AUDITORY RESYNTHESIS ABILITIES OF BLACK AND WHITE FIRST-AND THIRD-GRADE CHILDREN

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ABSTRACT

Several language researchers and theorists have suggested that Black inner city language is a substandard form of English, while others have said that it is simply a different language system or dialect--qualitatively neither better nor worse than that of "standard" English. As support for the former position, some studies have noted that although Black first-grade children were equivalent to White first-graders in cognitive development, by the third-grade the Black children performed significantly poorer in this area than did their White counterparts. In addition, other studies have suggested that Black children are impaired in their abilities to decode as well as encode language. Those studies which have concluded that Black children have inferiorly developed language processing skills have commonly ignored at least two important factors: 1) Matching socioeconomic and/or educational levels of the experimental and control groups and 2) the use of White middle class-biased stimuli.

In view of the above, this study investigated the perceptual resynthesis abilities of Black and White first- and third-grade children, using ten meaningful and ten non-meaningful consonant-vowel-consonant monosyllables which were systematically segmented with silent intervals of 100, 200, 300, and 400 msec.

The subjects for this study consisted of 80 Black and 80 White normal hearing first- and third-grade children matched according to socioeconomic

and educational criteria (all were participants in Title 1 programs). The subjects were randomly assigned to 16 ten-member groups, each groups comprised exclusively of either Black or White children who were first- or third-graders.

The ten meaningful and ten non-meaningful CVC monosyllables were spoken by a phonetically-trained White female speaker through high quality recording apparatus. Sixteen randomized versions of this master tape were made. The twenty monosyllables of each experimental tape were segmented by splicing silent intervals of 100, 200, 300, or 400 msec between phonemes. Each group of ten subjects heard one of the 16 randomized versions.

The 20 CVC monosyllables were presented individually to a listener via a high quality tape recorder. The subject's task was to resynthesize and repeat each segmented CVC monosyllabic unit. Subjects were not penalized for articulation disorders.

The results revealed that both the Black and White children improved in performance on this task from first- to third-grade. Further, the results suggested that the first-grade Black childrens' resynthesization of both the meaningful and non-meaningful CVC monosyllables was slightly inferior to the White first-graders. However, by the third-grade, the Black children were equal to, and in some instances, better than the White third-graders on this task.

All groups performed better on the meaningful than the non-meaningful CVC monosyllables. In addition, except for the Black first-graders, the major breakdown in resynthesis abilities was at the 200 msec segmentation level.

These findings suggest that there are no differences between the perceptual abilities, and speculatively, the cognitive abilities, of Black

and White children, when the children are matched according to a socio-economic and/or educational criteria. Further, since the experimenter was a White female, it may be argued that the Black first-graders would not perform as well as they would for a Black experimenter. The results are related to current theories of language processing. Implications for future research are suggested.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

The research regarding the perceptual and language abilities of Black children from lower socioeconomic families has reached an apparent dichotomy. Many investigators describe the Black child as possessing restricted or substandard language and cognitive abilities. Others, however, prefer to recognize these abilities as being a function and a result of a separate and unique culture-specific language system or dialect. The implications in the latter case do not place emphasis upon a deviation from any presupposed White norm. Rather, they reinforce the concept that inner city Black children function perceptually the same as any other child; their measured behavior is different, not deviant.

A major problem with much of the research regarding these two so-called schools of thought is that too often investigators have compared the performance of the "low income" Black child with that of the "middle income" White child. This type of comparison does not provide a means for determining whether any revealed differences in performance between Black and White children is due to an actual difference in cognitive and perceptual abilities or is simply a result of improper matching of experimental and control groups. Problems such as these, combined with a conceptual model of deprivation by the researcher and educator, may possibly distort and even obscure the facts which the researcher and educator seek.

The model of deprivation to which several educational schools of thought have adheared is symbolized in the use of such terms as culturally deprived, culturally disadvantaged, educationally disadvantaged, cognitively deprived and so on. Of particular concern is the fact that few, if any, of the schools that espouse such a model have clarified what it is the child is actually disadvantaged in. Sigel and Perry have criticized these erroneous "lables" which serve only to categorize these children as a homogeneous group which is essentially void of individual differences.[1]

Those who have been more explicit in their descriptions have been somewhat unclear in their statements and/or the data supporting their statements. For example, Engelmann has made the observation that Black children do not hear properly, that is, they "are unable to hear or repeat certain words in a statement; do not realize that more than one word can describe a given object; do not recognize that there are polar or contradictory structures in language; do not understand that a word applies to many different instances and do not approach a new setting with the understanding that one's words should be consistent with his actions."[2] This statement is not based upon any audiologically determined data. Rather, it is substantially a result of the intuitive knowledge of the author that a culture that is different from another culture in such aspects as language and concept formation is also disadvantaged and deprived.

Whether a model of cognitive perceptual abilities is needed is not the question raised in this paper. However, it would seem that rather than apply a model of auditory cognitive abilities and processing to Black children which a) places the predominant emphasis on the negative aspects

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[1] I. Sigel and C. Perry, "Psycholinguistic Diversity Among So-called Culturally Disadvantaged Children", (The Merrill Palmer Institute, 1970).

[2] S. Engelmann, "Cultural Deprivation-Description and Remedy", (Institute for Research on Exceptional Children, University of Illinois, 1964).

(Bernstein,[1] Bereiter and Engelmann,[2] and Cheyney[3]) and b) tends to confuse that which is more neurologically and innately determined with that which is more psychologically and experentially determined (Lenneberg,[4] and Chomsky[5]), it would seem more appropriate that educators and researchers make use of a more general model of such processing. That is, it may be more useful to utilize a model that may have applications across various subcultures and, in fact, populations.

It is the contention of this thesis that such a model has been reviewed and discussed by Aaronson[6] and that Aaronson's model can be applied to the development of auditory perceptual processing in all children. This thesis, then, will attempt to demonstrate that the inner city Black child not only has the potential to, but also functions perceptually in a manner similar to that of all children, according to a current model of auditory perceptual processing. However, before explicitly stating the problem to be studied, Aaronson's model and the research to date relative to the auditory perceptual abilities of Black children will be discussed.

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[1] B. Bernstein, "Social Structure, Language, and Learning", Educational Research, 3, (1961).

[2] C. Bereiter and S. Engelmann, Teaching Disadvantaged Children in the Preschool, (Englewood Cliffs: Prentice-Hall, 1966).

[3] A. Cheyney, Teaching Culturally Disadvantaged in the Elementary School, (Charles E. Merrill Books, Inc., Columbus, Ohio, 1967).

[4] E. Lenneberg, Biological Foundations of Language, (New York: Wiley and Sons, 1967).

[5] N. Chomsky, Language and Mind, (New York: Harcourt, Brace and World, 1968).

[6] D. Aaronson, "Temporal Factors in Perception and Short-Term Memory", Psychological Bulletin, 67, (1967).

Aaronson's Model

Aaronson[1] has suggested a model of short-term memory similar to an earlier model proposed by Broadbent[2] which emphasizes the importance of time and order effects in perceptual processing of auditorially presented stimuli. The Aaronson model is divided into two stages: Stage 1, analogous to Broadbent's sensory or S-system, is an unstable, large capacity storage system having a fast decay time, where low level, direct representations of the physical stimulus are received in parallel and stored in patterns. Stage 2 of Aaronson's presentation, analogous to Broadbent's perceptual or P-system, is a limited capacity, slow decay system which receives the stimulus patterns from Stage 1 in ordered series. If items arrive at too rapid a rate at Stage 2, or if several items arrive simultaneously, perceptual analysis of the message may be impeded. If the items are left in Stage 1 too long, rapid decay will occur, again hindering perceptual analysis.

Aaronson suggests and offers experimental support for three variables which may be manipulated to investigate her temporally-based model of short-term memory: 1) Presentation, rate, 2) Stimulus duration, which is analogous to physical on-time, and 3) Inter-item interval, which is analogous to physical off-time. Presentation rate, for example, can be held constant or varied by time-compressing or expanding the silent interval between each item. If the presentation rate is reduced beyond specified optimal limits by reduction of the stimulus duration, more time would be allowed for each item to decay in Stage 1. On the other hand, the

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[1] D. Aaronson, "Temporal Factors in Perception and Short-Term Memory", Psychological Bulletin, 67, (1967).

[2] D. Broadbent, "A Mechanical Model for Human Attention and Immediate Memory", Psychological Review, 64, (1957).

argument may be made that reducing only the item duration would allow more time for a decision to be made in the processing of each new distorted item. Thus, when the inter-item interval is long relative to item duration due to the temporal reduction of the item, one of the two above results is likely to occur. However, if the inter-item interval is short relative to the item duration due to reduction of the inter-item interval, would the same results be likely to occur? That is, which variable plays a more important role in the temporal characteristics of auditory perceptual processing? In her review, Aaronson has suggested that it is the inter-item interval that is predominant.[1] However, the results of Beasley, using sentential approximations similar to those developed by Miller[2], and used by Speaks and Jerger[3], pointed to the item duration as the predominant factor in such an analysis.[4] Beasley attempted to reconcile his findings with those of Aaronson[5] by suggesting that the "predominant" factor may vary, depending upon the nature of the stimuli being presented. The inter-item interval may play a more predominant role than item duration in perceptual analysis for stimuli such as clicks, digits, and word lists, since these stimuli require minimal applications of stored higher representational cues by the listener. However,

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[1]D. Aaronson, "Temporal Factors in Perception and Short-Term Memory", Psychological Bulletin, 67, (1967).

[2]G. Miller, Language and Communication, (New York: McGraw-Hill, 1963).

[3]C. Speaks and J. Jerger, "Method for Measurement for Speech Identification", Journal of Speech and Hearing Research, 8, (1965).

[4]D. Beasley, "Auditory Analysis of Time-Varied Sentential Approximations", Ph.D. Dissertation, University of Illinois, (1970).

[5]D. Aaronson, "Temporal Factors in Perception and Short-Term Memory", Psychological Bulletin, 67, (1967).

as the stimulus becomes more complex, as in sentential approximations, the item duration begins to play a more significant role. This suggests that the item duration and inter-item interval are both important phenomena when discussing the applications of time in auditory perceptual processing. Further, it underlines the importance of being specific about the stimulus used when discussing the applications of research results to models of perceptual analysis.

If it is assumed that the above interpretations of the temporal characteristics of auditory perceptual processing are accurate, then it may also be possible to assume that there exists a hierarchy in the development of such temporal factors. That is, it may be assumed that the inter-item interval plays an important role in the early acquisition and development of language and perceptual abilities. Item duration takes on a significant role after the basic phonological and perhaps syntactic characteristics have been established. This suggests, then, that if a model such as Aaronson's is to be applied to the analysis of the perceptual abilities of children, it is necessary to investigate the aspects of that model which represent basic stages in the developmental hierarchy. One such aspect is the inter-item interval. If Black children for some reason do not 'hear' as well as White children or are auditorially perceptually handicapped in some way, a test of perceptual abilities should reveal that handicap. In addition, such a test should indicate the location (whether Stage 1 or Stage 2, according to the model described in this study) and the manner (if temporal, whether it is due to an inability to make adequate use of the inter-item interval and/or whether the item duration is distorted in short-term memory) of that handicap. If, however, the auditory perceptual mechanism of Black children is not malfunctioning, at least at the basic perceptual levels, the test should reveal that fact. Such a test may also provide answers to certain equivocal findings which have appeared in research relative to Black language and, more specifically, the discrimination abilities of Black children.

Perceptual Abilities of Black Children

Recent research has attempted to investigate the language abilities of Black children. One factor indicative of language ability is auditory discrimination. Weiner, in a review of several studies, reported that auditory discrimination was related to articulation errors when the number of misarticulations was four or more.[1] Related to auditory discrimination is auditory resynthesis. Van Riper,[2] Roswell and Chall,[3] and Shriner and Daniloff[4] suggest that auditory discrimination in the form of phonemic resynthesization is an important predictor of the future development of articulation and language in children. Such a viewpoint suggests that auditory discrimination and auditory resynthesis would be related to the perceptual abilities of children. Bereiter and Engelmann compared the "culturally deprived" child to the deaf child in terms of verbal and perceptual communication abilities. They concluded that, "with regard to the important cognitive uses of language...both kinds of children are seriously deprived--the deaf child because he cannot understand what is said,

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[1]P. Weiner, "Auditory Discrimination and Articulation", Journal of Speech and Hearing Disorders, 32, (1967).

