the two sets of stimulus materials would interact with the level of the subject.

Four linguistic measures were applied to the language samples. These were the total number of words (TNW), mean length of utterance (MLU), Carroll type token-ratio (CTTR), and length complexity index (LCI). The means for the four linguistic measures were evaluated and the differences among them were analysed using analysis of variance. The following results were obtained:

(a) Treatments were different. Treatment 2 (multi-object pictures) yielded consistently larger scores and they were statistically significant for three of the four measures employed (TNW, LCI, and CTTR). The MLU means were different in the expected direction but the difference was not statistically significant.

(b) There were significant differences between the two MI-AB level groups (I and III). Group I scores were larger and statistically significant for three of the four measures used (MLU, LCI, and CTTR). Although the TNW means were not significant, they were also in the expected direction.

(c) There was no significant interaction between treatment and group on any of the four linguistic measures.

Thus, for elicitation purposes it is recommended that multi-object pictures be used for handicapped subjects at both levels.

Of the linguistic measures employed, the CTTR and LCI were found to be the most sensitive. However, for the LCI measure, relatively more time, intuition and some linguistic background was necessary on the part of the examiner. The MLU segmentation procedure based on "breath pause" might not be the most appropriate. Several of the protocols of the handicapped subjects revealed pauses at instances where the "normal" subject would have probably not paused. Further, these subjects seemed to have an uncommon intonation pattern. More research in these areas would be helpful.