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The effect of two time patterns on developing a secondary motor skill.

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BOSTON UNIVERSITY
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Thesis

THE EFFECT OF TWO TIME PATTERNS ON
DEVELOPING A SECONDARY MOTOR SKILL

Submitted by

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(B.S. in Education, Bridgewater State T.C., 1950)

In partial fulfillment of requirements for
the Degree of Master of Education

1952

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CHAPTER I

THE PROBLEM AND ITS SIGNIFICANCE

With the ever broadening horizons of education, methods of teaching, learning, and studying; time psychology is being considered as an important controlling factor. Many research workers have made contributions in this field with regards to learning mental skills; but more research needs to be done with the methods of learning motor skills. During the author's time of study at Boston University her interest was stimulated in this direction. Since the author was concerned mainly with high school girls, and among other things, the improvement of their motor skill, it is only fitting that her research be concentrated on this level.

STATEMENT OF THE PROBLEM

The problem of this thesis is to take a skill widely used by high school girls and to see what effect, if any, two time patterns of practice, directly related to many school situations, have on improving that skill.

SCOPE

A motor skill was selected, namely volleyball serving. Tests were conducted with two groups using two different time schedules of practice. The groups consisted of girls from grades nine to twelve and the groups were equated. Group I

practiced one day each week while Group II practiced three times per week. The testing was carried on for six weeks for both groups.

JUSTIFICATION

The reason these practice sessions were chosen was because they could be directly applicable to a normal school situation. That is, there would usually be about three periods of physical education weekly in which to develop specific skills. Is it enough to practice once a week? Three times per week? Will the person reach a peak week in a six week training period that will show significant gains, or will the progress be evenly distributed over each practice day in this period? By carrying on such a test program, an attempt was made to answer questions like these.

CHAPTER II

REVIEW OF LITERATURE

In the few years since Miller^{1/} completed his study on "The Effect of Various Interpolated Time Patterns on Motor Learning", many other students have been motivated in the same direction. In reading their work, the author has found that generally, Kingsley^{2/} has made many contributions to the area of time patterns in learning which could be directly applied to learning specific physical education activities. He said, "Practice should be conducted under conditions similar to those which will attend the use of the skill, and the procedures practiced should be those in which skill is desired."

Gates and Taylor^{3/} proved in a handwriting experiment that ".... there is not too much transfer of skill under strange circumstances."

In the study done by Miller at Boston University, four time patterns were tried and carried on for nine periods of practice. He arrived at the conclusion that the additive time

1/ Miller, A.G., The Effect of Various Interpolated Time Patterns of Motor Learning, Doctor's Dissertation, Boston University, 1948.

2/ Kingsley, H.L., The Nature and Conditions of Learning, Prentiss-Hall Co., New York, 1942, p.241.

3/ Gates, A.I., Taylor, G.A., "The Acquisition of Motor Control in Writing by Pre-School Children", Teachers College Record, 1923-24, p.459-468.

pattern was superior to practice once a week, three days per week, or daily. His subject of testing was billiard shots.

Chamberlain^{4/} later made a study using massed-evenly spaced-massed practice, and Longley^{5/} made a study using massed-evenly spaced practice. Chamberlain concluded that ".... some learning took place during this practice pattern. Massed-even space-massed time pattern showed significant gains only at the time of massed practice. No significant difference in the mean gain of Chamberlain's pattern over Longley's, although it was slightly higher. Miller's additive pattern showed a slightly higher mean gain but it was not too significant."

These studies above have been concerned mainly with the development of primary skill while the author used a secondary skill. Snoddy^{6/} says:

"There are two distinct processes of growth involved in learning; one called primary growth is said to be a positive function of both repetition and the interpolated time intervals, while the other called secondary growth, is the result of the stimulation afforded by practice. It is a settling process that establishes a base upon which the effectiveness of later practice depends. Short periods of practice stimulate primary growth, which continues on through the interpretive interval."

4/ Chamberlain, W.G., Effect of Massed-Evenly Spaced-Massed Practice on Learning a Motor Skill, Master's Thesis, Boston University, 1950.

5/ Longley, G. F., The Effect of Massed, Followed by Evenly Spaced Practice on Learning a Motor Skill, Master's Thesis, Boston University, 1949.

6/ Snoddy, G.S., Evidence for Two Opposed Processes in Mental Health, Science Press Printing Co., Lancaster, Pennsylvania, 1935.

Troy^{7/} made a study to determine peak performance in a given time pattern for subjects using a motor skill (billiard shots). He used eight practice periods, two per week. Each individual had played billiards before this experiment. Troy concluded, "The greatest gain came between the first and second period possibly because they learned the skill to be used. Fifth and sixth session showed next greatest gain; in seventh session the people showed peak performance."

Basset, Glasgow, and Locke^{8/} made a survey of tests on volleyball serving, 17 in all. They ranged from a test which calls merely for the ball to be served across the net to a test for hitting a basketball hung from a chain above the net. In the majority of tests the court is divided into areas and then calls for definite placement of the ball. Certain areas of placement scoring higher than others. In general, balls landing in the back area of the court are given a higher score than those landing in the front part. For the most part it can be said that the serving tests are objective. Because the test elements are constant, a certain reliability might be expected in serving tests if a sufficient number of trials are given.

7/ Troy, J.J., Study of Peak Performances in Relation to Practice Periods, Master's Thesis, Boston University, 1950.

8/ Basset, G., Glasgow, R., Locke, M., "Studies in Testing Volleyball Skills", Research Quarterly, Dec. 1937, Vol.8, No.4.

CHAPTER 111

METHOD OF PROCEDURE

This testing program was carried on at the High School of Practical Arts, Boston, Massachusetts during January and February 1952. In order to secure the cooperation of the girls, they were awarded credit units towards awards in their Athletic Association. Any girl could volunteer (this was done before the Christmas Holidays), but she was put into a group according to an ability rating obtained from a previous volleyball test. A list of 67 volunteers ranging from grades nine to twelve and from thirteen to eighteen years of age was obtained. After the pre-test, there were two equal groups ready to start the experiment.

