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MOTIVATIONAL FACTORS AND IQ-CHANGES IN CULTURALLY DEPRIVED CHILDREN ATTENDING NURSERY SCHOOL.

BY- ZIGLER, EDWARD BUTTERFIELD, EARL C.
YALE UNIV., NEW HAVEN, CONN.

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RECENT STUDIES HAVE INDICATED THAT (1) COGNITIVE ABILITY, (2) AMOUNT AND KIND OF INFORMATION LEARNED TO DATE, AND (3) MOTIVATIONAL FACTORS ALL CONTRIBUTE TO THE INTELLECTUAL FUNCTIONING OF CULTURALLY DEPRIVED CHILDREN. THE PURPOSE OF THIS STUDY WAS TO TEST THE EFFECT OF COGNITIVE ACHIEVEMENT AND MOTIVATIONAL FACTORS ON INTELLIGENCE TEST SCORES. STANFORD-BINET TESTS, FORM LM, WERE ADMINISTERED TO 40 NURSERY SCHOOL CHILDREN AND 12 NONNURSERY SCHOOL CHILDREN. AT THE BEGINNING OF THE NURSERY SCHOOL PROGRAM, THE NURSERY AND NONNURSERY CHILDREN RECEIVED INTELLIGENCE TESTS BY BOTH THE STANDARD AND OPTIMALLY-MOTIVATING PROCEDURES. THIS PROCESS WAS REPEATED ABOUT 7 MONTHS LATER, NEAR THE END OF THE NURSERY PROGRAM. IT WAS HYPOTHESIZED THAT (1) STANDARD TESTING PROCEDURES UNDERESTIMATE THE CULTURALLY DEPRIVED CHILD'S INTELLIGENCE, SO THAT INITIAL OPTIMAL TEST SCORES SHOULD BE HIGHER THAN INITIAL STANDARD TEST SCORES, (2) INCREASES IN STANDARD IQ SCORES SHOULD BE GREATER FOR THE NURSERY THAN FOR THE NONNURSERY CHILDREN, AND (3) THE CHILD'S MOTIVATIONAL STRUCTURE SIGNIFICANTLY AFFECTS TEST SCORES. THE EXPERIMENTAL RESULTS REQUIRED THE ACCEPTANCE OF ALL THREE HYPOTHESES. IT WAS CONCLUDED THAT THE NURSERY SCHOOL CHILDREN DID NOT INCREASE THEIR INTELLECTUAL ABILITY DURING THE NURSERY SCHOOL PROGRAM BUT BECAME BETTER ABLE TO USE THE INTELLECTUAL CAPACITY THAT THEY ALREADY HAD. (WD)

Motivational Factors and IQ-Changes in Culturally Deprived Children Attending Nursery School[1]

Edward Zigler and Earl C. Butterfield

Yale University

Abstract

Intelligence testing procedures allowing the separation of motivational from cognitive-achievement determinants of changes in Stanford-Binet IQs were employed with culturally deprived children who did or did not attend nursery school. The children who attended nursery school increased significantly more in their Standard IQ scores from the beginning to the end of the nursery school year than did the children who did not attend nursery school. The findings indicated that the increase in IQ which resulted from the nursery school experience was due to a reduction in the effects of debilitating motivational factors rather than to changes in rate of intellectual development.

