A COMPARISON OF FLEXIBILITY IN MONGOLOID, OTHER MENTALLY RETARDED AND NORMAL CHILDREN

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CHAPTER I

STATEMENT OF THE PROBLEM

The purpose of this study was to determine if there are significant differences in flexibility between mongoloid, other types of mentally retarded and normal children as measured by the following selected tests of extent flexibility: The Toe Touch, Twist and Touch and Abdominal Stretch described by Fleishman[1], and the Spinal Extension Test described by Scott and French.[2]

Need for the Study

Mental retardation is recognized as one of the major problems facing the world today. It has been estimated that in the United States alone 5.5 million people are mentally retarded. This is approximately three per cent of the total population. Children make up 2.5 million of this total. The natural population growth is expected

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[1]Edwin A. Fleishman, The Structure and Measurement of Physical Fitness (Englewood Cliffs, N. J., 1964), pp. 77-78.

[2]Gladys M. Scott and Esther French, Measurement and Evaluation in Physical Education. (Dubuque, Iowa, 1959), pp. 316.

to increase this total to 6.5 million by 1970, unless preventive measures are found.[3]

Despite the recognition of this problem, research has developed slowly. Although, some areas have received considerable study, other areas have remained virtually untouched. There have been very few studies in the area of physical education, in particular, the areas of physical fitness and motor development.

To do the best possible job of teaching, it is necessary for the instructor of mentally retarded students to obtain as much information as possible concerning the characteristics of his students. This includes intellectual, psychological and physical abilities of the child. Because of the paucity of research, less is known about the physical characteristics than the other areas of behavior.

Interest in the subject of this particular study was stimulated by the frequent observations of people who have worked with the mentally retarded, that the mongoloid is much more flexible than other children. This observation has been vocalized by some of the prominent scholars in this field. Scientific evidence

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[3]Cathy Covert, Mental Retardation - a Handbook for the Primary Physician, Reprinted from the Journal of the American Medical Association Vol. 191, No. 3, Jan. 18, 1965. Copyright American Medical Association, 1965, pp. XI.

supporting these observations is lacking, although Penrose[4] suggests that the mongoloid is characterized by a "laxness in the joint ligaments." Therefore, the author, has attempted to test this hypothesis.

Delimitations and Limitations

The subjects selected for study were forty boys and girls from the Children's Colony in Conway, Arkansas; twenty normal boys and girls, who volunteered for the study from Conway, Arkansas, and a second group of forty-two boys and girls from Hissom Memorial Center in Sand Springs, Oklahoma. The subjects were matched in both groups according to chronological age with no attempt to match the subjects in mental age, intelligence quotient or other factors. (See Review of Literature on Relation of Mental Age Versus Chronological Age to Performance.)

An immeasureable factor involved in this type of study is the level of communication with the mentally retarded. The intellectual level of the mentally retarded places limitations on their ability to understand and perform as instructed. A basic assumption in this investigation is that the mentally retarded subjects did understand and perform as instructed. The subjects were free from any observable physical defects.

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[4]L. S. Penrose, The Biology of Mental Defect (London 3rd Ed., 1963), pp. 205.

There is some evidence that range of motion is affected by such factors as muscle soreness and the individuals tolerance for it, ability of the individual to relax, room temperature, warm-up, and other environmental factors.[5] There is some controversey concerning the effects of body build on flexibility. The type of physical activity programs in which the subjects had previously engaged could have affected the results. No attempt was made to control these factors. It must also be noted that fear of losing balance might influence the scores of some subjects on two of the tests.

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[5]Gladys M. Scott and Esther French, Measurement and Evaluation in Physical Education. (Dubuque, Iowa, 1959), pp. 314-315.

CLASSIFICATION OF TERMS USED

Extent Flexibility - refers to the ability of the subject to extend or stretch and hold the body, or some part thereof, as far as possible in various directions.

Mongoloid Child - (a clinical type of mental retardation caused by translocation of chromosomes) is physically and mentally defective at birth. Characterized by eyes obliquely placed, fold of skin at inner edge of eye; flat, round face; round cheeks and large flat lips; large, long tongue usually protruding from mouth; small nose.

Mentally Retarded - usually considered a general term meaning all degrees of mental retardation from profound mental deficiency to borderline mental defect or to upper limits of dull normality.

CHAPTER II

REVIEW OF LITERATURE

In view of the lack of literature pertaining to flexibility in the mentally retarded, a selected review of related literature is presented. The selections are presented in three major areas: Mental Retardation, Mongolism, Physical Fitness and Flexibility.

Mental Retardation

Mental retardation is defined by the American Association on Mental Deficiency as "significantly sub-average intellectual functioning which manifests itself during the developmental period and is characterized by inadequacy in adaptive behavior."[1]

The mentally retarded are classified according to educational potential by the American Association of Mental Deficiency as follows: mild, 50-70 I.Q.; moderate, 35-50 I.Q.; severe, 20-35 I.Q.; and profoundly retarded.

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[1]J. W. Kidd, Mental Retardation (2:209 [Aug.]1964) from Mental Retardation - A Handbook for the Primary Physician. Reprinted from Journal of the American Medical Association, Vol. 28, (1957), p. 4.

I.Q. below 20.[2] There are other classification systems used by various groups.

Causes

In most cases of mental retardation the physician can make no specific etiologic diagnosis. Over 200 causes of retardation have been identified; however, the physician usually defines retardation only in terms of functional characteristics, significant impairments in intellectual functioning and in the social adaptation of the individual.[3]

Mental retardation may occur as a result of prenatal, natal or post-natal factors. Retardation resulting from biological factors which influence the biochemical and structural organization of the nervous system, include cretinism, phenylketonuria (PKU), hydrocephalus, and genetic disorders. Experiential factors which influence the organization of functions in the central nervous system during postnatal maturation may result in retardation. Examples of experiential factors occur as a result of environmental factors, would include viral infections, maternal diseases or injuries during

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[2]Cathy Covert, Mental Retardation - a Handbook for the Primary Physician, Reprinted from the Journal of the American Medical Association Vol. 191, No. 3, Jan. 18, 1965. Copyright American Medical Association, 1965, p. 1.

[3]Ibid.

the pre-natal period, birth complications or injuries, cultural deprivation and severe head injuries.

Motor Performance

Some research shows that when normal children and mentally retarded children are matched in mental age they do not differ significantly in performance. However, when they are matched chronologically the normal subjects surpass the mentally retarded.[4] On the other hand, Rarick indicated that the basic components of gross motor functions in the mentally retarded do not differ materially from those noted in persons of normal intelligence.[5] This statement would seem to indicate that although the mentally retarded are not capable of performing mentally at a normal level they may be able to achieve near normalcy in physical ability. Stein helps to substantiate this when he states that despite underachievement, the mentally retarded are much nearer the norm physically than mentally.[6]

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[4]Gushon Berkson and Gordon N. Cartor, "A Note on Method In Comparisons of Learning in Normals and the Mentally Retarded." American government of Mental Deficiency, Nov. 1962, Vol. 67, No. 3, p. 475.

[5]G. Lawerence Rarick, "The Factor Structure of Motor Abilities of Educable Mentally Retarded Children." Paper presented at the Joseph P. Kennedy, Jr., Foundation Scientific Symposium on Mental Retardation, April 11, 1966.

[6]J. U. Stein and R. Pangle, "What Research Says About Psychomotor Function of the Retarded." Journal of Health, Physical Education and Recreation. Vol. 34, April, 1966, pp. 36-38.

In view of the foregoing statements, it must be pointed out, that there is some research which indicates that intelligence and physical development is related. Data presented by Kugel and Mohr, support the conclusion that the greater the mental defect, the more retarded will be physical growth.[7] Sloan strongly suggests that motor proficiency is related to intelligence. The mental retardates seem to do worse as the complexity of the motor skill is increased.[8]

Perhaps Brace had a more convincing report when he found a substantial relationship between I.Q. and a combination of motor and athletic abilities in retarded girls.[9] Stein added to the evidence when he stated that motor proficiency and intelligence are more highly correlated in the retarded than in normal children.[10] While Brace's study supported the relationship between intelligence and motor performance, he suggested a factor not

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[7]Robert B. Kugel and John Mohr "Mental Retardation and Physical Growth" American Journal of Mental Deficiency Vol. 68: 41-48, July 1963.

[8]William Sloan, "Motor Proficiency and Intelligence" American Journal of Mental Deficiency 55(3):394-406, 1951.

[9]D. K. Brace, "Motor Learning of Feeble-Minded Girls" Research Quarterly, AAHPER 19:269-275(Dec. 1948).

[10]J.U. Stein and R. Pangle, "What Research Says About Psychomotor Function of the Retarded." Journal of Health, Physical Education and Recreation. Vol. 34, April, 1966, pp. 36-38.

previously mentioned, by observing that emotional reaction patterns more than physical ability may have influenced performance scores.[11]

Mongolism

Characteristics

Dr. Langdon Down first recognized mongolism as a seperate clinical entity in 1866.[12] It is estimated that ten per cent of all mentally retarded hospital cases belong to this class. The mongoloid is easily recognized by characteristic physical stigmata which included dwarfed stature, small round head, dysplastic face, straight sparse hair and short stout limbs and trunk. The face suggests an oriental configuration with epicanthic folds of skin making the intraocular distance seem unusually wide although it is actually diminished. The eyes are characterized by cataract, mypoia, strabismus and iris with peripheral white speckling. Protruding chin and lower lip, thickened buccal mucosa and a fissured tongue with enlarged papillae are characteristic of the mouth. The hands and feet are broad and clumsy; webbing of fingers and toes is not uncommon. The little finger tends to be very short and

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[11] D. K. Brace, "Motor Learning of Feeble-Minded Girls." Research Quarterly, AAHPER 19:269-275 (Dec. 1948).

[12] L. S. Penrose, The Biology of Mental Defect (London 3rd Ed., 1963), p. 205.

curve inward. The dermal ridges have a more transverse arrangement than is usual in normal hands. Radial loops occur on digits four and five but an ulnar loop is the characteristic fingerprint pattern.[13]

The personality of the mongoloid is reported to be affectionate, content, and relaxed with a cheerful and friendly disposition.[14] Language defects exist in the mongoloid person to a greater degree than in non-retarded persons and other types of retarded persons.[15] The reticulocyte count is significantly higher in mongoloids than in other mentally retarded and normal persons. There is some indication that the reticulocyte count increases in the female and decreases in the male with age.[16]

Hans Mautner found a high percentage of an incomplete fusion of the arches of the lower spine in mongoloids especially in young children.[17] However, other research indicates that mongoloid children between the

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[13]Ibid. 203-205.

