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Predictors of novel inflection learning by preschool-aged boys

Nakamura, Monica, M.S.

The University of Arizona, 1989

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PREDICTORS OF NOVEL INFLECTION LEARNING BY
PRESCHOOL-AGED BOYS

by

Monica Nakamura

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A Thesis Submitted to the Faculty of the
DEPARTMENT OF SPEECH AND HEARING SCIENCES
In Partial Fulfillment of the Requirements
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MASTER OF SCIENCE
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1989

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SIGNED: Monica Nakamura

APPROVAL BY THESIS DIRECTOR

This thesis has been approved on the date shown below:

Linda Swisher
Linda Swisher, Ph.D.
Associate Professor of Speech
and Hearing Sciences

Dec. 12, 1989
Date

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ABSTRACT

Twenty normally developing boys between the ages of 4:4 (years:months) and 5:7 were presented with stories designed to teach novel vocabulary and morphological inflections. A multiple regression analysis assessed the extent to which selected verbal and nonverbal skills contributed to the prediction of their performance on the inflection stories (INFL). Current inflection skills, as measured by the Grammatic Closure subtest of the Illinois Test of Psycholinguistic Abilities, accounted for nearly half of the INFL variance. In addition, performance on a posttest of vocabulary learning significantly ($p < .05$) contributed to the prediction of INFL performance. None of the three nonverbal measures was a significant contributor, although closer analysis of these findings indicates that the relation between nonverbal rule learning and inflection learning warrants further investigation. The results suggest that inflection learning is a language-specific phenomenon more tied to vocabulary skills than to nonverbal cognitive skills.

INTRODUCTION

The role that nonverbal cognitive skills play in language acquisition has received considerable attention. One outcome of these efforts is that child language investigators no longer consider "language" to be a unitary skill. Accordingly, theories are being formulated which address the relations among language subsystems and among specific language and cognitive subsystems (cf. Cromer, 1988; Owens, 1984; Rice, 1983). Both Pinker (1984) and Connell (1989) suggest that the acquisition of inflectional morphology by normally developing children, at least in the early stages, is dependent upon vocabulary skills. Because vocabulary skills are viewed as dependent upon nonverbal cognitive skills in normal (cf. Rice, 1983) and in language-impaired populations (cf. Curtiss, 1988), whether inflection skills are dependent upon nonverbal cognitive skills becomes an issue of interest.

Some investigators (cf. Cromer, 1988) suggest that morphological development, including the acquisition of inflections, is affected by the child's development of general cognitive skills; thus, they do not regard the acquisition of inflections as a modular ability. By contrast, other investigators (cf. Curtiss, 1988) view the development of inflectional morphology as occurring

relatively independently of other cognitive skills. This latter position receives support from studies of language-disordered populations in which inflection skills appear to be dissociated from other cognitive skills (Curtiss, 1981; 1988; Newfield & Schlanger, 1968; Swisher & Pinsker, 1971).

Pinker (1984) does not address the role of nonverbal cognitive skills in language acquisition. He suggests that inflected words are first learned as vocabulary units before patterns of inflection are abstracted. That is, children initially do not recognize that some vocabulary units are inflected and others are not. Only after this stage of language acquisition do they begin to acquire the rules which govern the use of inflections. Evidence that inflectional usage is rule governed appears when children overgeneralize an inflection rule relative to adult usage of the same rule (cf. Brown, 1973; Muma, 1978). For example, children overregularize the past tense, as in "goed", during this stage of language development.

Similarly, Connell (1989) proposes that children begin the acquisition of inflections by recognizing that words are sometimes but not always inflected. He suggests that children then search for a semantic notion to attach to the inflection. Finally, they formulate and test a rule to describe the relation between the inflection and its

meaning.

Connell (1989) further proposes that children have an innate induction ability which allows them to acquire language and, more specifically, inflections. This induction ability permits children to recognize patterns in a set of elements and to hypothesize rules to account for these patterns. Because Connell views language acquisition as "part of the overall cognitive process of learning" (p. 44), he suggests that this induction process is not restricted to linguistic skills.