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Recent years have witnessed a number of efforts to demonstrate that a variety of types of nursery school experience improves the intellectual functioning of culturally deprived children (e.g., Bereiter, 1966; Deutsch, 1963; Gray & Klaus, 1965). The most common indicator that a deprived child's level of cognitive ability has improved as a result of a nursery school experience has been the demonstration of an increased IQ on a standard intelligence test. The use of a change in an IQ test score as an indicator of change in a child's level of cognitive functioning carries with it the implicit assumption that this score is a relatively pure measure of the formal aspects of the child's cognitive structure. The authors have questioned this assumption and have argued that performance on an intelligence test is best conceptualized as reflecting three distinct factors: (a) formal cognitive processes; (b) informational achievements which reflect the content rather than the formal properties of cognition; and (c) motivational factors which involve a wide range of personality variables (Butterfield, in press; Zigler, 1967). A culturally deprived child may have an adequate storage and retrieval system, a formal cognitive feature, to master quickly the correct answer to the Binet vocabulary item "What is a gown?" but may respond incorrectly because he has never heard the word "gown" and thus has had no chance to achieve this particular content or piece of knowledge. Alternatively, the role of motivational factors can be seen in that instance in which the culturally deprived child, whose experiences have led him to be fearful and wary, knows what a gown is but responds "I don't know" in order to terminate as quickly as possible the unpleasantness of interacting with a strange and demanding adult. This conceptualization suggests

that changes in IQ test performance can reflect modifications in factors having little to do with those formal thought processes that have been investigated by such cognitive theorists as Piaget (1952), Bruner (1965), Vygotsky (1962), Werner (1961), and Bartlett (1958).

The possibility that IQ changes reflect modifications in something other than the formal aspects of cognition may explain a somewhat surprising phenomenon encountered in the literature on cultural deprivation. Evidence has now been presented indicating that a number of markedly different types of intervention programs all result in significant improvement in intelligence test performance. It may be that these alterations in IQ reflect real changes in the child's formal cognitive ability and that such alterations may result from any one of a number of environmental interventions. On the other hand, the argument presented above suggests that this improvement in test scores across programs varying greatly in their cognitive-training features reflects the common impact that such programs have on the non-cognitive factors which can also influence a test score. These two possibilities are not mutually exclusive, and the purpose of the present study was to determine how much of the change in IQ following nursery school experience was attributable to some combination of cognitive and achievement-content factors and how much to motivational factors alone.

A testing paradigm was employed which, although not allowing the separation of cognitive from achievement factors, did permit a determination of the role of motivational factors in changes in IQ scores. Previous work leads the authors to believe that culturally deprived children, as compared to middle-class children, although wary of adults (McCoy & Zigler, 1965), are more motivated toward securing their attention and praise (Zigler, 1963; Stevenson & Fahel, 1961; McCoy & Zigler, 1965); are less motivated to be correct for the sake of correctness alone (Terrell, Durkin, & Wiesley, 1959; Zigler & deLabry, 1962); and are willing to settle for

lower levels of success (Gruen & Zigler, 1966). If it is true that factors such as these serve to depress intelligence test performance and that these factors are positively influenced by a nursery school experience, then this influence alone would lead to heightened intelligence test performance. In order to test these possibilities, culturally deprived children were tested twice at the beginning of a year of nursery school, first with a standard intelligence test procedure and next with a test procedure directed at optimizing the child's motivation to perform well on an intelligence test. This same sequence was administered to the children at the end of the nursery school year. A group of children who did not attend nursery school was studied with the same testing sequence to assess the effects of nursery school experience. In addition, other children from both nursery and non-nursery groups received the four intelligence tests under standard testing conditions to assess how much of the increase between standard and optimal testing was due to the effects of simple retesting alone. This design allowed for the evaluation of three hypotheses: (a) Standard testing procedures underestimate the culturally deprived child's intelligence, a phenomenon which should manifest itself in the initial optimal test scores being higher than the initial standard test scores. (b) Increases in standard IQ test scores should be greater for the nursery than the non-nursery children. (c) A considerable portion of this improvement in standard intelligence test scores is due to changes in the child's motivational structure, a phenomenon which should manifest itself in smaller differences between standard and optimal IQs at the end as compared with the beginning of nursery school experience. This time of year effect in the difference between standard and optimal IQs should not be found for the non-nursery children.

Subjects

The Ss were drawn from two nursery schools serving children from lower-class homes and from a housing project in which children from one of the nurseries lived.