[14]George Domino et.al. "Personality Traits of Institutionalized Mongoloid Girls." American Journal of Mental Deficiency Vol. 68: 498-502, Jan. 1964.

[15]Thomas E. Jordon, The Mentally Retarded 2nd Ed. (Columbus, Ohio, 1966), p. 167.

[16]Adelyn Walker and Mortimer Garrison, Jr., "The Reticielocyte Count in Mongola," American Journal of Mental Deficiency Vol. 70, Jan., 1966, p. 509.

[17]Hans, Mautner, "Abnormal Findings on the Spine in Mongoloids" American Journal of Mental Deficiency Vol. 55, July, 1950, p. 105.

ages of seven and fourteen do not differ materially from normal children of corresponding age with respect to skeletal development.[18]

Causes

Mongolism appears to be the result of improper chromosome division which results in translocation or trisomy of chromosomes. Normally each parent yields a chromosome resulting in a haploid cell-body with the normal complement of two chromosomes. If the process works improperly, a chromosome from one pair may unite not with one chromosome from one pair, but with two chromosomes, a pair which failed to divide. The result is a trisomy, three chromosomes in one cell, and one chromosome in another cell. The child then has 47 instead of the normal 46 chromosomes; when this occurs to chromosome pair "21", the result is mongolism or Down's Syndrome.[19]

Physical Fitness

There have been a few studies in the area of physical

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[18]Lawerence Rarick, Ionel Rapoyort, and Vern Seefeldt, "Bone Development in Down's Disease," American Journal of Diseases of Children Vol. 107, pp. 7-13, 1964.

[19]Thomas E. Jordon, The Mentally Retarded 2nd Ed. (Columbus, Ohio, 1966), p. 250.

fitness of the mentally retarded. It seemed fitting to examine some of these studies.

Sengstock compared normal boys with mentally retarded boys. He concluded that the performance of mentally retarded boys was midway between the mentally age matched normal boys and the chronological age matched normal boys.[20] This would indicate the physical fitness level of the mentally retarded boys is below normal boys of the same age. Haydon determined that the retarded child is four to six years behind the normal child in the development of physical fitness and this difference seems to increase at each age level.[21] He observed that research shows that the mentally retarded boys carry 25 percent and the girls 40 per cent more fat than their non-retarded counterparts.[22]

McGraw indicated that mentally retarded boys involved in physical fitness programs do improve

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[20]Wayne L. Sengstock, "Physical Fitness of Mentally Retarded Boys" AAHPER Research Quarterly 37: 113-120, March, 1966.

[21]Frank J. Hayden, "The Influence of Exercise and Sport Programs on Children with Severe Mental Deficiency (I.Q. under 50)" Paper presented at the First International Congress of Psychology of Sport, Rome Italy, April 20-24, 1965.

[22]Frank J. Hayden, Physical Fitness for the Mentally Retarded 1964, p. 3.

significantly.[23] Therefore, it may be that the program more than physical characteristics of the mentally retarded affect physical fitness.

Flexibility

Fleishman describes Extent Flexibility as the, ability to flex or stretch the trunk and back muscles, as far as possible, in either a forward, lateral, or backward direction using slow stretching movements.[24]

Scott and French suggest a decrease in flexibility during the pre-adolescent growth spurt which might indicate that at this age, there may occur a disproportion of body segments or inelasticity of muscles being stretched by lengthening bones.[25]

A study of Harris suggests that flexibility does not exist as a single general characteristic which suggests that no one test could give a valid indication of flexibility for the individual.[26]

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[23]McGraw, Lynn W. "Motor Ability and Fitness of Institutionalized Mentally Retarded." Abstract of Research Papers 1968 AAHPER, published by AAHPER, 1968, p. 51.

[24]Fleishman, Examiner's Manual for the Basic Fitness Tests (Englewood Cliffs, New Jersey, 1964), p. 4.

[25]Gladys M. Scott and Esther French, Measurement and Evaluation in Physical Education. (Dubuque, Iowa, 1959), p. 315.

[26]Margaret L. Harris, "A Factor Analytic Study of Flexibility", Abstract of Research Paper 1968 AAHPER Convention, published by AAHPER, 1968, p. 80.

DeVries concluded that flexibility can be significantly improved by both static and ballistic methods of training. Therefore, the type of program in which the subject participates may help to determine his level of flexibility.[27]

There is some controversy concerning the effects of body build on flexibility. Scott and Wilson concluded from a study on college women that body build did not affect flexibility socres unduly.[28] However, Wear found that the Sit and Reach Test was significantly related to excess trunk plus arm length over leg length.[29] The relationship of trunk plus arm length to leg length in the ability to perform the Toe Touch test has been studied by one researcher. The results indicated a relationship of reach length to leg length is not an important factor in performance of this test for persons with average body builds. It was indicated, however, that persons with extreme body builds, a longer trunk plus longer arm measurement in relation to shorter legs would have an advantage in the

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[27]Herbert A. DeVries, "Evaluation of Static Stretching Procedures for Improvement of Flexibility" AAHPER Research Quarterly Vol. 33: 222-229, May 1962.

[28]Marjorie Wilson and Gladys A. Scott, "A Study of Flexibility in Relation to Physical Education Activities" unpublished study

[29]C. L. Wear "Relationships of Flexibility Measurements to Length of Body Segments." AAHPER Research Quarterly, Vol. 34: 234-238, May 1963.

performance of the Toe Touch Test.[30] One might conclude then, that flexibility scores could be affected by irregular body proportion.

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[30]M. R. Broer and Naomi R. G. Galles, "Importance of Relationship Between Various Body Movements in Performance of the Toe Touch Test." AAHPER Research Quarterly 29: 253-63, Oct. 1968.

CHAPTER III

METHOD AND PROCEDURE

Description of the Tests

The tests selected were the Toe Touch, Twist and Touch and Abdominal Stretch described by Fleishman,[1] and the Spinal Extension test described by Scott and French.[2] The tests were selected for their ease in administration and variety.

The Toe Touch test measures how far the subject could flex the spine and hip forward without bending the knees. The primary muscle groups being stretched were the hamstrings and the lower back muscles. The measuring scale extended ten inches above and below the top of a bench. The subject stood on the bench with the toes even with the front edge. With knees locked, the subject bent over and reached as far down as possible with his hands. No bobbing was allowed.

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[1] Fleishman, The Structure and Measurement of Physical Fitness. (Englewood Cliffs, N.J., 1964) pp. 77-78

[2] Gladys M. Scott and Esther French, Measurement and Evaluation in Physical Education (Dubuque, Iowa, 1959) p. 316.

Poley[3] obtained a reliability of .93 on this test with sixty-three college students and Magnusson[4] found reliabilities of .70 and .84 for first and sixth grade children respectively. On a sample from grades one through nine Buxton[5] found a reliability coefficient of .95.

The Twist and Touch test is designed to measure how far the subject could rotate the spine. A vertical line was drawn down the wall and extended onto the floor. A horizontal scale extended on either side of the vertical line on the wall and was marked from 0 to 30 inches. The twelve inch mark of the horizontal scale fell directly on the line extending down the wall. The scale was drawn from both right and left sides of the vertical wall line to accomodate preferred hands. The subject was tested for preferred hand (see page 24). The subject stood with his nonpreferred side toward the wall, arms length away, with feet together and toes touching the line extending onto the floor from the vertical line. The subject keeping his feet in place, twisted back around (toward his

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[3]Margaret Poley, "Postural Characteristics of College Women as Related to Build." PhD Dessertation, State Univ. of Iowa, 1948

[4]Lucille Magnusson, el. "The Effect of Specific Activity Program on Children with Low Muscular Fitness" PhD dessertation, State Univ. of Iowa, 1957.

[5]Doris Buxton, "Extension of the Kraus-Weber Test" AAHPER Research Quarterly; Vol. 28, Oct. 1957, p. 210.

preferred side) as far as possible and touched the wall with his preferred hand. The subject kept his hand at shoulder height with the palm facing the floor. The subjects feet were kept stationary by an assistant. The score was the fartherest point on the scale reached and held by the subject for two seconds. Fleishman obtained a reliability coefficient of .90 for this test[6] using "normal" subjects.

The Abdominal Stretch Test was a measure of how far the subject could hyperextend the spine. The subject stood with the front of his body against an iron net standard. A strap was placed around the subject's buttocks and attached to the standard, so that the hips were held firmly against the upright. The standard was anchored to the floor. The subject leaned backward as far as possible. The score was the horizontal distance from the standard to the subject's chin. No reliability scores were available for this test.

The Spinal Extension Test. This test involved back strength, as well as, abdominal extension. The subject lay in a prone position on a mat. The hands were clasped together behind his back. The subject raised his head and shoulders from the mat by arching the upper back. The score was the vertical distance from the suprasternal

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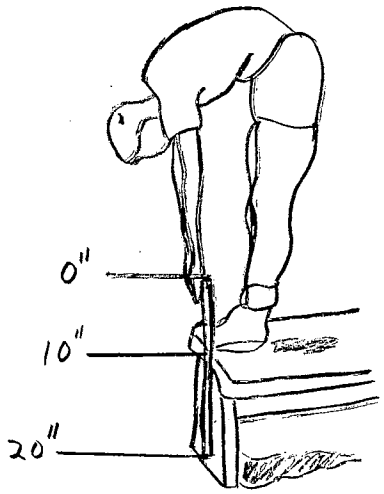
[6]Fleishman, Examiner's Manual for the Basic Fitness Tests (Englewood, Cliffs, New Jersey, 1964), p. 4.



