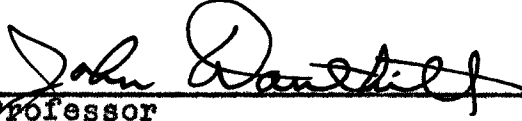




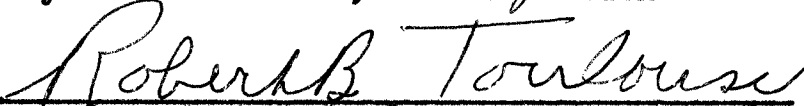
THE EFFECT OF THE VERTICAL PEG BOARD ON THE PERFORMANCE
OF PULL-UPS BY ELEMENTARY-SCHOOL BOYS

APPROVED:


Major Professor


Minor Professor


Director of the Department of Health,
Physical Education, and Recreation


Dean of Graduate School

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OF PULL-UPS BY ELEMENTARY-SCHOOL BOYS

THESIS

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Gloria J. Fox, B. S.

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CHAPTER I

INTRODUCTION

Total fitness is the ability to meet and cope with the stresses and interactions of life. Part of this total fitness is strength. The individual's strength is considered the capacity to exert muscular force. Since the beginning of time, physical strength has been one of the important factors for man's survival. In these modern times, there has been less requirement for the use of arm strength in an individual's daily activities. To develop and maintain strength, special programs such as rope climbing, ladderwork, weight lifting, obstacle courses and the use of many other types of ^{equipment} ~~apparatus~~ have been utilized.

This emphasis on programs to develop physical fitness received impetus from a research report published in December, 1953. The report, by Hans Kraus and Ruth Hirschland (3), contained information concerning the physical fitness of American youth compared to the fitness levels of youth from other nations. American youth did not compare favorably with the European youth on some of the specific test items. Additional studies conducted in this country produced similar results. The reaction of the public to this comparison of fitness levels prompted President Dwight D.

Eisenhower to create in 1956 the President's Council on Youth Fitness, with Shane McCarthy as executive director (5, p. 35). Almost immediately the American Association for Health, Physical Education, and Recreation began development of a national program for physical fitness. This program included the AAHPER Youth Fitness Test (1). One of the items selected for the test battery by the AAHPER Research Council was the ^{post} pull-up. This test is concerned with the strength of the arm and shoulder girdle.

To develop fitness, new equipment has been invented and some of the old has been changed and is being used for the first time in years by all students and not by just a few well-trained athletes. One such ^{method developed by} piece of equipment is ^{vertical} the ~~vertical~~ peg board. ~~The~~ ^{peg} board is advertised as a builder of muscle, with special emphasis on the biceps, forearm, back, chest and stomach. ^{Frank Griffin, 1922} It was originated by Frank Griffin, former Director of Physical Education at Sequoia Union High School, Redwood City, California, and was used by him in his physical education classes. Stan LeProtti (4), former teacher at Sequoia Union High School, now Associate Professor of Physical Education at Western Washington State College, Bellingham, Washington, used the peg board in the first fitness program at the La Sierra High School, Carmichael, California. The peg board is still used in this nationally renowned fitness program.

It was felt that some type of ~~apparatus~~ ^{weight program} was needed to motivate pupils in the elementary school physical education program to practice exercises for the development of arm strength. To boys ages ~~ten through thirteen~~ ¹³, practicing ~~pull-ups~~ ^{PUSH-UPS} seemed to be a boring, non-sociable activity. In an attempt to motivate pupils to practice the skills that might develop arm strength, a ~~vertical peg board~~ ^{WEIGHT TRAINING PROGRAM} was installed in an ~~elementary school~~ ^{THE MIDDLE} in the ~~North Texas area~~ ^{IN THE HIGHLAND SCHOOL DIST.}. When the ~~peg board~~ ^{weights used} was used at random during the school year of ~~1965-66~~ ¹⁹⁶⁶⁻⁶⁷, the average number of ~~pull-ups~~ ^{PUSH-UPS} performed by boys did not show improvement. It was felt, however, that if the ~~peg board~~ ^{weights used} was used in a specific program, it would be of some value toward the development of physical fitness of ~~elementary school boys~~ ^{these}.

