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An experimental study of the responses of mentally retarded children and normal children with reading problems to the Keystone Visual Survey Tests

Clarence Luther Hall
University of the Pacific

AN EXPERIMENTAL STUDY OF THE RESPONSES OF MENTALLY RETARDED CHILDREN AND NORMAL CHILDREN WITH READING PROBLEMS TO THE KEYSTONE VISUAL SURVEY TESTS

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Clarence Luther Hall

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CHAPTER I

INTRODUCTION TO THE STUDY

The Keystone Visual Survey Tests have been used by many schools and clinics for screening out pupils who have visual difficulties that may interfere with maximum performance in school work, or with efficiency of vision in other activities. This instrument has been used by the Stockton Unified School District and by the Laura Ann Sisk Memorial Reading Clinic at the College of the Pacific in screening children for referral to ophthalmologists and optometrists. Not diagnostic in any sense, the survey has been designed to show whether the pupil has over-all normal patterns of seeing or whether he should be referred to a competent specialist for professional attention. The extensive use of the Keystone Visual Survey Tests has not been justified by research concerning the role of perception in determining responses to the sub-tests of this instrument.

I. THE PROBLEM

Statement of the purpose. The purpose of this study was to: (1) analyze the value of the Keystone Visual Survey sub-tests in discriminating between mentally deficient children and normal children with reading difficulties; (2) investigate the effect of intelligence in determining

responses to the Keystone Visual Survey Tests; and (3) test the validity of the use of the Keystone Visual Survey Tests for vision screening of the mentally retarded.

Justification of the study. In discussing individual differences in perceiving, Gardner Murphy states that "the relation between the outer world and the individual is gravely misconstrued by the assumption that this world registers upon us all in about the same way."[1] Actually, each person receives a stimulus in an individual manner, so that there are as many reactions as there are perceivers. Experiments which indicate the individual differences in interpreting stimuli are legion. These interpretations are governed by the ability of the individual to judge, discriminate, or select on the basis of past experience. The ability to profit from these past experiences has been defined by some investigators as intelligence. Research in this area tends to differentiate various levels of perception and to establish a functional continuity between intelligence and perception. Many other investigations have been concerned with the factor of intellectual capacity in influencing perceptual activity because of the reciprocal relationship between learning and perception.

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[1]Gardner Murphy, Personality: A Bisocial Approach to Origins and Structure (New York: Harper and Brothers, 1947), p. 332.

The present study was designed to investigate the differences in visual perception of a group who by diagnosis have been identified as having general learning difficulties accompanied by limited intellectual capacity as compared to a group who have a specific learning difficulty with average or above average intelligence. These populations were chosen for comparison because they have a common problem of reading difficulty. This relationship has an important bearing, since the failure to achieve in reading is very frequently the primary consideration by the classroom teacher in identifying and labeling a child as being mentally retarded. It would be important for the teacher to know whether perception does or does not affect the achievement. The instructional approach would be vastly different if it were known that the pupil is handicapped in the ability to judge, select, discriminate and interpret accurately the symbols that are perceived visually in the learning of the basic school skills.

Teachers, school nurses, optometrists and ophthalmologists who have the responsibility of visual screening and examination should be aware that perceptual difficulty, but not visual difficulty, might be responsible for an incorrect response. No amount of prescribed correction by an eye specialist could rectify a condition that was perceptual other than visual.

Psychometrists and psychologists have the need for information which may be provided by this study. Test interpretation would be influenced by the knowledge that visual perception might be faulty due to factors other than emotional overlay, damage to the central nervous system, or visual handicap.

An attempt was made to control the variables dealt with in this study, so that the experimental factor was isolated for measurement. By design, the experimental method was used in making this investigation.

It was not the intention of this investigation to determine the value of the Keystone Visual Survey Test in identifying or diagnosing mental retardation, but to provide a basis for better understanding of the effect of mental deficiency on the interpretation of a visual stimulus.

Statement of the hypothesis. The thesis of this experiment was that a significant difference will be found between the responses of mentally retarded children and the responses of normal children with reading problems to the Keystone Visual Survey Tests after the variable of visual anomalies has been eliminated.

II. DEFINITION OF TERMS USED

Mentally retarded. The child whose full scale score on the Wechsler Intelligence Scale for Children or on the

Stanford-Binet, Form L, is below 75. An attempt has been made to diagnose any physical or emotional factors which might tend to depress an individual's score, and cases where the results are indicated to be unduly affected by these factors have not been classified as mentally retarded.

Perception. This term will be used to refer to an experience which is occasioned by the stimulation of sense organs. That is, perceptions are to be distinguished from reveries, trains of association, and hallucinations because these are not directly caused by stimulation. A perception requires the presence of a stimulus. As the term is used here, perception refers to those interactions between the individual and his environment in which the response is governed by the meaning the individual's prior experiences have given to the stimulus configuration.

