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A Study to Determine the Effects of Extraneous Visual Cues on the Accuracy of Shooting a Basketball

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A Study to Determine the Effects of Extraneous

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The writer wishes to express his appreciation to Dr. Groves, Dr. Lowell, and Dr. O'Brien for their assistance and guidance. Also to Jim Kimball, the writer's appreciation for his help with the series of tests necessary for the completion of this study, and to my wife, Peggy, for her assistance.

William L. Geurin

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CHAPTER I

INTRODUCTION

The writer, through participation and experience as a varsity basketball player, had found that many coaches stress concentrating on the rim when shooting baskets. It was believed that the rim should be the target area, but that other factors were present which technically influenced the ability of a player to shoot and score successfully. It was this technical point that intrigued the writer. Since no game of basketball is played in the dark, most coaches would be correct in picking a main target at which to aim, although many other cues might affect the scoring results. When an individual player changes to a different floor, this may present variations in depth perception due to extraneous cues that alter the accuracy of scoring. Technically, if a player "sees" only the target - the rim, then extraneous cues should not alter his ability to score.

Are coaches then employing the correct and basic factor important to scoring - as concerns visual ability, or, should they be aware that - technically speaking, other factors are involved?

PURPOSE

It was the writer's hypothesis that the shooter applies his visual prowess to use extraneous cues when judging the shot. The subjects were not expected to shoot as accurately without the use of extraneous visual cues as they would when shooting under normal conditions. The purpose of this study was to determine the effect of the extraneous visual cues on the accuracy of shooting a basketball.

CHAPTER II

REVIEW OF LITERATURE

In the search for available literature it was found that very little work had been done recently relating directly to this type of study. Research leaders in the field of Physical Education such as John D. Lawther,[1] The Pennsylvania State University, and G. Lawrence Rarick, The University of Wisconsin, stated that they did not know of any studies that were relevant.[2] Most information discovered by the writer was compiled before 1930.

In the following review only those studies and statements related to the effect of extraneous cues on the accuracy of shooting a basketball, are included.

According to Griffith,[3] the ability of the average person to estimate a distance is very low. Griffith further states that if

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[1]John D Lawther, personal letter.

[2]G. Lawrence Rarick, personal letter.

[3]Coleman R. Griffith, Psychology of Athletics (New York: Charles Scribner's Sons, 1928)

it is impossible to pick out, as a requisite for the performance of an activity, such a special skill as judging distance, it follows that the practice of such a skill should be as much a part of the coaching program as practice in the skills of the activity.

Speaking of mental functions and mental capacities, Griffith[1] says:

> Some men have learned these capacities in their boyhood games as in high school play; a very few may be born with special dispositions toward excellence in these capacities, but most men have enough innate capacity; they fail because the training of these capacities is left as a sort of by-product from hours of practice in other kinds of skills.

Turnell[2] found that there was a very low coefficient of correlation between visual imagery and the ability to shoot a basketball successfully. The ability to gather images collectively or to memorize images is not important.

Oliphant[3] stated that in shooting baskets in basketball the same angle of error in projecting the ball from two distances should result in errors (misses) at the basket proportional to the squares

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[1] Ibid., p. 47.

[2] Amy Turnell, "The Relationships of Visual Imagery to the Ability to Learn Certain Game Skills," (Unpublished Master's dissertation, State University of Iowa, 1939), pp. 29-31.

[3] Harve A. Oliphant, "A Study of Improvements in Shooting Baskets as Related to the Amount of Practice," (Unpublished Master's dissertation, State University of Iowa, 1939), pp. 26-28.

of the distances thrown. Thus there should be approximately four times as many misses from a distance of forty feet as from a distance of twenty feet.

Griffith[1] determined in a study of free-throws fifteen feet from the basket that approximately twice as many errors were made with reference to the distance (too far or short) as were made in the lateral directions (right or left). This finding is supported by Oliphant[2] as being true for shots from other areas of the playing court.

Kinesthesis has to do with controlling body movements through sense organs located in the muscles. Lawther[3] states that in the human body, a group of muscles readjust movement errors signalled by the sense organs. As the readjustment for correction of inaccurate movements nears completion, the muscular force applied for correction decreases. Moreover, the antagonistic muscles pick up additional tension that acts like a brake to the movement.

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[1]Coleman R. Griffith, "Types of Errors in Free-Throws," Athletic Journal (September, 1930) 22-26.

[2]Oliphant, loc. cit., pp. 27-28.

[3]John D. Lawther, Psychology of Coaching (New York: Prentice-Hall Inc., 1951) p. 234.

Condlind[1] and others conducted a study and stated that the purpose was to reduce the sensory stimulation available to the individual to determine the effects on various perceptual and motor skills. "The effect of Sensory Deprivation. . .had no significant effect upon depth perception. . ."[2]

Anderson[3] found through the use of visual aids, that children using visual aids showed a definite increase in the accuracy of shooting a basketball over those who did not use the visual aids. According to Anderson it then follows that other visual aids will be picked up by the shooter in his practicing in order to improve his accuracy.

It can be concluded from these studies that people do pick up and use extraneous cues in performing skills. One idea was brought out by Griffith which the writer feels is very important. This concept is that the participants should be taught to use these extraneous cues and the instructor should not depend solely on the ability of the individual to pick up the extraneous cues through participation.

