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Signature Christine L. Summefield
Date August 4, 1972
ABILITY OF EDUCABLE MENTALLY RETARDED BOYS
AND GIRLS TO INCREASE FLEXIBILITY

by
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A professional paper submitted to the Graduate Faculty in
partial fulfillment of the requirements for the degree
of
MASTER OF EDUCATION
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Approved:

Head, Major Department

Chairman, Examining Committee

Graduate Dean

MONTANA STATE UNIVERSITY
Bozeman, Montana

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The author would like to express her sincere appreciation for the contributions made to this study by the staff of the Physical Education Department.

I would like to give acknowledgment to Mr. Wallace Forsgren and Helen Howard for their help in procuring subjects.

A special note of thanks is given to Dr. Albert Suvak, Associate Professor in the Education Department, for his help with the computer programming and analysis.

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This study was conducted in order to determine if flexibility training would increase flexibility.

Twelve educable mentally retarded students were divided into two groups, one experimental group and one control. The 12 subjects had an IQ range of 48 to 79 and an age range of 10 to 14. The subjects were from Willson Elementary School, Bozeman, Montana.

The entire study was conducted over a ten-week period. The following three test items were used to determine the effects of the flexibility program: (1) trunk and hip flexion and extension, (2) hip flexion and extension, and (3) sideward trunk and hip flexion and extension.

The investigator found it possible to accept the hypothesis. There would be an increase in flexibility of the subjects directly related to the flexibility training program.
Chapter 1

INTRODUCTION

In the United States alone, the 1970 estimate of mentally retarded under the age of twenty-one was 2,720,000. This was an increase of 540,000 over the last ten years.

In early history, abnormal children were either destroyed or were made fools, jesters, and entertainers for the aristocrats of the times.

Until recently, little had been done for the mentally retarded individuals. With the establishment of the Kennedy Foundation for Mental Retardation, the retarded child has come into view as a person who needs help and acceptance to advance to his fullest potential.

Because of proper preparation of the mentally retarded and the community, the mentally retarded have now been generally accepted as functional citizens.

Statement of the Problem

General problem. The problem of this study was to determine the effects of a ten-week flexibility program on six educable mentally retarded students.

Specific problem. Specific problems were:

1. To determine the effects of a ten-week flexibility program on each subjects' flexibility.
2. To determine the effects of a ten-week flexibility program on the following: (a) hip flexion and extension, (b) trunk and hip flexion and extension, and (c) sideward trunk and hip flexion.

Delimitations

This study was delimited to: (1) twelve special education students enrolled at Willson Elementary School, Bozeman, Montana, (2) March 25 through May 29 of 1970, (3) IQ range of 48 to 79, (4) age range of 10 to 14, and (5) the effects of flexibility training on each subject before and after training.

Definitions

Mental retardation. "Subaverage general intellectual functioning which originated during the developmental period and is associated with impairment of adaptive behavior."^1

Educable mentally retarded. This includes two groups:

1. Mild retarded, IQ 52-68 some degree of educability in terms of reading and writing; is educable in the area of social and occupational competence.

2. Borderline retarded, IQ 68-84 it is difficult to classify this type of child; usually he is capable of competing with most children in activities other than academic; some of these children are placed in special classes while the majority remain in regular

classes in the public schools; many of the children in this category come from culturally deprived areas.\textsuperscript{2}

Flexibility. "Range of movement possible in any given joint."\textsuperscript{3}

Justification of the Study

The establishment of basic concepts in the area of physical activity and its relationship to the mentally retarded need to be developed.

It was established by Leighton that the normal child had the ability to increase flexibility with training.\textsuperscript{4} Harvey also stated that stretching exercises of any type might significantly improve toe touching ability.\textsuperscript{5} All of the previous studies which the investigator had found were conducted with normal children. Few studies have indicated whether the educable mentally retarded child with training had the ability to increase his flexibility.

\textsuperscript{2}Ibid., p. 264.


The purpose of this study was to establish whether educable mentally retarded children could improve their flexibility. Thus, greater significance might be used in comparing the educable mentally retarded child with the normal child in the area of flexibility. Auxter compared normal boys with educable mentally retarded in the area of flexibility and found the mentally retarded inferior in some areas of flexibility. The investigator felt that Auxter's findings might have been due to lack of physical activity rather than mental capacity.