III. ORGANIZATION OF THE REMAINDER OF THE THESIS

The following pages represent an attempt to review the literature concerning the present study. Chapter III is concerned with the data and explains the methods used in conducting the study. The population is identified, and a description of the measuring instrument is given. Chapter IV describes the method of gathering data. The tables of raw data are also presented. Chapter V is concerned with the methods used in testing the null hypothesis that there

is no difference between the responses of mentally retarded children and the responses of normal children with reading problems to the Keystone Visual Survey Tests after the variable of visual anomalies has been eliminated. The statistical formulas used and the tables of results are presented. The concluding chapter summarizes the thesis, conclusions are drawn, and recommendations for further study are made.

CHAPTER II

REVIEW OF THE LITERATURE

There is a vast amount of research literature on the influence of culture on perception, the physiological aspects of perception, and of sensory organization of perception. A similar amount of experimentation has been concerned with stimulus variables. A search of the literature, however, has revealed very limited research investigating the role of intelligence in perceiving.

Gardner Murphy[1] states that "there is certainly a misunderstanding that personal factors play no role in determining responses to well-structured perceptual situations." This conception implies that personal factors are unimportant except in the ambiguous situation. The importance of recognizing individual differences in perceiving is summarized by Murphy in an earlier work as he concludes that:

> We might summarize the relation between this great complexity of the problem of perception and the false simplicity often assigned to it by saying that we do not really see with our eyes or hear with our ears. If we all saw with our eyes, we should all see pretty much alike; we should differ only so far as retinal structure, eyeball structure, etc., differ. We differ much more widely than this because we see not only with our

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[1] Gardner Murphy (ed.), Personality Through Perception (New York: Harper and Brothers Publishers, 1954), p. 3.

> mid-brain, our visual and associative centers, and with our systems of incipient behavior, to which almost all visual perceiving leads.[2]

Krech and Calvin[3] found evidence supporting the hypothesis that "perceptual responses proceed through a hierarchical order of levels of organization in the human being." On the basis of the results of their study they concluded that, "the ease of progress through such an order is related to measures of intelligence." Recent research by Piaget[4] tends, as well, to differentiate levels of perception and to indicate a continuity between perception and intelligence.

The importance of controlling the variable of visual anomalies in the present investigation has been supported in the literature. Kirschen[5] made a study in which he found a significantly higher incidence of visual anomalies among mentally retarded children than among normal children.

After a thorough examination of available sources of information, the investigator was unable to find studies which, (1) had used the Keystone Visual Survey Tests for

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[2]Murphy, op. cit., p. 333.

[3]David Krech and Allen Calvin, "Levels of Perceptual Organization and Cognition," Journal of Abnormal and Social Psychology, 48:394-400, 1953.

[4]Jean Piaget, "Perception and Intelligence," Bulletin de l' Etude de Psychologie de l' Universite' de Paris, 4:25-34, 1950.

[5]Morris Kirschen, "A Study of Visual Performance of Mentally Retarded Children," American Journal of Optometry, 31:282, June, 1954.

purposes similar to its use in this study, (2) had adequately controlled the variable of visual anomalies in investigating relationships between visual perception and intelligence, or (3) had investigated the differences in visual perception between populations similar to the samples used in this study.

CHAPTER III

SOURCE OF DATA

This section of the investigation is concerned with data and explains the methods used in conducting the study. The population is identified, and a description of the measuring instrument is given.

I. SELECTION OF THE SAMPLES

Mentally retarded sample. The forty subjects in this group were all pupils in the Point One classes for the educable mentally retarded at Jackson School in Stockton, California. They had been certified as mentally retarded by the admissions committee composed of representatives from psychological services, special education, and medicine and psychiatry. The identification is based on an evaluation of work-ups by the regular classroom teacher and principal, the psychiatric social worker, the medical consultant, and the school psychologist. The arbitrary upper limit for placement in the Point One classes in Stockton Unified School District is an intelligence quotient of 75 and the arbitrary lower limit an intelligence quotient of 50, as measured by an individual intelligence test. The intelligence of the group here studied was measured by the full scale score on the Wechsler Intelligence Scale for Children or

the Stanford-Binet, Form L. No etiological classification was attempted.

Each of the subjects in the group was given a thorough examination by an eye specialist to rule out the variable of uncorrected vision difficulties as having effected the responses to the visual stimuli. The study by Kirschen[1], in which he found a significantly higher incidence of visual anomalies among mentally retarded children than among normal children, indicated the need to control this variable. Those individuals diagnosed as having visual anomalies were not used in this study.