[2]C. Van Riper, Speech Correction, Principles and Methods, (Englewood Cliffs: Prentice Hall, 1954).

[3]F. Roswell and J. Chall, Roswell-Chall Auditory Blending Test, (New York: Essay Press, 1963).

[4]T. Shriner and R. Daniloff, "Resynthesis of Segmented CVC Syllables by Children", Journal of Speech and Hearing Research, (In Press: 1970).

the lower-class child because he is not sufficiently exposed to language in its cognitive uses."[1]

Reviews of the existing literature reveal further differences in the language abilities of children from various social classes (Shriner,[2] Raph,[3] Povich and Baratz,[4] Deutsch,[5] and Baratz and Shuy[6]). The results of some of these studies has been to view White language performance as being superior to Black language in several areas. Raph, in her review of the literature, indicated that the language model of the disadvantaged child was "meager, restricted in a variety of vocabulary, repetitive and routinized, incorrect grammatically, innaccurate in pronunciation and articulation with poor syntactical form."[7] Such a model would be expected to produce a meager and restricted form of language for the so-called "disadvantaged" child.

Entwisle, using a word association paradigm, found first-grade Black slum children to be more advanced in linguistic development than

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[1]C. Bereiter and S. Engelmann, Teaching Disadvantaged Children in the Preschool, (Englewood Cliffs: Prentice-Hall, 1966), pp. 31-32.

[2]T. Shriner, "Sociolinguistics and Language", Handbook of Speech Pathology, (New York: Appleton-Century-Crofts, In Press: 1969).

[3]J. Raph, "Language Characteristics of Culturally Disadvantaged Children: Review and Implications:, Review of Educational Research, 35, (1965).

[4]E. Povich and J. Baratz, "A Discussion of the Language Studies of the Economically Disadvantaged Child", Center for Applied Linguistics, Washington, D. C.

[5]C. Deutsch, "Auditory Discrimination and Learning: Social Factors", Merrill Palmer Quarterly, 10, (1964).

[6]J. Baratz and R. Shuy, Teaching Black Children to Read, (Washington, D. C., Center for Applied Linguistics, 1969).

[7]J. Raph, "Language Characteristics of Culturally Disadvantaged Children: Review and Implications", Review of Educational Research, 35 (1965).

suburban children of the same intelligence.[1] However, she reported that a reversal occurred at the levels of the third- and fifth-grades; at these stages the suburban children responded with more mature word associations than did the Black children. Entwisle suggests that a possible explanation for this reversal effect may be due to the fact that verbal models presented to lower-class children are uncomplicated, whereas those for suburban children are more varied. The more elaborate model for the suburban children, therefore, could serve as a temporary handicap. The results of a study measuring language development using the Illinois Test of Psycholinguistic Abilities (ITPA) by Gerber and Hertel showed that the "culturally deprived" children were less adept at understanding the meaning of auditory and visual symbols than were the "culturally non-disadvantaged". They were described as being "less able than the culturally non-disadvantaged preschool children to relate spoken words in a meaningful way. They put ideas into words or gestures more poorly than did the non-disadvantaged children. They were less able to handle the syntactical and inflectional aspects of language without conscious effort, and were less able to correctly reporduce a sequence of symbols."[2] However, Holland has criticized the conclusive statements of Gerber and Hertel, pointing out that a test designed to measure the language performance of a specific population cannot be adequately utilized to measure the performance of a group which is linguistically different.[3]

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[1]D. Entwisle, (T. Shriner and R. Daniloff, Op. Cit.), "Developmental Sociolinguistics: In Inner City Children", American Journal of Sociology, 74, (1968),

[2]S. Gerber and C. Hertel, "Language Deficiency of Disadvantaged Children", Journal of Speech and Hearing Research, 12, (1969) p. 278.

[3]A. Holland, "Comment on 'Language Deficiency of Disadvantaged Children' ", Journal of Speech and Hearing Research, 13, (1970).

Howard, Hoops, and McKinnon administered the Vocal Encoding subtest of the Illinois Test of Psycholinguistic Abilities to 480 children from both high and low socio-economic status.[1] Their results showed that many of the responses given by the low socioeconomic group were not creditable, although, following a grammatical analyzation, it was found that these childrens' responses were an efficient form of expression. For example, on the Auditory-Vocal Automatic subtest, the picture of a "wrecked" car was described as being "torn up" or "smashed up". Neither of these responses, according to the instructions of the ITPA, could be scored as being correct; however, they do demonstrate an understanding of the meaning of the stimulus presented.

Testing the effects of feedback and positive reinforcement on the Wepman Auditory Discrimination Test, Berlin and Dill found that the scores of the Black children improved with special instructions and verbal reinforcement.[2] The authors then relate their findings to the need for further research in the examination of test administration procedures with Black children. The recommendation for further research put forth by Berlin and Dill supports Povich and Baratz in their contention that many of these studies fail to take into consideration the effect which the experimental setting may have on lower class children. They suggest that this type of experience is not one with which the lower class child is familiar and that this unfamiliarity may inhibit the language performance

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[1] M. Howard, et al, "Language Abilities of Children with Differing Socio-Economic Backgrounds", (Detroit: Wayne State University, 1969).

[2] C. Berlin and A. Dill, "The Effects of Feedback and Positive Reinforcement on the Wepman Auditory Discrimination Test Scores of Lower Class Negro and White Children", Journal of Speech and Hearing Research, 10. (1967).

of these children.[1] They stress the importance of realizing that these studies use "standard" English as the criterion of adequate language and speech. Stewart points out that conversational omissions and substitutions can occur in a dialect pattern and that meaning can be lost if a listener, charged with the task of analyzing verbal responses, is not familiar with the speech of that particular community.[2]

Realizing the existing limitations of testing procedures, Baratz prefers to view the language of Black children not as "substandard" but rather as a "well-ordered, highly structured, highly developed language system which in many aspects is different from standard English."[3] Thus, she views Black language in terms of "dialectology" which is defined as being "the study of language differences within a speech community, with a dialect simply defined as a variety of a language, generally mutually intelligible with other varieties of that language, but set off from them by a unique complex of features of pronunciation, grammar and vocabulary. Dialect, thus used, is not a derogatory term but a descriptive one."[4]

While most studies have focused primarily on evaluating the verbal output of Black children, there exists a need for examining and correlating such findings with research dealing with auditory perceptual abilities. Deutsch, assuming Black children possessed perceptual problems,

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[1]E. Povich and J. Baratz, "A Discussion of the Language Studies of the Economically Disadvantaged Child", Washington, D. C.: Center for Applied Linguistics, (1965).

[2]W. Stewart, "Sociolinguistic Factors in the History of American Negro Dialects", The Florida FL Reporter, 5, (1967).

[3]J. Baratz, "Language and Cognitive Assessment of Negro Children: Assumptions and Research Needs", ASHA, (1969).

[4]J. Baratz and R. Shuy, Teaching Black Children to Read, (Washington, D. C.: Center for Applied Linguistics, 1969), p. 3.

assessed the auditory discrimination abilities of disadvantaged Black children and found that they did not discriminate as well as did White children coming from middle class environments.[1] However, Wiggins has pointed out that such auditory discrimination tests must, to be accurate, compare the performance of Black children with norms which have been established from other persons who speak this dialect.[2] He states that the responses of Black children which are judged as incorrect by White norms do not necessarily reflect underdeveloped auditory discrimination abilities, but rather are a product of the child's language system. Shriner and Miner compared 25 "culturally disadvantaged" and 25 "culturally advantaged" children on the ability to apply morphological rules to unfamiliar perceptual stimuli.[3] A comparison of scores revealed no statistically significant differences on a semantically involved task of having the child "auditorialy cloze a statement with certain contextual clues"[4] using 10 noun pluralizations, six verb forms and four possessives with non-meaningful words.

Findings such as this tend to counteract the suggestion of Bereiter and Engelmann[5] and Raph[6] that Black (that is, "disadvantaged") children

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[1] C. Deutsch, "Auditory Discrimination and Learning: Social Factors", Merrill Palmer Quarterly, 10, (1964).

[2] M. Wiggins, "An Investigation of Auditory Discrimination Skills in Children Who Speak Nonstandard English", (Flint, Michigan, 1969).

[3] T. Shriner and L. Miner, "Morpohlogical Structures in the Language of Disadvantaged and Advantaged Children", Journal of Speech and Hearing Research, 11, (1968).

[4] Ibid., p. 606.

[5] C. Bereiter and S. Engelmann, Teaching Disadvantaged Children in the Preschool, (Englewood Cliffs: Prentice-Hall, 1966).

[6] J. Raph, "Language Characteristics of Culturally Disadvantaged Children: Review and Implications:, Review of Educational Research, 35, (1965).

cannot imitate or repeat sentence elements but rather tend to analyze whole sentences. Apparently the disadvantaged children of the Shriner and Miner study were able to differentiate word-like units. Raph also notes that the "culturally privileged child learns early that sentences are made up of words so that he imitates the noises that occur within words, but not the noises that occur between words. The culturally deprived child, in contrast, tends to approximate the whole sequence of noises."[1] (Unfortunately Raph never makes clear exactly what these mysterious "noises" are.) This argument, then, leads one to the conclusion that Black children would probably exhibit difficulties in resynthesizing stimuli whose inter-phonemic interval had been experimentally manipulated. However, that children may exhibit such a difficulty is not surprising since Shriner and Daniloff showed that middle and upper-middle class children revealed such a breakdown in resynthesis abilities. They tested the perceptual resynthesis performance of 80 normal-speaking first- and third-grade children with four silent inter-phonemic interval levels of 50, 100, 200, and 400 msec, using both meaningful and non-meaningful consonant-vowel-consonant (CVC) syllables. Their results showed that a) the non-meaningful monosyllables were more difficult to resynthesize than meaningful monosyllables, b) that the breakdown interval for meaningful words was 200 msec, and c) that there was no significant difference between the responses of the first-and third-grade children.[2] This suggests that if children from lower income families, and especially Black children,

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[1]J. Raph, "Language Characteristics of Culturally Disadvantaged Children: Review and Implications", Review of Educational Research, 35, (1965), p. 206.

[2]T. Shriner and R. Daniloff, "Resynthesis of Segmented CVC Syllables by Children", Journal of Speech and Hearing Research, (In Press: 1970).

are handicapped relative to middle class White children in making use of the inter-phonemic interval in auditory analysis, this difficulty may be exhibited by comparing the data obtained by Shriner and Daniloff to data obtained on a similar group of Black and White "culturally deprived" children. In addition, such a study would reveal whether this handicap, if it exists, is limited to Black children or whether it is characteristic of all children from lower socioeconomic cultures.

Raph also states that the "culturally deprived" child lacks "experience with verbally mature adults...his first words are likely to be composed of meaningless syllables which only vaguely resemble words and inflections he has heard, but does not understand."[1] However, Raph fails to realize that this conception of language development is a bona fide learning theory which has been put forth in various forms by Mowrer,[2] Van Riper,[3] and others. She attempts to support her argument by citing an example from Bereiter and Engelmann in which a child had to repeat a 13-word sentence which contained a conjunctional choice. ""The mother told the boy he could have a penny or a nickel.")[4] The Black child could not do this repetition task, according to Raph, because he did not understand the concept of conjunctional choice and so would not repeat the last three words. The relationship of this "choice concept" to the development of semantics in language is vague, at best. However, it is assumed for the moment that

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[1]J. Raph, "Language Characteristics of Culturally Disadvantaged Children: Review and Implications", Review of Educational Research, 35 (1965), p. 206.