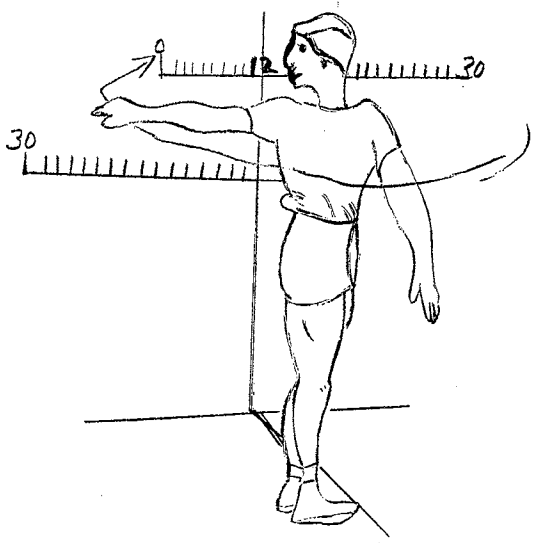


Figure 1. Toe Touch Test

Twist and Touch Test

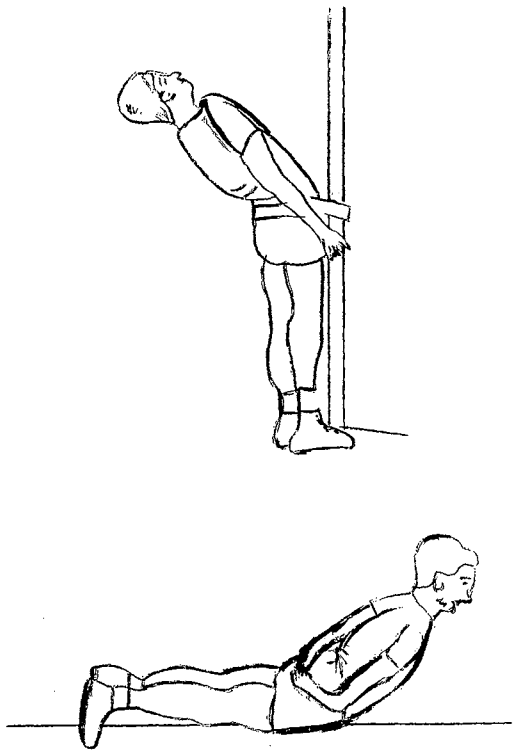


Figure 2. Abdominal Stretch Test

Spinal Extension Test

notch to the mat. The score was taken by placing the string on the suprasternal notch before the subject started to lift and pulling the string taut vertically while the subject was at the top of extension. The string length was measured on a ruler. Poley obtained a reliability coefficient of .87 on sixty three college students for this test.[7]

Procedure

The problem consisted of comparing the flexibility of mongoloid, other mentally retarded and normal children. The first group of forty subjects including mongoloid and other types ofmentally retarded children selected from the Children's Colony in Conway, Arkansas. Twenty normal subjects volunteered for the study from a Conway, Arkansas private school. The group of sixty subjects consisted of thirty girls, ten mongoloid, ten girls with other types of mental retardation and ten normal girls; thirty boys, ten mongoloid, ten with other types ofmental retardation and ten normal boys. The normal subjects were volunteers from physical education classes in the St. Francis junior and senior high school. The two twenty-one year old normal subjects were undergraduates in a college physical education class at Oklahoma State University.

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[7]Margaret Poley, "Postural Characteristics of College Women as Related to Build" PhD Dissertation, State Univ. of Iowa, 1948.

The I. Q. for the mongoloid girls ranged from 16 to 35, and for the mentally retarded girls, I.Q. ranged from 15 to 39. The chronological ages ranged from 11 to 18 years. I.Q. for the mongoloid boys ranged from 13 to 23, and for the mentally retarded boys I.Q. ranged from 19 to 50. The chronological ages of the boys ranged from 14 to 21 years. The mongoloid, mentally retarded and normal groups were matched according to chronological age and sex.

The second group consisted of forty-two subjects from Hissom Memorial Center in Sand Springs, Oklahoma. The subjects consisted of 12 mongoloid and 12 of other types of mentally retarded girls; nine mongoloid boys and nine boys with other types of mental retardation. The I.Q. for the mongoloid girls ranged from 17 to 59, and for the mentally retarded girls I.Q. ranged from 30 to 69. The I.Q. range was 20 to 49 for the mongoloid boys and 18 to 72 for the mentally retarded boys. The chronological ages for the girls ranged from 7 to 18 years and for the boys the chronological ages ranged from 8 to 19 years.

The subjects were tested in their regular gymnasiums as they came in for their scheduled classes. The tests were administered by the author and an assistant employed by the particular institution involved. The assistant helped the subject keep his knees straight and feet in place for the Abdominal Stretch, Toe Touch and Twist and

Touch Tests. For the Twist and Touch Test, the subjects were tested for preferred hand. They were asked to take and pass an object, if the subject consistantly used the same hand, it was assumed that the hand used was his preferred hand. If doubt remained, however the subject was asked to "write" with a pencil. The hand with which he wrote was assumed to be the dominant one.

The subjects were taken in groups of six or fewer, to be tested individually. Each subject was given verbal encouragement and told to do their "very best". This was reinforced by praise after the first trial and they were challenged to do better. Two trials were given on each test and the best of the two trials was accepted.

Treatment of the Data

Dwyer's Single Computational Formula[8] was used to evaluate the difference between the means of the matched groups. The formula is as follows:

$$t^2 = \frac{\Sigma X^2 (N-1)}{N\Sigma X^2 - (\Sigma X)^2} \qquad \text{Where } X = X_1 - X_2$$

$$N = N_1 = N_2$$

The level of confidence selected was .05.

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[8] Dwyer's Single Computational Formula from "Computational Design for Evaluating the Significance of a Difference Between Means", A. T. Slater Hammel, p. 214. AAHPER Research Quarterly, May 1965, p. 212.

Comparisons were made on the subjects within their groups as follows:

The Arkansas Group

The Mongoloid girls were compared to the mentally retarded girls
The Mongoloid girls were compared to the normal girls
The Mentally retarded girls were compared to the normal girls
The Mongoloid boys were compared to the normal boys
The Mentally retarded boys were compared to the normal boys
The Mentally retarded boys were compared to the Mongoloid boys

The Hissom Group

The Mongoloid girls were compared to the mentally retarded girls
The Mongoloid boys were compared to the mentally retarded goys

There was no comparison between the Hissom and Arkansas groups because of the difference in chronological ages. There was no normal sample drawn to match and compare with the Hissom mongoloid and mentally retarded subjects.

CHAPTER IV

RESULTS

Using Dwyer's Single Computational Formula[1] the following t ratios were obtained.

Computations for the Arkansas Group

Mongoloid Girls Compared to Mentally Retarded Girls:

1. The mongoloid girls were significantly superior to the mentally retarded girls with a t ratio of 6.18 on the Toe Touch Test.
2. The mongoloid girls were significantly superior to the mentally retarded girls on the Twist and Touch Test with a t ratio of 7.20.
3. The mongoloid girls were significantly superior to the mentally retarded with a t ratio of 4.68 on the Spinal Extension Test.
4. The t ratio of the Abdominal Stretch Test was not significant at .11 for the

[1] Ibid.

mongoloid girls over the mentally retarded girls.

Mongoloid Girls Compared to Normal Girls:

1. The mongoloid girls were significantly superior to the normal girls with a t ratio of 3.88 on the Toe Touch Test.
2. The t ratio for the Twist and Touch Test of the mongoloid and normal girls was not significant with a result of 1.59 favoring the mongoloid.
3. The Spinal Extension Test was not significant with a t ratio of 1.79 in favor of the mongoloid over the normal girls.
4. The Abdominal Stretch Test was significant with a t ratio of 4.66 with the normal superior to the mongoloid girls.

Mentally Retarded Girls Compared with Normal Girls:

There was no significant t ratio at the five per cent level on any of the tests comparing normal and mentally retarded girls.

1. The t ratio for the Toe Touch Tests was 1.66 for the normal over the mentally retarded girls.
2. The t ratio for the Twist and Touch Test was 2.62 favoring the mentally retarded girls.
3. The t ratio for the Spinal Extension Test