Professional visual examination. Complete visual examination by a competent eye specialist was made possible through the cooperation of three Stockton optometrists. A consistent examination which could be evaluated with a minimum of subjectivity was devised by this panel of specialists. Their examination included tests for near and far point visual acuity, ophthalmoscopy, cover test for orthophoria, esophoria (approximate degree), exophoria (approximate degree), strabismus (type and degree), and retinoscopy. A copy of the record form used in examining these children is in the appendix. Forty-seven mentally retarded children

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[1]Kirschen, loc. cit.

were taken to the offices of the optometrists in groups of five and examined individually.

The panel of optometrists met with the investigator, and the visual examinations for each of the forty-seven mentally retarded children were evaluated. Seven of the subjects so examined, according to the consensus of the panel, had visual conditions which could have unduly effected their response to the Keystone Telebinocular. These seven subjects were not included in the experimental group. Only two of the seven had been identified as having a visual handicap or had received professional attention prior to this study. The forty remaining subjects make up the experimental sample. The following data were computed for this group:

1. chronological age range was 7.17 to 13.0
2. mean age was 10.66
3. intelligence quotient range was 48 to 75
4. mean intelligence quotient was 65.12

Reading clinic sample. The forty subjects in this group were all clients of the Laura Ann Sisk Memorial Reading Clinic at the College of the Pacific. Some were self-referrals, and others had been referred to Clinical Services at the College of the Pacific by their family physician, optometrist, ophthalmologist, or by a representative of their school. Each of the subjects in this group had been diagnosed as being educationally retarded with specific

difficulty in reading. All of the children in this group had average or above average intelligence as measured by the full scale score of the Wechsler Intelligence Scale for Children or by the Stanford-Binet, Form L. Before inaugurating a remedial reading program for these children, the director of the reading clinic required an examination by a competent eye specialist to rule out any uncorrected visual handicap as a primary factor in the reading disability. Thus, none of the subjects used in the control sample had visual anomalies. The forty cases from the reading clinic used in this study were chosen at random from the clinic files. Those cases not meeting the criterion of average intelligence or better and those beyond an age range comparable to the mentally retarded group were not included. The following data were computed for this group:

1. chronological age range was 8.0 to 13.92
2. mean chronological age was 10.20
3. intelligence quotient range was 90 to 161
4. mean intelligence quotient was 110.05

II. DESCRIPTION OF THE TEST USED

The Keystone Visual Survey Tests provide a binocular screening procedure. Findings obtained indicate whether the pupil has over-all normal patterns of seeing, or whether he should be referred to a competent eye specialist for

professional attention. The battery consists of fourteen tests including a test for simultaneous binocular perception, a test for vertical imbalance, tests for lateral imbalance at far point and near point, tests for the usable vision of the right eye at far point and at near point, tests for the usable vision of the left eye at far point and at near point, a test for the usable vision of both eyes at the near point, a test for depth perception and a test for color perception.[2] The color perception test was not included in this study because a majority of the mentally retarded subjects were unable to identify the block letters used. It was impossible to determine whether the failure here was due to educational retardation, or to perceptual difficulty. Unusual responses were noted, however, on other sub-tests where seven mentally retarded subjects referred to black and white stimuli as pink, brown, purple and green.

Not diagnostic in any sense, the Keystone Tests are intended only as a screening device. When the tests are administered and a profile drawn, the examiner may use the results as an aid in making referrals to the specialist in eye care. The record form for use with the Keystone Visual Survey Tests is in the appendix. The tests are used as a

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[2] M. E. Broom, M. Duncan, D. Emig, and J. Steuber, Effective Reading Instruction (second edition; New York: McGraw-Hill Book Company, 1951), p. 407.

screening procedure in evaluating vision by more than 3,500 school systems, more than 4,000 industries, and in the offices of thousands of ophthalmologists and optometrists.[3]

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[3] Manual of Instructions for the Keystone Visual Survey Service (Meadville, Pennsylvania: 1954), insert.

CHAPTER IV

COLLECTION AND PRESENTATION OF DATA

This chapter describes the method of gathering data. The tables of raw data are also presented.

I. METHOD OF GATHERING DATA

All of the children in the Point One classes for the educable mentally retarded at Jackson School were given the Keystone Telebinocular Tests. This population had difficulty understanding what was expected of them; hence, added care and time had to be taken in the administration. The examiner used a pencil as a pointer on most sub-tests in directing the subject's attention to the desired stimulus, and directions had to be repeated frequently.