[2]O. Mowrer, "Hearing and Speaking: An Analysis of Language Learning", Journal of Speech and Hearing Disorders, 23, (1958).

[3]C. Van Riper, Speech Correction, Principles and Methods, (Englewood Cliffs: Prentice Hall, 1954).

[4]J. Raph, "Language Characteristics of Culturally Disadvanteged Children: Review and Implications", Review of Educational Research, 35 (1965), p. 206.

the Black child is unable to apply semantics to word units, perhaps an indication of this handicap would also be revealed in a more basic type of task which incorporates stimuli similar to that of Shriner and Daniloff; that is, the Black child should reveal a marked inability to resynthesize meaningful consonant-vowel-consonant (CVC) monosyllables when compared to the White child. In addition, if this handicap is characteristic of all low-income children, Black and White children of this socioeconomic grouping should be markedly different from the children in the Shriner and Daniloff study.[1]

Finally, Raph has said that the "culturally deprived" child lacks "the use of language as a means of getting and dealing with incoming verbal cues...(and)...that which is even more critical is the fairly conclusive evidence that the delay or deficit has a profound influence on later learning...this gap in ability to manipulate symbols is seldom narrowed sufficiently for the child to succeed in school."[2] Thus, if Raph is correct that Black children function at a level of development similar to that of younger middle class White children and that they never catch up, and if this is the result of a perceptual handicap, be it psychological and/or neurological, then resynthesis abilities (an auditory perceptual task) of Black children whould show a steady decline from the first-to the third-grade. Such an expectation would appear warranted in view of

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[1] T. Shriner and R. Daniloff, "Resynthesis of Segmented CVC Syllables by Children", Journal of Speech and Hearing Research, (In Press: 1970).

[2] J. Raph, "Language Characteristics of Culturally Disadvantaged Children: Review and Implications", Review of Educational Research, 35, (1965), p. 207.

the suggestions of Entwisle,[1] Gerber and Hertel,[2] and Deutsch[3] that Black children are well behind their White middle class counterparts by the third-grade. However, the White children, especially the middle class, would reveal no such decline. This would be essentially true if the stimuli used approached a reasonable degree of being culture-free, that is, not culture-bound.

In summary, a study should be carried out that would reveal in depth whether children of low income families suffer from perceptual deficits. Further, it should attempt to uncover information relative to the semantic and phonological factors of language processing and to reveal if such deficitits, if they exist, are cummulative.

Statement of the Problem

In summary, several researchers have suggested that Black ghetto language or dialect is a substandard form of English and that the cognitive abilities of Black children are inferior to those of White children. Others, however, have suggested that Black ghetto language is simply a different form of language--neither better nor worse than so-called "standard" English. They do not regard the Black child as innately hampered by any lack of cognitive perceptual abilities. It would appear necessary then to investigate the differences between "Black" and "White"

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[1] D. Entwisle, (T. Shriner and R. Daniloff, Op. Cit.), "Developmental Sociolinguistics: In Inner City Children", American Journal of Sociology, 74, (1968).

[2] S. Gerber and C. Hertel, "Language Deficiency of Disadvantaged Children", Journal of Speech and Hearing Research, 12, (1969).

[3] C. Deutsch, "Auditory Discrimination and Learning: Social Factors", Merrill Palmer Quarterly, 10, (1964).

language performance as related to specified language-determinant variables, such as perceptual resynthesis abilities, in order to determine whether the suggestion of substandard versus standard differences in the language abilities of the two groups does indeed exist. Further, if these differences exist, they should be related to current theories and models of auditory perceptual processing.

The purpose of this study, then, is to investigate the differences in auditory perceptual resynthesis abilities between lower socioeconomic Black and White first and third-grade children using meaningful and non-meaningful CVC monosyllables which have been systematically segmented with silent inter-phonemic intervals of 100, 200, 300, and 400 msec of time.

CHAPTER II

EXPERIMENTAL PROCEDURES

This study consisted of 160 subjects which were randomly assigned to one of sixteen conditions. Each condition was a combination of one of four inter-phonemic interval levels by specific levels of grade and race. There were ten subjects per condition.

Subjects

The subjects used in this study were 80 first- and third-grade Black children whose performance on this task was compared to that of 80 White children of the same grade levels. All subjects were drawn from two Lansing, Michigan "inner city" schools which were federally funded through Title I programs. Thus, the subjects were families of lower socioeconomic status as determined by Title I criteria.

All subjects had normal hearing as ascertained by school records of audiological testing which had been performed during the semester prior to the carrying out of this study. The subjects were of normal intelligence as revealed by school records.

The subjects of the predominantly Black and the predominantly White schools were independently and randomly placed into eight groups of ten each, resulting in a total of 160 subjects.

Each subject was administered the Bryngelson and Glaspey[1] picture cards in order that any deviant articulation patterns could be determined. In addition, each child was asked to count to twelve and enter into conversational speech with the experimenter who was a trained speech pathologist. Any misarticulations noted during these three situations were hand-recorded by the experimenter prior to each child's experimental session and were accounted for when scoring the total number of correct responses for that child. Thus, if it was observed that, prior to the experimental session, a subject substituted one sound for another, it was not scored as being an incorrect response if this particular substitution occurred on one of the test items. This same procedure was employed for any omissions or distortions of sounds. Appendix C lists the subjects and their misarticulations which were scored as correct responses during the test.

Stimulus Generation

The stimulus material used were the same tapes used by Shriner and Daniloff[2] for their resynthesis study with middle class White children. The stimuli consisted of a master recording of ten meaningful and ten nonmeaningful CVC monosyllables. Each of ten different initial consonants, /n, m, b, d, dʒ, tʃ, ʃ, s, l, r/, were used in each set of monosyllables, each pair having the same initial consonant and differing only in the central vowel. The monosyllabic pairs are listed in Appendix A.

Figure 1 depicts the recording session situation. Each phoneme of the twenty CVC monosyllables used in this study was read separately at nor-

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[1]B. Bryngelson and E. Glaspey, Speech Improvement Cards, (Chicago: Scott, Foresman, 1941).

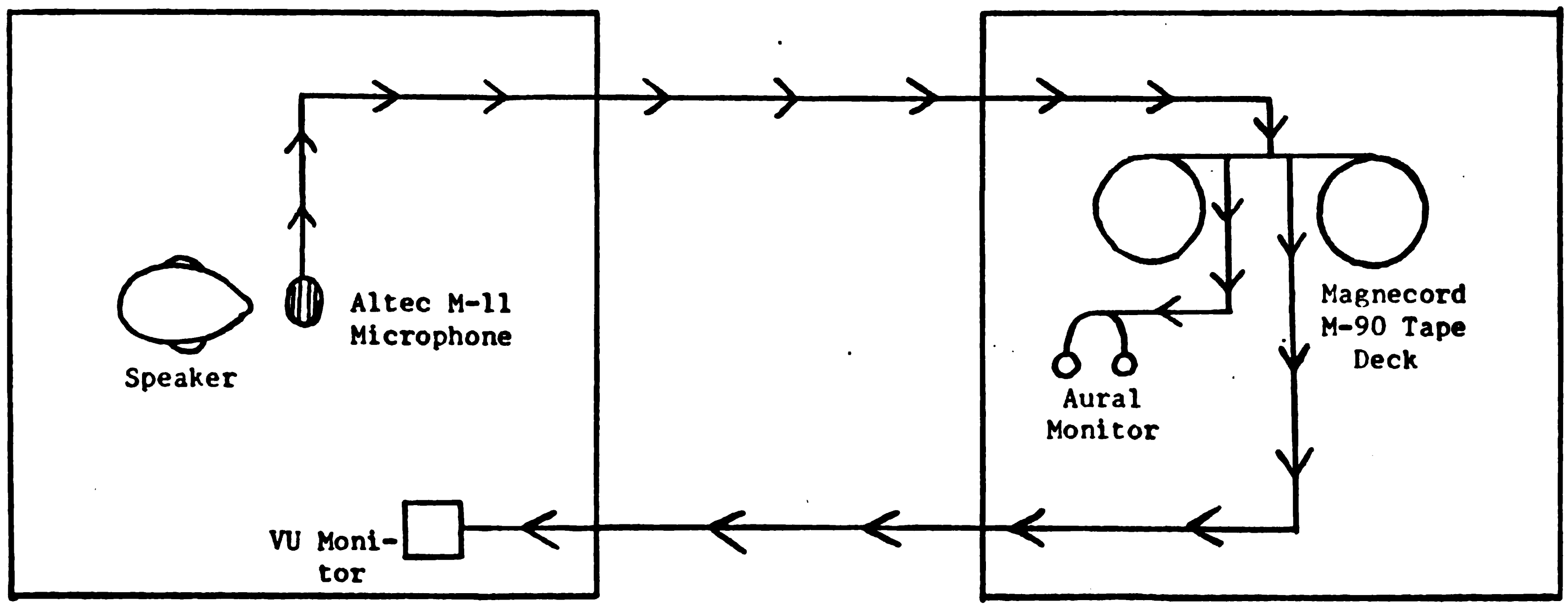
[2]T. Shriner and R. Daniloff, "Reassembly of Segmented CVC Syllables by Children", Journal of Speech and Hearing Research, (In Press: 1970).

mal conversational speech and effort level by a trained, White female phonetician who spoke general American English. The speaker was seated in a sound-treated room with a Daven VU meter in front of her to monitor her vocal intensity level. The phonemes were recorded at 15 ips onto a Magnecord M-90 tape deck via an Altec M-11 condensor microphone. Four copies were made of this master recording. Then, specified silent intervals of either 50, 100, 200, or 400 msec of magnetic tape were spliced between each phoneme to construct each CVC unit, a single silent interval level being used for each of the four experimental tapes. This resulted in four experimental tapes, each tape corresponding to a single level of inter-phonemic interval (IPI) size.

The 50 msec condition was eliminated from the present study and was replaced by a 300 msec condition. In making this latter condition, a procedure similar to that described above was followed. A copy of the 400 msec inter-phonemic interval tape was recorded using a Sony ESP Auto Reverse Model 770 tape deck (frequency response of 40 - 18,000 Hz ± 2 dB) at 7½ ips and an Ampex Model 601 (frequency response of 80 - 14,000 Hz) tape deck. The 400 msec tape was copied directly from the Ampex 601 onto the Sony 770. This new tape was then spliced to insert 300 msec of silent magnetic tape between each phoneme. Three graduate students in Speech Pathology listened to this tape to ensure that all newly spliced CVC monosyllables were intelligible.

Each segmented word for all four experimental conditions was embedded in the carrier phrase, "Repeat ________ please". Sixteen different rancomnizations of these tapes were then made--four randomnizations for each of the four conditions. Each randomized version was initiated by the practice items /wɪtʃ/ and /witʃ/ which contained the same inter-phonemic interval

Figure 1.--Schematic representation of the recording situation and apparatus.