Volleyball serving in this experiment was considered as a secondary skill. Snoddy^{1/} says there are two opposed processes in mental growth, primary growth (that growth in learning which appears early, is stable, is a positive function of repetition and interpolated time) and secondary growth (that growth in learning which appears later, is highly unstable, is enhanced by withdrawal of time and lost through the effect of long intervals interpolated in the practice).

1/ Snoddy, G.S., Evidence for Two Opposed Processes in Mental Growth, Lancaster, 1935, Science Press, pp. 103.

The pre-test was taken by all girls in October, 1951. It is the volleyball test recommended by French and Cooper.^{2/} The serving court is marked off into seven scoring areas, each with different values, as illustrated by Chart 1 (page 8). The highest value, five, is obtained by hitting the ball to the base line of the court. With five serves the best possible score would be 25. Each girl was allowed two trials of five serves each, and the better score was recorded. When it came time to equate the groups, all girls with a score of 24 or 25 were distributed, two in each group. Next were those with scores of 23 and 22; this continued until the groups were even in number and serves.

On January 3, 1952 these two groups were posted, and from then on everyone was known as a number on the score sheet. As can be seen from the score sheets*, each girl could keep track of her own score from the beginning of the experiment to the end. She could also see the scores of others without necessarily knowing who they were. All subjects were told if they missed out on a practice day they were automatically disqualified from the experiment.

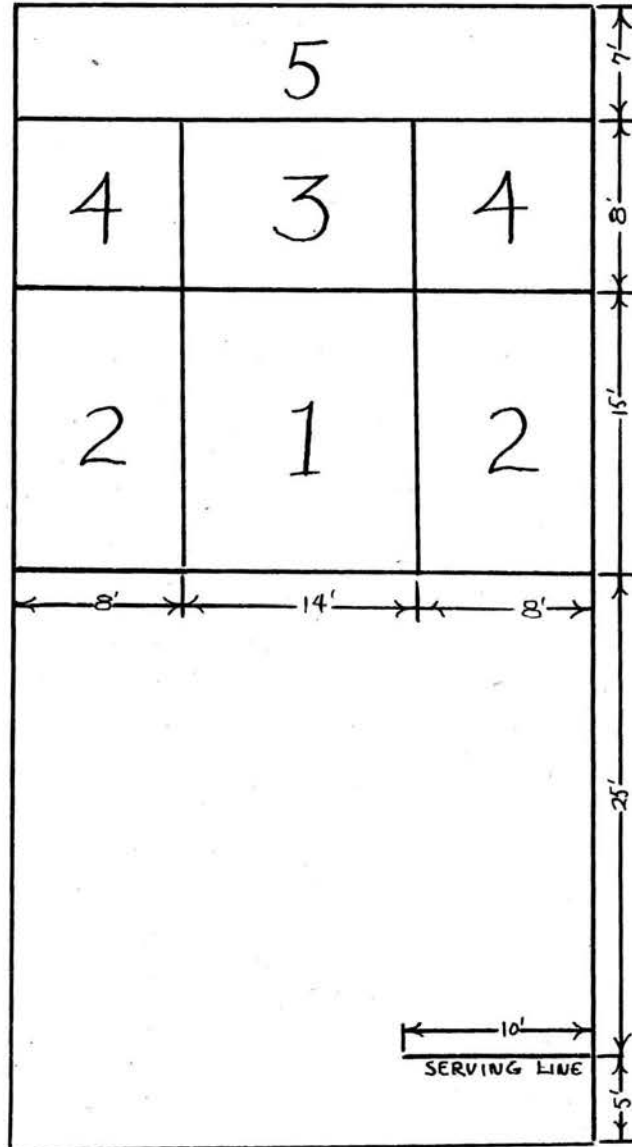
Group I (one-practice-per-week) was tested on Fridays. Thirty-four girls reported January 11, 1952 to start taking the

^{2/} Cooper, B., French, E.L., "Achievement Tests in Volleyball For High School Girls", Research Quarterly, May 1937, Vol.8,N2.

**

A sample score sheet appears in the Appendix.

CHART I. VOLLEYBALL COURT USED IN THE PRE-TEST.



Net: 7 feet high

Ceiling Clearance: 13 feet 8 inches.

test, but by the last testing day, February 15, nine girls had dropped out and therefore, 25 completed the test.

Group II (three-times-per-week) was tested on Mondays, Tuesdays, and Wednesdays. Thirty-three girls began the experiment on January 7, 1952 and 25 completed the test on February 13.

There were 67 who took part in the first week and 50 who completed the whole six week program. This large drop out may be attributed to the large number of absentees due to the virus during January and February. When they missed school on a practice day, their scores were omitted from the final counting.

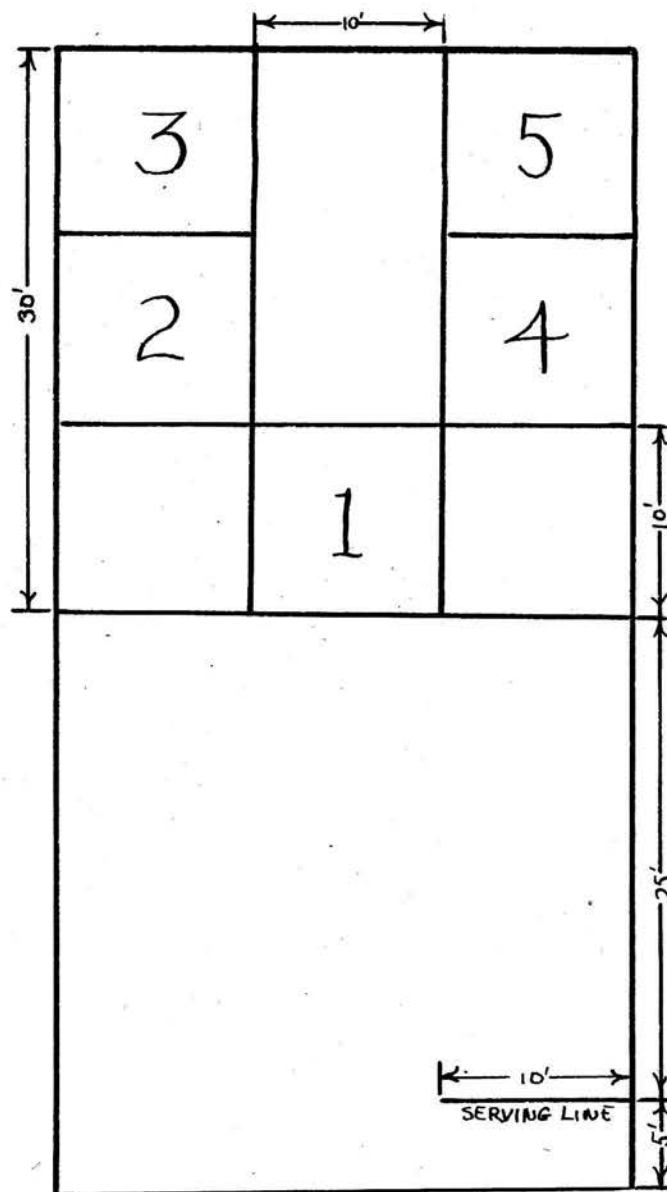
The test itself was taken on a regulation volleyball court 60 feet by 30 feet. There was a serving line 10 feet long from the side line and five feet from the back line. The serves were taken from behind this line. The net was seven feet high. These last two modifications were approved for high school girls by the N.S.W.A. as stated in their volleyball rule book.^{2/} The court being served to was marked into five 10 feet by 10 feet squares, as shown in Chart II (page 10).