Tests V and VI are designed to check usable vision at far point for the right and left eye, respectively. The tests consist of a series of sign boards of diminishing size along a railroad track that goes to infinity. Each sign board has five white squares, four in a diamond arrangement with one white square in the center of the diamond. There is a black dot in one of the white squares forming the diamond on each sign board, and the subject is to indicate whether the top, bottom, left or right white square has the black dot in it. A reproduction of a sign board was made by

the examiner in order that the subject could indicate his response on it if he appeared confused in designating his response verbally.

A similar technique was used on tests XII, XIII, and XIV. These three tests are designed, respectively, to check usable vision of the right, left, and both eyes at near point. These tests consist of a series of discs made of lines, dots, or gray arranged in a circle with progressively less well defined differences. Three sample discs in which the differences are obvious are included for instruction of the subject. It was necessary for the examiner to indicate the disc that the subject was to respond to, and then refer to the sample discs to identify that response. If this were not done, the subjects frequently forgot the language symbols for the three configurations and would be unable to respond verbally.

The difficulty the mentally retarded group had in performing the tasks on the Keystone Telebinocular, and the care taken in administering the battery, are reflected in the total administration time. It took an average of approximately seventeen minutes to administer the tests to this group, whereas, the manual for use with the Visual Survey Series[1] states that the administration of the complete

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[1] Manual of Instructions for the Keystone Visual Survey Service, op. cit., p. 1.

battery should not require more than four minutes. Experience with this instrument in the Reading Clinic at the College of the Pacific has shown that administration normally takes three to five minutes.

II. PRESENTATION OF DATA

The raw data for Keystone Tests V, VI, VII, XII, XIII, and XIV are given in Table I and Table II for the experimental and control groups, respectively. Table III and Table IV present the raw data for Keystone Tests I, II, III, IV, X, and XI for the experimental and control groups, respectively.

TABLE I

DATA FOR EXPERIMENTAL GROUP ON KEYSTONE TESTS
V, VI, VII, XII, XIII, AND XIV

Case No.	Test V	Test VI	Test VII	Test XII	Test XIII	Test XIV
1	10	9	10	16	18	14
2	7	6	12	17	11	14
3	3	7	12	13	14	13
4	10	9	12	12	12	14
5	9	9	12	17	16	13
6	2	2	12	0	7	9
7	2	3	12	14	12	14
8	5	7	12	14	9	14
9	6	4	12	16	9	15
10	5	0	12	13	13	12
11	2	0	3	11	12	11
12	9	9	12	8	7	12
13	9	9	12	19	17	17
14	6	7	10	10	10	15
15	9	8	12	9	10	13
16	2	7	12	18	19	17
17	6	9	12	4	14	11
18	1	1	12	10	9	11
19	3	7	0	9	10	8
20	3	3	9	7	9	13
21	0	7	4	17	16	17
22	5	3	12	10	11	15
23	7	9	12	16	10	15
24	4	2	12	11	12	19
25	8	10	12	14	13	19
26	3	6	12	19	14	13
27	4	3	3	13	12	13
28	2	2	3	5	4	5
29	7	7	11	15	15	14
30	9	10	12	16	14	16
31	1	2	0	10	9	8
32	6	8	12	11	11	13
33	0	0	0	0	0	0
34	5	4	1	14	5	15
35	9	4	1	10	11	11
36	7	8	12	17	12	16
37	10	7	12	14	13	13
38	4	6	5	14	13	14
39	10	10	12	20	17	16
40	8	9	12	16	14	14

TABLE II

DATA FOR CONTROL GROUP ON KEYSTONE TESTS
V, VI, VII, XII, XIII, AND XIV

Case No.	Test V	Test VI	Test VII	Test XII	Test XIII	Test XIV
1	10	8	12	16	19	15
2	10	10	12	13	14	16
3	10	10	12	18	18	20
4	8	9	10	14	13	13
5	9	8	11	15	13	17
6	10	9	12	14	20	16
7	9	10	12	15	19	18
8	7	8	12	19	17	19
9	10	10	12	19	16	16
10	9	10	12	19	22	21
11	7	7	12	17	20	19
12	7	9	12	14	14	14
13	8	7	12	17	15	16
14	7	7	12	19	16	17
15	6	9	12	14	15	19
16	6	8	12	19	19	21
17	9	8	12	13	19	19
18	4	5	12	18	18	18
19	5	10	10	10	11	16
20	4	7	12	16	16	15
21	10	10	12	18	15	19
22	8	9	12	17	15	14
23	10	10	12	15	13	16
24	10	9	12	20	14	20
25	10	10	12	20	17	19
26	7	9	12	17	18	18
27	4	5	11	13	16	15
28	9	2	12	15	18	15
29	9	9	12	12	13	12
30	9	10	12	19	21	19
31	7	9	12	18	19	17
32	10	10	12	15	17	20
33	8	10	12	16	16	16
34	9	4	12	16	20	17
35	10	10	12	19	17	18
36	8	10	12	20	20	19
37	9	9	12	20	20	18
38	9	9	11	16	17	20
39	8	8	12	18	20	19
40	6	6	10	19	18	18