Nursery Group One. Thirty-five children from a low-income housing project who were attending one of four sessions (two rooms) of a Ford Foundation-sponsored nursery school four one-half days per week were randomly divided into a Standard-Optimizing (S-O) test procedure group (N=19) and a Standard-Standard (S-S) group (N=16). Occupations of fathers and family income placed these children in the lower-lower socio-economic class. During the course of the year, three children were lost from the S-O group and three were lost from the S-S group because they dropped out of the nursery school or were chronically absent. The age, initial IQ, sex and racial composition of the 16 S-O condition Ss and 13 S-S condition Ss for whom there were complete data are given in Table 1.

Nursery Group Two. Fifteen children from upper-lower-class (as judged by father's occupation and family income) homes who were attending a Ford Foundation-sponsored nursery school four one-half days a week were randomly divided into an S-O test procedure group (N=10) and an S-S testing procedure group (N=5). During the course of the year, two children from each of the groups were lost as subjects because they dropped out of nursery school or were repeatedly absent. The age, initial IQ, sex and racial composition of the eight S-O condition Ss and three S-S condition Ss for whom there were complete data are given in Table 1.

Both Nurseries One and Two were under the administrative direction of Mrs. Adelaide Phillips and the direct supervision of Mrs. Jeannette Galambos. Mrs. Galambos has played a major role in developing activity guides and training procedures for Head Start nursery school teachers. Each of the nursery school classes was conducted by a trained nursery school teacher, and each had at least one teacher's aide. The classes had enrollments of no more than 15 children and ran for approximately two and one-half hours a day. The classes differed somewhat in the character of the play things and materials available, but each had a variety of typical nursery school materials. There were variations in the day-to-day

programming of the nursery schools, but an "average" day may be described as follows: The day began with a free play period of approximately 45 minutes during which both the teacher and the aide encouraged and assisted children in activities of the children's choice. There followed a period of directed musical activities which lasted about 20 minutes, after which there was a brief rest period when quiet music was played or a soothing story was read to the children. Then the children were given a snack of juice and an edible such as a small sandwich or a few cookies. The day was usually concluded with a special activity such as introducing some small animal to the children, reading them a special story, etc. In addition to such typical days, half-day excursions to parks, fire or police stations, etc., were taken by each of the classes. The focus of all of the classroom activities was on giving the children a variety of experiences with objects, activities, and concepts designed to ready them for kindergarten, and on providing them with many pleasant and positive experiences with the adults in the nursery schools.

Non-nursery Control Group. Nineteen children who were from lower-lower-class homes in the housing project served by Nursery One were divided into an S-O group (N=12) and an S-S group (N=7). The parents of these children had attempted to enroll them in Nursery One. They were not enrolled in the nursery school either because they were slightly too young or because the nursery school was not large enough to serve all children in the project. No particular criteria were used to exclude children who were of age. During the course of the year, 3 S-O condition Ss and 4 S-S condition Ss were lost from this group because they moved from the housing project. The age, initial IQ, sex and racial composition of the 9 S-O and 3 S-S control Ss are given in Table 1.

Insert Table 1 about here

As may be seen in Table 1, it was not possible to make the groups comparable in all respects.

Intelligence Testing

Four Stanford-Binet Intelligence Tests, Form LM, were administered to all Ss. Two tests were administered approximately three weeks apart in the Fall at the beginning of the school year and two were administered in the Spring at the end of the year. Approximately seven months of nursery school experience intervened between the Fall and Spring testings. The tests were administered by two female Es who had had considerable experience in both intellectual evaluation of and psychological research with young children.

Standard Test Procedures. Standard testing procedures (Terman & Merrill, 1961) were employed for all four examinations of the S-S condition Ss and for the first Fall and first Spring examinations of the S-O condition Ss. Since there is some ambiguity as to what constitutes standard testing, it should be noted that the examiners attempted to be neutral though friendly towards the children in the Standard condition. In keeping with the standard test instructions, encouragement to continue was given at appropriate times. The items from year level III were always administered first in the Standard examinations.