Statement of the Problem

The purpose of the study was to determine the effect of the use of the ~~vertical peg board~~ ^{weight training program} on the performance of the ~~pull-ups~~ ^{PUSH-UPS} by boys in grades ~~five and six~~ ⁶ in an elementary school in the North Texas area. ^{AT HIGHLAND MIDDLE SCHOOL GRANGER, OHIO}

Hypotheses of the Study

The hypotheses of the study included

1. There are no differences between the means of the groups for the post-training pull-up test.
2. Neither training procedure will show a difference between the pre-training and post-training means.

Definition of Terms

The following definitions of terms were used in the study:

Vertical peg board.--A slab of maple hardwood three inches thick, eight inches wide and sixty-four inches long. Two rows of holes are drilled in the board, in a staggered position, left and right on nine-inch centers. The board is designed to be mounted on a wall in a vertical position. The holes are drilled at an angle downward so that when a wooden hand-grip peg is placed in a hole and weight is applied, the peg will not pull out.

Pull-up.--An exercise of grasping an over-head bar in a hanging position and drawing the body upward to a vertical position with the chin over the bar and then lowering the body to the starting position.

Purposes of the Study

The study was undertaken for the following purposes:

1. To secure data on the effect of ^{ix PROGRESSIVE WEIGHT TRAINING} ~~the vertical peg~~ ^{PUSH-UPS AND PULL-UPS} board on the performance of ~~pull-ups~~ ^{PULL-UPS} by boys in grades five ^{W. S. GARRARD, OHIO} and six in an elementary school in the North Texas area.

2. To secure data on the effect of ^{PULL-UPS} standard training procedures on the performance of ~~pull-ups~~ by boys selected for the study.

3. To evaluate the effects of the ~~vertical peg board~~ ^{pull-up}

and the standard training procedures on the performance of

Push-ups
pull-ups by pupils included in the study.

Limitations of the Study

The study was limited to:

1. The effects of the ^{ONE METHOD} ~~two methods~~ of training on the performance of pull-ups by boys in grades ~~five and six~~ in an ~~elementary school~~ ^{HIGHWAY SCHOOL} in the North Texas area.

2. Boys of ages ¹²⁻¹³ ~~ten through thirteen~~ years.

Survey of Previous Studies

An extensive search of literature revealed no previous study to which the present study is directly related.

DeWitt (2), however, made a comparative study of three types of chinning tests to determine the most efficient hand position in the total number of chins performed, and if kipping and kicking might be of some use as an aid to increased performance. The subjects were young men of college age who performed the palms-in, palms-out, and kip-kick chins.

The results of DeWitt's study show that the mean of the chins performed in the palms-in position is greater than the mean of the chins performed in the palms-out position. All seventy-three subjects that appeared for the last test performed the three methods of chinning. The study confirmed that, on the average, a man can do approximately two more chins with the palms-in grip than with palms-out grip, without

the aid of the kip-kick. It was concluded in the study that since chinning tests indicated strength and are not meant to include skill as a factor in the total performance, the kip-kick method should not be used as a substitute for a test of shoulder girdle strength and endurance.

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4. LeProtti, Stan, "La Sierra's Fitness Program, Panacea for Youth Unfitness," Scholastic Coach, XXXI (September, 1960), 35, 80.
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Youth Fitness Test Manual (1, p. 16) was administered to the subjects and scores were recorded as each subject completed the test.

Two groups, equated on the basis of the results of the pre-training test, were selected from each grade. To equate the groups, the scores of the subjects from each class were placed in rank order, from the highest to the lowest. Starting with the highest score each subject of the fifth grade was assigned by the "A-B-B-A" method to either Group I or Group II. This process was repeated to assign the subjects from the sixth grade to Groups III and IV.

Procedures for the Practice by Groups

After the subjects were selected and placed in their respective groups each group was assigned a specific training procedure. Group I of the fifth grade and Group III of the sixth grade were assigned to the vertical peg board. Group II of the fifth grade and Group IV of the sixth grade were assigned to a pull-up bar.

The subjects were informed that the length of time for the practice of the skills would be two trials a day, four days a week, for a period of six weeks. The subjects were also asked not to climb or pull on any object during the course of the study. It was explained that the subjects would not miss their complete physical education class period. In accordance with an agreement made with the foot-

ball coach, the subjects who participated in the elementary school football program were requested not to take part in any exercises that included pushing or pulling.