Each girl took five consecutive serves to each square, a total of 25 in all. Four girls took the test at the same time. By alternating the girls after every five serves it was found that 25 serves could be made per practice without the element

2/

National Section of Women's Athletics, The Official Softball-Volleyball Guide, A.S. Barnes Co., New York, 1948.

CHART II. VOLLEYBALL COURT USED IN THE EXPERIMENT.



Net: 7 feet high.

Ceiling Clearance: 13 feet 8 inches.

of fatigue or reddened wrists being encountered. It also made scoring easier. The order of serving to the squares was kept constant throughout the six weeks, that is; square one was always first, followed by two, three, four, and five.

If the ball landed on the line of the square it was good. If a foot fault occurred, or if for any reason the ball hit the ceiling, hanging apparatus, or the floor outside the square, it was counted as a bad serve. If the server was aiming for spot one and the ball landed in spot two, it was out, and could not be counted as a good serve in spot two later on. Because of the low ceiling clearance in the gym (13 feet 8 inches), the girls were forced to keep their serves low. In a sense this was a good fault, but then again, as is shown in the results, it hampered the server from lobbing the ball into any spot.

All serves were called out as "Good" or "Bad" by the author, and a trained assistant recorded the score for each group.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

SIGNIFICANCE OF DATA

A critical ratio (CR) of 2.06 (0.05 level) will be considered indicative of a significant difference since there are 95 chances out of 100 that the mean gains for one group are greater than for another.^{1/}

SUMMARY OF DATA^{2/}

When the experiment was started the groups were equal in ability. This is shown in Table I , page 13. The mean of the first practice session for both groups was 4.9 and the critical ratio 0.00.

At the end of the first week Group II, the three-days-per-week-group showed a decided gain over Group I, the one-day-per-week-group. The critical ratio of the difference between them was 2.47. Therefore, there are 98.6 chances out of 100 that the mean for Group II is greater than for Group I and is probably not due to sampling fluctuations.

The critical ratio of the difference between the two groups at the end of the six weeks was 2.2 in favor of Group II

^{1/} Garrett, H.E., "Statistics in Psychology and Education", Longmans, Green and Co., New York, 1947, p. 201.

^{2/} The records of all the serves for both groups and their individual subjects are included in the appendix in Tables X and XI.

the three-times-per-week-group. Therefore, there are 97.2 chances out of 100 that the mean gain for Group II is greater than for Group I.

TABLE I

DIFFERENCE IN MEANS OF GROUP I, THE ONE-DAY-PER-WEEK-GROUP AND GROUP II, THE THREE-DAYS-PER-WEEK-GROUP FOR THE FIRST PRACTICE SESSION.