Optimizing Test Procedures. A special optimizing procedure was employed to administer the second Fall and second Spring tests to the S-O condition Ss. The optimizing procedures employed to heighten the children's motivation to respond correctly to the intelligence test items while not giving them test relevant information were as follows:

1. The Picture Vocabulary item was presented first in order to assure some degree of initial success.

2. The next items to be administered were determined by the child's performance on the Picture Vocabulary test. If the child completed fewer than ten

Picture Vocabulary items, year level II-6 was given next; if he completed 14 or more items, year level IV was given next. This procedure maximized the number of successes the child had early in the testing experience.

3. Whenever a child missed two consecutive items, he was given an easier item from a previous age level before he was given the next item.

4. If a child did not respond to an item, he was gently encouraged to do so. Such encouragement was continued until either the child responded or the examiner felt that the child could or would not respond correctly and that further encouragement would be frustrating to him.

Results

Preliminary analyses indicated no significant differences between male and female Ss, between white and negro Ss, between the results obtained by the two experimenters, or between the two different classes in Nursery One. For the sake of simplicity, the sex of S, race of S, experimenter and classes within Nursery One dimensions are disregarded in the following analyses. Additional preliminary analyses indicated that increases from the first to second and first to third IQs were not significantly related to the first IQ for either S-S or S-O children.

The mean IQs at all four testings of the S-O and S-S Nursery One, Nursery Two and Non-nursery Control children are given in Table 2. Table 2 also presents the results of an overall, unequal N, Duncan multiple range test (Kramer, 1956). In order to facilitate the presentation of the results, additional analyses which bear directly upon the three predictions tested in this study are reported below.

Insert Table 2 about here

A direct difference t test indicated that there was a significant increase in IQ from the first to the second Fall Standard testings for all S-S condition Ss combined ($t_{18} = 3.28$, $p < .01$). To evaluate the hypothesis that there would

be a greater increase from a Standard to an Optimal testing than from a Standard to a Standard testing, a 2 x 3, Condition (S-S vs. S-O) by Group (Nursery One, Nursery Two, Non-nursery Control) unweighted means, factorial analysis of variance was performed on the differences between IQs obtained from the first and second Fall testings. This analysis yielded a significant main effect for Condition ($F_{1/46} = 7.07$, $p < .025$), indicating that, for all three groups, the increase in IQ in the Fall was greater from a Standard to an Optimizing condition than from a Standard to a Standard condition (see Table 3). Neither the main effect for Groups nor the Group x Condition interaction approached statistical significance.

Insert Table 3 about here

In order to evaluate the prediction that nursery school experience would increase IQ, the increase in IQ from the first Fall (Standard) testing to the first Spring (Standard) testing of the combined Nursery groups (M = 6.38) was compared to the Fall-to-Spring increase of the Non-nursery group (M = 1.50). The Nursery group increased significantly more than the Non-nursery group ($t_{50} = 2.04$, $p < .05$).

In order to evaluate the prediction that the increase from Standard to Optimizing testing would be less in the Spring than in the Fall for the Nursery school groups, while there would be no difference between these Fall and Spring increases for the Non-nursery group, a 2 x 3, Season (Fall and Spring) by Group (Nursery One, Nursery Two, Non-nursery Control) mixed analysis of variance was performed on the difference scores (Test Two minus Test One in the Fall and Test Four minus Test Three in the Spring) of the Ss in the S-O condition. A significant main effect for Season ($F_{1/30} = 7.45$, $p < .025$) indicated that the increase from Standard to Optimizing testing was greater for all groups in the Fall than in the Spring (see Table 4). Neither the main effect for Groups nor the predicted Group

by Season interaction attained acceptable levels of statistical significance. However, the difference scores employed in this analysis, by failing to reflect the baselines over which Fall and Spring increases from Standard and Optimal testing occurred (See Figure 1), masked an important piece of evidence: the optimal score of the Non-nursery group decreased from Fall to Spring (M of Test Two minus Test Four = -5.11), while the optimal score of the two Nursery groups combined increased slightly (M = 1.29). A t test indicated that this differential change in optimal scores of the Nursery and Non-nursery groups was significant ($t_{31} = 2.11$, $p < .05$).