Instruction for the procedures during the training period were explained, after which two ^{6th grade} ~~fourth-grade~~ boys demonstrated the proper practice procedures on the ~~pull-up bar~~ and the peg board. At the beginning of each physical education class period the subjects lined up in the order they were assigned at the pull-up bar or the vertical peg board.

For all practice sessions a mat was placed on the floor underneath the vertical peg board. The climb on the vertical peg board was started by facing the board with the subject's knees on the mat and a peg clasped in each hand. The pegs were then installed in the two lowest hole positions. Using the upper peg position as leverage, the lower hand would move the lower peg to the next higher position. Succeeding moves would be made by alternating hand and peg positions on the board; and the subject could not let his knees touch the mat on the way down. The subject could straighten his legs, but could not use his knees to grip the board nor push with his toes on the board or wall. Each peg advance scored one point (2). The scores were recorded for both trials.

The procedure for the practice on the pull-up bar was to perform as many pull-ups as possible during each trial. Each pull-up scored one point. The scores were recorded for

both trials.

Administration of the Post-Training Pull-Up Test

At the conclusion of the six-week training period the subjects were again tested on the pull-up test. On the day of the administration of the post-training pull-up test the subjects were instructed orally concerning the final single-trial pull-up test. The subjects were then tested and the scores were recorded as each subject completed the test.

PUSH UP 100 RIMS ONE DAY FOR 2 DAYS
PUSH UP 100 RIMS
PUSH UP 100 RIMS

Treatment of Data

The data from the pre-training and post-training pull-up tests were placed in rank order so that the results could be treated statistically. In order to determine whether or not differences between the means of the ~~groups~~ ^{groups} on the pre-training tests and post-training tests were large enough to be statistically significant, ~~the analysis of variance as~~ ^{PRE COURSE} described by Lindquist (3, pp. 57-58) was utilized as the statistical technique.

The t-value for the difference between means as described by Tate (4, p. 466) was computed to determine whether the groups made statistically significant gains from the pre-training to the post-training tests.

The analyses and findings based on the results of the computations of the study are reported in Chapter III.

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CHAPTER III

PRESENTATION OF DATA

The pre-training and post-training pull-up test scores of ³² ~~104~~ fifth- and sixth-grade boys were collected and statistically analyzed to determine the effectiveness of the use of the vertical peg board on the performance of ^{PUSH-UPS 10/76} pull-ups. The results of these analyses are presented in this chapter.

The raw ^{PUSH-UPS} ~~pull-up~~ test scores were recorded as outlined in the AAHPER Youth Fitness Test Manual (1, p. 16). These scores were used for all statistical analyses.

The data were organized so that an analysis of the differences between the means for the groups on the pre-training pull-up test could be made. A similar analysis was made concerning the differences between the means for the groups on the post-training test. The F values for these analyses are reported. The analysis of variance as described by Lindquist (2, pp. 57-58) was the statistical technique selected for these analyses.

To examine the difference between the means for each group for the pre-training and post-training test, the t-test as described by Tate (3, p. 466) was selected.

For all analyses a level of significance of .05 was selected for the rejection of the null hypothesis.

Findings

The means and standard deviations of the scores made by the four groups on the pull-up tests at the beginning and at the end of a six-week training period are reported in Table I. Group I in the fifth grade and Group III in the sixth grade were assigned to the vertical peg board during the training period. Group II in the fifth grade and Group IV in the sixth grade were assigned to the pull-up bar.

TABLE I

MEANS AND STANDARD DEVIATIONS OF SCORES FOR THE
PRE-TRAINING AND POST-TRAINING PULL-UP TESTS

Groups	Pre-Training		Post-Training	
	Mean	S.D.	Mean	S.D.
Grade 5-I* (<u>N</u> =29)	3.07	2.78	5.59	4.07
Grade 5-II** (<u>N</u> =31)	2.74	2.42	5.26	2.91
Grade 6-III* (<u>N</u> =22)	2.82	2.74	4.14	3.14
Grade 6-IV** (<u>N</u> =22)	2.86	2.65	5.73	3.88

*Performed on the vertical peg board.

**Performed on the pull-up bar.

The summary table for the analysis of scores for the pre-training pull-up test is presented in Table II. The F

value of .08 reported for this analysis indicates that the differences between the means for the pre-training test are not great enough to be statistically significant at the .05 level.