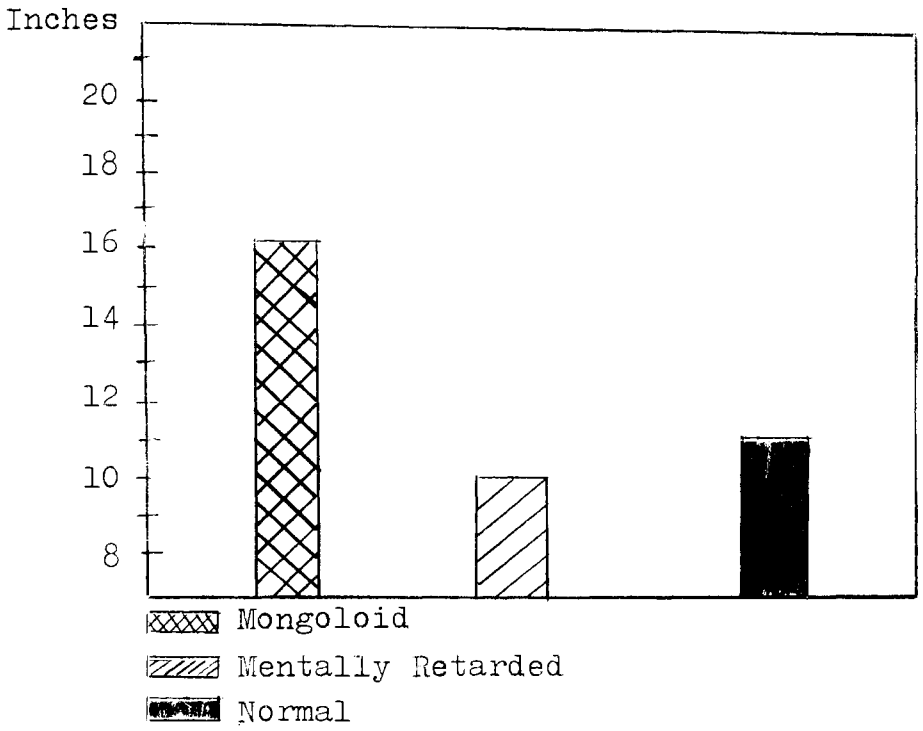

Figure 3. Mean Scores for the Toe Touch Test for Arkansas Girls

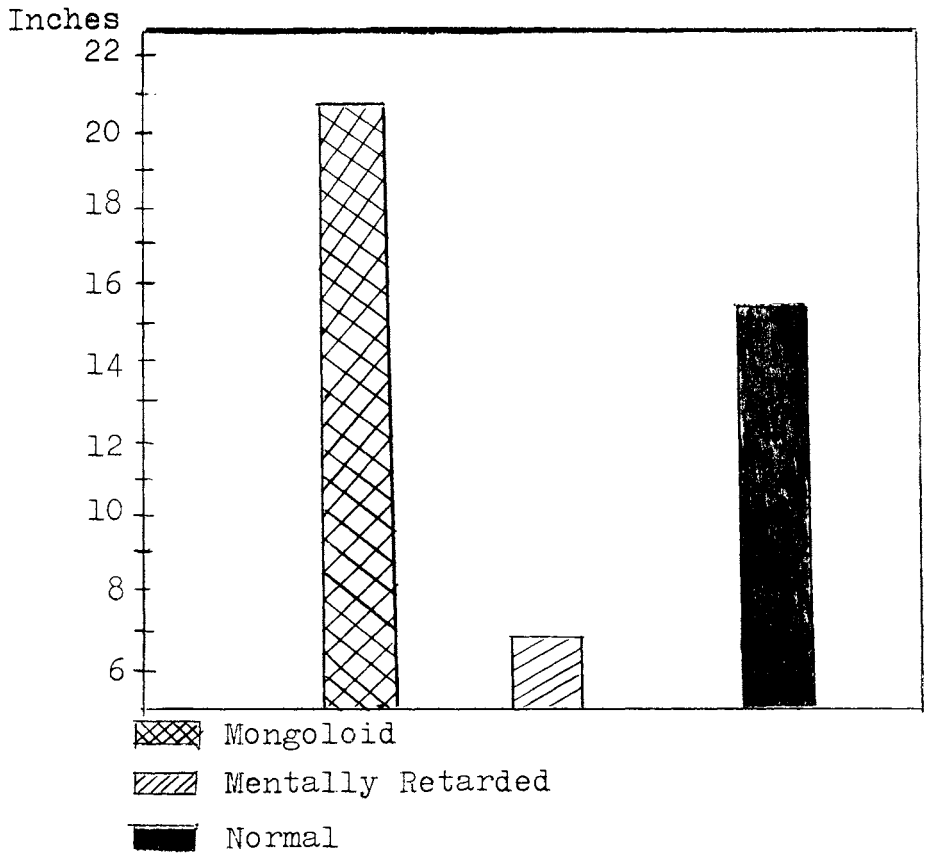

Figure 4. Mean Scores for the Twist and Touch Test for the Arkansas Girls

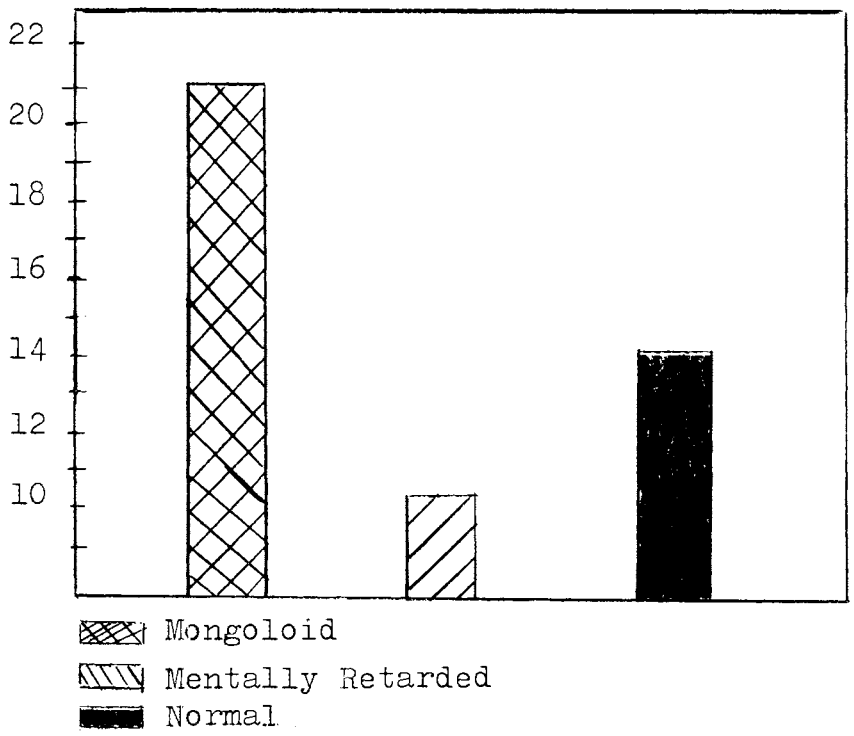

Figure 5. Mean Scores for the Spinal Extension Test for the Arkansas Girls

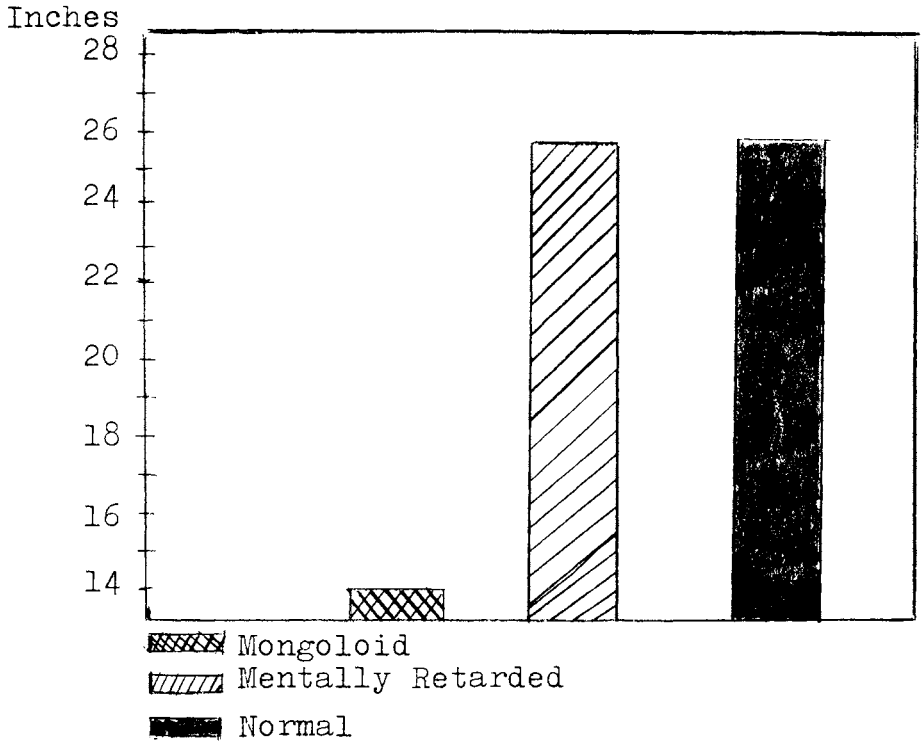

Figure 6. Mean Scores for the Abdominal Stretch Test for the Arkansas Girls

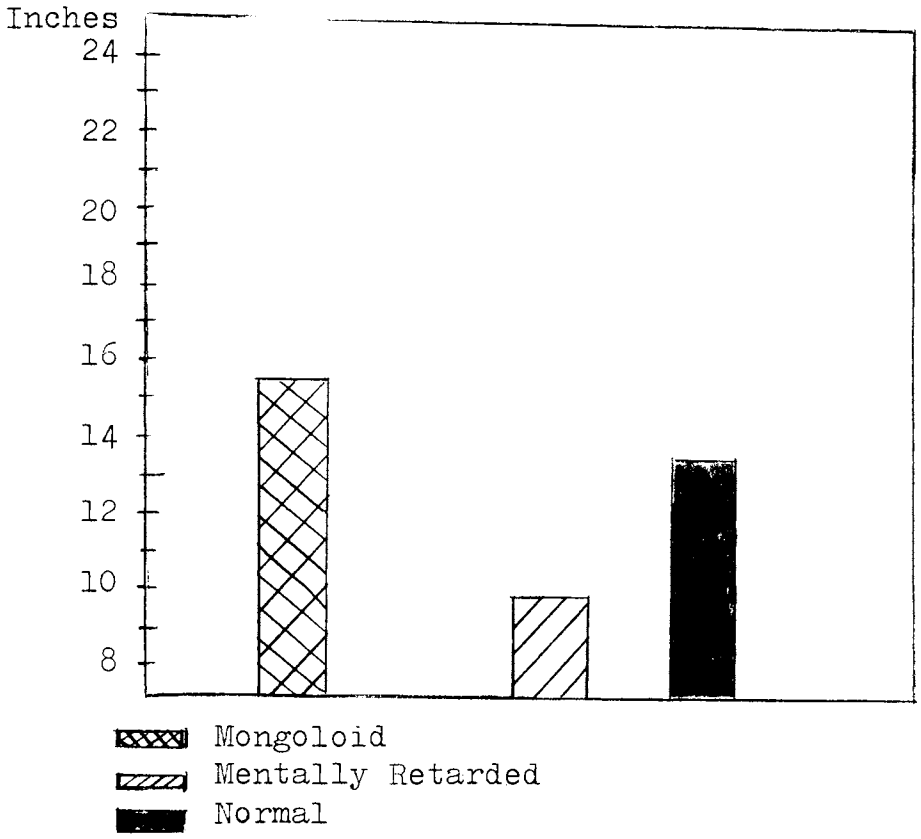

Figure 7. Mean Scores for the Toe Touch Test for the Arkansas Boys

was 1.79 in favor of the normal over the mentally retarded girls.

4. The t ratio for the Abdominal Stretch was .90 for the normal over the mentally retarded girls.

Mongoloid Compared with Mentally Retarded Boys:

1. The t ratio for the Toe Touch Test was significant at 3.10 for the mongoloid boys over the mentally retarded boys.
2. The t ratio for the Twist and Touch Test was not significant at 1.10 in favor of the mongoloid boys.
3. The t ratio for the Spinal Extension Test was significant at 7.21 in favor of the mongoloid boys.
4. The t ratio for the Abdominal Stretch Test was significant at 3.47 for the mentally retarded boys.

Mongoloid Compared with Normal Boys:

There was no significant t ratio on any of the tests comparing normal and mongoloid boys.