Insert Table 4 and Figure 1 about here

If the motivational interpretation of the increase in Standard IQ following the nursery school experience is correct, then a significant relationship should be found between the difference score obtained at the beginning of the year and the difference in Standard IQs found over the course of the year. The larger the increase between Test One and Test Two for the Nursery groups at the beginning of the year (a difference which reflects the initial magnitude of the debilitating effects of motivational factors), the greater the increase between Test One and Test Three over the course of the year. This relationship would not be expected in the Non-nursery School Control group since amelioration of the influence of those factors which reduce Standard IQ performance should not occur in children not attending nursery school. Product-moment correlations calculated between the discrepancy between Tests One and Two and the discrepancy between Tests One and Three were found to be .51 for the Nursery S-O condition Ss, .59 for the Nursery S-S condition Ss, and .26 for the Non-nursery S-O condition Ss. (The correlation was not calculated for the Non-nursery S-S condition Ss because there were too few of them to make the calculation meaningful.) The correlations for the two Nursery school groups were significantly ($p < .01$) different from zero while the

correlation for the Non-nursery group was not.

Discussion

The major goal of the present study was to determine how much of the increase in standard intelligence test performance of deprived children following a nursery school experience was attributable to a combination of cognitive achievement factors and how much to motivational factors. The testing paradigm was such that motivational factors could be separated from cognitive and achievement factors. Thus, had there been both an increase in the rate of acquisition of knowledge and cognitive processes and an amelioration in initially debilitating motivational factors, there would have been an increase in Optimal IQ from Fall to Spring in addition to a decrease in the magnitude of the difference between Standard and Optimal IQs from Fall to Spring. No group showed a significant improvement in Optimal IQ from Fall to Spring. The Nursery School groups' Standard IQ rose significantly toward the Fall Optimal IQ over the course of the year, whereas the Non-nursery group's did not. These findings indicate that there were no IQ changes due to cognitive-achievement factors, but rather that the significant difference in improvement in Standard IQ performance found between the Nursery and Non-nursery groups was attributable solely to motivational factors. It thus appears that the primary benefit accruing to the children in this particular nursery school program was not an increase in their rates of formal cognitive development, but rather that by the end of the year they were better able to use their intelligence.

That the culturally deprived child has more intelligence than he is often credited with was indicated by the finding of a significantly greater increase from the Standard to Optimal testing than from the Standard to Standard testing at the beginning of the year. The motivational position advanced in this paper would generate the expectation that such a great store of unused intelligence

would not be found among middle-class children whose motivational systems are such as to produce a relatively optimal performance regardless of which testing procedure is used. Although the present study offers no evidence on this point, some support comes from Hutt's (1947) finding that well-adjusted middle-class children given a standard intelligence test did not differ in IQ from those given an optimal test very similar to the one employed in this study.