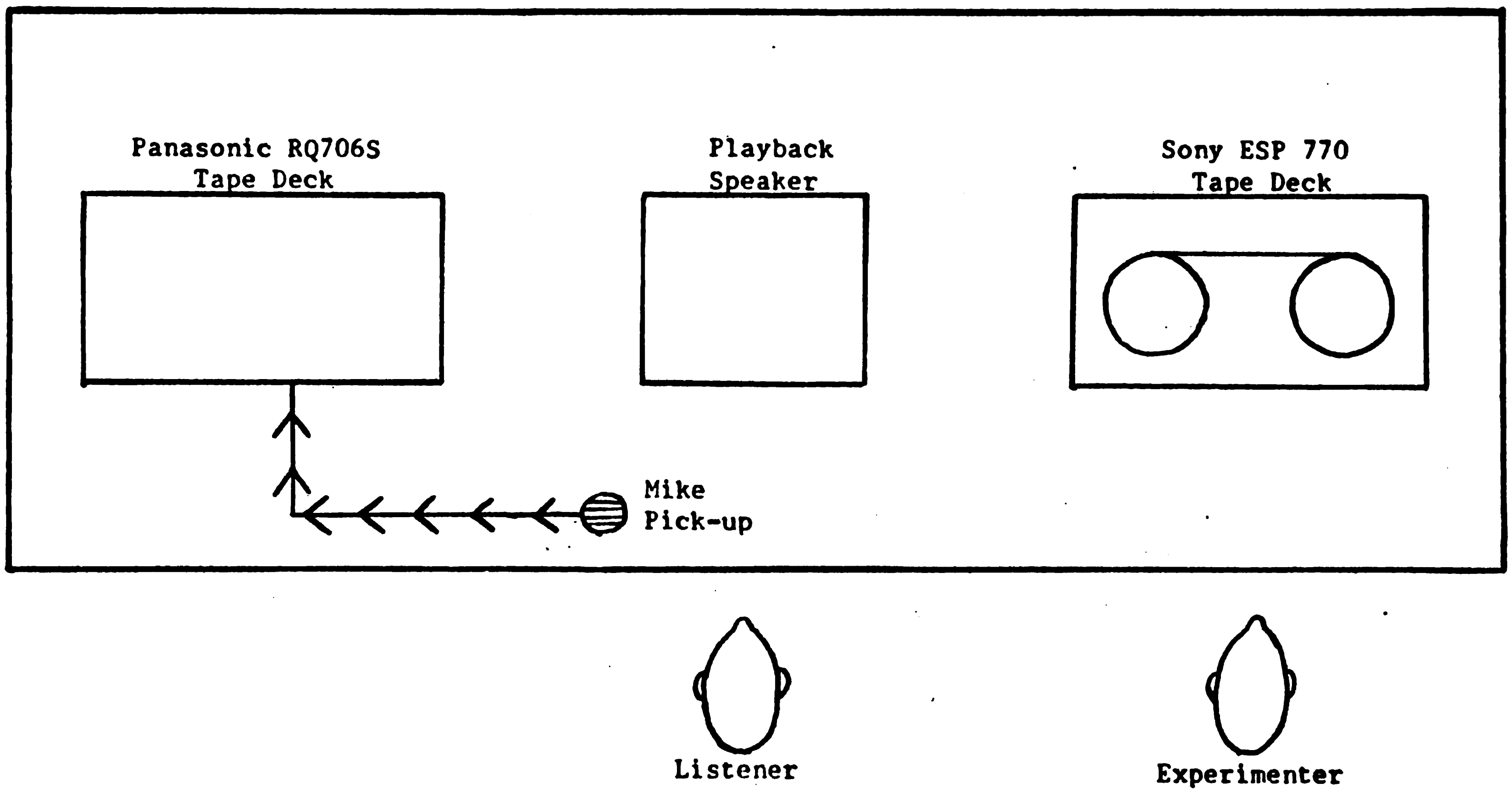
level as did the rest of the items of that condition. Ten seconds of silent listener response time was allotted for each experimental item.

<u>Presentation Procedures</u>

Each subject was seated individually in a school office while directly facing the speaker of the playback apparatus which was placed approximately twelve inches in front of him. This placement enabled the speaker to provide an average 70-74 dB SPL to the chair in the listening room. The S/N ratio at this point was better than 14 dB as measured on the linear scale with the Bruel and Kjar Model 2203 Sound Level Meter with a Type 4131 condensor microphone. A single experimental tape was played back free field to each listener individually via the Sony tape recorder used in making the experimental tapes.

Figure 2 depicts the listening session situation. In a given session the following set of instructions was given orally by the experimenter. "You are going to hear a lady on the tape recorder saying some words. I want you to listen to her and tell me exactly what the word is she said. Now, what word is it if she says '/k-æ-t/'?" At this point the child was to resynthesize the three phonemes and say the word "cat." The experimenter then spoke several meaningful and non-meaningful CVC constructions using objects in the room. In each instance, subjective silent delays were left between the phonemes of each syllable which the child was to resynthesize. If the child was able to do this successfully, he was asked to listen to and repeat the two practice items on the tape. If the child was not able to resynthesize these two practice items, the tape was stopped and the experimenter gave additional examples until the child was responding appropriately. If he was able to correctly resynthesize the practice items, the entire tape

Figure 2.--Schematic representation of the listening situation and apparatus.



of twenty items was played non-stop. The child's responses were recorded both on an answer sheet by the experimenter and on a Panasonic tape recorder Model RQ706S.

After each session, the child was given a bag of M&M's as a reward for participating in the experiment.

Analysis

The data was hand-scored by the experimenter. This method of judging correct responses was discovered to be more effective than relying upon the child's taped responses since misarticulations which the experimenter observed during the actual testing situation were not discernable when listening to the tape. For example, the experimenter observed that several children said the word "mom" for the test item /m-ɑ-n/. However, the taped version of this response was not precise enough to indicate this error.

The number of items correctly resynthesized was the score for a single subject. This score was then converted into a percentage correct score. Three such percentage correct scores were obtained for each subject: a total of all monosyllables correct, the number correct for the ten meaningful items, and the number correct for the ten non-meaningful items.

The data were placed into a Winer[1] multi-factor (four-factor) analysis of variance with repeated measures design (Case II), and suitable F-tests were performed (computerized). There were ten subjects per cell for a total of 160 subjects, 80 at each grade level (40 Black and 40 White), and 40 subjects for each of the four inter-phonemic interval levels (20 Black and 20 White).

[1]B. Winer, Statistical Principles in Experimental Design, (New York: McGraw-Hill, Inc., 1962).

CHAPTER III

RESULTS

The results of this study support the thesis that Black first- and third-grade children are not impaired in their perceptual resynthesis abilities of monosyllabic units. The over-all results demonstrate that the inter-phonemic interval, grade level, and the semantic (meaningful and non-meaningful) factors all function as important elements in perceptual resynthesis. Race is a significant factor in that the Black third-graders show greater improvement in resynthesis abilities from first- to third-grade than do White third-graders. The discussion of the results illustrates these facts more specifically.

Table 1 depicts the results of a multifactor (four factor) analysis of variance with repeated measures (Case II, Winer)[1] which was performed on the data. The mean score for each factor under consideration by level in combination with all other factors by level are presented in Tables 2 through 4. Figures 3 through 6 illustrate the mean data in graphic form. Appendix D presents several subeffects tables depicting the data for several non-significant interactions. Appendix E lists the raw score data for each subject. The results of a similar study by Shriner and Daniloff[2]

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[1]B. Winer, Statistical Principles in Experimental Design, (New York: McGraw-Hill, Inc., 1962), p. 337.

[2]T. Shriner and R. Daniloff, "Reassembly of Segmented CVC Syllables by Children", Journal of Speech and Hearing Research, (In Press: 1970).

are also depicted in each graph for comparative purposes.

<u>Main Effect of Race</u>

Table 1 reveals that the main effect of race (Black versus White) is not significant at $p<.05$. Thus, the over-all means of 46 percent and 49 percent for the two groups, Black and White children respectively, when averaged over both grade levels, both semantic levels, and the four levels of inter-phonemic interval do not differ (See Table 2 and Figure 3). This suggests that when educational and economic factors are considered in matching, Black and White lower elementary school children would perform equally-well on a perceptual resynthesis task of this level of complexity. However, the significant ($p<.05$) Race x Grade interaction (See Table 1) reveals that grade level had a significant differential effect upon the results of the two levels of race on this task. As illustrated in Table 3 and Figure 5, the Black third-graders demonstrate a larger degree of improvement in resynthesis ability from first- to third-grade than do the White children. Specifically, the mean percent of responses correct for Black first-graders are slightly poorer than the means for the White first-graders (though not significantly so), but by the third-grade a reversal occurs and the Black children do slightly better than the White children (though, again, not significantly so). In addition, this trend toward a greater degree of improvement for the Black children is independent of both the semantic (meaningful and non-meaningful) factor and inter-phonemic interval level. This is supported by the non-significant interactions of Race x Inter-phonemic Interval, Race x Semantic, and Race x Grade x Inter-phonemic Interval x Semantic (See Table 1 and Appendix D).

Table 1.--Summary table of an analysis of variance performed on the percentage correct scores at two levels of Race (Black - White) factor (A), four levels of Inter-phonemic Interval (100, 200, 300, 400 msec) size factor, (B), two levels of Grade (First - Third) factor (C), and two levels of Semantic (Meaningful - Non-meaningful) factor (D).

Source	SS	df	MS	F
A	0.050	1	0.0500	1.04
B	1.690	3	0.5634	11.71***
C	0.861	1	0.8611	17.89***
AxB	0.097	3	0.0325	0.67
AxC	0.364	1	0.3645	7.57**
BxC	0.123	3	0.0411	0.85
AxBxC	0.015	3	0.0050	0.10
D	8.128	1	8.1281	402.93***
AxD	0.002	1	0.0020	0.10
BxD	0.201	3	0.0671	3.33*
CxD	0.001	1	0.0011	0.05
AxBxD	0.001	3	0.0005	0.02
AxCxD	0.024	1	0.0245	1.21
BxCxD	0.124	3	0.0414	2.05
AxBxCxD	0.015	3	0.0050	

* $p<.05$
** $p<.01$
*** $p<.0005$

Table 2.--Summary table of the mean percentage correct main effects of the four factors: Race (Black - White), Inter-phonemic Interval (100, 200, 300, 400 msec), Grade (First - Third), and Semantic (Meaningful - Non-meaningful). Also, this table reveals means for the sub-effects Race x Inter-phonemic Interval, Grade x Inter-phonemic Interval, and the significant ($p<.02$) Semantic x Inter-phonemic Interval. (See Appendix D for tabled mean percentage correct scores of the non-significant triple interactions.)

	Inter-phonemic Interval in msec				
	100	200	300	400	Joint
Black	58.00	44.00	42.25	42.50	46.68
White	62.75	41.75	49.00	42.25	49.18
First Grade	53.00	40.50	41.25	36.25	47.75
Third Grade	67.75	45.25	50.00	49.50	53.12
Meaningful	80.50	57.00	59.50	58.50	63.87
Non-Meaningful	40.25	28.74	31.75	27.25	32.00
JOINT	60.37	28.75	45.62	42.87	

Table 3.--Summary table of mean percentage correct scores of the Race x Grade and Race x Semantic sub-effects. (See Appendix D for the mean percentage correct scores for the non-significant interaction effects).

	Black	White	Joint
Meaningful	62.37	65.37	63.87
Non-Meaningful	31.00	33.00	32.00
First Grade	38.12	47.37	47.75
Third Grade	55.25	51.00	53.12
JOINT	46.68	49.18	

Figure 3.--Mean percentage correct scores for both levels of Race and Grade at each Inter-phonemic Interval segmentation level. (Includes scores of both Meaningful and Non-meaningful stimuli combined.)