1. The t ratio for the Twist and Touch Test was 1.11 for the mongoloid boys over the normal boys.
2. The t ratio for the Spinal Extension Test was 1.25 for the normal boys over the mongoloid boys.

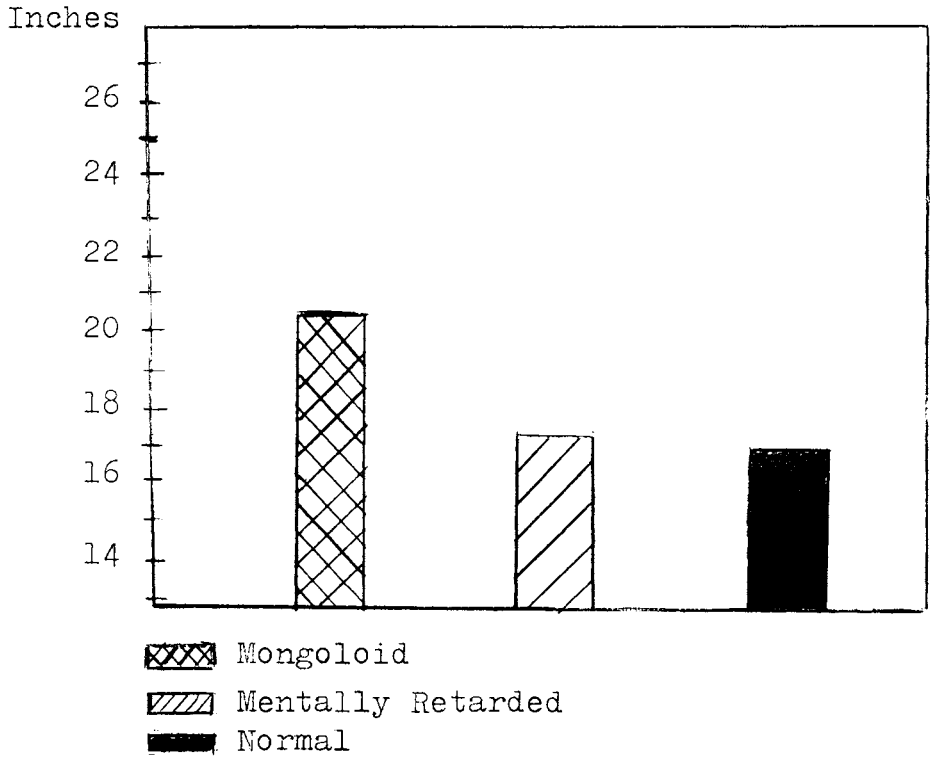

Figure 8. Mean Scores for the Twist and Touch Test for the Arkansas Boys

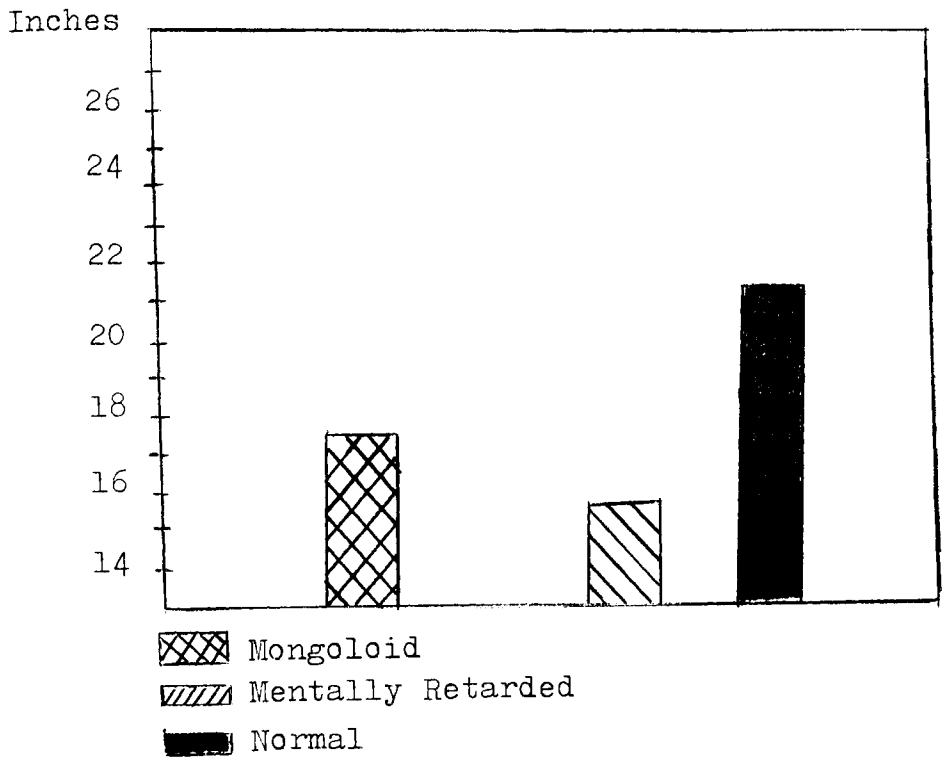

Figure 9. Mean Scores for the Spinal Extension Test for the Arkansas Boys

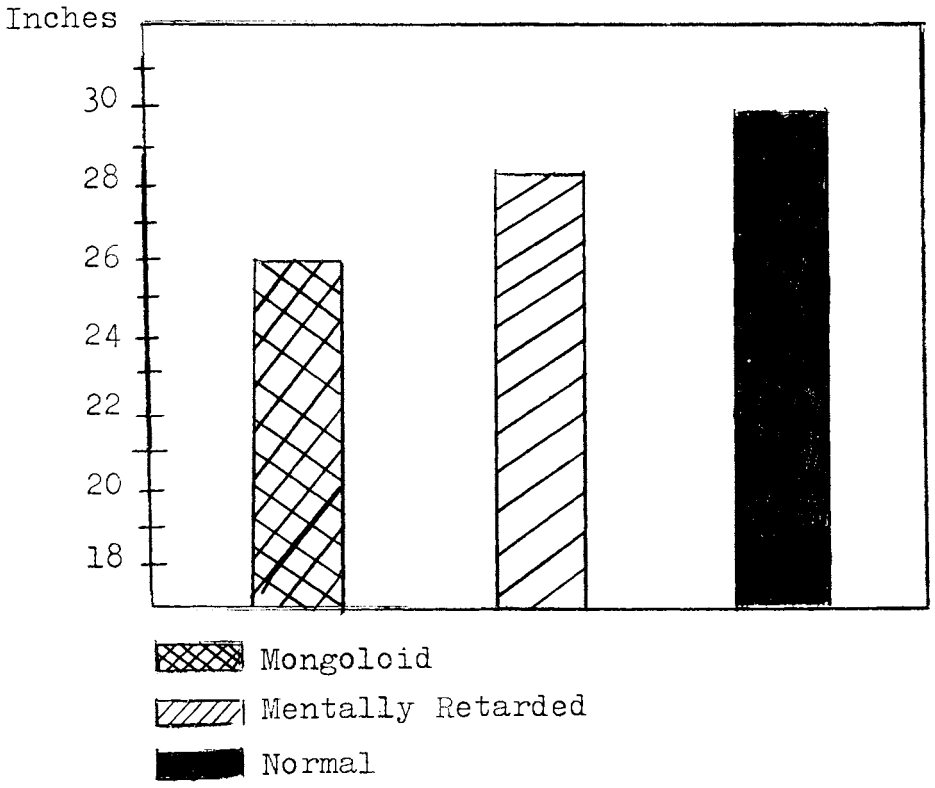

Figure 10. Mean Scores for the Abdominal Stretch Test for the Arkansas Boys

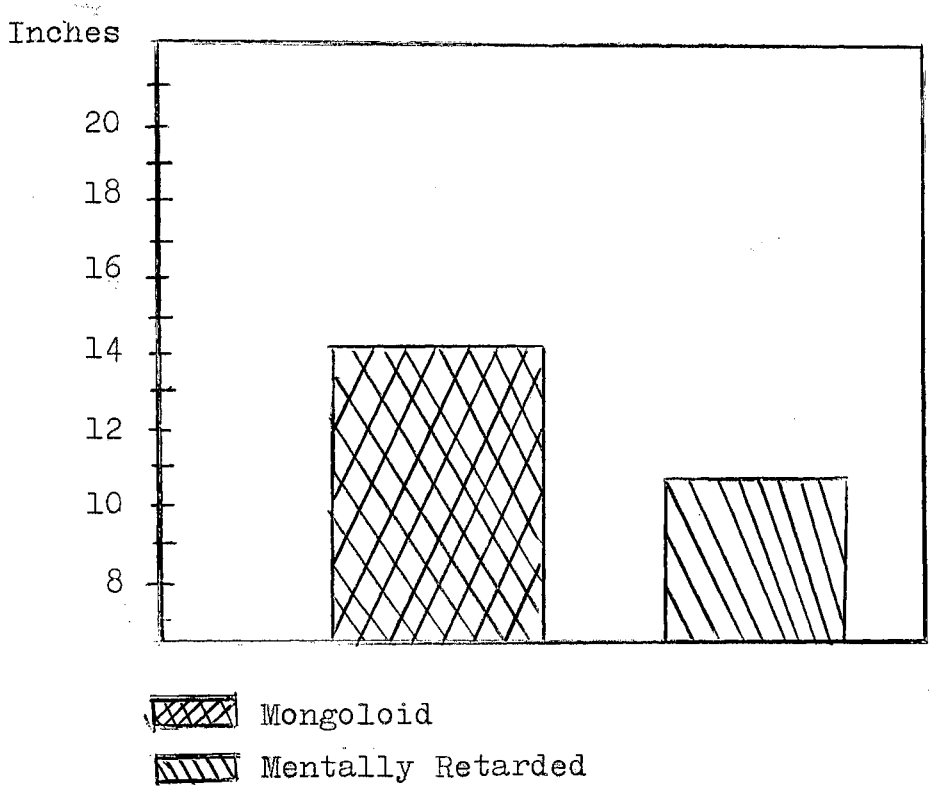

Figure 11. Mean Scores for the Toe Touch Test for the Hissom Girls.