Further evidence that the increase in Standard IQ over the course of the year was due to the child's greater ability to utilize his intelligence in a standard situation was obtained in the finding that the magnitude of the difference between the two testings at the beginning of the year was positively related to the size of the increase in Standard testings over the course of the year. It is of some interest to discover that a prediction of how well a child will do as a result of attending this nursery school is enhanced by knowing the difference between two IQ scores obtained at the outset of the nursery school experience, particularly in view of the fact that the children's initial Standard IQs did not predict the magnitude of their increase in IQ. This failure to find a relationship between initial IQ and improvement in IQ following a nursery school experience is somewhat inconsistent with recent findings obtained with culturally-deprived children. For instance, Eisenberg (1966) found an inverse relationship between initial level of IQ as measured by the PPVT and increase in IQ over the course of a summer Head Start experience. Furthermore, studies which have reported improvement in intelligence test performance following a preschool experience (Deutsch, 1963; Gray & Klaus, 1965) appear to have investigated children having lower initial IQs than those studies which have reported no increase in intelligence test performance following such an experience (Alpern, 1966; Blatt & Garfunkel, 1965). A comparison of the present findings, based on a seven-month nursery school program, with those of Eisenberg, who investigated a two-month

program, suggests that all deprived children, not just those with lower IQs, may benefit from a nursery school experience, providing the experience is of long enough duration.

The finding that the differences in scores between the initial Fall Standard-Standard testings and the initial Fall Standard-Optimal testings were equally predictive of the increase in Standard IQ between Fall and Spring would appear to have implications for the interpretation of typically-found increases in IQ between two standard testings. Such increases have usually been considered to be almost artifactual in nature and to reflect nothing more than some vague practice or familiarity effects. The findings of this study suggest that the increase between the two Standard testings at the beginning of the year is due to the short-term amelioration of the effects of motivational factors analogous to the long-term amelioration underlying the discovered increase in Standard IQ over the course of the year. Such a short-term amelioration effect is plausible if one assumes that the deprived child suffers from a general wariness of adults and that in this study the wariness was reduced as a result of: (a) learning during the initial examination that the examiner was not a punishing adult and (b) the reduction of his general wariness resulting from positive interactions with adults during the intervening three-week period.

In respect to (a) it has now been found that a child who has positive experiences with a particular adult is more responsive to the social reinforcers dispensed by that adult (Berkowitz, Butterfield & Zigler, 1965; Berkowitz & Zigler, 1965; McCoy & Zigler, 1965). An even more pertinent finding to the present study is that a child shows an increase on an intelligence test administered by an adult with whom he has had prior positive experiences (Sachs, 1952). In respect to (b), it is unfortunate that the size of the Standard-Standard Non-nursery subgroup precluded a statistical test of the effects of the intervening two weeks of

nursery school experience. That this intervening experience may produce some effect is suggested by the fact that the absolute mean difference between the two Standard testings was over twice as large for the two Nursery groups as for the Non-nursery school group.

A surprising finding of the present study was the significant decrease in Optimal scores over the course of the year found in the Non-nursery Control group. This drop in the Optimal score could reflect a decrease in the rate of cognitive development as a result of having spent seven more months of living in culturally depriving surroundings. Alternatively, it could indicate that with seven more months of such experiences the debilitating motivational effects became so much more entrenched that the Optimizing procedure was no longer capable of off-setting them. The failure to find any significant decrease in this group's Standard IQ from Fall to Spring argues in favor of the second possibility. This drop in the Optimal IQ score in conjunction with the relatively young ages of the Non-nursery Control group does highlight the need to involve the deprived child in a preschool experience early in his life.

Several general conclusions can be drawn from this study concerning the value of preschool programs for culturally deprived children. The children participating in the program investigated showed a significant increase in their functional intelligence as measured in a standard testing situation. Although this increase appears to reflect the fact that the nursery school experience alleviated debilitating motivational factors rather than increased the child's rate of cognitive development, its importance should not be underestimated. As has been noted (Kohlberg & Zigler, 1967), despite the frequent criticisms leveled against the IQ measure, a child's IQ score obtained in a standard situation has more behavior correlates than any other psychological measure. There can thus be little questi that the demonstrated improvement in their Standard IQ indicates that these