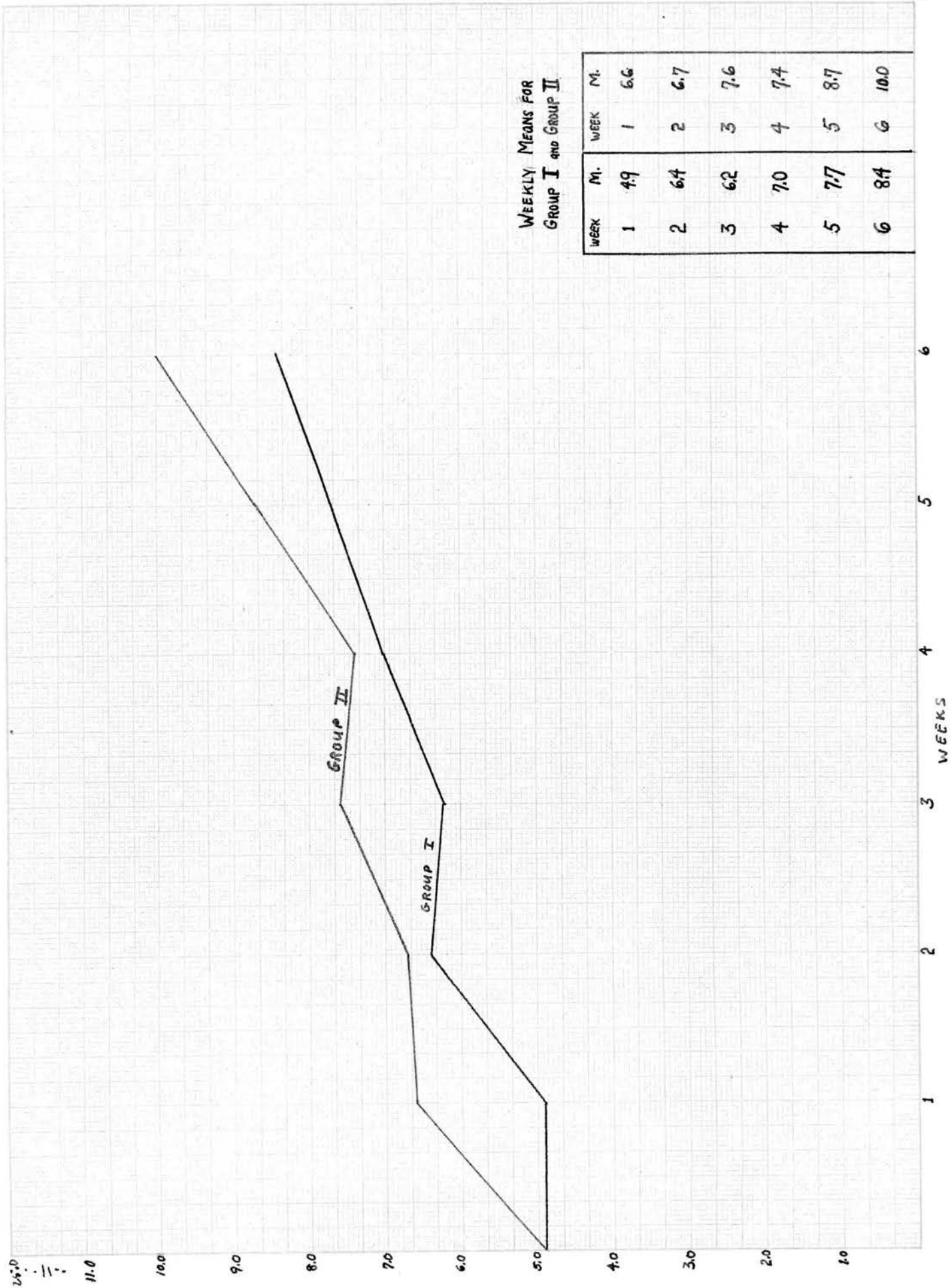
Prac.	No.	Group	Mean	SE _m	D _{m2-m1}	SE _d	Cr.
1	25	I	4.9	0.55			
					0.0	0.88	0.0
1	25	II	4.9	0.69			

TABLE II

DIFFERENCE IN WEEKLY MEAN GAINS FOR GROUP I, THE ONE-DAY-PER-WEEK-GROUP AND GROUP II, THE THREE-DAYS-PER-WEEK-GROUP.

Week	Group	No.	Mean	SE _m	D _{m2-m1}	SE _d	CR.
1	I	25	4.9	0.55	1.9	0.78	2.47
	II	25	6.8	0.55			
2	I	25	6.2	0.48	0.5	0.84	0.59
	II	25	6.7	0.69			
3	I	25	6.0	0.74	1.6	0.93	1.72
	II	25	7.6	0.55			
4	I	25	6.8	0.73	0.6	0.93	0.65
	II	25	7.4	0.56			
5	I	25	7.5	0.64	1.2	0.92	1.30
	II	25	8.7	0.72			
6	I	25	8.1	0.47	1.9	0.89	2.20
	II	25	10.0	0.75			

DIAGRAM I COMPARISON OF WEEKLY MEAN IMPROVEMENT OF GROUP I. THE ONE-DAY-PER-WEEK-GROUP AND GROUP II, THE THREE-DAYS-PER-WEEK-GROUP.



Form No. 906-10 Modifies to Centimeter
 AMERICAN PAPER CO., HOLLYWOOD, MISS.

TABLE III

DIFFERENCE IN MEANS OF THE FIRST AND LAST PRACTICE PERIOD FOR GROUP I, THE ONE-DAY-PER-WEEK-GROUP.

Week	Group	No.	Mean	SE _m	D _{m1-m6}	SE _d	CR.
1	I	25	4.9	0.55			
6	I	25	8.1	0.47	3.2	0.72	4.4

By comparing the means of the first and last practice day for Group I, the one-day-per-week-group, a critical ratio of 4.4 is obtained. This is indicative of a true difference in the means, and not a difference due to chances of sampling.

TABLE IV

DIFFERENCE IN MEANS OF THE FIRST AND LAST PRACTICE PERIOD FOR GROUP II, THE THREE-DAYS-PER-WEEK-GROUP.

Week	Group	No.	Mean	SE _m	D _{m1-m6}	SE _d	CR.
1	II	25	4.9	0.69			
6	II	25	10.06	0.75	5.1	1.02	5.0

Table IV above indicates that a very significant gain was made by Group II, the three-days-per-week-group, from the first to the last practice period. The CR. of 5.0 reveals that there are 99.9 chances out of 100 this difference is not due to errors of sampling.

TABLE V

DIFFERENCE IN MEAN GAINS OF GROUP I, THE ONE-DAY-PER-WEEK-GROUP, AND GROUP II, THE THREE-DAYS-PER-WEEK-GROUP.

Week	Group	No.	D_{mg}	SE_{mg}	$D_{mg1-mg2}$	SE_d	CR.
1-6	I	25	3.2	0.72			
1-6	II	25	5.1	1.02	1.9	1.23	1.54

Table V shows clearly that although the two groups made significant gains from the first to the last week of the experiment, the gain of Group II over Group I was not a statistically significant one.

DIAGRAM II DAILY MEAN IMPROVEMENT OF GROUP I, THE ONE-DAY-PER-WEEK-GROUP AND GROUP II, THE THREE-DAYS-PER-WEEK-GROUP.

Form No. 888-10 Millimeters to Centimeter
 AMERICAN PAPER & PAPER CO., HOLYOKE, MASS.