TABLE III

DATA FOR EXPERIMENTAL GROUP ON KEYSTONE TESTS
I, II, III, IV, X, AND XI

Case No.	Test I	Test II	Test III	Test IV	Test X	Test XI
1	+	+	+	+	+	+
2	+	+	+	+	-	+
3	+	+	+	+	-	+
4	+	-	+	+	-	+
5	+	+	+	+	-	+
6	+	+	+	-	+	+
7	+	+	+	+	-	+
8	-	+	+	+	-	-
9	+	+	+	+	+	+
10	+	+	+	+	+	+
11	+	+	+	+	+	+
12	+	+	+	+	+	+
13	+	+	+	+	+	+
14	+	+	-	+	+	+
15	+	+	-	+	-	+
16	+	+	+	+	-	+
17	+	+	-	+	+	+
18	+	-	+	+	+	+
19	+	+	-	+	+	+
20	-	+	-	+	+	+
21	+	+	+	+	+	+
22	+	+	+	+	-	+
23	+	+	+	+	+	+
24	+	+	+	+	+	+
25	+	+	+	+	+	+
26	+	+	-	+	+	+
27	+	+	+	+	+	+
28	+	-	+	+	-	-
29	+	+	-	+	+	-
30	+	+	-	-	-	-
31	+	+	+	+	+	+
32	+	+	+	+	+	+
33	+	-	+	+	+	+
34	+	-	-	+	+	+
35	+	+	+	+	+	+
36	+	-	+	+	+	+
37	+	-	+	+	+	+
38	+	+	+	+	+	+
39	+	+	+	+	+	+
40	+	+	+	+	-	-

TABLE IV

DATA FOR CONTROL GROUP ON KEYSTONE TESTS
I, II, III, IV, X, AND XI

Case No.	Test I	Test II	Test III	Test IV	Test X	Test XI
1	+	+	-	-	+	+
2	+	+	+	+	+	+
3	+	+	+	-	+	+
4	-	+	+	+	+	+
5	+	+	-	-	+	+
6	+	+	+	+	+	+
7	+	+	+	+	+	+
8	+	+	+	+	+	+
9	+	+	+	+	-	-
10	+	+	+	+	+	+
11	+	+	+	+	-	+
12	+	+	-	+	+	+
13	-	+	+	+	-	+
14	+	+	+	+	-	+
15	-	+	+	+	+	+
16	+	+	-	+	+	+
17	+	+	-	+	-	+
18	+	+	+	+	+	+
19	+	-	-	-	-	-
20	+	-	+	-	+	+
21	+	+	+	+	+	+
22	+	+	+	+	+	+
23	+	+	+	+	+	+
24	+	-	+	+	+	+
25	+	+	+	+	-	+
26	+	-	+	-	+	+
27	+	+	+	+	+	+
28	-	+	+	+	+	+
29	+	+	+	+	+	+
30	-	+	+	-	-	+
31	+	+	+	+	+	+
32	+	+	+	+	-	+
33	+	-	-	+	-	+
34	+	+	+	+	+	+
35	+	+	-	+	+	-
36	+	+	+	+	-	-
37	+	-	+	+	+	+
38	+	+	+	+	-	+
39	+	+	+	-	-	+
40	+	+	-	+	-	+

CHAPTER V

STATISTICAL TREATMENT OF DATA

This chapter is concerned with the methods utilized in testing the null hypothesis that there is no difference between the responses of mentally retarded children and the responses of normal children with reading problems to the Keystone Visual Survey Tests after the variable of visual anomalies has been eliminated. The statistical formulas used and tables of the results are presented.

I. STATISTICAL TREATMENT OF DATA

Keystone sub-tests V, VI, VII, XII, XIII, and XIV. The mean, standard deviation and variance for each group on each of these tests was computed. The F test, as described by Edwards[1] was applied to determine the degree of homogeneity of the two variances for each of these sub-tests. The F ratio is computed by the following formula:

$$F = \frac{s_1^2}{s_2^2}$$

In all cases F was significant beyond the .01 level of confidence as shown by Table V. The greater degree of variability was in the mentally retarded sample on each of these sub-tests. The variances for the experimental and

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[1] Allen L. Edwards, Statistical Methods for the Behavioral Sciences (New York: Rinehart and Company, 1955), p. 272.