children were generally more competent by the end of the nursery school year. This study also suggests that the deprived child's general level of competence should not be equated with his level of cognitive ability, and it calls into question the frequently espoused view that the deprived child's basic problem is an intellectual deficit. The findings indicate that the deprived child suffers from an emotional and motivational deficit which decreases his usual intellectual performance to a lower level than we would expect from his intellectual potential as measured in an Optimizing test situation. In trying to improve the deprived child's general level of performance, it would appear at least as important to attempt to correct his motivational inadequacies by developing nursery programs geared specifically toward changing his adverse motivational patterns as it is to concentrate on teaching cognitive skills and factual knowledge. In respect to measurable, unambiguous improvements in the child's basic cognitive functioning, the particular program investigated in this study would have to be considered a failure. However, in terms of the child's competence in performing tasks like those he will encounter in his everyday school experiences, this program must be considered a success. This raises the intriguing question of exactly what standards should be employed in assessing the value of such national intervention efforts as Project Head Start. It would appear that such interventions should be assessed in terms of their success in fostering greater general competence among deprived children rather than their success in developing particular cognitive abilities alone.

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Footnotes

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Table 1

Sex and Racial Composition and Mean

CAs and IQs of the Three Groups

	Nursery One (N=29)		Nursery Two (N=11)		Non-nursery Control (N=12)	
	Negro	White	Negro	White	Negro	White
Male	13	8	1	2	4	2
Female	6	2	6	2	5	1
	Mean	SD	Mean	SD	Mean	SD
CA	4.11	.37	4.75	.28	3.43	.42
IQ	79.8	9.9	93.4	8.7	86.5	10.1

Table 2

Results of Unequal N Duncan Multiple Range Test between the Three Groups' Mean IQs from the Four Testings of Standard-Optimizing (S-O) and Standard-Standard (S-S) Conditions[a]

Group	Condition	N	Fall Test 1	Fall Test 2	Spring Test 3	Spring Test 4
Nursery One	S-O	16	80.13_{h}	$\underline{91.94}_{de}$	85.94_{fg}	$\underline{91.81}_{de}$
	S-S	13	79.31_{h}	84.69_{fg}	82.62_{gh}	86.54_{fg}
Nursery Two	S-O	8	95.34_{cd}	$\underline{103.38}_{ab}$	105.25_{a}	$\underline{107.50}_{a}$
	S-S	3	88.30_{def}	93.00_{d}	101.00_{abc}	98.33_{bc}
Non-nursery Control	S-O	9	87.44_{efg}	$\underline{98.22}_{bc}$	89.44_{def}	$\underline{93.11}_{d}$
	S-S	3	83.67_{fgh}	85.67_{fg}	83.67_{fgh}	88.67_{def}

[a] Means which share a common subscript are not significantly different from one another, while means which do not share a subscript are significantly ($p. < .05$) different (Kramer, 1956). Underlined means were obtained in Optimizing test conditions.

Table 3

The Three Groups' Mean Increase in IQ between Standard-Optimal Conditions and between Standard-Standard Conditions in the Fall

Group	Standard-Optimal Increase	Standard-Standard Increase
Nursery	11.68 (N=16)	4.61 (N=13)
Nursery Two	8.00 (N=8)	4.67 (N=3)
Non-nursery Control	10.78 (N=9)	2.00 (N=3)