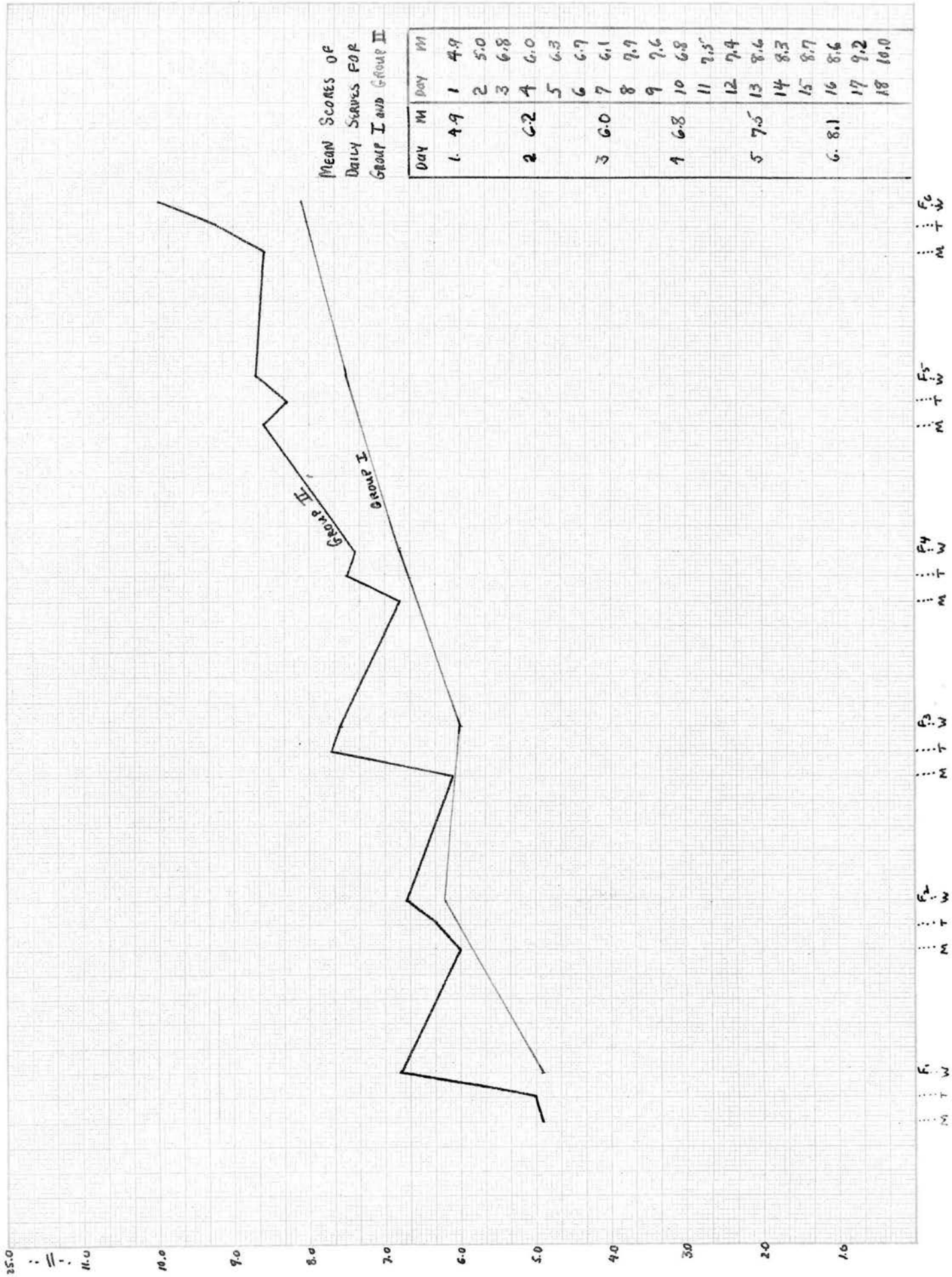


TABLE VI

DIFFERENCE IN MEANS OF THE FIRST PRACTICE OF THE FIRST AND LAST WEEKS FOR GROUP II THE THREE-DAYS-PER-WEEK-GROUP.

Week	Group	No.	Mean	SE _m	D _{m1-m6}	SE _d	CR.
1	II	25	4.9	0.69			
6	II	25	8.6	0.61	3.7	0.92	4.0

Table VI shows that a significant gain was made from the first practice of the first week (Monday, January 7) to the first practice of the last week (Monday, February 11) for Group II.

TABLE VII

DIFFERENCE IN MEAN GAINS OF GROUP I, THE ONE DAY PER-WEEK GROUP, AND GROUP II, THE THREE-DAYS-PER-WEEK - GROUP (USING THE FIRST PRACTICE OF EACH WEEK).

Week	Group	No.	D _{mg}	SE _{mg}	D _{mgl-mg2}	SE _d	CR.
1-6	I	25	3.2	0.72			
1-6	II	25	3.7	0.92	0.5	1.17	0.43

Table VII shows clearly that although the two groups made significant gains from the first to the last week, when using the first practice day of each week of Group II as a basis for comparison with Group I, there is no comparable difference.

DIAGRAM III COMPARISON OF THE FIRST AND THIRD PRACTICE OF EACH WEEK FOR GROUP II, THE THREE-DAYS-PER-WEEK-GROUP WITH GROUP I, THE ONE-DAY-PER-WEEK-GROUP.