TABLE II

ANALYSIS OF VARIANCE FOR PRE-TRAINING
PULL-UP TEST
(N=104)

Source of Variance	Sum of Squares	Degrees of Freedom	Variance Estimate	<u>F</u> *
Between	1.71	3	.57	.08
Within	725.66	100	7.26	. . .
Total	727.38	103

*F value of 2.68 required to denote significance at .05 level.

The summary table for the analysis of scores for the post-training pull-up test is presented in Table III. The F value reported for this analysis is .92. This indicates that the differences between means for the post-training test are not great enough to be statistically significant at the .05 level. The null hypothesis of there being no differences between the means of the groups for the post-training pull-up test is accepted.

TABLE III

ANALYSIS OF VARIANCE FOR POST-TRAINING
PULL-UP TEST
(N=104)

Source of Variance	Sum of Squares	Degrees of Freedom	Variance Estimate	<u>F</u> *
Between	35.42	3	11.81	.92
Within	1289.92	100	12.90	. . .
Total	1325.35	103

*F value of 2.68 required to denote significance at .05 level.

The results of these analyses indicate that the mean for any one of the groups is not significantly different from the mean for any of the other groups on either the pre-training or the post-training test.

To determine whether any of the groups made gains on the performance of pull-ups during the course of the study, further analysis of the scores was made. The t for the difference between the means on the pre-training test and post-training test for each group was computed. In cases where the value of the computed t is equal to or greater than the t required to denote statistical significance at the .05 level, the difference is reported as being statistically significant.

In Table IV the means for the groups on the pre-training and post-training test, the t for the difference between

the means for each group, and the \underline{t} required to denote statistical significance at the .05 level are reported.

TABLE IV
SIGNIFICANCE OF DIFFERENCES BETWEEN MEANS
FOR EACH GROUP FOR PRE-TRAINING AND
POST-TRAINING PULL-UP TEST

Groups	Pre-Training Mean	Post-Training Mean	\underline{t} -Value for Difference	Critical \underline{t}^{**}
Grade 5-I ($\underline{N}=29$)	3.07	5.59	5.59*	2.05
Grade 5-II ($\underline{N}=31$)	2.74	5.26	6.22*	2.04
Grade 6-III ($\underline{N}=22$)	2.82	4.14	2.92*	2.09
Grade 6-IV ($\underline{N}=22$)	2.89	5.73	5.40*	2.09

*Significant at .05 level.

** \underline{t} -value required to denote significance at .05 level.

The significant \underline{t} -values reported indicate that the gain made by each group was great enough to be statistically significant. The difference between the pre-training mean and the post-training mean for each group is statistically significant at the .05 level. The null hypothesis that there are no differences between the pre-training and post-training means is rejected.

Since two of the groups were subjected to the same training procedure these groups were combined and the \underline{t} for

the difference between means for each of these groups was computed. The mean for these combined groups, along with the \underline{t} for the difference between each pair of means, and the \underline{t} required to denote statistical significance are reported in Table V.

TABLE V

SIGNIFICANCE OF DIFFERENCES BETWEEN MEANS
FOR SUBJECTS USING THE SAME TRAINING
METHODS FOR PRE-TRAINING AND POST-
TRAINING PULL-UP TEST

Method	Pre-Training Mean	Post-Training Mean	\underline{t} -Value for Difference	Critical \underline{t}^d
Peg Board ^a ($\underline{N}=51$)	2.96	4.04	3.56 ^c	2.00
Pull-Up ^b ($\underline{N}=53$)	2.79	5.51	8.84 ^c	2.00

^aPeg board consists of Grade 5-I and 6-III.

^bPull-up consists of Grade 5-II and 6-IV.

^cSignificant at .05 level.

^d \underline{t} -value required to denote significance at .05 level.

To discover if there is a difference between the post-training means of the groups subjected to different training procedures, the \underline{t} for the difference of the means and the \underline{t} required to denote statistical significance at the .05 level was computed. The \underline{t} -value .89 for the difference between the post-training means of the groups did not prove statistically significant. The critical \underline{t} to denote significance is 1.98.

Summary of the Findings

The data reported in Tables II-V reveal the following findings relative to the means for the groups subjected to the specific training procedures:

1. For the post-training pull-up test, the differences between the means are not great enough to be statistically significant.