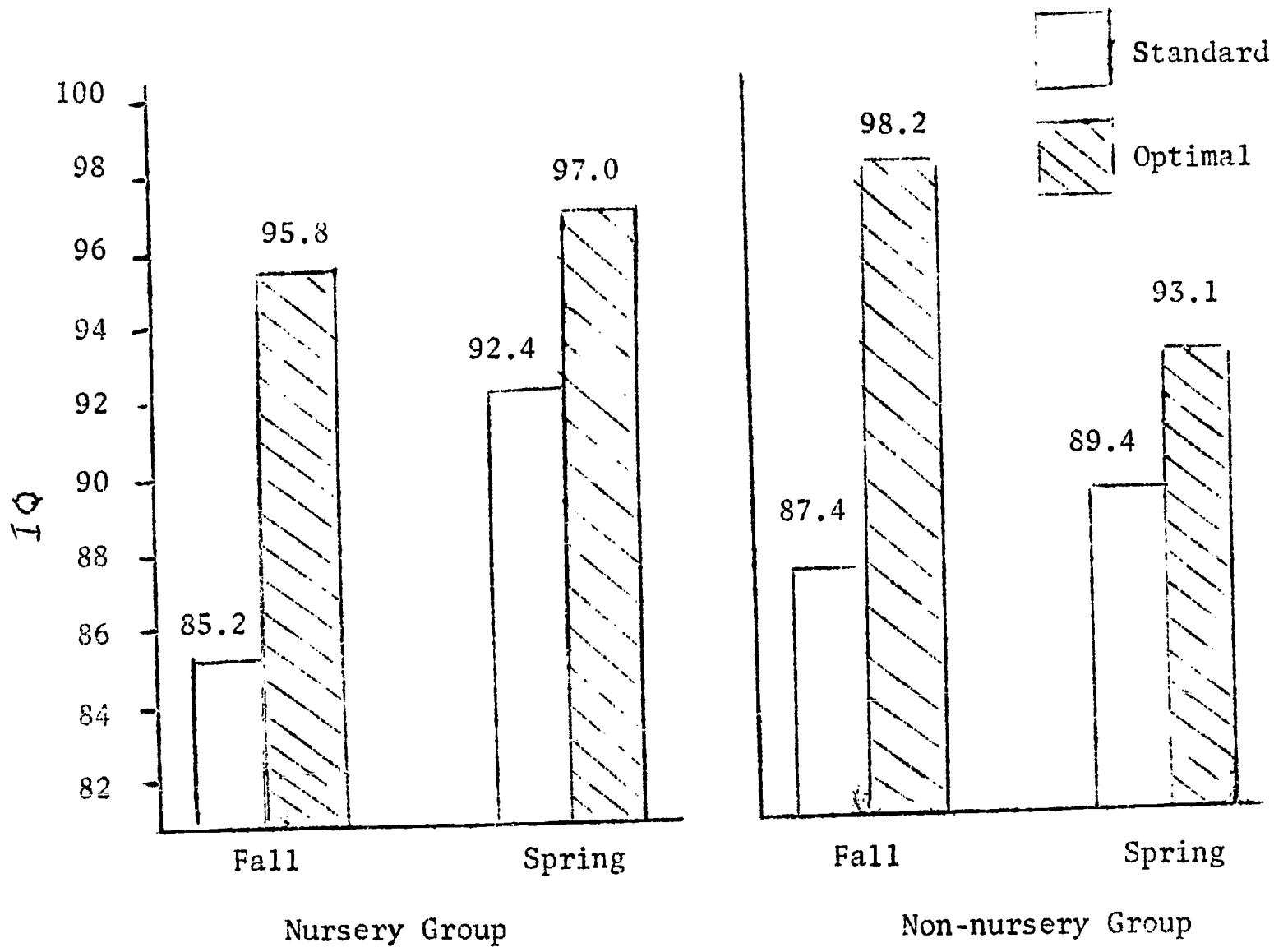
Table 4

The Three Groups' Mean Increase in IQ from Standard to Optimal Testings in the Fall and the Spring

Group	N	Fall	Spring
Nursery One	16	11.68	5.00
Nursery Two	8	8.00	2.35
Non-nursery Control	9	10.78	3.67

Figure Caption

Fig. 1. Mean IQs of Combined Nursery and of Non-nursery S-O Condition Groups for Standard and Optimal Fall and Spring Testings.


Standard
Optimal
IQ
100
98
96
94
92
90
88
86
84
82
85.2
95.8
92.4
97.0
87.4
98.2
89.4
93.1
Fall
Spring
Fall
Spring
Nursery Group
Non-nursery Group