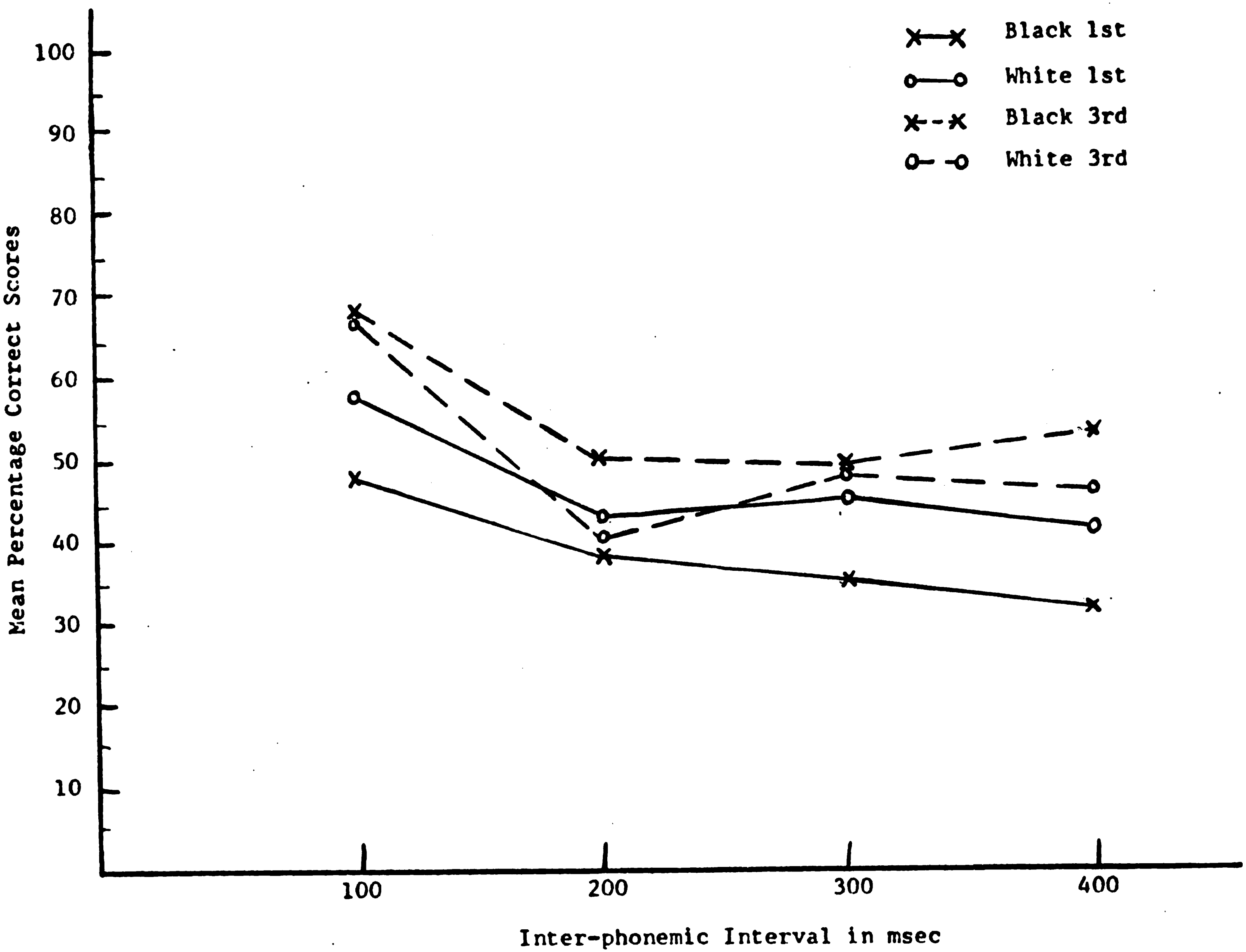


Figure 4.--Mean percentage correct scores for both levels of Race and Grade. (Includes scores of both Meaningful and Non-meaningful stimuli combined.) The results of the Shriner and Daniloff study are also depicted for comparative purposes.

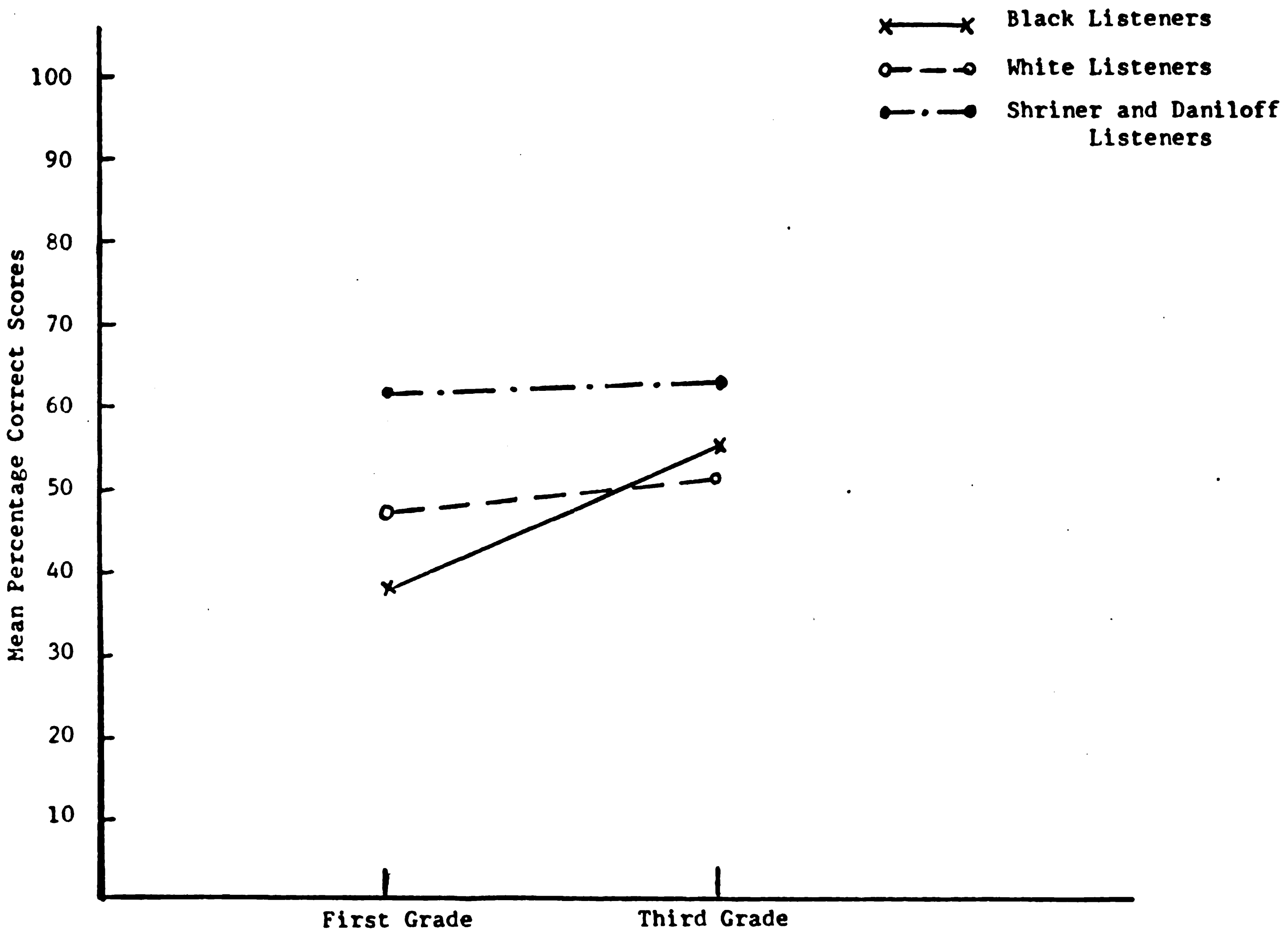
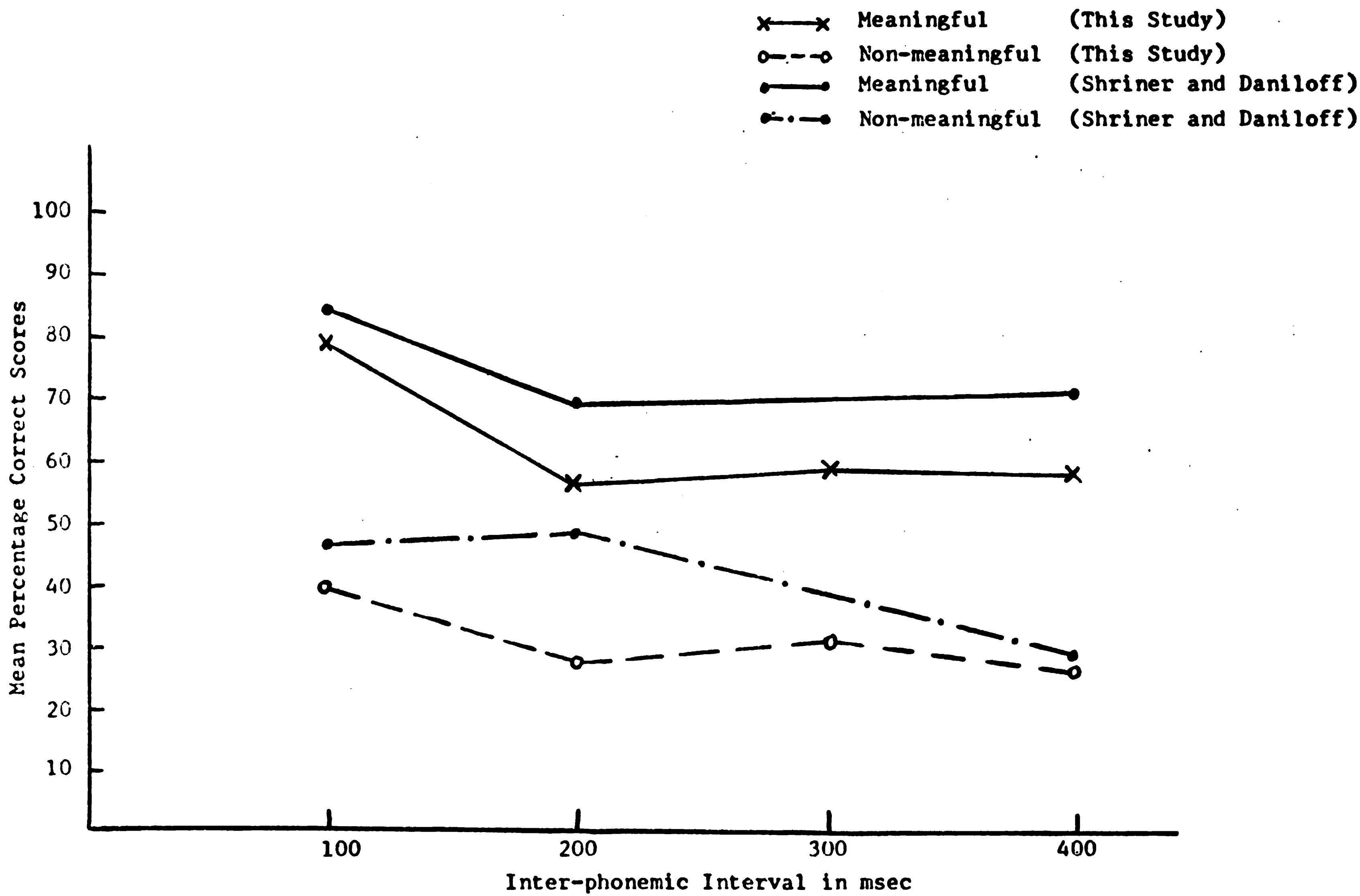


Figure 5.--Mean percentage correct scores for both levels of the Semantic factor at each Inter-phonemic Interval level. (The results of the Shriner and Daniloff study are also depicted for comparative purposes.)



Effect of Inter-phonemic Interval

Table 1 reveals that the main effect of inter-phonemic interval level is highly significant ($p < .0005$). Table 2 and Figure 3 reveal that this effect is most pronounced between inter-phonemic interval levels of 100 and 200 msec. Beyond 200 msec the mean over-all percent correct scores tend to plateau. An exception to this leveling off effect is the over-all scores of the Black first-graders, which tended to continue decreasing out to 400 msec, although this decrease was not significant.

Table 1 also reveals a significant ($p < .02$) Inter-phonemic Interval x Semantic interaction. Reference to Table 2 and Figure 5 reveals that although the mean percent correct scores were greater for the meaningful CVC monosyllables than for the non-meaningful CVC monosyllables at all inter-phonemic interval levels for both races and both grades, there was a greater decrease in scores between inter-phonemic intervals of 100 and 200 msec for the meaningful than the non-meaningful CVC monosyllables. The effects of inter-phonemic interval on this task were independent of race and grade level, as revealed by the non-significant interactions of Race x Inter-phonemic Interval and Grade x Inter-phonemic Interval (See Tables 1 and 2).

Effect of Grade Level

The highly significant F-ratio ($p < .0005$) for Grade level shown in Table 1 suggests that third-graders are better than first-graders at this task (See Tables 1 and 2 and Figure 3). The significant Race x Grade interaction (See Tables 1 and 3 and Figure 4) discussed above, illustrates that the Black children made a substantially larger increase in the percentage correct score between the first and third grades than did their White counter-parts. This effect is independent of inter-phonemic interval level and semantic level, as suggested by the non-significant Grade x Inter-phonemic Interval and Grade x Semantic interactions (See Tables 1 and 4).