The purpose of the present study was to describe the extent to which measures of certain verbal and nonverbal cognitive skills contribute to predictions of the learning of novel inflections by preschool-aged, normally developing boys. Because these children have passed the early stages of language acquisition, and a standardized task was contrived to present the stimuli, the term "learning" is used to refer to the verbal behaviors elicited during the investigation.

Variables which could contribute to inflection learning performance are illustrated in Figure 1. A finding that only a measure of current inflection skills contributes to the prediction of novel inflection learning performance would be compatible with a modularity hypothesis.

Interpretation of such a finding, however, is problematic because all possible contributors have not been entered into the equation. A modularity hypothesis is similar to a null hypothesis--each can only be rejected in favor of an alternative hypothesis.

A finding that a measure of vocabulary skills but not measures of nonverbal cognitive skills contributes to the prediction of novel inflection learning performance would suggest that inflection learning is not modular; language and nonlanguage skills would appear to be disassociated to some extent. A finding that nonverbal cognitive skills contribute to the prediction would suggest that inflection learning is not language specific.

Figure 1. Variables which could contribute to predictions of novel inflection learning performance.

METHOD

Subjects

Twenty monolingual, English-speaking boys between the ages of 4:4 (years:months) and 5:7, with a mean age of 4:10, were selected from three regular preschools. Thirteen subjects attended preschool A, five subjects attended preschool B, and two subjects attended preschool C. All subjects passed a hearing screening at 30 dB HL at 500 Hz and 20dB HL at 1000, 2000, and 4000 Hz. A level of 30 dB HL at 500 Hz was used because of the ambient noise present at the preschools. No other inclusion criteria were set except that subjects be described as "normally developing" by their teachers and parents, with no reported concern regarding language development.

Materials

Training story. An interactive story format was used to familiarize subjects with the experimental procedures. The presenter read a short story and manipulated objects to dramatize the story line. The figures were manipulated within the boundaries of a piece of colored construction paper which was taped to the center of the table in an effort to focus the subject's attention. The story involved a bear and a pig who performed the actions of running and rolling. The stories included requests to the child to

verbally identify the figures and actions at predetermined intervals.

Vocabulary stories and posttest. Two vocabulary stories (VOCAB) were presented to teach the subjects four novel, CVC vocabulary items. These stories provided subjects with a core vocabulary to which the novel inflections could later be attached. The vocabulary items consisted of two inanimate and two animate nouns referring to clay objects, and two verbs referring to actions performed by an animate noun on an inanimate noun. Two sets of vocabulary items (see Appendix A) and clay figures were developed to reduce effects of word or figure saliency across subjects.

Each story contained 10 presentations of each of the four vocabulary items and included five opportunities for the subject to respond to each item. After one to two presentations of an item, the subject was requested to identify the item. Requests for identification did not directly follow a presentation of the item. For example:

This is a gack.

He likes to play.

*What is he?

A vocabulary posttest (PTVOCAB) was given to measure immediate retention of vocabulary items. Each subject was

asked to identify each item twice for a total of eight possible responses. The PTVOCAB served as a measure of how well subjects learned the novel vocabulary.

Inflection stories and posttests. Two inflection stories (INFL) were presented to teach two novel inflections. The inflections, /ʌ/ and /u/, served as suffixes for the novel noun and verb stems. The noun inflection referred to the size of the inanimate and animate nouns. The verb inflection referred to the size of the actions. These concepts were chosen to be represented by novel word endings because size is not coded with an inflection in English.

The INFL contained both the previously learned vocabulary items and their inflected forms. Each story contained 10 presentations of each item, six in the inflected and four in the uninflected forms. The INFL followed the same format as the VOCAB. The subject was given three opportunities to respond to each inflected item and two opportunities to respond to each uninflected item.

A posttest to measure retention of the inflected items (PTINFL) was administered following the INFL. The subject was shown the object or action corresponding to a vocabulary stem while the presenter provided the stem. The larger object or action was then presented, and the subject was

asked to identify the inflected form (e.g., "This is a teeg. What is this?" [teegu]). The subject had two opportunities to identify each of the four inflected items. In addition, four unfamiliar novel stems were presented to assess generalization of the novel inflections. Two opportunities to inflect each unfamiliar stem were provided during this generalization probe (GEN).