3. The t ratio for the Toe Touch test was 1.29 for the mongoloid boys over the normal boys.
4. The t ratio for the Abdominal Stretch Test was 1.60 for the normal boys over the mongoloid boys.

Mentally Retarded Compared with Normal Boys:

There was no significant t^2 on any of the tests comparing mentally retarded and normal boys. The scores, however, favored the normal boys.

1. The t ratio for the Toe Touch Test was 1.83 for the normal boys over the mentally retarded boys.
2. The t ratio for the Twist and Touch Test was .90 for the normal boys over the mentally retarded boys.
3. The t ratio for the Spinal Extension Test was 1.14 for the normal boys over the mentally retarded boys.
4. The t ratio for the Abdominal Stretch Test was 2.09 for the normal boys over the mentally retarded boys.

Computations for the Hissom Group

Mongoloid Compared with Mentally Retarded Girls

1. The t ratio for the Toe Touch Test was significant at 4.26 for the mongoloid girls over the mentally retarded girls.

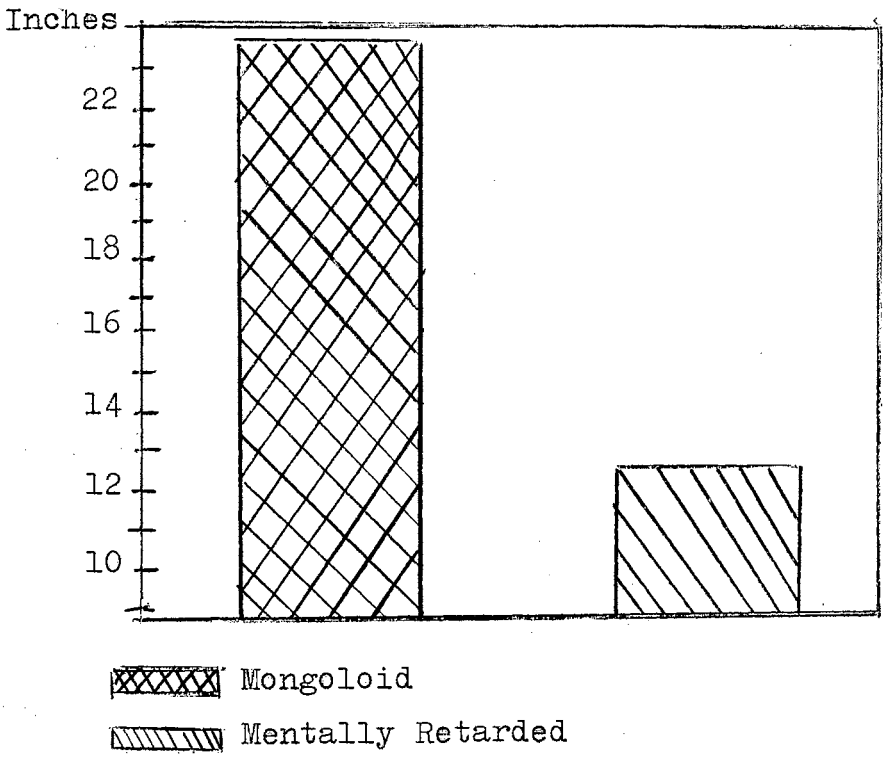

Figure 12. Mean Scores for the Twist and Touch Test for the Hissom Girls

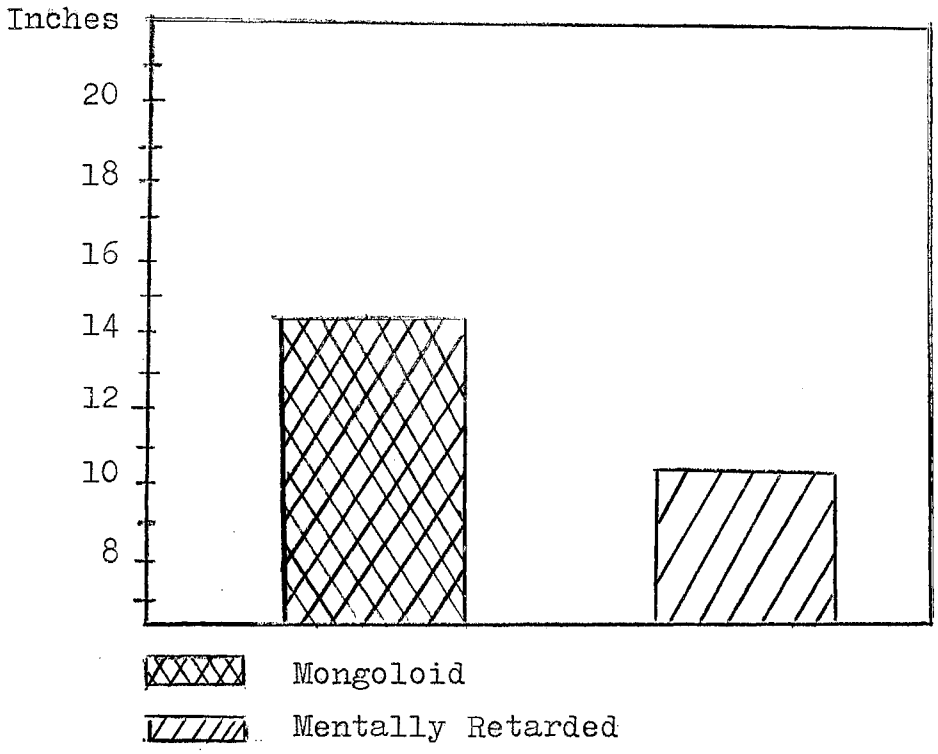

Figure 13. Mean Scores for the Spinal Extension Test for the Hissom Girls

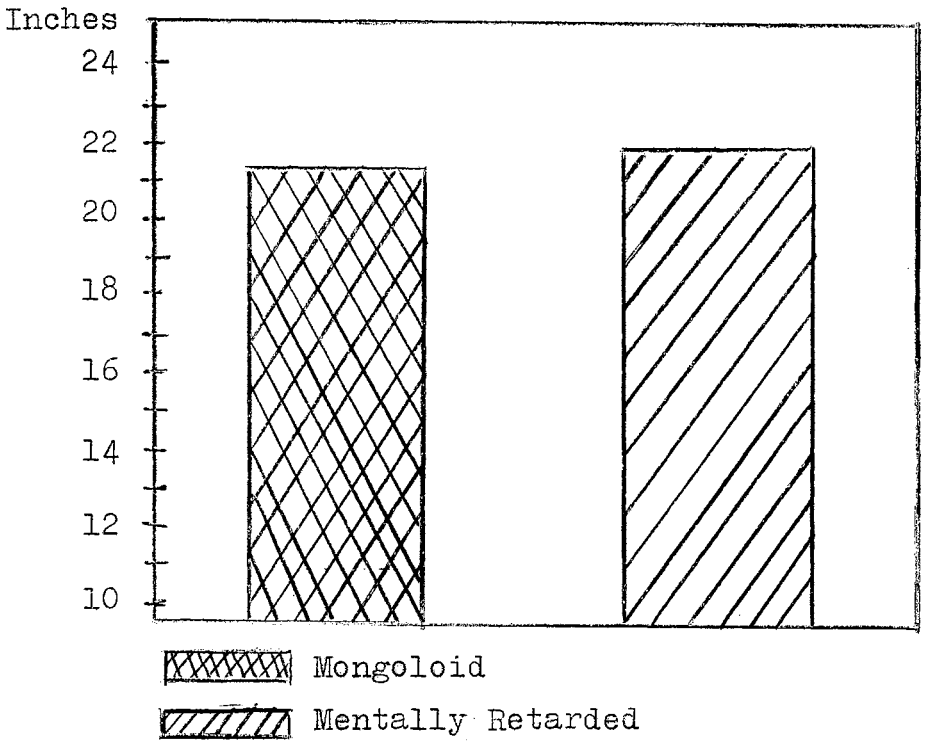

Figure 14. Mean Scores for the Abdominal Stretch Test for the Hissom Girls

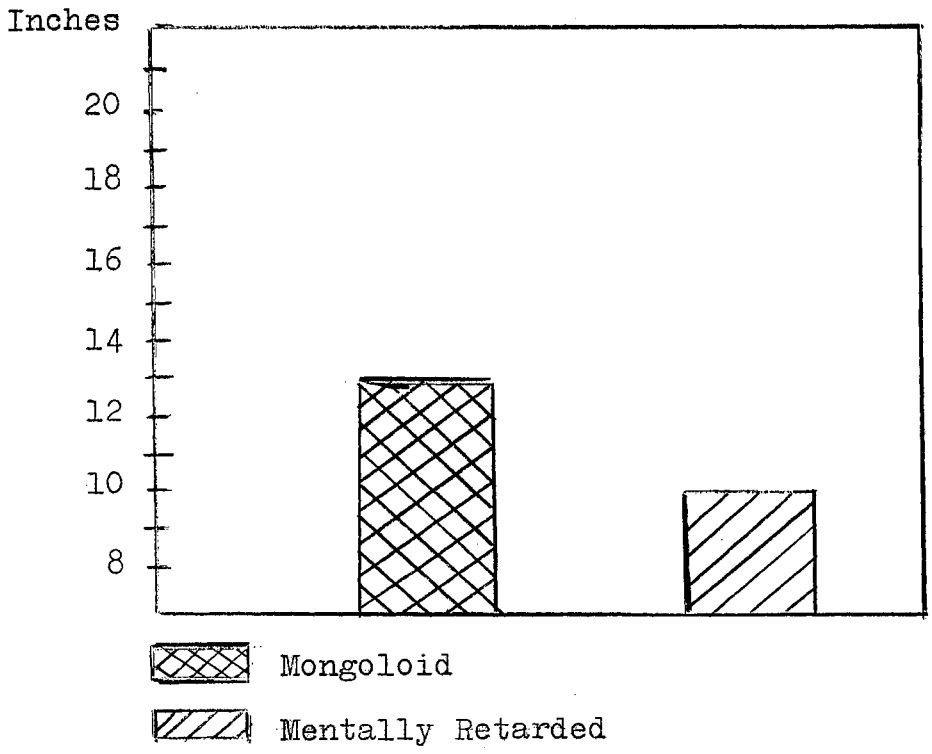

Figure 15. Mean Scores for the Toe Touch Test for the Hissom Boys

2. The t ratio for the Twist and Touch Test was significant at 4.06 with the mongoloid girls superior to the mentally retarded girls.
3. The t ratio for the Spinal Extension test was not significant at 2.46 for the mongoloid girls over the mentally retarded girls.
4. The t ratio for the Abdominal Stretch test was not significant at .92 for the mongoloid girls favoring the mentally retarded girls.