Table 4.--Summary table of mean percentage correct scores for the Grade x Semantic sub-effects.

	First Grade	Third Grade
Meaningful	58.50	69.25
Non-Meaningful	27.00	37.00

Effect of Semantic Factor

As stated above, both Black and White first- and third-graders perform significantly better ($p<.0005$) on the meaningful than the non-meaningful CVC monosyllables. This effect is independent of race and grade levels but is a function of inter-phonemic interval since Table 1 shows that the Inter-phonemic Interval x Semantic interaction is significant at $p<.02$. Table 2 and Figure 5 illustrate that at all four levels of inter-phonemic interval the children perform better on the meaningful than the non-meaningful stimuli. In addition, the 100 msec condition provides the highest percent of responses correct for both meaningful and non-meaningful stimuli. Beyond 100 msec there tends to be a plateauing of the scores for both semantic levels. However, in all instances, the meaningful is higher than the non-meaningful means.

Summary

In summary, the results reveal that the White children did not perform significantly better than the Black children on this task. Also, it appears that the major breakdown in resynthesis abilities occurs at the 200 msec level for both Black and White first- and third-graders. Third-graders perform significantly better on this task than do first-graders. Also, the improvement in the percentage correct scores for the Black children from first to third-grade covered a greater range than did the scores for the White children. All children performed better on this task when the stimuli was semantically meaningful than when it was semantically non-meaningful.

CHAPTER IV

DISCUSSION

Auditory Perceptual Processing

Aaronson, in describing her model of auditory perceptual processing, has noted that rapid rates of stimulus presentation tend to limit the amount of time for the listener to develop encoding strategies. However, she suggests that any degradating effects due to distortion of the stimulus may be offset by increasing the interstimulus interval. (In this study, the interstimulus interval may be held to be the inter-phonemic interval.)[1] Thus, the stimulus duration is an important factor in Stage 1 processing, but Stage 2 processing is primarily dependent upon the interstimulus interval. That is, the interstimulus interval must be long enough to allow processing of each item, but not so long that the item being processed in Stage 2 will decay. If the interstimulus interval is distorted, then certain item errors (that is, errors in the analysis of the processed items) can be expected to occur.

An examination of the scores of the subjects of this study suggests that CVC monosyllables are least difficult to resynthesize at the shortest (100 msec) inter-phonemic interval condition (See Figure 5). In view of Aaronson's model, it may be hypothesized that the decision process of the

[1] D. Aaronson, "Temporal Factors in Perception and Short-Term Memory", Psychological Bulletin, 67 (1967).

100 msec condition stimulus items is based upon analysis of a single CVC unit with three elements rather than three units, each with a single element. That is, the unit to which perceptual decisions are assigned at this condition is a basic unit comprised of three phoneme elements; the decision is based on the analysis of the whole unit, simply because the time between elements of this unit is not so long as to allow subsequent elements to decay in Stage 1 before they are processed in Stage 2. In addition, the inter-phonemic interval does not allow Stage 2 decay of processed items before the entire CVC unit is received and resynthesized. This would support Aaronson and Sternberg in their contention that subjects delay in identifying items presented with fast rates until the presentation of the total unit has been completed.[1] That is, the items in the 100 msec condition are rapidly presented relative to the other three conditions of inter-phonemic interval used in this study.

At the 200 msec condition, however, there occurs a breakdown in the childrens' resynthesis abilities. This breakdown is apparent in both this study and that of Shriner and Daniloff.[2] It appears that at this condition, the CVC stimuli contain too large an amount of inter-phonemic interval silent time to be processed as a total unit with three elements. On the other hand, the silent time is too short to allow processing strategies to be employed that would treat the input as though the CVC monosyllables were three units, each with a single element. It is speculated, then, that at the 200 msec condition, an "uncomfortable" situation exists for the listener in which

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[1]D. Aaronson and S. Sternberg, "Effects of Presentation Rate and Signal-to-Noise Ratio on Immediate Recall", Paper read at Eastern Psychological Association, Philadelphia, (1964).

[2]T. Shriner and R. Daniloff, "Reassembly of Segmented CVC Syllables by Children", Journal of Speech and Hearing Research, (In Press: 1970).

perceptual processing strategies for resynthesis cannot be adequately employed. With neither approach of processing fully open to him, the listener is apparently unable to resynthesize the monosyllabic unit since decay time sets in before he has sufficient time to devise a strategy (Neisser[1]) to resolve this conflict in perceptual processing.

As the stimulus reaches the 300 msec condition, more time is allotted to the listener to develop a strategy whereby each phoneme is processed individually. Although this concept is supported by improvement in scores at the 300 msec condition, this added inter-phonemic interval time is apparently not sufficient to allow for optimum perceptual processing. The listener evidently continues to attempt to process the monosyllables as either a total unit or as isolated phonemes with neither approach being highly successful.

It is apparently not until the 400 msec condition that sufficient time has been allotted to enable the listener to make full use of the strategy of processing each phoneme as a single element unit. Thus, each phoneme arrives at Stage 2 individually, but the time between each phoneme's arrival is not so great that it allows decay to set in. This speculation is consistent with Aaronson and Sternbergs' statement that in cases of slow presentation rates, subjects tend to identify digits immediately as they are presented.[2] Thus, the listener would store each phoneme unit until all three units had been processed and then resynthesize these three units into a larger CVC unit.

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[1]U. Neisser, Cognitive Psychology, (Appleton-Century-Crofts; New York, 1966.).

[2]D. Aaronson and S. Sternberg, "Effects of Presentation Rate and Signal-to-Noise Ratio on Immediate Recall", Paper read at Eastern Psychological Association, Philadelphia, (1964).

In this view, then, the listener will use one of two perceptual processing strategies in resynthesizing segmented auditory stimuli. He will either respond to each stimulus as a single X-element unit or respond to the stimulus as though it were X number of units. The strategy used will depend upon the size of the segmentation interval. If he is unable to decide upon which strategy to use, then errors result in the form of either a) lost or distorted elements and/or b) lost or distorted elements which the listener attempts to correct by replacement with other, similar elements--in this case, phonemes.

An interesting postulate may be made regarding the phonologically-based distinctive features theory of perception (in particular the distinctive features systems of Jakobson, Fant and Halle[1] and Chomsky and Halle[2]). A theory of distinctive features suggests that each phonological element in a linguistic unit is composed of several characteristic features and that these features alone, or in combination, describe the inherent characteristics of a particular phoneme or unit. Perception, then, occurs by the analysis on the part of the receiver of these characteristic features. It is suspected, then, that when strategies cannot be adequately engaged and errors occur in the form of phonemic substitutions, the substituted phoneme would have features similar to the lost phoneme. This suspicion is supported by reference to the raw data in this study; for example, the /g/ in /l-ʊ-g/ is replaced by a /k/. However, this phonological correction may be influenced by stored semantic elements.

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[1] R. Jakobson, et al., Preliminaries to Speech Analysis, (Boston: MIT Press, 1965).

[2] N. Chomsky and M. Halle, The Sound Pattern of English, (New York: Harper and Row, 1968).

In view of this idea, it could be argued that children of both races and grades "heard", or allowed to pass from Stage 1 to Stage 2, only those features of sounds which would make meaningful the presented non-meaningful monosyllabic stimuli. For example, highly consistent errors for all children were as follows: /ʃ-eɪ-dz/ for /ʃ-eɪ-z/, /r-ʌ-n/ and /r-ʌ-g/ for /r-ʌ-d/, and /n-i-z/ for /n-eɪ-z/. An examination of these substitutions reveals that phonologically the pairs closely resemble each other, that is, in each case only one phoneme has been added or altered, whereas the other two phonemes remain the same. However, the resynthesized response is semantically distinct. Thus, as noted by Beasley, the analysis in Stage 2 employs both the semantic and phonological sub-systems, and the degree of employment of each, may be dependent upon the complexity of the stimulus.[1] That is, the more complex the input, (for example, "meaningless" stimuli), the more sub-systems employed and the greater the degree of that employment (Beasley[2] and Shriner and Daniloff[3]). For example, phonological modification occurred on two meaningful words in this task: /dʒ-ɑ-n/ for /dʒ-ʌ-g/ and /tʃ-ɪ-k-ɨn/ for /tʃ-ɪ-n/. It can be hypothesized that, although meaningful, these words (/tʃ-ɪ-n/ and /dʒ-ʌ-g/) were difficult to resynthesize and were therefore received as essentially "non-meaningful" stimuli. The listener would then process them in the same manner as was employed for the non-meaningful stimuli mentioned above, that is, with the addition or omission of certain features of a sound which would then enable the word to become "meaningful." In some instances this phenomenon was exhibited by

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[1] D. Beasley, "Auditory Analysis of Time-Varied Sentential Approximations", Ph. D. Dissertation, (University of Illinois, 1970).

[2] Ibid.

[3] T. Shriner and R. Daniloff, "Reassembly of Segmented CVC Syllables by Children", Journal of Speech and Hearing Research, (In Press: 1970).

children "hearing" their own names, and, in one case, a child hearing the name of a currently prominent politician /n-ɪ-ks-ə-n/ for /tʃ-ɪ-n/.

These findings appear to support Shriner and Daniloffs' statement that a task of resynthesis is more easily mastered when additional and supportive systems are incorporated to facilitate perceptual processing.[1] In particular, it seems that it is occasionally necessary for the semantic and phonological systems of the perceiver to interact to allow adequate perceptual processing to occur. Thus, it has been suggested by Beasley[2] that a perceptual decision unit may vary, depending upon the complexity of the stimulus input. Although a decision may be made instantaneously on a semantically meaningful input unit, if the unit increases in complexity by becoming semantically "non-meaningful", reference to stored distinctive features becomes necessary. If reference to the system of stored phonological features proves to be inadequate, an inaccurate response results.

An alternate argument presents itself, however, which employs a semantic rather than phonological basis of perceptual processing. This argument would suggest that it is the meaningful stimuli which are received at the automatic level, whereas non-meaningful stimuli are processed at the higher, representational level. Thus, the childrens' errors could be viewed with regard to this type of approach on the basis that they may have "automatically" anticipated that a given stimulus was meaningful. They then responded with a meaningful word before processing the entire unit of individual phonemes. Such a completion of processing would have proved the stimulus presented to be non-meaningful. Thus, the /l-ʊ-k/ for /l-ʊ-g/

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[1]T. Shriner and R. Daniloff, "Reassembly of Segmented CVC Syllables by Children", Journal of Speech and Hearing Research, (In Press: 1970).

[2]D. Beasley, "Auditory Analysis of Time-Varied Sentential Approximations", Ph. D. Dissertation, (University of Illinois, 1970).

substitution may have been formulated by the child before the final phoneme was presented. If it is assumed that such processing occurs on an automatic basis, the child would then have had to apply fewer semantic and phonologically-based cues when processing the meaningful stimuli.

In addition, reference to Figure 5 reveals that semantic aspects of perceptual processing are influenced by the inter-phonemic interval level. That is, it appears that there is a greater decrease in the percentage correct scores for the meaningful than the non-meaningful CVC monosyllables between the 100 and 200 msec inter-phonemic interval conditions. This could be explained by the fact that the non-meaningful CVC monosyllables are depressed initially and have less distance to deteriorate on a percentage basis. In spite of this effect, all subjects, Black and White, performed better on meaningful than non-meaningful CVC monosyllables.

In summary, then, the auditory resynthesis of CVC monosyllables necessitates the use of various strategies for the different conditions of inter-phonemic interval. Such strategies may be influenced by elements which are characteristic of each phoneme or a semantic factor. This study provides overwhelming evidence showing that normal Black and White children, when properly matched, do not differ in abilities on tasks designed to measure basic perceptual processing. That is, both groups of children provide similar types of information relative to theories of perception and are consistent with current models of perception as measured by their responses to the stimuli presented in this study.