Research Method

Testing procedures. Twelve educable mentally retarded students were divided into two even numerical groups, experimental and control.

The experimental group met for thirty minutes twice a week for ten weeks. A pretest was administered the first day of the ten weeks, and a posttest was administered the last day of the ten weeks. For standardization, the students were not permitted any muscular warmup before the pretest and posttest. During the ten weeks, one period each week, or a total of four and one-half hours, was devoted to flexibility exercises and games. The other four and one-half hours were devoted to flexibility exercises and tumbling, which included forward rolls, backward rolls, handstands, cartwheels, and back bends.

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Each subject in the control group was required to participate in the specific flexibility pretest at the beginning of the ten-week period and a posttest at the end of the ten weeks. During the ten-week period, the control group participated in their daily activities without any specific program. The control group was compared to the experimental group to observe if everyday activities would increase flexibility.

Pilot Study

Two male mentally retarded students from A. J. Woods School, Casper, Wyoming, were used for the pilot study.

The pilot study determined what type of flexibility test to adopt. The determining factor was the ease at which these skills could be performed after a verbal and visual explanation. The following three test items were selected from Leighton's Flexibility Tests: (1) trunk and hip flexion and extension, (2) hip flexion and extension, and (3) sideward trunk and hip flexion and extension. 7

Common faults found in performing the test items were: (1) forward flexion at the waist in sideward trunk and hip flexion and extension, (2) feet spread, and (3) knees flexed.

---

Population

Twelve educable mentally retarded students from Willson Elementary School, Bozeman, Montana, were selected as subjects. Six of the students were randomly picked to participate in the experimental group. The IQ range of the entire group was from 48 to 79, and age range was ten to fourteen years.

Data Collection

This investigator collected the needed data on March 25 and 27 for the pretest and on May 27 and 29 for the posttest. The data was collected at Willson Elementary School, Bozeman, Montana.

Tools that were used to test the subjects were Leighton's flexion and extension test and flexometer. The reliability coefficient of these tests ranged from .889 to .997. Specific tests that were used were: (1) trunk and hip flexion and extension, (2) hip flexion and extension, and (3) sideward trunk and hip flexion and extension.

Flexometer - The flexometer consists of a weighted 360-degree dial and a weighted pointer mounted in a case about four and one-half inches in diameter. The case is secured to the body segments by a strap. In the operating position, the dial and pointer coincide and point upward. Separate locking devices are provided,

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and the dial is locked in place when the segment is in position to begin a test action. The pointer may be locked in the point of finished movement.  

Hypothesis

There will be an increase in flexibility of the subjects directly related to the flexibility training program.

\[10\] Ibid.
Chapter 2

REVIEW OF RELATED LITERATURE

Previous studies have been conducted in the area of flexibility. The following studies have compared normal with mentally retarded, normal with normal, and normal boys with normal girls. The studies also indicate that the normal child has the ability to increase flexibility when trained. Studies indicate that age plays a part in flexibility and that ballistic or static stretching exercises have the same ability to increase flexibility.

Mentally Retarded Compared to Normal

Glanville and Kreezer found that the educable mentally retarded are not as flexible as the normal individual when matched in height, weight, and age. They found the older the subjects, the greater the difference in flexibility between the educable mentally retarded and the normal subject, with the normal subject having the greater range of motion. Sometime during the developmental period, the mentally retarded child stops developing in the same manner a normal person does. They found in previous work that mongoloids have a greater joint range of motion than a regular mentally retarded child.¹

Auxter, in a study comparing the flexibility of a normal group of boys with a group of mentally retarded boys, did not find a great

difference in flexibility in the area of trunk flexion and extension, but found a noticeable difference in comparing ankle flexion and extension.  

Mentally Retarded

When Brown administered the Kraus-Weber test, which has a flexibility portion, to trainable mentally retarded, he found that flexibility ranked second in failure for the mentally retarded. He also found that trainable mentally retarded girls were more flexible than the trainable mentally retarded boys. Brown stated that a physical education program might improve the scores for trainable mentally retarded on the Kraus-Weber test. He also stated that children who participate in physical education activities failed fewer tests than children who did not participate in physical education activities.