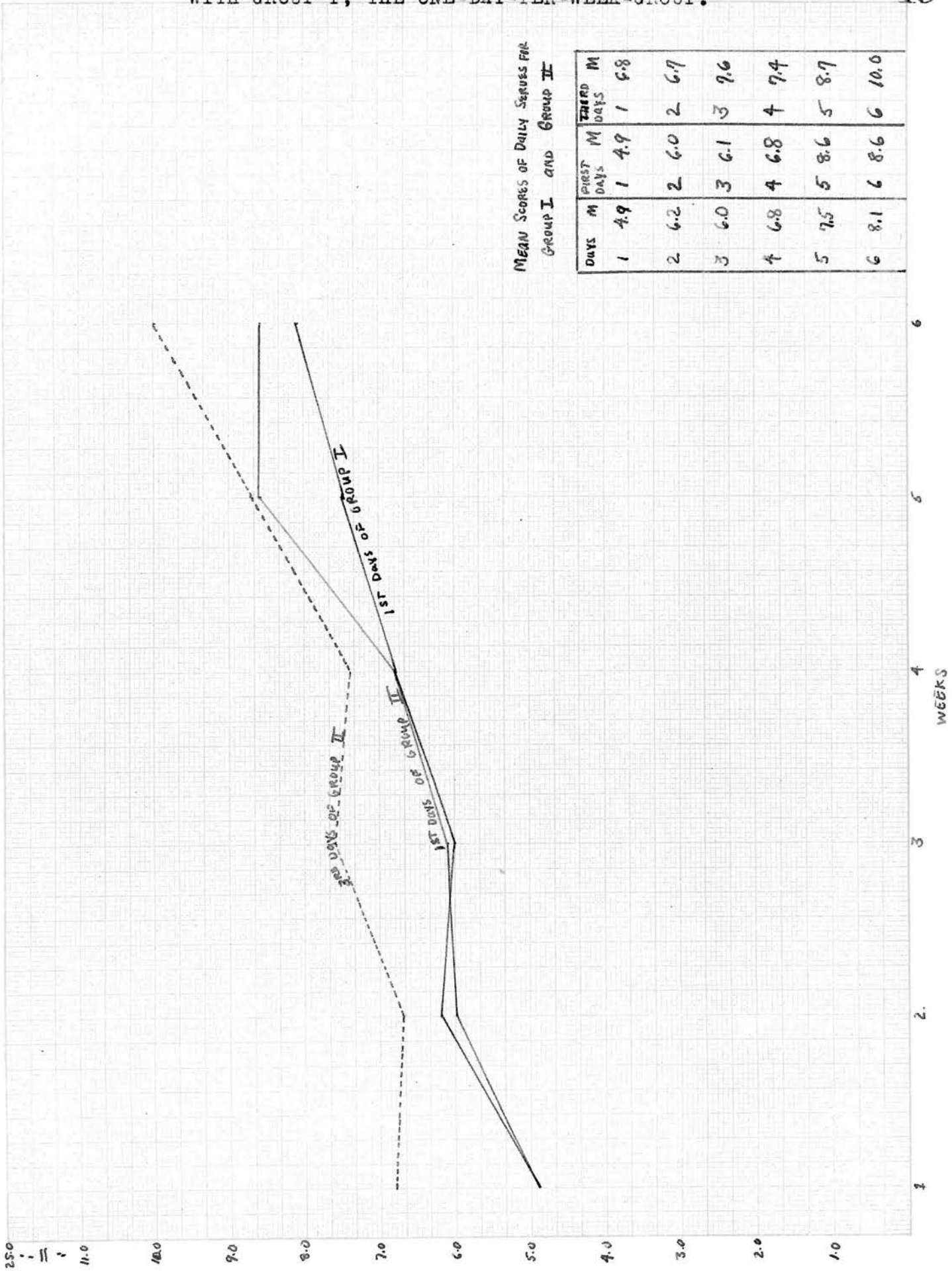


TABLE VIII

MEAN SCORES OF DAILY SERVES FOR EACH SPOT
FOR GROUP I, THE ONE-DAY-PER-WEEK-GROUP.

Weeks	Spots					Daily Totals
	1	2	3	4	5	
1	0.5	1.2	0.6	1.6	1.0	4.9
2	1.3	1.7	0.7	1.5	1.2	6.4
3	1.1	1.5	0.6	1.8	1.2	6.2
4	1.4	1.6	1.1	1.5	1.4	7.0
5	1.6	1.6	1.0	2.2	1.3	7.7
6	1.6	1.7	1.2	2.5	1.4	8.4

Table VIII above gives the mean scores of daily serves for each spot for Group I, the one-day-per-week-group. From this table it can be seen that spot four was easy, and spots three and five most difficult to serve to. This may be explained by the position of these spots. Four was close and directly in front of the serving line. Three and five were in the back left and right hand corners respectively.*

The daily mean totals show substantial gains with the exception of the second to third day. Here there is a drop of the mean gain from 6.4 to 6.2. Table X in the appendix shows this drop to be caused by 12 girls making poorer scores than in the previous week; three remaining constant; and only 10 showing improvement. This improvement is diagrammed on page 17.

* See Chart II, page 10.

Table IX on page 22 gives the mean scores of daily serves for each spot for Group II, the three-days-per-week-group. This includes 18 practice sessions over the six week period. From the first to the third practice of each week some improvement was shown; but at the first practice of the following week a four day lay off had occurred, and the scores had dropped. In all cases but one (fourth to fifth week) the first practice of the week was worse than the third practice of the previous week. These gains and drops are more clearly illustrated by Diagram II, page 17.

Both groups seemed to end up the last week with a great show of interest, maybe because they knew the test was nearing the end. As was the case with Group I, the fourth spot had the best scores, and spot three the poorest.