Mongoloid Compared with Mentally Retarded Boys:

1. The t ratio for the Toe Touch Test was not significant at 1.90 for the mongoloid boys.
2. The t ratio for the Twist and Touch Test was not significant at 1.20 for the mongoloid boys over the mentally retarded boys.
3. The t ratio for the Spinal Extension test was significant at 3.96 for the mongoloid boys over the mentally retarded boys.
4. The t ratio for the Abdominal Stretch was significant at 6.10 for the mentally retarded boys over the mongoloid boys.

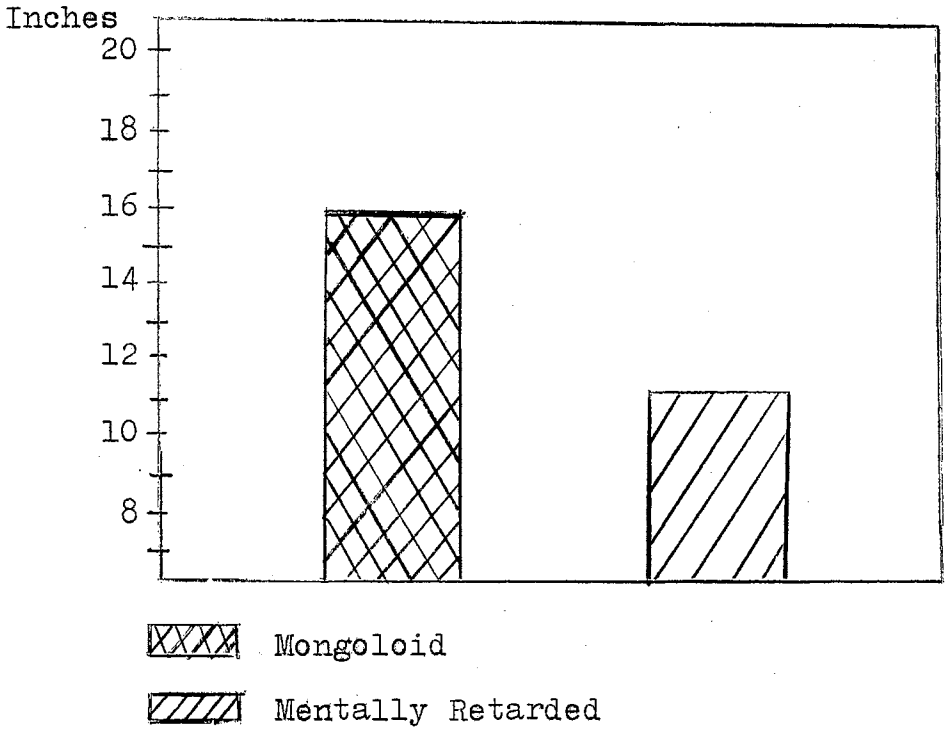

Figure 16. Means Scores for the Twist and Touch Test for the Hissom Boys

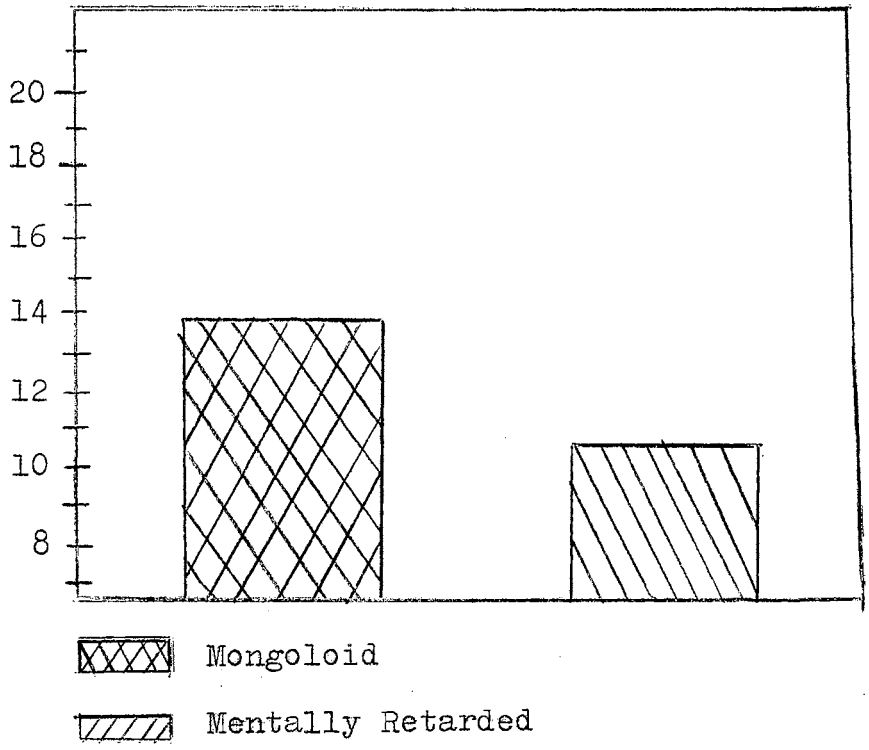

Figure 17. Mean scores for the Spinal Extension Test for the Hissom Boys

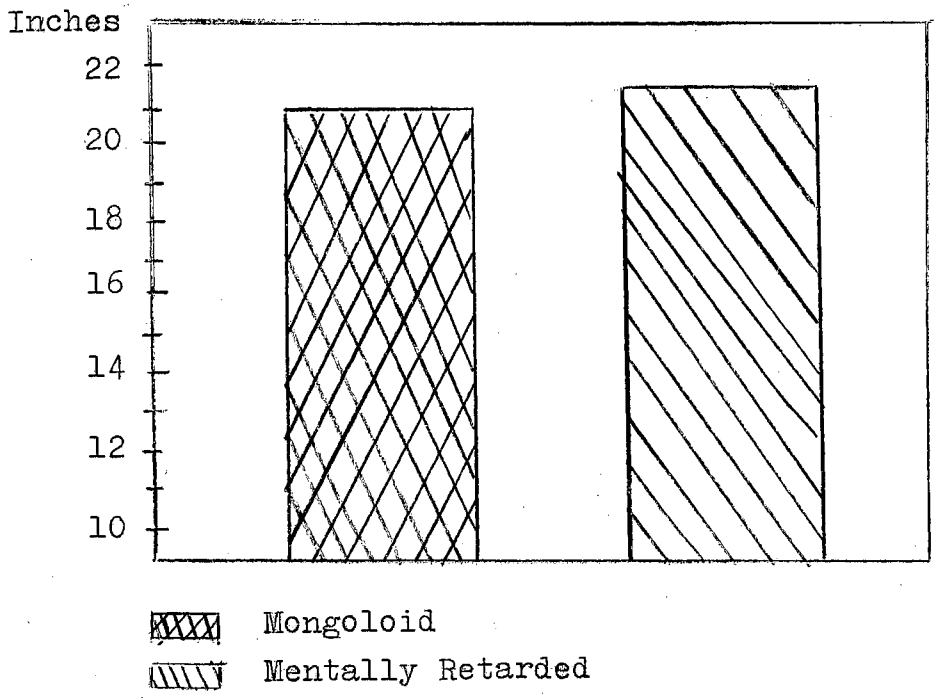

Figure 18. Mean Scores for the Abdominal Stretch Test for the Hissom Boys

TABLE I

MEAN SCORES IN INCHES FOR THE ARKANSAS GROUP

	Toe Touch	Twist and Touch	Abdominal Stretch	Spinal Stretch
Mongoloid Girls	16.15	20.80	14.02	21.00
Mentally Retarded Girls	9.95	6.70	25.60	10.15
Normal Girls	11.05	15.70	25.70	13.90
Mongoloid Boys	15.40	20.45	25.90	17.27
Mentally Retarded Boys	9.80	17.35	28.20	15.27
Normal Boys	13.60	17.05	29.95	21.37

TABLE II

MEAN SCORES IN INCHES FOR THE HISSOM GROUP

	Toe Touch	Twist and Touch	Abdominal Stretch	Spinal Extension
Mongoloid Girls	14.04	23.5	21.80	14.52
Mentally Retarded Girls	10.30	12.30	21.72	10.80
Mongoloid Boys	12.80	15.80	20.80	13.77
Mentally Retarded Boys	9.60	11.00	21.3	10.40

Discussion

The literature suggests that the type of physical activity program in which the individual participate may affect the flexibility scores. With this in mind, it should be pointed out that the Arkansas mentally retarded subjects and the mongoloid subjects participated in the same physical activity program. Yet, from the test results on the mean scores the mongoloid children were superior on 5 out of 8 tests with one being significant to the other mentally retarded and normal children. Whereas the mentally retarded children's mean scores were below the normal subjects on all of the tests of flexibility (none significantly). Of the subjects in the Hissom group, the mongoloid girls mean scores were superior, though not significantly, in all tests over the other mentally retarded girls and the mongoloid boys were superior (one was significant) in three of the four tests.

One of the most interesting observations concerning the results of the two groups on the Abdominal Stretch and Spinal Extension Tests. All mongoloid boys and the Arkansas group of mongoloid girls when compared with normal girls, scored lower on the Abdominal Stretch test than did the other children. But, on the Spinal Extension test, which proposed to measure the same type of flexibility, the mongoloid children except the mongoloid boys from Hissom were

superior in all the comparisons, though not significantly in some cases. This could possibly indicate that the tests do not test the same things. For instance, the Spinal Extension test does require a certain amount of back strength while the Abdominal Stretch test may have required courage for some of the children.

Another factor of notable interest was that the Arkansas mongoloid girls were significantly superior to the other mentally retarded girls on the Spinal Extension Test in their group while on the same test the Hissom Mongoloid girls were not superior to the other mentally retarded girls in their group. And the Arkansas mongoloid boys were significantly superior to the other mentally retarded boys on the Spinal Extension test while the Hissom boys were not. One possible explanation of this result might be participation in different types of physical activity programs. Other variables such as origin from different sections of the country, access to corrective therapy and possibly other factors may have entered into this result.