Ability of Normal Children to Improve Flexibility

In Bosco's study, there were ninety-five normal subjects, divided into four groups: beginners, advanced beginners, intermediates, and advanced. The subjects participated in a gymnastics program for

---


twelve weeks. The subjects met one to three hours a week with ten minutes of rapid warm-up and the remainder of the time was involved with gymnastics activities. He found the greatest number of failures (inability to touch the floor and hold it for three seconds) in the entire test to be in the beginners group who had only completed one twelve-week program. The only other failure was in the intermediate group.

It was pointed out that the twelve year old age group had previously rated last in flexibility when Kraus-Weber and researchers from Indiana University administered the test. However, in Bosco's study, the twelve year olds were not rated last in flexibility.⁴

Shaffer, in her study, found that a semester program of conditioning exercises based on physiological needs produces rapid gains in strength and flexibility. Most of the normal female subjects had never participated in a scheduled physical education class before the experiment; but after a semester, they matched the European children's rate of success in passing the Kraus-Weber test. One of the conclusions drawn from this report was that greater height and weight does not affect the outcome of flexibility.⁵


Leighton's study revealed that a program of exercise to increase flexibility administered over an eight-week period increased flexibility in twenty-seven of his thirty test items. He also found normal boys in the age range of ten through eighteen decreased in flexibility from the age of ten to sixteen. He feels that flexibility varies more with the habituated activity pattern of the subjects than with their age.  

Shaffer found most normal children who had permissive games programs based entirely on learning and playing games and those who do not have physical education class during pre-pubital and adolescent periods of rapid growth fall below the clinical standard for minimum muscular fitness and this increases with time. Shaffer worked with her students twice a week for two semesters and had a two percent failure on the Kraus-Weber test compared with sixty percent nationwide failure. She was stressing the need for formal work, not permissible games.  

Francis found in his study of motor ability of the educable mentally retarded that the retarded child was similar in motor ability to the normal child but at a lower level. The retarded child benefited

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from the same type of exercise a normal child did but required a
patient instructor to assist in his achievement.8

Age and Sex Relationship to Flexibility

Buxton found in her study of reaching the toes or beyond that
girls were more flexible than boys; and, at the age of twelve, both
boys and girls were at their peak of inflexibility. She also found
warmup improves flexibility.9

A study conducted by Hupprich indicated that girls up to the
age of twelve increased in flexibility but declined thereafter.10

Gurewitch found in a mixed group of normal subjects a decline
from age seven to seventeen in flexibility, with an increase from six¬
teen to eighteen. Studies indicated that interest in physical activity
related positively to flexibility tests.11

8R. J. Francis and G. L. Rarick, Motor Characteristics of
1960).

9Doris Buxton, "Extension of the Kraus-Weber Test," Research
Quarterly, XXVIII, 3 (October, 1957), pp. 210-17.

10Florence L. Hupprich and Peter O. Sigerseth, "The Specificity
of Flexibility in Girls," Research Quarterly, XXI, 1 (March, 1950),
pp. 25-30.

11A. D. Gurewitch and Margaret O'Neil, "Flexibility of Healthy
Kendall and Kendall also found that at the age of twelve fewer subjects could touch their toes while in a sitting position.¹²

Types of Exercises

DeVries compared the use of two types of exercises, static stretching and ballistic. Static stretching exercises were performed by holding a position without movement. The other was ballistic which involved quick jerks and pulls upon the body segments. The subjects in DeVries' research met for seven 33-minute periods. DeVries found that flexibility can be significantly improved by both static and ballistic exercises.¹³


Chapter 3

ANALYSIS OF DATA

In trunk and hip flexion and extension, the subject started in a standing position with his feet together, knees extended and arms extended with his hands clasp overhead. The strap was fastened around the chest at nipple height with the flexometer either on the right or left side just below the axillary space. The students were instructed to keep their knees extended with the plantar surface of their feet in contact with the floor at all times. The first movement was a hyperextension of the trunk as far as possible and the dial was locked. The subject was then instructed to flex the trunk as far forward as possible. The pointer was then locked in place, the subject relaxed, and a reading was recorded.