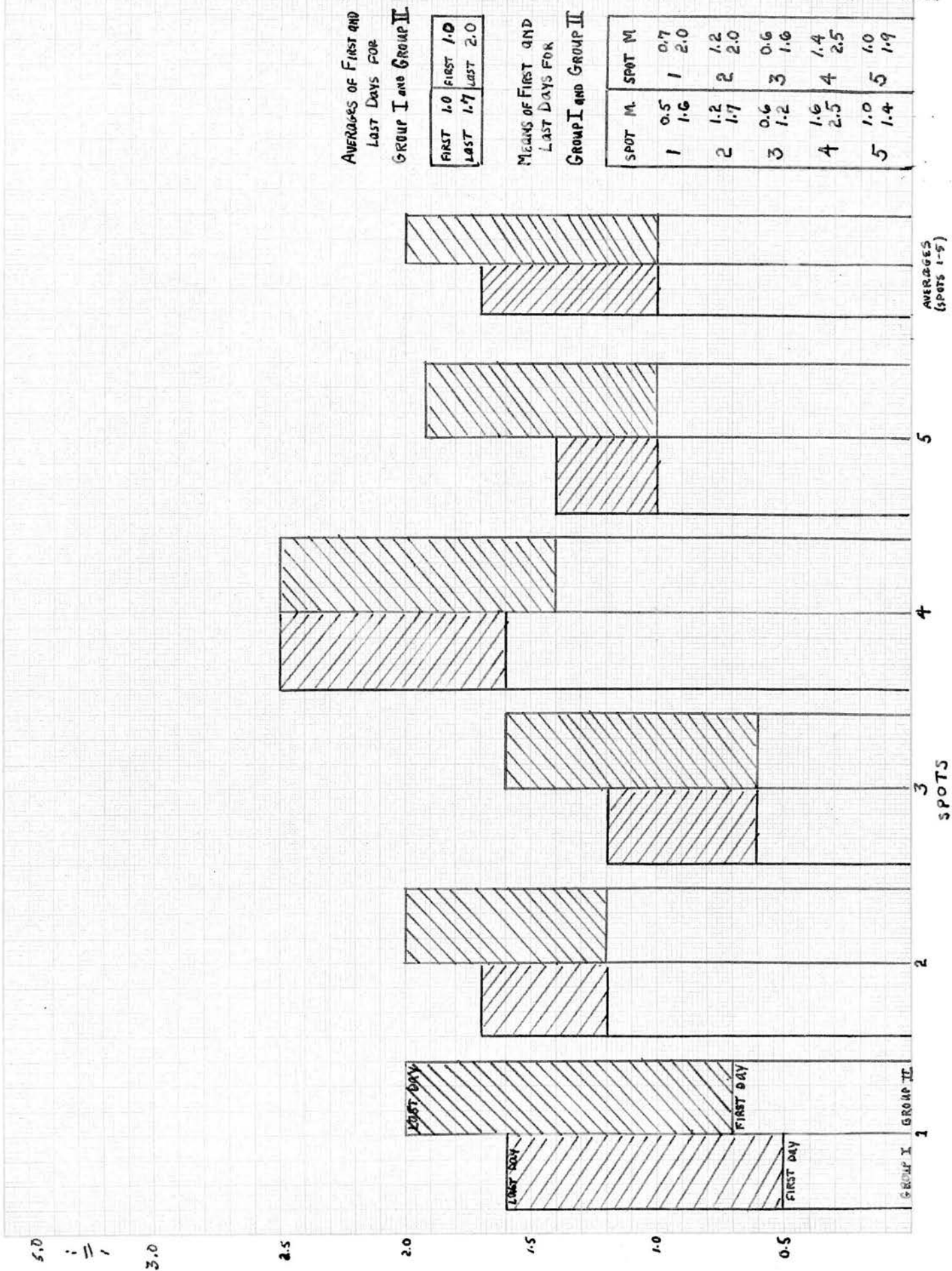
A comparison of weekly mean improvement is drawn on Diagram I, page 14. This was done by using the last practice day of each week as a basis for comparison. Although both groups started on the first day with a mean of 4.9, by the end of the first week Group II had three days to improve its score and Group I only one day. This helps to explain the wide divergence of the curves at the end of the first week. Over the six week period, there was never too much difference in the mean scores.

TABLE IX
 MEAN SCORES OF DAILY SERVES FOR EACH SPOT
 FOR GROUP II THE THREE-DAYS-PER-
 WEEK-GROUP.

Weeks	Spots					Totals
	1	2	3	4	5	
1 a.	0.7	1.2	0.6	1.4	1.0	4.9
b.	1.0	1.2	0.4	1.3	1.1	5.0
c.	1.3	1.5	0.9	1.7	1.2	6.6
2 a.	1.2	1.4	0.8	1.6	1.0	6.0
b.	1.3	0.9	0.9	1.9	1.3	6.3
c.	1.4	1.4	0.9	1.8	1.2	6.7
3 a.	1.3	1.3	0.8	1.6	1.1	6.1
b.	1.5	1.5	1.1	2.2	1.4	7.7
c.	1.3	1.6	1.2	2.4	1.1	7.6
4 a.	1.4	1.5	0.9	1.6	1.4	6.8
b.	1.6	1.7	1.2	1.9	1.2	7.6
c.	1.4	1.6	1.0	2.0	1.4	7.4
5 a.	1.7	1.6	1.4	2.2	1.7	8.6
b.	1.4	2.0	1.3	2.2	1.4	8.3
c.	1.7	2.0	1.2	2.2	1.6	8.7
6 a.	1.7	1.8	1.6	1.9	1.6	8.6
b.	1.6	2.0	1.6	2.3	1.7	9.2
c.	2.0	2.0	1.6	2.5	1.9	10.0
Total						
a.	8.0	8.8	6.1	10.3	7.8	41.0
b.	8.4	9.3	6.5	11.8	8.1	44.1
c.	9.1	10.1	6.8	12.6	8.4	47.0
Grand Total	25.5	28.2	19.4	34.7	24.3	132.1

Group I made a 14.24 per cent improvement from the first to the last day (Diagram IV, page 24). Group II made a 20.64 per cent improvement from the first over the last day as is shown in Diagram IV, page 24. This however is not a statistically significant difference.

DIAGRAM IV COMPARISON OF THE MEAN SCORES OF THE FIRST AND LAST DAY FOR GROUP I, THE ONE-DAY-PER-WEEK-GROUP AND GROUP II THE THREE-DAYS-PER-WEEK-GROUP.



AVERAGES OF FIRST AND LAST DAYS FOR GROUP I and GROUP II

SPOTS	GROUP I FIRST	GROUP I LAST	GROUP II FIRST	GROUP II LAST
1	0.7	1.0	1.4	1.7
2	1.2	1.6	1.7	2.0
3	0.6	1.2	1.2	1.7
4	1.6	2.0	2.0	2.5
5	1.0	1.4	1.4	1.9

MEANS OF FIRST AND LAST DAYS FOR GROUP I and GROUP II

SPOTS	GROUP I SPOT M	GROUP I SPOT M	GROUP II SPOT M	GROUP II SPOT M
1	0.5	1	0.7	2.0
2	1.2	2	1.2	2.0
3	0.6	3	0.6	1.6
4	1.6	4	1.4	2.5
5	1.0	5	1.0	1.9

CHAPTER V

SUMMARY AND CONCLUSION

SUMMARY

This experiment, the effect of two time patterns on developing a secondary motor skill, was conducted in the field of time psychology. Two groups using volleyball serves as a skill took part in the testing. Group I practiced once-per-week and Group II three-times-per-week.