2. For each group the difference between the pre-training mean and the post-training mean is statistically significant at the .05 level.

3. When groups subjected to the same training procedure are combined, the difference between the pre-training mean and the post-training mean is statistically significant at the .05 level.

4. The difference between the post-training means is not statistically significant at the .05 level when the groups subjected to the same training procedures are combined.

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3. Tate, Merle W., Statistics in Education, New York, The Macmillan Company, 1955.

CHAPTER IV

CONCLUSIONS, DISCUSSION, AND
RECOMMENDATIONS

Weight lifting
The vertical peg board is used in physical fitness pro-
grams by high school physical educators all over the United

States. *But* ~~The use of this apparatus received impetus by the famous La Sierra High School Physical Fitness Program, Carmichael, California. The vertical peg board is rarely used~~

in the elementary school. It was felt, however, that if a child could execute the ~~pull-up~~ *PULL-UP* as outlined in the AAHPER Youth Fitness Test Manual (1, p. 16), the child could also ~~benefit from weight~~ *benefit* ~~perform on the vertical peg board~~ since both require shoulder *girdle*

PROGRESSIVE WEIGHT TRAINING
girdle strength. This study investigated the effect of the ~~vertical peg board~~ *PULL-UP* on the performance of ~~pull-ups~~ by boys in

MIZOIA
grades ~~five and six~~ in an elementary school in the ~~North Texas~~ *North* area. ~~All boys in the two grades~~ *32* who were at least ~~ten~~ *13* and not yet fourteen years of age served as subjects for the study.

PULL-UP
A single trial pre-training ~~pull-up~~ test was administered to the subjects. *Subjects were placed on a progressive weight program.* ~~The subjects from each grade were placed into two groups, equated on the basis of the first administration of the pull-up test. One group from the fifth grade and one from the sixth grade was assigned to the vertical peg board while the other two groups were assigned to the pull-up which included~~ *CURLS, INVERTED CURLS, MILITARY PRESS.*

MEMBER

NUMBER OF REPEATATIONS
40 MIN.

bar. Each of the groups performed on the assigned apparatus for a period of six weeks. The subject performed ~~two~~ trials per day, four days a week during this period. At the end of the training, a single trial pull-up ^{test} was administered to all subjects.

The raw scores of the subjects on each test were used for all analyses. The means and standard deviations for each ~~group~~ on each of the tests were computed. ^{STOP} The analysis of variance was the statistical technique selected to determine the significance of the differences between the means of the groups on the pre-training test and the post-training test. In each case the F was not large enough to denote statistical significance. For all analyses a level of significance of .05 was selected.

To determine whether the gain by each of the groups between the pre-training test and the post-training test was statistically significant, the t for the difference between the means was computed. In each case this difference between the means was statistically significant at the .05 level.

The groups that used the same training procedure were then combined and the t for the difference between the pre-training and post-training means for each of these groups was computed. Again, the t was, in each case, large enough to denote statistical significance at the .05 level. The t was computed for the difference between the post-training means of the groups using the same training procedures. The t

was not large enough to denote statistical significance at the .05 level.

Conclusions

The findings would seem to warrant the following conclusions concerning the effects of the vertical peg board in the performance of pull-ups by elementary-school boys:

1. Neither training procedure is superior to the other as a means for improving performance of pull-up tests by elementary-school boys.

2. Both training procedures proved effective as a means of improving the performance of elementary-school boys on the pull-up test.

Discussion

There are many variables that will enter into a study of this nature. One such variable is the natural competition between friends or individuals that exists outside the controlled situation. There was no request in the study to the subjects to perform to the best of their ability. Some individuals respond to requests, while others have no response, or rejection. It should be noted that the motivation factor was not a part of this study but the desire to excel in strength exercises and in testing programs is a natural phenomenon of boys in this age group.

Before and during the study the subjects were asked not to climb, move heavy objects, push and pull or use any other

means of strengthening the shoulder girdle outside the training period. However, little control over the activities of the subjects around the home can be assured when the subjects attend a public school.

Neither practicing the pull-up nor practicing on the vertical peg board proved superior for improving the pull-up test scores of the groups in this study. The vertical peg board itself is a challenge to any individual and should be looked on as an incentive apparatus in assisting the physical education instructor in developing the shoulder girdle strength of pupils.