TABLE V

VARIANCES AND HOMOGENEITY OF VARIANCES FOR KEYSTONE TESTS V, VI, VII, XII, XIII, AND XIV

Keystone Test	Variance		F*
	Experimental	Control	
V	9.53	3.98	2.39
VI	9.84	3.53	2.79
VII	19.39	3.33	5.82
XII	22.80	6.36	3.58
XIII	22.71	6.87	3.31
XIV	12.59	4.80	2.62

*All differences were beyond the .01 level of confidence (F at the .01 level is 2.11).

control samples are given in Table V. Examination of the distributions of the scores of the reading clinic group showed that the scores of this sample were limited by the instrument used. The Keystone Visual Survey Tests are, by construction, a screening battery. This instrument is not designed to measure upper limits, but is concerned whether given standards are met. An examination of the distributions shows that the scores of the reading clinic sample were concentrated near the upper end of these tests, whereas, the scores of the mentally retarded sample were nearer a normal distribution. Had the tests had higher ceilings, more of the reading clinic cases would have had higher scores. This would almost certainly have resulted in greater variance for the reading clinic sample, giving a higher degree of homogeneity of variance with less significant F, and a greater significance of the difference between the means.

The significance of the difference between the means of the two groups for sub-tests V, VI, VII, XII, XIII, and XIV was computed. On all of these sub-tests the variances differed significantly so that the sums of squares were not pooled in determining whether the two means differ significantly.

The following formula as given by Edwards[2] was used in computing the significance of the difference between the means:

$$s_{\bar{X}_1 - \bar{X}_2} = \sqrt{\frac{s_1^2}{n_1} - \frac{s_2^2}{n_2}}$$

The values of t for the difference between the means were computed and are shown in Table VI. For all of these sub-tests the null hypothesis was rejected beyond the .01 level of confidence.

II. KEYSTONE TESTS I, II, III, IV, X, AND XI

Individual scores on the Keystone tests for simultaneous perception, vertical posture, lateral posture at far and near point, and fusion at far and near point were scored plus or minus on the basis of whether the response was satisfactory or unsatisfactory as recorded on the record form. Chi-square was used to analyze these findings. Because the frequencies were small, a correction was made.

> A suitable correction for small frequencies, for the 1 degree of freedom has been developed by Yates. It consists simply of reducing the magnitude of all deviations by $\frac{1}{2}$ unit.[3]

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[2] Ibid., p. 273.

[3] Oliver L. Lacey, Statistical Methods in Experimentation (New York: The MacMillan Company, 1953), p. 141.

TABLE VI

MEANS AND DIFFERENCES ON KEYSTONE TESTS
V, VI, VII, XII, XIII, AND XIV

Keystone Test	Mean		Difference between the means	*t*
	Experimental	Control		
V	5.45	8.12	2.67	4.60
VI	5.82	8.42	2.60	4.48
VII	9.30	11.78	2.48	3.31
XII	12.48	16.55	4.95	5.82
XIII	11.60	16.90	5.30	6.09
XIV	13.15	17.35	4.20	6.36

*All differences were beyond the .01 level of confidence (*t* at the .01 level is 2.71).

The formula for chi-square corrected for continuity as given by Edwards[4] is:

$$\chi^2_c = \sum_1^k \frac{(|n_i - n_i'| - .5)^2}{n_i'}$$

None of the differences between the samples on these tests were significant, so that the null hypothesis was accepted. The values of chi-square are shown in Table VII.

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[4] Edwards, op. cit., p. 383.

TABLE VII

VALUES OF CHI-SQUARE FOR KEYSTONE TESTS I, II, III, IV, X, AND XI

Keystone Test	Chi-Square*
I	1.096
II	.095
III	.000
IV	2.003
X	2.236
XI	.000

*None of the chi-square values were significant.

CHAPTER VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

In this concluding chapter an attempt is made to summarize the findings presented in the foregoing chapters. Conclusions are drawn and recommendations are made.

I. SUMMARY

This study has been an attempt to investigate the differences in the visual perception of mentally retarded children and normal children with reading problems. The Keystone Telebinocular was the instrument used.

The Keystone battery is widely used in vision screening by schools and reading clinics. The validity of the use of this device in screening mentally retarded children was tested in this study and the value of each sub-test in discriminating between mentally deficient children and normal children with reading difficulties was analyzed.

Tests VIII and IX were not included in this analysis because these tests of color perception involve the identification of block letters. It was difficult to determine whether failure to respond correctly was due to educational retardation or due to visual perception. Unusual responses were noted on other sub-tests, however, where seven of the mentally retarded subjects referred to black and white stimuli as pink, brown, purple, and green.

A thorough search of the literature failed to reveal any studies closely related to this investigation. Individual differences in perception are recognized by the authorities, but little research has been done in this area. Limited study indicates a relationship between perception and intelligence.