Five areas into which the ball was served were used throughout the experiment. Each practice period consisted of five serves per person to each spot, 25 in all. Group I (one-practice-per-week) had six practices over the six week period; Group II (three-practices-per-week) had 18 practices in all.

All conditions were kept as constant as possible for each group throughout the entire six weeks. At the end of the experiment, all data were treated statistically and then analyzed.

CONCLUSIONS

1. Learning of the skill of volleyball serving took place during both time patterns.
2. Although Group II, the three-days-per-week-group made a 6.40 per cent greater gain than Group I, the one-day-per-week-group, this gain was not a statistically significant one.

3. When the first day of each week for Group II, the three-days-per-week-group, is used as a basis for comparison with Group I, the one-day-per-week-group, it is seen that there is practically no difference in gain. The peak at the end of each week for Group II is due to the consistency of practice three days in a row.
4. The results of this experiment would seem to indicate that in order to get best performance, practice three days immediately preceding a game would be ideal.
(Practice Monday, Tuesday, Wednesday, and play game on Thursday)

SUGGESTIONS FOR FURTHER RESEARCH

1. An experiment using the same skill but with different time patterns such as; daily, twice per week, three days per week staggered (M-W-F), additive, massed-spaced.
2. A parallel study using a different skill.

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APPENDIX

TABLE X. RAW SCORES, MEANS, RANGES, AND STANDARD DEVIATIONS FOR THE FIRST GROUP.

Number	Practice Sessions						Sub-totals
	1	2	3	4	5	6	
1	6	8	8	17	18	13	70
2	3	3	1	2	2	4	15
3	1	4	4	7	7	8	31
4	3	5	7	7	6	9	37
5	2	3	5	3	3	6	22
6	5	11	10	12	13	13	64
7	7	6	0	3	5	7	28
8	3	1	2	4	3	3	16
9	2	3	7	9	10	9	40
10	9	5	2	3	3	6	28
11	2	3	0	4	3	3	15
12	2	3	9	4	9	10	37
13	9	7	3	3	6	6	34
14	10	13	12	14	12	12	73
15	1	6	2	4	4	7	24
16	9	13	9	11	12	12	66
17	4	7	1	6	9	6	33
18	5	9	14	6	3	9	46
19	14	11	17	13	13	14	82
20	1	2	2	5	7	7	24
21	7	9	7	7	9	6	45
22	5	7	9	9	7	9	46
23	6	9	8	6	9	11	49
24	3	4	6	7	5	6	33
25	4	9	9	11	12	13	58
Totals	123	161	154	175	192	211	1,016
Means	4.9	6.2	6.0	6.8	7.5	8.1	39.4
Ranges	1 14	1 13	0 17	2 17	2 18	3 14	9 93
S. D.	2.75	2.40	3.70	3.66	3.21	2.34	18.06

TABLE XI RAW SCORES, MEANS, RANGES, AND STANDARD DEVIATIONS FOR THE SECOND GROUP

Number	Practice Sessions															Sub-totals			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		16	17	18
1	6	4	3	4	3	9	4	4	7	7	7	7	7	6	6	4	6	8	102
2	4	6	6	12	8	10	7	9	10	8	9	6	13	9	12	9	7	6	151
3	4	5	9	8	8	7	11	10	6	5	6	7	9	11	10	4	3	2	123
4	10	8	6	12	9	8	9	10	8	6	10	13	9	7	12	10	12	14	173
5	5	8	7	4	6	9	7	7	10	7	4	2	7	3	6	7	12	14	125
6	9	7	9	8	9	10	6	8	7	4	11	5	10	5	7	8	12	14	145
7	2	7	8	3	8	4	3	3	7	5	5	5	8	9	6	9	9	11	112
8	2	2	5	2	3	2	3	2	2	4	2	2	5	3	0	1	3	3	47
9	0	6	6	6	7	8	2	5	8	10	10	13	13	12	9	6	9	11	141
10	3	3	7	3	6	8	7	9	9	8	11	10	9	5	12	10	8	9	147
11	2	5	3	1	3	3	2	6	5	4	7	9	8	4	6	8	7	7	90
12	4	9	11	6	3	4	7	12	10	9	8	7	6	11	13	11	15	14	160
13	5	4	8	5	8	14	13	13	11	13	9	9	10	10	14	7	8	14	175
14	6	4	5	11	8	8	5	8	3	8	8	10	9	6	12	13	13	13	152
15	3	4	4	3	1	1	3	3	7	5	9	7	11	9	11	13	13	14	121
16	6	6	9	8	9	4	7	9	7	8	3	6	7	8	5	7	6	6	121
17	4	2	7	6	3	3	7	4	5	6	11	6	7	4	9	9	6	10	104
18	3	1	2	3	1	5	4	6	3	5	6	5	2	6	5	7	6	7	73
19	2	3	8	5	4	3	7	7	9	10	9	2	7	11	5	8	7	9	116
20	11	2	6	7	9	7	6	11	12	7	9	11	11	11	8	10	12	12	162
21	4	6	7	6	4	10	8	11	11	4	3	7	7	6	9	10	13	9	135
22	16	12	17	15	14	17	14	15	16	14	16	17	18	17	20	19	21	21	299
23	6	8	9	8	10	11	10	10	9	8	12	9	12	17	11	13	13	14	184
24	3	3	4	1	6	1	2	3	6	2	5	2	8	7	6	4	4	6	73
25	0	1	3	2	4	1	3	5	2	6	3	3	4	8	7	7	6	7	72
Totals	122	126	166	150	157	167	153	193	189	170	188	185	216	208	217	214	231	251	3,303
Means	4.9	5.0	6.8	6.0	6.3	6.7	6.1	7.7	7.6	6.8	7.5	7.4	8.6	8.3	8.7	8.6	9.2	10.0	132.3
Ranges	0	1	3	1	1	1	2	2	2	2	3	2	2	3	1	1	3	2	32
	16	12	17	15	14	17	14	15	16	14	16	17	18	17	20	19	21	21	299
S. D.	3.44	2.09	2.76	2.84	2.30	3.44	3.16	2.90	2.76	2.63	3.04	2.80	2.97	2.56	3.60	3.03	3.30	3.75	53.37