Procedures

The experimenter trained two speech-language pathology students who did not know the purpose of the experiment to administer the novel inflection-learning task. The test battery was administered by the experimenter and a graduate student in speech-language pathology. All students were supervised by a certified speech-language pathologist.

The hearing screening and the training story were administered on the first day. On days 2 and 3, components of the inflection-learning task were presented in the following order: (day 2) VOCAB, PTVOCAB; (day 3) vocabulary check, vocabulary drill, INFL, PTINFL, GEN. The test battery was administered on a fourth, final day. Subjects received paper stickers for their participation following each session.

During all sessions, the presenter was seated across a table from the subject in a room at the subject's preschool.

To introduce the novel vocabulary, presenters explained that the subject would hear two stories about creatures from another planet. Presenters instructed each subject to listen carefully. During the training story and the VOCAB, children received feedback concerning the accuracy of their responses, because some subjects of a pilot study had invented their own "words" for the vocabulary items. During the VOCAB, the presenter repeated the vocabulary item following the feedback to control for the number of item presentations (e.g., "yes/no, he's a gack"). No differential feedback was provided during the PTVOCAB, INFL, PTINFL, or GEN. Responses to all stories, posttests, and generalization probes were scored as correct or incorrect.

Prior to administering the INFL, a vocabulary check was given to assess overnight retention of vocabulary items. A preestablished criterion of three out of four items correct was required. No subject met this criterion, so each was drilled on the vocabulary items until the criterion was met.

Presenters administered the INFL in the same manner as the VOCAB. The INFL was followed by the PTINFL and the GEN.

Test Battery

The presentation of standardized measures was randomized for each subject to minimize test-order effects. Tests were selected to assess skills that could contribute

to novel inflection learning. The Grammatical Closure subtest of the Illinois Test of Psycholinguistic Abilities (ITPA/GC) (Kirk & Kirk, 1968) was selected to reflect current expressive inflection levels. The Expressive One-Word Picture Vocabulary Test (EOWPVT) (Gardner, 1979) was selected to reflect current expressive vocabulary levels. The Block Design subtest of the Wechsler Preschool and Primary Scale of Intelligence (WPPSI/BD) (Wechsler, 1967) was selected to assess general, nonverbal cognitive levels which do not appear to be related to inflection learning. (Performance on the WPPSI/BD correlates with overall performance on the WPPSI [$r = .77$] [Wechsler, 1967].) Two other nonlinguistic skills, associative learning, as assessed by the Animal House subtest of the WPPSI (WPPSI/AH), and rule learning, as assessed by the Rule/Nonrule Governed Learning subtest of the Muma Assessment Program (MAP/RG) (Muma & Muma, 1979) were selected to reflect cognitive abilities which may contribute to inflection learning. Selected tests were relatively strong psychometrically (cf. McCauley & Swisher, 1984).

Counterbalancing

Novel vocabulary stems and inflections were counterbalanced across subjects to minimize specific word and inflection effects as well as the effects of possible

figure saliency. Inflections were counterbalanced across nouns and verbs (e.g., ten subjects received the /ʌ/ inflection as the noun suffix and the /u/ inflection as the verb suffix, and ten children received the reverse).

Vocabulary items were counterbalanced across story presentations and generalization probes for both presenters. Presenters used one of the vocabulary sets in the story presentations and the other vocabulary set in the generalization probes for the first five subjects they trained.

In addition, the animate figures were counterbalanced across story presentations and generalization probes. Presenter 1 used one figure in the story presentations and a second figure in the generalization probes, and presenter 2 did the reverse.

Reliability

Procedural reliability was evaluated independently for each of the two presenters. The story presentations for twenty percent of the subjects, four subjects for each presenter, were selected at random and videotaped. The sessions for these subjects were checked for accuracy of item presentation on a sentence by sentence basis by a trained observer. In addition, each scored response to story items, posttests, and standardized tests for the same

subjects was checked by trained observers to establish point-to-point reliability for scoring of responses.