Hip flexion and extension also began in a standing position, with the feet together, knees extended, and the arms extended overhead with the hands clasp. The flexometer was fastened on either the right or left side with the strap and flexometer at the same height as the umbilicus. The subject was instructed not to flex his knees, move his feet, or permit his heels or toes to rise from the floor at anytime during the test. The subject then hyperextended his trunk as far as possible and the dial was locked in place. The subject was then instructed to flex the trunk as far forward as possible. The pointer was locked in place and the subject relaxed and a reading was recorded.
Sideward trunk and hip flexion and extension begins with the subjects in a standing position, feet together, knees extended, and the arms at the sides. The flexometer was positioned in the center of the back at nipple height. The plantar surface of both feet should remain on the floor at all times, and the knees should be extended. The subject was required to flex laterally. The subject was allowed to hyperextend the trunk but not flexion. The subject flexed to the left as far as possible, and the dial was locked in place. The subject then flexed as far as possible to the right, and the pointer was locked in place. The subject relaxed and the reading was recorded.

The statistical results were programmed into the Sigma VII Computer at Montana State University, Bozeman, Montana. The data was collected by the investigator and recorded on score cards for each subject. (See Appendix) The computer program was designed with the assistance of Dr. Albert Suvak. The cards were programmed into the computer by the staff at the Computer Center.

The data was programmed to determine if the statistics were significant at the .05 level of confidence. This signifies that the results obtained would be identical ninety-five out of one hundred trials.

The pretest, posttest, and the difference between the two tests for the experimental group are presented in Table 1, page 17. The pretest, posttest, and the differences between the two tests for the con-
The means, standard deviations, and T-tests for the three flexibility tests for both groups as computed by the Sigma VII Computer are given in Table 3, page 19. The T-test score for trunk and hip flexion and extension was 3.979, which was above the needed 2.228 and, therefore, was significant at the .05 level of confidence. The T-test score for hip flexion and extension was 3.884, which was also above the needed 2.228 and, therefore, was significant at the .05 level of confidence. T-test score for side-ward trunk and hip flexion was 4.019, which was also above the needed 2.228 and, therefore, was also significant at the .05 level of confidence. From the data obtained, the hypothesis which stated there would be an increase in flexibility of the experimental group directly related to the flexibility training program can be accepted at the .05 level of significance.
Table 1
Pretest, Posttest, and Difference of the Two for the Experimental Group

<table>
<thead>
<tr>
<th>Test</th>
<th>Subject</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Difference</th>
</tr>
</thead>
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<td>Trunk and hip</td>
<td>1</td>
<td>125</td>
<td>155</td>
<td>+ 30</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>138</td>
<td>145</td>
<td>+ 17</td>
</tr>
<tr>
<td>flexion</td>
<td>3</td>
<td>148</td>
<td>175</td>
<td>+ 27</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>125</td>
<td>153</td>
<td>+ 28</td>
</tr>
<tr>
<td>and extension</td>
<td>5</td>
<td>155</td>
<td>167</td>
<td>+ 12</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>180</td>
<td>185</td>
<td>+ 5</td>
</tr>
<tr>
<td>Hip flexion</td>
<td>1</td>
<td>97</td>
<td>135</td>
<td>+ 38</td>
</tr>
<tr>
<td>and</td>
<td>2</td>
<td>103</td>
<td>118</td>
<td>+ 15</td>
</tr>
<tr>
<td>extension</td>
<td>3</td>
<td>123</td>
<td>120</td>
<td>- 3</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>87</td>
<td>98</td>
<td>+ 12</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>121</td>
<td>125</td>
<td>+ 4</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>136</td>
<td>145</td>
<td>+ 9</td>
</tr>
<tr>
<td>Sideward trunk and</td>
<td>1</td>
<td>22</td>
<td>80</td>
<td>+ 58</td>
</tr>
<tr>
<td>hip flexion</td>
<td>2</td>
<td>30</td>
<td>85</td>
<td>+ 55</td>
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<td>and</td>
<td>3</td>
<td>34</td>
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<td>+ 76</td>
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<td>extension</td>
<td>4</td>
<td>24</td>
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<td>+ 66</td>
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<td>6</td>
<td>50</td>
<td>140</td>
<td>+ 90</td>
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Table 2
Pretest, Posttest, and Difference of the Two for the Control Group