Some of the literature points out that the mentally retarded are inferior in physical fitness to normal children of the same age. However, in this study on five of eight computations the scores (though not significantly) favored the mongoloid children over the normal children in flexibility. The Toe Touch Test significantly favored

the mongoloid girls over the normal girls. The children with other types of mental retardation, from the same institution as the mongoloid children, tended to score lower on all of the tests than the normal children. None of these were significant.

The reason for the flexibility of the mongoloid is not clear. Some authors have suggested in the literature that irregular body build would give an individual an advantage on a flexibility test. However, in the mongoloid child there is the possibility that his body build would be a disadvantage to him on flexibility tests, since he is characterized as having short, stumpy limbs. Penrose suggested a possible cause of increased flexibility in the mongoloid as a laxness in the joint ligaments.[2]

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[2]L. S. Penrose, The Biology of Mental Defect (London 3rd Ed., 1963), p. 205.

CHAPTER V

SUMMARY AND CONCLUSIONS

This study consisted of a comparison of the flexibility of mongoloid, other types of mentally retarded and normal children. The Arkansas group consisted of forty subjects from the Children's Colony in Conway, Arkansas. The subjects consisted of thirty girls and thirty boys. The Normal Subjects included ten boys and ten girls from a private school in Conway, Arkansas. The chronological ages of the girls ranged from 11 to 18 years, and the chronological ages of the boys ranged from 14 to 21 years.

The second group from Hissom Memorial Center in Sand Springs, Oklahoma consisted of twenty-four girls and eighteen boys. The chronological ages of the girls ranged from 7 to 18 years and for the boys chronological ages ranged from 8 to 19 years.

The subjects were matched according to chronological age and sex within their groups. The tests used were the Toe Touch, Twist and Touch and Abdominal Stretch as described by Fleishman,[1] and the Spinal Extension test

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[1]Fleishman, Edwin A. The Structure and Measurement of Physical Fitness. (Englewood Cliffs, N.J., 1964), pp. 77-78.

described by Scott and French.[2] The tests were administered by the author and an assistant from the particular institution involved.

Dwyers Single Computational Formula[3] was used to evaluate the difference between the means in the matched groups. The selected level of confidence was 5%.

Conclusions

The results of this study would seem to justify the following conclusions for the two groups involved.

Both Groups

1. The mongoloid girls are significantly superior to the mentally retarded girls on the Toe Touch and Twist and Touch Tests.
2. The mongoloid boys are significantly superior to the mentally retarded boys on the Spinal Extension Test.
3. The mentally retarded boys are significantly superior to the mongoloid boys on the Abdominal Stretch Test.

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[2]Gladys M. Scott and Esther French, Measurement and Evaluation in Physical Education (Dubuque, Iowa, 1959), p. 315.

[3]Dwyers Single Computational Formula from "Computational Design for Evaluating the Significance of a Difference Between Means", A. T. Slater Hammel, p. 214, AAHPER Research Quarterly, May 1965, p. 212.

Arkansas Group

1. The mongoloid girls are significantly superior to the normal girls on the Toe Touch Test.
2. The normal girls are significantly superior to the mongoloid girls on the Abdominal Stretch Test.
3. The mongoloid boys are significantly superior to the mentally retarded boys on the Toe Touch Test.
4. The mongoloid girls are significantly superior to the mentally retarded girls on the Spinal Extension Test.
5. There are no significant differences between the mongoloid and normal boys.
6. There are no significant differences in flexibility between the mentally retarded girls and the normal girls.
7. There are no significant differences in flexibility between the mentally retarded boys and the normal boys.
8. The mentally retarded boys were significantly superior to the mongoloid boys on the Abdominal Stretch Test.

Implications and Suggestions for Future Study

The small size of this group makes it impossible to

draw valid inferences for the general population. Research using a large sample might show different results. But since the majority of the tests though not significant showed a predominant trend of the flexibility scores in favor of the mongoloid, further research seems warranted.

Should there be further research in this area, the author would make the following suggestions: The tests selected for the study should eliminate such factors as back strength and fear of falling. It would be preferable to select tests with available norms and to add additional tests to other joints of the body.

The sample should be large enough to include subjects from a cross section of the country to eliminate the possible difference effects of programs.

It would be interesting to match the subjects according to mental age rather than chronological age since the literature shows that the mentally retarded are more near the normal children when matched according to mental age.

A comparison of flexibility between the mongoloid boys and girls might show some significant differences. Should research prove a difference in the flexibility of the mongoloid from other children, norms should be developed for the mongoloid children.

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APPENDIX

TABLE III

RAW SCORES IN INCHES FOR ARKANSAS MONGOLOID GIRLS

Subject	Toe Touch	Twist and Touch	Abdominal Stretch	Spinal Extension	CA
1	14	19	14	17.5	18
2	15.5	16	17.5	11.5	11
3	18	19	22	11	14
4	16	23	11	28.5	13
5	20	21	30.5	11.5	15
6	17	21	18.5	13	14
7	13	20	17.5	11	14
8	14	18	21	11	14
9	19	26	30.5	11.75	13
10	15	20	21	13	14

TABLE IV

RAW SCORES IN INCHES FOR ARKANSAS MONGOLOID BOYS

Subject	Toe Touch	Twist and Touch	Abdominal Stretch	Spinal Extension	CA
1	17	19	32	17	17
2	12	20	25.5	16	14
3	12	18	24	12.5	16
4	14	26	22	19.5	17
5	17	14	24	19.5	15
6	12.5	20	24.75	22.5	21
7	19.5	26.5	30	21.5	17
8	19	22	27	17	17
9	17	26	28.5	16	21
10	14	13	21.5	11.25	14

TABLE V

RAW SCORES IN INCHES FOR THE NORMAL ARKANSAS GIRLS

Subject	Toe Touch	Twist and Touch	Abdominal Stretch	Spinal Extension	CA
1	10.5	18	26.5	15	18
2	10	12	22	10	11
3	5	14	21.5	15	14
4	10.5	14	28.5	15.5	13
5	10	21	32	13.5	15
6	13	14	26	17	14
7	10	16	20.5	15.5	14
8	15	22	29	10.5	14
9	16.5	8	27	10	13
10	10	18	24	17	14

TABLE VI

RAW SCORES IN INCHES FOR THE NORMAL ARKANSAS BOYS

Subject	Toe Touch	Twist and Touch	Abdominal Stretch	Spinal Extension	CA
1	15	21	30	26	17
2	13	24	28	20	14
3	13	14	24	15.5	16
4	14.5	14	30	25.75	17
5	12.5	19	34.5	24.5	15
6	14.5	18	34	13	21
7	15	15	32.5	25	17
8	15	12	28.5	25	17
9	11	15.5	27	12	21
10	13	18	31	27	14

TABLE VII

RAW SCORES IN INCHES FOR THE ARKANSAS MENTALLY RETARDED GIRLS

Subject	Toe Touch	Twist and Touch	Abdominal Stretch	Spinal Extension	CA
1	8	3	18	7	18
2	11	9	23	11	11
3	9	5	24	9.5	14
4	9	15	27	8.5	13
5	9	10	31	9	15
6	13	13	34	11	14
7	7	4	25	9	14
8	11.5	0	26	12	14
9	11	4	24	12.5	13
10	11	4	24	12	14

TABLE VIII

RAW SCORES IN INCHES FOR THE ARKANSAS MENTALLY RETARDED BOYS

Subject	Toe Touch	Twist and Touch	Abdominal Stretch	Spinal Extension	CA
1	6	35	16	30.5	17
2	12	14	23.25	19	14
3	13	18.5	16	31.5	16
4	11	12	14.5	29	17
5	14	18	15	22.25	15
6	10	11	8	24	21
7	10	16	18	31.5	17
8	13	14	18	35	17
9	7	18	12	29.25	21
10	2	17	12	30	14

TABLE IX

RAW SCORES IN INCHES FOR THE HISSOM MONGOLID GIRLS

Subject	Toe Touch	Twist and Touch	Abdominal Stretch	Spinal Extension	CA
1	14	28	16.5	13.25	7
2	13.5	30	20.5	15	10
3	13	30	21.5	14	10
4	12.5	26	25	11.5	16
5	15.5	21.5	25	14	17
6	14	29	25.25	16	13
7	17	15	21	18	18
8	14.5	23	22.5	18	14
9	14	20	17.5	14	11
10	15	19	22.5	11	11
11	14	24	21	18.5	11
12	11.5	17	16	11	12

TABLE X

RAW SCORES IN INCHES FOR THE HISSOM MONGOLOID BOYS

Subject	Toe Touch	Twist and Touch	Abdominal Stretch	Spinal Extension	CA
1	15.5	19	21.5	15.5	13
2	14	14	19.5	12.5	19
3	11	13	26	12.5	14
4	15	6	22	13	13
5	12	23	20	14.5	8
6	13	24	22	16.5	12
7	12.5	18	12	12.5	9
8	12.5	21	24	16	12
9	10	5	21	12	16

TABLE XI

RAW SCORES IN INCHES FOR THE HISSOM MENTALLY RETARDED GIRLS

Subjects	Toe Touch	Twist and Touch	Abdominal Stretch	Spinal Extension	CA
1	12.5	12	20	8.5	7
2	10.5	25	20.5	11.5	10
3	11	20	28	10	10
4	11	18	21	9.5	16
5	8	6	20	9	17
6	10	5	21	8	13
7	11.5	12	32.5	14	18
8	11	12	23.75	13	14
9	7.5	3	21.5	10	11
10	12.5	13	17	9.25	11
11	12	6	14.5	11.5	11
12	6	12	21	15	12

TABLE XII

RAW SCORES IN INCHES FOR THE HISSOM MENTALLY RETARDED BOYS

Subjects	Toe Touch	Twist and Touch	Abdominal Stretch	Spinal Extension	CA
1	11	9	19	8.5	13
2	7	0	25	9.25	19
3	17	12	18	10	14
4	10	15	24	10	13
5	10	12	18	9.5	8
6	7	15	24	12	12
7	13	13	21	10.5	9
8	8.5	9	19	11.75	12
9	10	14	24	12	6

VITA

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