Items were presented with an average of 98.8% accuracy, ranging from 96.4% to 100%. Point-to-point reliability for the scoring of the VOCAB and the PTVOCAB ranged from 89.6% to 100%, with an average of 96.1%. Reliability for the INFL, the PTINFL, and the GEN ranged from 92.9% to 100%, with an average of 95.3%. The standardized measures were scored with an average of 97.5% accuracy, ranging from 80.0% to 100%.

RESULTS

Performance on the INFL ranged from 10 to 22 correct responses out of a total of 24 for all subjects except one who provided two correct responses. This subject was excluded from the data analysis because his outlying scores were so extreme that they suggest that he belongs to a different population than the other subjects.¹

The intercorrelations of all the variables are presented in Table 1. The highest, significant correlation was obtained between performance on the INFL and the ITPA/GC ($r=.70$, $p<.05$). Significant correlations with INFL performance at the .05 level also were obtained with performance on the GEN ($r=.66$), VOCAB ($r=.61$), EOWPVT ($r=.60$), PTVOCAB ($r=.59$), and PTINFL ($r=.55$). No other correlations between INFL performance and the remaining variables reached statistical significance. Figure 2 illustrates the correlations applied to the model of possible predictors.

A multiple regression analysis was conducted using INFL performance as the criterion variable and age, EOWPVT, ITPA/GC, WPPSI/BD, WPPSI/AH, MUMA/RG, and PTVOCAB as predictor variables. Data were analyzed using a forward model on the SAS program, release 6.03 (SAS Institute, Inc., 1988). The F-ratio, which reflects the variable's

Table 1

Pearson correlation coefficients between all variables assessed in the present study.

Variable	Variable										
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. AGE	1.0	.16	.14	.30	.44*	.05	.14	-.15	.004	.51*	.23
2. EOWPVT		1.0	.77*	.60*	.62*	.08	.33	.35	.38	.47*	.18
3. GEN			1.0	.66*	.38	.33	.62*	.50*	.57*	.53*	.42
4. INFL				1.0	.70*	.37	.55*	.59*	.61*	.37	.11
5. ITPA/GC					1.0	.08	.19	.19	.45*	.19	.18
6. MUMA/RG						1.0	.50*	.23	.58*	.08	.03
7. PTINFL							1.0	.39	.54*	.21	.14
8. PTVOCAB								1.0	.67*	.42	.33
9. VOCAB									1.0	.26	.17
10. WPPSI/AH										1.0	.51*
11. WPPSI/BD											1.0

Note. 1. Age, 2. EOWPVT = Expressive One-Word Picture Vocabulary Test, 3. GEN = Generalization Probe, 4. INFL = Inflection Stories, 5. ITPA/GC = Grammatic Closure subtest of the Illinois Test of Psycholinguistic Abilities, 6. MUMA/RG = Rule/Nonrule Governed Learning subtest of the Muma Assessment Program, 7. PTINFL = Inflection Posttest, 8. PTVOCAB = Vocabulary Posttest, 9. VOCAB = Vocabulary Stories, 10. WPPSI/AH = Animal House subtest of the Wechsler Preschool and Primary Scale of Intelligence, 11. WPPSI/BD = Block Design subtest of the WPPSI.

*p<.05.

*p<.05

Figure 2. Correlations between each of the predictor variables and the criterion variable. (EOWPVT = Expressive One-Word Picture Vocabulary Test; INFL = Inflection Stories; ITPA/GC = Grammatic Closure subtest of the Illinois Test of Psycholinguistic Abilities; PTVOCAB = Vocabulary Posttest; MUMA/RG = Rule/Nonrule Governed Learning subtest of the Muma Assessment Program; WPPSI/AH = Animal House subtest of the Wechsler Preschool and Primary Scale of Intelligence; WPPSI/BD = Block Design subtest of the WPPSI.)

contribution to the model, was calculated for each predictor variable. The forward model first selects the variable that independently accounts for the greatest amount of variance. Next, variables that account for the greatest amount of the remaining variance are sequentially entered. No further additions to the model were made when the F-ratios associated with remaining variables failed to reach a probability level of .5 for entry into the model.