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<th>Pretest</th>
<th>Posttest</th>
<th>Difference</th>
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<tr>
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<td>1</td>
<td>134</td>
<td>125</td>
<td>- 9</td>
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<td></td>
<td>2</td>
<td>173</td>
<td>165</td>
<td>- 8</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>105</td>
<td>110</td>
<td>+ 5</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>175</td>
<td>140</td>
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<td>105</td>
<td>105</td>
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<td>Hip flexion and extension</td>
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<td>156</td>
<td>100</td>
<td>- 56</td>
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<td>6</td>
<td>109</td>
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<td>- 9</td>
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<tr>
<td>Sideward trunk and hip flexion</td>
<td>1</td>
<td>19</td>
<td>55</td>
<td>+ 36</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>60</td>
<td>120</td>
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<td>3</td>
<td>29</td>
<td>40</td>
<td>+ 11</td>
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<td>4</td>
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<td>+ 11</td>
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<td>20</td>
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<td>+ 25</td>
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<tr>
<td></td>
<td>6</td>
<td>96</td>
<td>80</td>
<td>- 16</td>
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Table 3
Mean, Standard Deviation, and T-test for Three Tests of Flexibility

<table>
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<th>Mean</th>
<th>S.D.</th>
<th>T-test</th>
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<tbody>
<tr>
<td>Trunk and hip flexion</td>
<td>Experimental</td>
<td>19.83</td>
<td>9.22</td>
<td>3.97</td>
</tr>
<tr>
<td>and extension</td>
<td>control</td>
<td>-7.00</td>
<td>13.69</td>
<td></td>
</tr>
<tr>
<td>Hip flexion</td>
<td>Experimental</td>
<td>12.50</td>
<td>12.78</td>
<td>3.88</td>
</tr>
<tr>
<td>and extension</td>
<td>control</td>
<td>-25.00</td>
<td>19.89</td>
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<td>Experimental</td>
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<td>13.64</td>
<td>4.01</td>
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<tr>
<td>and extension</td>
<td>control</td>
<td>21.16</td>
<td>23.56</td>
<td></td>
</tr>
</tbody>
</table>
Summary

This study was designed to determine the effects of a ten-week flexibility program on six educable mentally retarded students. There were twelve subjects involved with an IQ range of 48 to 79 and age range from ten to fourteen. The subjects completed the following three flexibility test items designed by Leighton: (1) hip flexion and extension, (2) trunk and hip flexion and extension, and (3) sideward trunk and hip flexion and extension.

This investigator found it possible to accept the hypothesis. There was an increase in flexibility of the subjects directly related to the flexibility training program. The T-test scores were 3.98 for trunk and hip flexion and extension, 3.88 for hip flexion and extension, and 4.02 for sideward trunk and hip flexion and extension. In order to be significant at the .05 level, the scores had to be greater than 2.228.

Conclusion

An analysis of the results from the Sigma VII Computer made it possible to conclude that:

1. The experimental group had a T-test score on trunk and hip flexion and extension that was significantly higher than the control group.
2. The experimental group had a T-test score on hip flexion and extension that was significantly higher than the control group.

3. The experimental group had a T-test score on sideward trunk and hip flexion that was significantly higher than the control group.

4. From this study it appears that educable mentally retarded can increase flexibility with training.

Recommendations

The following are this investigator's recommendations for future similar studies:

1. This same type of study should be conducted with trainable mentally retarded subjects.

2. There should be a flexibility training program to include mentally retarded, as well as normal subjects, to observe the difference in time and ability to increase flexibility.

3. There should be further studies to discover when mentally retarded subjects reach their high and low points of flexibility in relation to chronological and mental age.

4. There should be further studies to determine if the flexibility of mentally retarded subjects has any relationship to body weight or size in height.
LITERATURE CITED
LITERATURE CITED

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APPENDIX