Perception and Black Language

Although there is no significant difference between the Black and White children in their auditory resynthesis abilities, there is a significant

Race x Grade interaction. An examination of the data reveals that third-graders of both races perform significantly better on this task than do first-graders. In addition, it may be observed (See Figure 4) that Black third-graders do not perform differently than White third-graders on this task. Shriner and Daniloff, in their study involving middle class White children, did not find Grade to be a significant factor. However, they did state that the scores of the third-graders were numerically and graphically better than those of the first-graders.[1]

Two separate and opposing arguments could be made regarding these findings. It could be expected that the Black child would show large gains in his over-all language and cognitive abilities between first- and third-grades if it is assumed that the Black child enters school already handicapped in language abilities as a result of his essentially non-verbal environment (Raph,[2] Bereiter and Engelmann,[3] Reissman,[4] and others). The Black child is then functioning at a level of a middle class White child of a younger age (Raph[5]). Essentially, the Black child has begun to master that form of language with which he has had major cultural contact (Baratz[6]). Yet upon entering school he discovers a new set of phonological,

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[1] T. Shriner and R. Daniloff, "Reassembly of Segmented CVC Syllables by Children", Journal of Speech and Hearing Research, (In Press: 1970).

[2] J. Raph, "Language Characteristics of Culturally Disadvantaged Children: Review and Implications", Review of Educational Research, 35, (1965).

[3] C. Bereiter and S. Engelmann, Teaching Disadvantaged Children in the Preschool, (Englewood Cliffs: Prentice-Hall, 1966).

[4] F. Reissman, (M. Black), "Characteristics of the Culturally Disadvantaged Child", The Disadvantaged Child, (Boston: Houghton Mifflin, 1966).

[5] J. Raph, "Language Characteristics of Culturally Disadvantaged Children: Review and Implications", Review of Educational Research, (1965).

[6] J. Baratz, "Language and Cognitive Assessment of Negro Children: Assumptions and Research Needs", ASHA, (1969).

syntactic, and semantic rules with which he must deal. The Black child is therefore charged with the task of learning two similar but different forms of language--a task which, it can be hypothesized, requires him to become more "language-conscious" than his White counterpart, who experiences only repetition of familiar language patterns. It is not surprising, then, to note that by the third-grade, the Black child has slightly surpassed the White child in a language-based task, that is, perceptual resynthesization.

In contrast, it could be argued that the Black first-graders' scores were not totally indicative of their full potential on this task due to a White "experimenter effect." The experimenter in this study was a White young adult female, while the teachers of the Black first-graders were Black. It could therefore be contended that the scores of these children would have been higher had the experimenter been Black. In addition, teachers of both of the Black third-grade classes were White, a situation which may, in part, account for the fact that no inhibiting experimenter effect would occur at the thrid-grade.

In summary, Black and White children function neuroperceptually and psychoperceptually similarly in terms of auditory discrimination abilities as measured by this task. Thus, the language of Black children is not "deprived" or "disadvantaged" or "handicapped," at least in terms of auditory resynthesis. This finding is in agreement with those of Johnson,[1] Wiggins,[2] and Shriner and Miner[3]. Therefore, auditory discrimination as measured by

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[1]K. Johnson, "The Language of Black Children: Instructional Implications", Racial Crisis in American Education, (Chicago: Follett Educational Corporation, 1969).

[2]M. Wiggins, "An Investigation of Auditory Discrimination Skills in Children Who Speak Nonstandard English", Unpublished Manuscript, 1969.

[3]T. Shriner and L. Miner, "Morphological Structures in the Language of Disadvantaged and Advantaged Children:, Journal of Speech and Hearing Research, 11, (1968).

auditory resynthesis is not a "cause" of the "restricted" form of language used by Black children, contra Raph[1]. Nor does it appear that Black "disadvantaged" children are unable to "hear" as well as "advantaged" children as Engelmann has stated.[2] In addition, Black children do not seem to differ from White children (both lower and middle class, as revealed by Figures 3 and 5), in any large degree, in their abilities to repeat what they hear, at least for semantically and temporally distorted CVC units.

If the auditory resynthesis abilities of Black children were impaired, their articulation should have reflected signs of this impairment according to previously cited research. Such misarticulations could in turn have been expected to have had a negative effect upon their resynthesis abilities. It has been suggested by Van Riper[3] and Lerea[4] that children with articulation defects should be less able to auditorially resynthesize words than children with normal articulation. In addition, Beasley has suggested that auditory analysis and articulation are related to syntactic development in children.[5] Shriner, Holloway, and Daniloff have demonstrated that children with articulation deficits "have less developed syntax and would

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[1]J. Raph, "Language Characteristics of Culturally Disadvantaged Children: Review and Implications", Review of Educational Research, 35, (1965).

[2]S. Engelmann, "Cultural Deprivation-Description and Remedy", (Institute for Research on Exceptional Children, University of Illinois, 1964).

[3]C. Van Riper, Speech Correction, Principles and Methods, (Englewood Cliffs: Prentice Hall, 1954).

[4]L. Lerea, "Phonemic Analysis-Synthesis Skills of Normal and Speech Defective Children", The Psychological Record, 14 (1964).

[5]D. Beasley, "Auditory Analysis of Time-Varied Sentential Approximations", Ph. D. Dissertation, (University of Illinois, 1970).

be less able to apply these rules to the perception-integration-resynthesis of segmented CVC's than normals, who possess more developed syntax."[1] Davison, using a task similar to the one used in this study, found that resynthesis ability was not related to articulation competency.[2] However, he used an inter-phonemic interval of 1000 msec. Therefore, the results of his study were highly limited with respect to generalizations regarding perceptual processing. These ideas appear to be of significance when viewing the language and cognitive abilities of the inner city Black child, as both the articulation and language patterns of his particular dialect have been regarded by various researchers as being defective. When analyzing the scores of both Black and White children on this resynthesis task, however, it is apparent that no significant differences due to race exist.

An observation regarding the "substandard" articulation errors (as based upon the data of Labov[3]) of Black children with those of White children reveals two different forms of "errors" (See Appendix C). It can be seen that fewer Black children misarticulated the /s/ phoneme than did the White children and, further, that no Black child misarticulated the /r/ phoneme. In addition, no White child utilized the /f/θ/ substitution, as did the majority of Black children with misarticulations. Although the phonological aspects of the Black dialect have been criticized as reflecting phonologically inferior forms of language, it could be argued that of the two groups, the Black children comprise the only group whose

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[1] T. Shriner, et al., "The Relationship Between Articulatory Deficits and Syntax in Speech Defective Children", Journal of Speech and Hearing Research, 12, (1969).

[2] D. Davison, "Auditory Synthesizing Abilities of Children with Varying Degrees of Articulatory Proficiency", Michigan State University, 1969.

[3] W. Labov, "Some Sources of Reading Problems for Negro Speakers of Non-standard English", Teaching Black Children to Read, (Center for Applied Linguistics: Washington, D. C., 1969).

misarticulations reflect patterns of articulation which are heard in their immediate environment. If Engelmann is correct in his conclusion that certain children do not hear or repeat certain words,[1] then perhaps it is the White children for whom this statement holds true. Such a conclusion could be offered in view of the fact that it is the White children whose misarticulations are not representative of patterns of articulation which are commonly "heard" in their environment. For example, the /θ/s/ and /w/r/ substitutions exhibited by the White children are recognized only as being articulation defects which must be corrected in order for the speech of those individuals to be socially acceptable.

Shriner and Daniloff predicted, on the basis of a similar resynthesis task involving middle class White children, that "the largest differences between children with articulatory deficits and normal children would occur on meaningful CVC's: normals would apply their superior knowledge of syntax to aid them with resynthesis of meaningful CVC's but not to nonmeaningful CVC's."[2] Since no significant Race x Semantic differences were apparent on the present task, it can only be concluded that the subjects used, both Black and White, were "normal" and equal in their articulatory and auditory perceptual resynthesis abilities.

An additional inference which may be made is that if "disadvantaged" children, and in particular Black children, are perceptually handicapped in auditory discrimination abilities and suffer from severe learning disabilities requiring remediation by "educational specialists," this handicap

[1]S. Engelmann, "Cultural Deprivation-Description and Remedy", (The Institute for Research on Exceptional Children, University of Illinois: Champaign, 1964).

[2]T. Shriner and R. Daniloff, "Reassembly of Segmented CVC Syllables by Children," Journal of Speech and Hearing Research, (In Press: 1970).

is not of an auditory resynthesis nature. (Of course, ther is a possibility that those who espoused a "perceptual handicap" in these children were themselves handicapped by 1) a lack of a clear definition of perception and/or 2) an inability to adequately assess perceptual ability to middle class White children, much less lower class "disadvantaged" Black and White children.) If this conclusion is well-founded, as will be revealed by future research, then such findings should have profound effects on programs for speech and language of the inner city Black child. For example, drills and tasks of repetition such as those advocated by Bereiter and Engelmann[1] may be a waste of time and effort and, in addition, may increase the child's concept of himself as an inferior human being (Johnson[2]). Perhaps a more sociologically and economically profitable approach to such programs will be to view these children as characterized, not by some nebulous perceptual disorder, but rather by an acceptable and structurally adequate perceptual language system. And, optimistically, perhaps such a positive approach to speech and language will be influential in altering current thinking, both Black and White, of a more general sociological nature.

Implications for Future Research

Perhaps the most obvious area requiring further research is that with regard to the nature of the stimuli used in this study. The tapes used consisted of CVC monosyllables whose individual phonemes were read in isolation

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[1] C. Bereiter and S. Engelmann, *Teaching Disadvantaged Children in the Preschool*, (Engelwood Cliffs: Prentice-Hall, 1966).

[2] K. Johnson, "The Language of Black Children: Instructional Implications", *Racial Crisis in American Education*, (Chicago: Follett Educational Corporation, 1969).

rather than as an on-going unit. Therefore, little or no co-articulation effects, which may influence perceptual resynthesis, were present, a fact which detracts from the "naturalness" of the task according to Shriner and Daniloff[1]. Since the phonemes may only approximate the stored patterns upon which the listener may base a perceptual decision, this task of resynthesis is a more difficult one. Thus, it is not clear how accurately the results obtained in this manner reflect actual perceptual processing. Beasley has pointed out that stimuli such as clicks, digits, and word lists do not sufficiently test on-going language processes, but that "sententially approximated material provides a more adequate appraisal of the auditory perceptual processing of everyday speech."[2] It would seem, then, that to balance the limitations of the stimuli used in this study, additional research should be carried out utilizing stimuli which are more representational of actual speech and language behavior. Thus, future research should investigate the auditory resynthesis abilities of children using longer units such as sentential approximations which do not distort co-articulatory effects within word boundaries. For such a task, "sentences" could be used which are spoken by both Black and White speakers in order to determine what effect, if any, such a manner of presentation would have upon the listener.

In addition, more information should be obtained which would reveal whether the errors made on such a task of resynthesization are primarily item or order errors. This might be further differentiated into initial,

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[1]T. Shriner and R. Daniloff, "Reassembly of Segmented CVC Syllables by Children", Journal of Speech and Hearing Research, (In Press: 1970).

[2]D. Beasley, "Auditory Analysis of Time-Varied Sentential Approximations", Ph. D. Dissertation, (University of Illinois, 1970).

nedial, and final position errors of substitutions, omissions, and distortions. Such findings should then be viewed in light of Aaronson's model and possible implications drawn as to the location and manner of such "breakdowns" in resynthesis ability. Further, it would seem necessary to study the effects of varying both semantic and syntactic units upon the auditory resynthesis abilities of both Black and White groups, using samples from the forms of language used by both groups.

Another obvious area for future study deals with possible results of an experimenter effect. Although there were no significant differences on the present study between the abilities of Black and White children, it would seem beneficial to readminister the task to both groups using a Black experimenter in order to observe what effects, if any, the experimenter would have upon the results of both Black and White listeners. Of particular interest would be a comparison of the scores of the Black first-graders which had been obtained by both a Black and White experimenter.