A summary of the multiple regression model obtained using this procedure is presented in Table 2. Variables are listed in the order in which they were entered into the regression equation. The amount of variance independently contributed by each variable (partial r-square) and the combined amount of variance of the variables as they are added to the model (model r-square) also are summarized. The F values reflect the significance of the variance that can be attributed to each variable beyond what is contributed by previous variables. Level of significance for each variable is provided.

Five of the seven predictor variables were entered into the model and accounted for 77% of the variance [$F(5, 13) = 8.73, p < .01$]. The ITPA/GC and PTVOCAB accounted for a significant proportion of the variance independently of the other predictors, contributing 49% and 21% of the variance,

Table 2

Summary of the multiple regression model of the variables contributing to predictions of novel inflection learning performance.

Variable	Partial R ²	Model R ²	F Ratio	Prob>F
ITPA/GC	0.49	0.49	16.44	.0008
PTVOCAB	0.21	0.70	11.41	.004
MUMA/RG	0.05	0.75	2.92	.11
AGE	0.01	0.76	0.51	.49
EOWPVT	0.01	0.77	0.56	.47

Note. ITPA/GC = Grammatic Closure subtest of the Illinois Test of Psycholinguistic Abilities; PTVOCAB = Vocabulary Posttest; MUMA/RG = Rule/Nonrule Governed Learning subtest of the Muma Assessment Program; EOWPVT = Expressive One-Word Picture Vocabulary Test.

respectively. The MUMA/RG, age, and EOWPVT also met the .5 probability level for entry into the model; however, the additional contribution of these variables was not statistically significant ($p < .05$). Limited ranges for performance on the MUMA/RG and age may have contributed to the low statistical power of these variables. The WPPSI/BD and WPPSI/AH did not meet the .5 probability level for entry into the model.

The incorrect responses made by subjects on the INFL were analyzed to assess the nature of the errors. Error responses were placed into three categories: "complete error" (i.e., no responses, incorrect stem + incorrect inflection, or incorrect stem + no inflection), "vocabulary error" (i.e., incorrect stem + correct inflection), and "inflection error" (i.e., correct stem + incorrect inflection, or correct stem + no inflection). The total number of errors in each category was 83, 13, and 152, respectively. A three-way chi-square indicated a significant difference for the frequency of the three types of errors [$\chi^2(4, N=20) = 28, p < .01$]. A second chi-square indicated that the difference between the "complete error" and "inflection error" categories also was significant [$\chi^2(1, N=20) = 55, p < .01$]; subjects made significantly more inflection errors during the INFL.

A significant difference between correct noun responses ($M = 9.3$) and correct verb responses ($M = 5.8$) on the INFL was obtained [$t(36) = 4.61, p < .05$]. No significant differences were found between responses to the two inflections, / Λ / and / u / [$t(36) = 0.17, p > .05$] or between the INFL means for subjects attending preschool A and subjects attending the other two preschools [$t(17) = 1.28, p > .05$]. In addition, no significant differences were found for presenters [$t(17) = 0.79, p > .05$], or for word sets [$t(17) = 0.61, p > .05$].

DISCUSSION

The findings of the present study of normally developing, preschool-aged boys suggest that inflection learning is a language-specific phenomenon more tied to vocabulary skills than to nonverbal cognitive skills. Current level of inflection skills, as measured by the Illinois Test of Psycholinguistic Abilities (ITPA/GC), was the greatest contributor to the prediction of performance on the novel inflection learning stories (INFL). In addition, performance on the novel vocabulary posttest (PTVOCAB) accounted for a significant amount ($p < .05$) of the INFL variance. In contrast to these findings, each of the three measures of nonverbal skills accounted for only a small percentage of the INFL results.

There are, however, major caveats which must be attached to the conclusion that inflection learning is relatively dissociated from nonverbal cognitive skills. Certain components of language acquisition appear to be associated with different cognitive abilities at different points in development (Bates, 1979). Hence, the low predictive power of the nonverbal cognitive measures may be a result of the cognitive abilities selected for study within the age range investigated.