Recommendations

Additional research is needed on the ~~peg board~~ because ^{WEIGHT TRAINING AT} ~~of the various types of boards that are on the market.~~ ^{ELEMENTARY LEVEL} The subjects in the elementary school might be able to manipulate ^{WEIGHTS THUS} ~~a horizontal peg board in a shorter period of time and~~ thus gain a faster and better feeling of achievement and self-image. It should be noted also that the hand-grip pegs have a larger grip than is advisable for the younger subjects of the study. There has been some speculation as to the weight of the hand-grip peg. Repetitions of this study should consider these variables with the lowering of the age bracket.

Since the subjects of this age group are probably not aware of their capacities, the pre-training and post-training ^{PUSH-UP} ~~pull-~~ ^{DIP} up test should be administered more than once to increase the reliability of the scores.

Since this study has indicated the possible effective-
^{the} ~~ness of the vertical peg board for improving scores in pull-~~ *Proper weight program for improving scores on a*
~~up tests, further research concerning the value of the vertical~~ *physical pull-up & dips tests* *weight training*
~~peg board in the area of physical~~ ^{abilities} *fitness* is recommended.
elementary

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APPENDIX

RAW SCORES OF SUBJECTS IN GRADE FIVE ASSIGNED
THE VERTICAL PEG BOARD
(Group I)

Subject	Pull-Up Test	
	Pre-Training	Post-Training
H. M.	11	15
C. J.	8	13
J. L.	7	13
M. D.	6	11
D. R.	6	8
F. R.	5	9
D. K.	5	7
J. B.	5	3
W. B.	5	4
B. O.	4	11
L. R.	4	5
J. G.	4	6
L. D.	3	7
D. B.	3	4
D. M.	3	7
J. I.	2	7
C. P.	2	7
J. J.	2	2
R. B.	1	3
L. H.	1	3
R. H.	1	2
R. R.	1	3
J. L.	0	0
C. J.	0	4
J. R.	0	0
K. J.	0	1
A. R.	0	1
D. R.	0	0
A. S.	0	6

RAW SCORES OF SUBJECTS IN GRADE FIVE ASSIGNED
THE PULL-UP BAR
(Group II)

Subject	Pull-Up Test	
	Pre-Training	Post-Training
B. C.	8	9
W. M.	8	7
J. D.	6	6
W. T.	6	12
R. A.	6	7
Q. B.	5	8
R. O.	5	11
S. B.	5	8
T. H.	4	6
D. M.	4	5
C. J.	4	4
B. T.	4	3
R. A.	3	7
R. S.	3	10
L. S.	2	8
E. H.	2	7
J. I.	2	3
W. P.	2	2
J. T.	1	6
R. H.	1	4
T. M.	1	5
D. M.	1	5
B. G.	1	1
E. C.	1	5
S. L.	0	4
J. H.	0	2
T. P.	0	2
F. M.	0	1
O. P.	0	5
G. S.	0	1
D. R.	0	2

RAW SCORES OF SUBJECTS IN GRADE SIX ASSIGNED
THE VERTICAL PEG BOARD
(Group III)

Subject	Pull-Up Test	
	Pre-Training	Post-Training
D. S.	10	9
L. D.	7	10
R. A.	7	6
C. J.	5	8
H. W.	5	8
W. K.	5	6
R. W.	4	3
C. P.	4	7
J. B.	3	6
B. D.	3	3
J. C.	2	2
M. J.	2	2
J. R.	2	7
L. J.	2	1
D. R.	1	3
D. T.	0	0
D. B.	0	0
F. M.	0	2
M. H.	0	6
P. V.	0	1
D. W.	0	1
R. K.	0	0

RAW SCORES OF SUBJECTS IN GRADE SIX ASSIGNED
THE PULL-UP BAR
(Group IV)

Subject	Pull-Up Test	
	Pre-Training	Post Training
H. G.	8	15
J. H.	8	11
E. G.	7	10
W. G.	6	8
R. T.	5	10
B. G.	5	5
T. B.	4	11
W. R.	4	6
V. B.	3	3
R. T.	3	6
B. H.	3	5
D. M.	2	4
B. L.	2	3
J. S.	2	4
J. M.	1	2
D. A.	0	0
E. G.	0	8
R. P.	0	6
J. S.	0	4
J. W.	0	3
H. B.	0	0
H. J.	0	6

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