An examination of the graphic representation of the data from the Shriner and Daniloff study as compared to that of inner city Black children of the same grade level would lead one to hypothesize that if both groups of children continued to maintain their current trends in performance, Black third-graders would eventually equal or surpass the performance of the middle class White children (See Figure 4). It would appear beneficial, then, to test Black and White fifth-graders (both lower and middle class) in order to further discern whether the "cumulative" deficit effect purported by Raph[1] has any merit relative to this task, or whether a "cumulative" improvement effect on the part of the Blacks continues to prevail.

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[1]J. Raph, "Language Characteristics of Culturally Disadvantaged Children: Review and Implications", Review of Educational Research, 35, (1965).

Finally, investigations of time allotted for listener response should be carried out. This would enhance the knowledge of listener strategy used in auditory perceptual processing.

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APPENDIX A

LIST OF MEANINGFUL AND NON-MEANINGFUL CONSONANT-VOWEL-CONSONANT MONOSYLLABIC STIMULUS ITEMS USED IN THIS STUDY.

MEANINGFUL	NON-MEANINGFUL
/noz/	/neɪz/
/mæn/	/mɑn/
/bɛd/	/bɑd/
/dɔg/	/dɛg/
/dʒʌg/	/dʒig/
/tʃɪn/	/tʃʌn/
/ʃuz/	/ʃeɪz/
/sʌn/	/sɛn/
/lɛg/	/lʊg/
/rɛd/	/rʌd/

APPENDIX B

ANSWER SHEET AND SCORING FORM USED BY THE EXPERIMENTER.

NAME____________________
AGE____________________
GRADE____________________
DATE____________________

Condition____________________

Misarticulations____________________

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.
16.
17.
18.
19.
20.

Comments:

APPENDIX C

TOTAL LIST OF MISARTICULATIONS AND THOSE WHICH WERE ACCOUNTED FOR DURING SCORING OF THE RESPONSES.

BLACK

First Grade

Subject Number	Misarticulations
2	f/θ
11	Omits l,* tʃ/ʃ*
13	/s/ Distortion
17	θ/s,* ð/z*
21	f/θ
22	f/θ
23	kr/tr, gr/dr
26	θ/s,* ð/z*
37	ʃ/tʃ*
39	f/θ
40	f/θ

Third Grade

Subject Number	Misarticulations
43	f/θ
52	f/θ
54	θ/z (Medial)
67	θ/s,* ʃ/tʃ*
73	f/θ
75	f/θ
80	θ/s,* ð/z*

WHITE

First Grade

Subject Number	Misarticulations
82	w/r*
84	s/tʃ,* s/ʃ*
86	θ/s,* s/z*
89	w/r*
90	θ/s,* ð/z*
98	θ/s* ð/z* θ/ʃ*
103	w/r*
107	w/r*
112	ʃ/tʃ* (Initial)
113	θ/s,* ð/z*
117	/r/ Distortion

Third Grade

Subject Number	Misarticulations
122	/s/ Distortion
126	s^t/tʃ*
131	t/θ, s/ʃ,* s/tʃ*
132	Omits /f/ /r/ Distortion
152	θ/s,* ð/z*
155	w/r,* s/ʃ,* s/tʃ*

*Misarticulation of sound used in this study.

APPENDIX D

TABLES DEPICTING THE MEAN DATA FOR THE NON-SIGNIFICANT TRIPLE INTERACTIONS.

Table D.1--The mean percentage correct scores for the non-significant triple interaction of Race x Inter-Phonemic Interval x Semantic.

	Inter-Phonemic Interval in msec							
	100		200		300		400	
	M	NM	M	NM	M	NM	M	NM
Black	78.00	38.00	57.75	30.50	56.00	28.50	58.00	27.00
White	83.00	42.50	56.50	27.00	63.00	35.00	59.00	27.50

Table D.2--The mean percentage correct scores for the non-significant triple interaction of Inter-Phonemic Interval x Grade x Semantic.

	Inter-Phonemic Interval in msec							
	100		200		300		400	
	M	NM	M	NM	M	NM	M	NM
First	73.00	33.00	56.50	24.50	56.00	26.50	48.50	24.00
Third	88.00	47.50	57.50	33.00	63.00	37.00	68.50	30.50

Table D.3--The mean percentage correct scores for the non-significant triple interaction of Race x Grade x Semantic.

	First		Third	
	M	NM	M	NM
Black	52.75	23.50	72.00	38.50
White	64.25	30.50	66.50	35.50

APPENDIX E

TABLED VALUES OF THE PERCENTAGE CORRECT SCORES FOR EACH SUBJECT FOR ALL LEVELS OF EACH FACTOR.

First Grade Set Black-100 Subject Number	Meaningful	Non-Meaningful	Total
1	80.0	40.0	60.0
2	20.0	10.0	15.0
3	90.0	40.0	65.0
4	60.0	20.0	40.0
5	90.0	30.0	60.0
6	70.0	00.0	35.0
7	80.0	50.0	65.0
8	80.0	70.0	75.0
9	90.0	20.0	55.0
10	20.0	00.0	10.0
$\bar{X}$	68.0	28.0	48.0

First Grade Set Black-200 Subject Number	Meaningful	Non-Meaningful	Total
11	60.0	30.0	45.0
12	70.0	40.0	55.0
13	70.0	40.0	55.0
14	50.0	40.0	45.0
15	50.0	30.0	40.0
16	50.0	10.0	30.0
17	50.0	20.0	35.0
18	60.0	10.0	35.0
19	30.0	10.0	20.0
20	30.0	10.0	20.0
$\bar{X}$	52.0	24.0	38.0

First Grade Set Black-300 Subject Number	Meaningful	Non-Meaningful	Total
21	30.0	00.0	15.0
22	30.0	00.0	15.0
23	40.0	10.0	25.0
24	30.0	10.0	20.0
25	20.0	20.0	20.0
26	60.0	60.0	60.0
27	50.0	30.0	40.0
28	70.0	30.0	50.0
29	90.0	50.0	70.0
30	60.0	10.0	35.0
$\bar{X}$	48.0	22.0	35.0

First Grade Set Black-400 Subject Number	Meaningful	Non-Meaningful	Total
31	40.0	10.0	25.0
32	20.0	10.0	15.0
33	30.0	20.0	25.0
34	50.0	50.0	50.0
35	50.0	20.0	35.0
36	40.0	10.0	25.0
37	20.0	10.0	15.0
38	40.0	20.0	30.0
39	90.0	20.0	55.0
40	50.0	30.0	40.0
$\bar{X}$	43.0	20.0	31.5

Third Grade Set Black-100 Subject Number			
41	90.0	70.0	80.0
42	90.0	20.0	55.0
43	90.0	60.0	75.0
44	90.0	40.0	65.0
45	90.0	50.0	70.0
46	90.0	50.0	70.0
47	100.0	60.0	80.0
48	90.0	50.0	70.0
49	70.0	30.0	50.0
50	80.0	50.0	65.0
$\bar{X}$	88.0	48.0	68.0

Third Grade Set Black-200 Subject Number			
51	80.0	40.0	60.0
52	40.0	10.0	25.0
53	70.0	50.0	60.0
54	60.0	40.0	50.0
55	60.0	20.0	40.0
56	50.0	40.0	45.0
57	80.0	40.0	60.0
58	60.0	30.0	45.0
59	50.0	70.0	60.0
60	80.0	30.0	55.0
$\bar{X}$	63.0	37.0	50.0

Third Grade Set Black-300 Subject Number	Meaningful	Non-Meaningful	Total
61	60.0	50.0	55.0
62	80.0	80.0	80.0
63	70.0	20.0	45.0
64	50.0	20.0	35.0
65	70.0	30.0	50.0
66	60.0	40.0	50.0
67	70.0	30.0	50.0
68	90.0	40.0	65.0
69	40.0	20.0	30.0
70	50.0	20.0	35.0
$\bar{X}$	64.0	35.0	49.5

Third Grade Set Black-400 Subject Number	Meaningful	Non-Meaningful	Total
71	90.0	40.0	65.0
72	30.0	10.0	20.0
73	20.0	00.0	10.0
74	80.0	40.0	60.0
75	40.0	30.0	35.0
76	90.0	40.0	65.0
77	100.0	50.0	75.0
78	90.0	40.0	65.0
79	100.0	40.0	70.0
80	90.0	50.0	70.0
$\bar{X}$	73.0	34.0	53.5

First Grade Set White-100 Subject Number	Meaningful	Non-Meaningful	Total
81	90.0	50.0	70.0
82	80.0	50.0	65.0
83	80.0	60.0	70.0
84	90.0	10.0	50.0
85	50.0	10.0	30.0
86	80.0	30.0	55.0
87	70.0	00.0	35.0
88	80.0	40.0	60.0
89	90.0	80.0	85.0
90	70.0	50.0	60.0
$\bar{X}$	78.0	38.0	58.0

First Grade Set White-200 Subject Number	Meaningful	Non-Meaningful	Total
91	80.0	20.0	50.0
92	20.0	20.0	20.0
93	60.0	30.0	45.0
94	60.0	30.0	45.0
95	70.0	00.0	35.0
96	70.0	50.0	60.0
97	40.0	20.0	30.0
98	60.0	40.0	50.0
99	70.0	10.0	40.0
100	80.0	30.0	55.0
$\bar{X}$	61.0	25.0	43.0

First Grade Set White-300 Subject Number			
101	70.0	80.0	75.0
102	70.0	20.0	45.0
103	50.0	00.0	25.0
104	60.0	10.0	35.0
105	60.0	10.0	35.0
106	60.0	60.0	60.0
107	60.0	10.0	35.0
108	70.0	40.0	55.0
109	60.0	10.0	35.0
110	50.0	50.0	50.0
$\bar{X}$	61.0	29.0	45.0

First Grade Set White-400 Subject Number			
111	70.0	30.0	50.0
112	60.0	30.0	45.0
113	40.0	10.0	25.0
114	60.0	20.0	40.0
115	50.0	10.0	30.0
116	50.0	20.0	35.0
117	50.0	10.0	30.0
118	50.0	60.0	55.0
119	60.0	40.0	50.0
120	50.0	50.0	50.0
$\bar{X}$	54.0	28.0	41.0

Third Grade Set White-100 Subject Number	Meaningful	Non-Meaningful	Total
121	90.0	50.0	70.0
122	100.0	40.0	70.0
123	90.0	60.0	75.0
124	80.0	60.0	70.0
125	90.0	60.0	75.0
126	90.0	40.0	65.0
127	80.0	50.0	65.0
128	80.0	10.0	45.0
129	90.0	70.0	80.0
130	90.0	30.0	60.0
$\bar{X}$	88.0	47.0	67.5

Third Grade Set White-200 Subject Number	Meaningful	Non-Meaningful	Total
131	40.0	20.0	30.0
132	40.0	00.0	20.0
133	40.0	60.0	50.0
134	40.0	00.0	20.0
135	60.0	30.0	45.0
136	70.0	80.0	75.0
137	80.0	10.0	45.0
138	60.0	10.0	35.0
139	30.0	40.0	35.0
140	60.0	40.0	50.0
$\bar{X}$	52.0	29.0	40.5

Third Grade Set White-300 Subject Number	Meaningful	Non-Meaningful	Total
141	70.0	50.0	60.0
142	90.0	50.0	70.0
143	80.0	70.0	75.0
144	30.0	10.0	20.0
145	60.0	00.0	30.0
146	70.0	40.0	55.0
147	50.0	30.0	40.0
148	40.0	20.0	30.0
149	80.0	50.0	65.0
150	50.0	30.0	40.0
$\bar{X}$	62.0	35.0	48.5

Third Grade Set White-400 Subject Number	Meaningful	Non-Meaningful	Total
151	60.0	30.0	45.0
152	90.0	30.0	60.0
153	60.0	30.0	45.0
154	70.0	20.0	45.0
155	60.0	50.0	55.0
156	60.0	00.0	30.0
157	50.0	50.0	50.0
158	50.0	30.0	40.0
159	60.0	10.0	35.0
160	80.0	20.0	50.0
$\overline{X}$	64.0	27.0	45.5