It also is possible that the tests chosen as predictors did not adequately assess the targeted abilities. For example, the behaviors sampled by the Block Design subtest of the Wechsler Preschool and Primary Scale of Intelligence (WPPSI/BD) may not be representative of general cognition as originally postulated. The statistical power of the Rule/Nonrule Governed subtest of the Muma Assessment Program (MUMA/RG) was compromised because over half of the subjects did not complete the MUMA/RG. The lack of evidence that age was a contributor to the prediction of performance on the INFL also may be a result of the limited age range chosen for this study.

The ITPA/GC accounted for nearly half of the INFL variance. This finding indicates that novel inflection learning is linked more strongly to current levels of skills in the same language subsystem than to vocabulary skills. Thus, although inflection learning is predicted to a fair degree by vocabulary skills, it appears to be a somewhat self-contained ability as studies of language-impaired children have indicated (cf. Curtiss, 1981; 1988).

The present results reflect the tie between vocabulary and inflection skills which is postulated to occur during language acquisition (Connell, 1989; Pinker, 1984). The "poor" inflection learners did not have the same level of

competence with the vocabulary as the "good" inflection learners. The additional meaning contributed to a word by an inflection may have more easily become apparent to the "good" vocabulary learners because they had established a firm meaning base for the stem. The child could then formulate a rule to account for the presence of the inflection (Connell, 1989; Pinker, 1984).

The finding that subjects gave more correct responses to the inflected nouns than to the inflected verbs may be related to the level of vocabulary competence. The inflections may have been more readily attached to nouns than to verbs because "action" words appear to be more semantically complex than "object" words (Camarata & Schwartz, 1985). Another possibility is that the semantic notions coded by the inflections were more complex for verbs than nouns. Subjects tended to provide accurate noun responses, whereas their verb responses remained uninflected. Still another explanation is that the difference between learning to attach inflections to nouns and to verbs may be a result of a spurious, task-related effect. In each story, noun items were presented to the subjects before the verb items.

The finding of a statistically significant relation between the ITPA/GC and INFL performance begins to validate

the INFL as a learning task that does, indeed, tap skills important to inflection acquisition. The INFL is further validated by the finding that the novel inflections learned during the INFL were generalized to untrained word stems. The overgeneralization of inflections that characterize natural language acquisition was also observed during the training and generalization sessions. Additional evidence that subjects were learning inflections as units independent of the vocabulary stem was obtained by analyzing the errors produced during the INFL. Errors occurred on the vocabulary stem alone or on the inflectional morpheme alone.

Knowledge of measures which contribute to the prediction of inflection learning eventually may help investigators and clinicians identify the needs of poor inflection learners. For example, children diagnosed as specifically language impaired (SLI) evidence normally developing pragmatic and semantic skills along with a limited use of morphological elaborations (cf. Leonard, 1987). If the predictors are found to be the same for SLI children as for normal children, then SLI children would appear to bring normal, yet deficient, skills to the task of inflection learning. A finding that a different set of measures contributes to the prediction would suggest that SLI children bring alternative skills to the task of

inflection learning.

The identification of measures which contribute to the prediction of inflection learning has direct implications for studies of therapeutic approaches to children with inflection difficulty. The current findings, for example, suggest the possibility that improvement of vocabulary skills may be found to aid inflection learning. As suggested by the the model proposed by Connell (1989), once vocabulary skills have been strengthened, contrasts in meaning between inflected and uninflected words may further facilitate inflection learning.

Additional studies are needed to examine measures of verbal and nonverbal abilities not selected as predictors for this study. It is possible that other variables may significantly contribute to predictions of inflection learning. For example, syntactical (Brown, 1973; Cromer, 1988; Curtiss, 1981; 1988; Muma, 1978), and auditory short-term memory skills (Curtiss, 1981) have been tied to morphological development. Still another possibility is that an untested variable might account for both vocabulary and inflection learning performance.

A more rigorous test of the relation between inflection learning and nonverbal cognitive skills may yield different results as well. The third contributor to the

prediction of INFL was made by a measure of nonverbal rule learning, despite the fact that over half of the subjects did not complete the test. Hence, it is possible that future studies may indicate that not only verbal skills but also certain cognitive skills contribute to inflection learning.