A sampling of forty-seven mentally retarded children were screened with the Keystone Telebinocular, and given a complete vision examination by a competent eye specialist. Seven of these children were diagnosed as having visual anomalies, so were not included in the study. The remaining forty subjects make up the experimental group. The chronological age range, mean age, intelligence quotient range, and mean intelligence quotient were computed for this group. The intelligence quotient was computed on the basis of full scale scores on the Wechsler Intelligence Scale for Children or on the Stanford Binet, Form L.

The chronological age range was 7.17 years to 13.0 years. The mean age was 10.66 years. The intelligence quotient range was 48 to 75. The mean intelligence quotient was 65.12.

The forty children in the control group were clients of the Laura Ann Sisk Memorial Reading Clinic at the College of the Pacific. They were chosen at random from the clinic files from among those children who (1) had average or above

average intelligence as measured by the Wechsler Intelligence Scale for Children or the Stanford Binet, Form L, (2) were within the approximate age range of the experimental sample, and (3) had no visual anomalies as determined by a qualified eye specialist. The chronological age range of this sample was 8.0 years to 13.92 years. The mean chronological age was 10.20 years. The intelligence quotient range was 90 to 161. The mean intelligence quotient was 110.05.

The mean, standard deviation and variance for each sample was computed for tests V, VI, VII, XII, XIII, and XIV. The F test was applied to determine the homogeneity of the two variances for each of these sub-tests. In all cases F was significant beyond the .01 level with the greater degree of variability in the mentally retarded sample on each test.

The nature of the measuring device limited the performance of the reading clinic sample; hence, there was a concentration of scores near the upper limit of the tests. If the measuring instrument had a higher ceiling there would be a greater homogeneity of variance and a more significant difference between the means.

The significance of the difference between the means for tests V, VI, VII, XII, XIII, and XIV was computed. The values of $\underline{t}$ for the difference was also computed. For all of these sub-tests the null hypothesis was rejected at the .01 level of confidence.

Chi-square corrected for continuity was used to analyze data from tests I, II, III, IV, X, and XI. None of the differences between the samples on these tests was significant; thus rejection of the null hypothesis was not justifiable.

II. CONCLUSIONS

This study has been an attempt to: (1) analyze the value of the Keystone Visual Survey Service tests in discriminating between mentally retarded children and normal children with reading problems; (2) investigate the effect of intelligence in determining responses to this battery of tests; and (3) test the validity of the use of this instrument for screening vision of mentally deficient children.

Tests I, II, III, IV, X, and XI are of no value in discriminating between mentally retarded children and normal children with reading difficulty. An examination of the stimulus materials on these tests, however, shows that they do not proceed through levels of difficulty. There is a single response to each of these tests, whereas, the other tests used in the study have ten, ten, twelve, twenty-two, twenty-two, and twenty-two items, respectively, arranged according to degree of difficulty. The subject is not required to make fine discriminations or judgments on these single response tests; hence, their lack of value as a discriminative battery should be expected.

The discriminative value of tests V, VI, VII, XII, XIII, and XIV was significant and high. The null hypothesis for each of these tests was rejected beyond the .01 level of confidence.

The hypothesis that a significant difference would be found between the responses of mentally retarded children and the responses of normal children with reading problems to the Keystone Visual Survey Tests was substantiated for half of the tests studied.

The results of this study would seem to indicate that perceptual factors beyond vision, as examined by an eye specialist, affect the responses of mentally retarded children to the Keystone Telebinocular tests that are arranged in degrees of difficulty. This instrument would not, therefore, be a valid instrument for the visual screening of children of limited intelligence.

III. RECOMMENDATIONS FOR FURTHER INVESTIGATION

This study emphasizes the need for further investigation of the role of intelligence in perception. A greater knowledge in this area would benefit the teacher, eye specialist, and psychologist.

Studies similar to the present one, using different population samples, should be a worthwhile contribution to the field. An investigation of the relationship between

intelligence and color perception using culture-free stimuli should be of worth. A correlational study investigating the relationship between intelligence and perception should also prove valuable.