FOOTNOTE

1. When this subject's scores are included in the regression equation, PTVOCAB and ITPA/GC remain the best two predictors at $p < .03$ and $p < .27$ respectively. The increased probability levels are not suprising given that the inclusion of the outlying scores adds substantial heterogeneity to the distributions.

APPENDIX A
Novel Vocabulary Items and Referents

Word Set			
1	2		Referent
Gack	Dake	=	A figure
Teeg	Toam	=	A toy
Dapp	Bepp	=	Figure moves back and forth while on stomach on toy
Ped	Mab	=	Figure moves in circles while upright on toy

Note. /gæk/ /deɪk/
 /tig/ /tom/
 /dæp/ /bɛp/
 /pɛd/ /mæb/

REFERENCES

- Bates, E. (1979). The emergence of symbols: Cognition and communication in infancy. New York: Academic Press.
- Brown, R. (1973). A first language. Cambridge, MA: Harvard University Press.
- Camarata, S.M. & Schwartz, R.G. (1985). Production of object words and action words: Evidence for a relationship between phonology and semantics. Journal of Speech and Hearing Research, 28, 323-330.
- Connell, P.J. (1989). Facilitating generalization through induction teaching. In L.V. McReynolds (Ed.), Generalization strategies in the treatment of communication disorders (pp. 44-62). Philadelphia, PA: Brian C. Decker, Inc.
- Cromer, R.F. (1988). Differentiating language and cognition. In R.L. Schiefelbusch & L.L. Lloyd (Eds.), Language perspectives: Acquisition, retardation and intervention (2nd Ed.) (pp. 91-124). Austin, TX: Pro-Ed.
- Curtiss, S. (1981). Dissociations between language and cognition: Cases and implications. Journal of Autism and Developmental Disorders, 11, 15-30.
- Curtiss, S. (1988). Abnormal language acquisition and the modularity of language. In F.J. Newmeyer (Ed.),

Linguistics: The Cambridge survey: Vol. 2. Linguistic theory: Extensions and implications (pp. 96-116). New York: Cambridge University Press.

Gardner, M.F. (1979). Expressive One-Word Picture Vocabulary Test. Novato, CA: Academic Therapy Publications, Inc.

Kirk, S. & Kirk, W. (1968). The Illinois Test of Psycholinguistic Abilities (Rev. ed.). Urbana, IL: University of Illinois Press.

Leonard, L.B. (1987, March). Specific language impairment from a crosslinguistic perspective. Paper presented at Department of Speech and Hearing Sciences Colloquium, University of Arizona, Tucson, Arizona.

McCauley, R.J. & Swisher, L. (1984). Psychometric review of language and articulation tests for preschool children. Journal of Speech and Hearing Disorders, 49, 34-42.

Muma, J.R. (1978). Language handbook: Concepts, assessment, intervention. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Muma, J.R. & Muma, D.B. (1979). Muma Assessment Program. Lubbock, TX: Natural Child Publishing Co.

Newfield, M.U. & Schlanger, B.B. (1968). The acquisition of English morphology by normal and educable mentally retarded children. Journal of Speech and Hearing

Research, 11, 693-706.

Owens, R.E., Jr. (1984). Language development: An introduction. Columbus, OH: Charles E. Merrill Publishing Co.

Pinker, S. (1984). Language learnability and language development. Cambridge, MA: Harvard University Press.

Rice, M.L. (1983). Contemporary accounts of the cognition/language relationship: Implications for speech-language clinicians. Journal of Speech and Hearing Disorders, 48, 347-359.

SAS Institute, Inc. (1988). SAS Software, Release 6.03. Cary, NC: SAS Institute, Inc.

Swisher L. & Pinsker, E.J. (1971). The language characteristics of hyperverbal, hydrocephalic children. Developmental Medicine and Child Neurology, 13, 746-755.

Wechsler, D. (1967). Wechsler Preschool and Primary Scale of Intelligence. New York: The Psychological Corporation.