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APPENDIX

VISUAL SCREENING EXAMINATION

Name _____

Birthdate _____ Date _____

1. Snellen: R _____ L _____

   Near Point: R _____ L _____

2. Ophthalmoscopy:

   A. Negative _____

   B. Positive _____

      Give details: _____

      _____

3. Cover Test:

   A. Orthophoria _____

   B. Esophoria _____

      Approximate degree _____

   C. Exophoria _____

      Approximate degree _____

   D. Strabismus _____

      Type _____ Degree _____

4. Retinoscopy:

   R _____ L _____

Dr. _____

KEYSTONE VISUAL SURVEY TESTS

School Survey Cumulative Record Form No. 3

For Use with No. 46 Visual Survey Telebinocular

Name_____ Sex_____

Date_____ Teacher_____

Date of birth_____ (yr. mo. da.) C. Age_____ (year. mo.) M. Age_____ (yr. mo.) Grade_____

School_____ City_____

Address_____ Phone_____

Referred by _____

Approved by _____

Principal or_____

Wearing Glasses: Yes ___ No___

Snellen Standard (if desired)

With Glasses: Right____ Left____

Without Glasses: Right____ Left____

		Left Only	Right Only	UNSATISFACTORY Underconvergence and Low Usable Vision				Hatched Retest Area	EXPECTED within Heavy Black Lines	Hatched Retest Area	UNSATISFACTORY Overconvergence	
Set at Far Point	Test 1 (DB-10A) Simultaneous Vision (Far Point)											
	Test 2 (DB-8C) Vertical Posture (Far Point)	only	only									
	Test 3 (DB-9) Lateral Posture (Far Point)	only	15-14-13 · · 3-2-1 Numbers Only	15	14	13	12	11	10 9 8	7	6 5 4	3 2 1
	Test 4 (DB-4K) Fusion (Far Point)	only	only	Four, widely separated		Four, near each other					Four, near each other	Four, widely separated
	Test 5 (DB-3D) Right Eye, Usable Vision (Far Point)		No Dots Seen Unless Left Eye Is Occluded	1 T 49%	2 R 70%	3 L 84%	4 T 92%	5 B 96%	6 B 98% 7 L 100%	8 R 102%	9 T 103%	10 R 105%
	Test 6 (DB-2D) Left Eye, Usable Vision (Far Point)	No Dots Seen Unless Right Eye Is Occluded		1 B 49%	2 L 70%	3 R 84%	4 R 92%	5 T 96%	6 L 98% 7 B 100%	8 L 102%	9 R 103%	10 T 105%
	Test 7 (DB-6D) Stereopsis (Far Point)	+ only	only ●	1 +	2 ○	3 ✳	4 ○ 5 □ 6 □ 7 ♡ 8 +	9 ✳	10 + 11 ♡ 12 ○			
	Test 8 (DB-13) Instruction Only (Far Point)	1 I	2 C	3 Y	4 U	5 O	6 S	7 E	8 H	9 N	10 P	11 L 12 F
	Test 9 (DB-14) Color Perception (Far Point)	1 F	2 P	3 U	4 C	5 L	6 L	7 C	8 F	9 I	10 F	11 L 12 C
Move to Near Point	Test 10 (DB-9B) Lateral Posture (Near Point)	only	10-9 · · · · 4-3-2 Numbers Only	10		9		8	7	6 5 4	3	2
	Test 11 (DB-5K) Fusion (Near Point)	only	only	Four, widely separated		Four, near each other					Four, near each other	Four, widely separated
	Test 12 (DB-16) Usable Vision—Right (Near Point)	1 D 10%	2 D 20%	3 L 30%	4 D 40%	5 L 50%	6 D 50%	7 D 60%	8 L 60%	9 D 70%	10 L 70%	11 D 80% 12 G 80%	13 L 90%	14 L 90%	15 D 100%	16 D 100%	17 G 102%	18 D 102%	19 L 103%	20 D 103%	21 D 105%	22 L 105%
	Test 13 (DB-17) Usable Vision—Left (Near Point)	1 L 10%	2 D 20%	3 D 30%	4 D 40%	5 L 50%	6 D 50%	7 L 60%	8 D 60%	9 D 70%	10 D 70%	11 L 80% 12 L 80%	13 G 90%	14 D 90%	15 L 100%	16 D 100%	17 L 102%	18 D 102%	19 L 103%	20 G 103%	21 D 105%	22 L 105%
	Test 14 (DB-15) Usable Vision—Both (Near Point)	1 D 10%	2 L 20%	3 D 30%	4 D 40%	5 L 50%	6 D 50%	7 D 60%	8 L 60%	9 D 70%	10 D 70%	11 G 80% 12 L 80%	13 L 90%	14 D 90%	15 L 100%	16 D 100%	17 L 102%	18 D 102%	19 G 103%	20 D 103%	21 D 105%	22 L 105%

Complete directions for the administration of these tests will be found in the manual provided for this purpose.

The user should familiarize himself with the information given on the **backs of the cards.**

For **Snellen Equivalents** of Tests 5, 6, 12, 13, and 14 see the **Manual,** pp. 12 and 14.

Pointing with a pencil or similar object will facilitate greatly the giving of most of these tests — and save time.

Interpretation of the Record Form. When all replies are checked in the "EXPECTED" column (set off by heavy lines) visual performance is considered to be satisfactory in so far as this test goes.