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[1]Douglas K. Conclind et. al. "Effect of Sensory Deprivation on Some Perceptual and Motor Skills," Perceptual and Motor Skills (October, 1959) pp. 91-97.

[2]Ibid., p. 95.

[3]Theresa Anderson, "A Study of the Use of Visual Aids in Basket Shooting," Research Quarterly (December, 1942) p. 536.

CHAPTER III

METHODOLOGY

PROCEDURE

Twenty students from Eastern Illinois University, varying in age from eighteen to twenty-five years, were used as subjects. All of the subjects had a background in basketball as a member of the varsity or freshman basketball team, or as a high school player. Each subject took the test under experimental conditions which were set up to eliminate the extraneous cues, and the mean was calculated. Each subject then took the test under controlled conditions. All of the tests were administered in the basketball gymnasium located at Eastern Illinois University's Laboratory Training School.

The test consisted of twenty shots by each individual from three different positions on the floor. One position was at the top of the free throw circle. The other two were on the extended foul line, six feet to the left and six feet to the right of the foul line. Each player took sixty shots for each test comprising a total of one hundred and twenty shots for both tests. For each

test there were twelve hundred shots attempted by the twenty subjects comprising a total of twenty-four hundred shots attempted for both tests.

CONTROLLED CONDITIONS

The controlled conditions were the same as those present in a practice situation. A lighted gym at night time was used for testing under controlled conditions.

EXPERIMENTAL CONDITIONS

The experimental condition used for testing was a darkened gymnasium, the rim being the only visual object. The most satisfactory experimental conditions were achieved by using flashlights of the pen-light variety to illuminate only the rim. One small flashlight was taped down on top of the rim, focusing the beam on the rim. The light was covered with wire fencing to protect it from the force of the ball. The backboard was covered with cardboard painted black to eliminate any reflection. The rim was painted with orange flourescent paint so it would reflect the light beams. The windows were covered, and this method proved to be satisfactory in establishing the desired experimental testing conditions.

ANALYSIS OF DATA

The raw data[1] from all three locations (left side, right side, and middle) and the total of the scores were recorded under controlled and experimental conditions. Using McCloy's[2] procedure the significance of the difference between the controlled and experimental means was determined. The standard error of the difference between experimental and controlled means for each of the three locations and the appropriate t ratio were obtained. The .01 percent level of confidence was chosen to denote statistically significant differences; t ratios that were statistically significant at or beyond the .01 percent level necessitated a rejection of the null hypothesis.

FINDINGS

Table I shows the data accumulated under the testing conditions from which the following results are noted.

Shooting from left side of floor

The mean score for the group under experimental conditions was 6.25 successful shots. A mean score of 9.75 was made by

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[1]The data appears in the Appendices A-D.

[2]Charles McCloy and Norma Young, Test and Measurements in Health and Physical Education (New York: Appleton, Century, Crofts, Inc.), p. 430.

TABLE I

DEGREES OF FREEDOM, GROUP MEAN, DIFFERENCE OF GROUP MEANS, t RATIO, AND LEVELS OF CONFIDENCE

Measurements	df	Experimental	Controlled	Difference	t Ratio	Levels of Confidence
Left Side	19	6.25	9.75	3.50	4.50	* .001
Right Side	19	5.50	11.20	5.70	7.90	* .001
Middle	19	4.85	10.50	4.85	5.90	* .001
Total	19	17.40	31.40	14.00	7.30	* .001

*beyond the .001 level

the group under controlled conditions. A t ratio of 4.5 was found which was statistically significant beyond the .001 percent level of confidence.

Shooting from right side of floor

The mean score for the group under experimental conditions was 5.5 successful shots. A mean score of 11.2 successful shots was made by the group under controlled conditions. A t ratio of 7.9 was found which was statistically significant beyond the .001 percent level of confidence.

Shooting from middle of floor

The mean score for the group under experimental conditions was 5.65 successful shots. The mean score for the group under controlled conditions was 11.5. The t ratio was calculated to be 5.4. This t ratio was statistically significant beyond the .001 percent level of confidence.

Total

The total mean score for the group under experimental conditions was 17.4 and the total mean score for the group under controlled conditions was 31.4. The t ratio was calculated to be 7.34. This t ratio was statistically significant beyond the .001 percent level of confidence.

DISCUSSION OF FINDINGS

All of the subjects had better scores under controlled conditions than experimental conditions, when shooting from the left side. Only one subject did better under experimental conditions when shooting from the right side and middle. This subject also shot better under experimental conditions for the total from all three locations. It is the writer's contention that this subject's performance could possibly be the result of certain psychological factors. The subject seemed to have certain inferiority characteristics which could have affected his performance under controlled conditions when others were watching him.

The writer feels that the subjects were all interested in their shooting scores and put forth their best efforts in an attempt to outshoot the other subjects. The purpose of the testing was not disclosed to the subjects until all testing was completed. Therefore, the writer believes that the competition between subjects provided the motivation needed which encouraged concentration on shooting.

CHAPTER IV

SUMMARY AND CONCLUSIONS

The effect of extraneous cues on the accuracy of shooting a basketball was determined by administering a shooting test to a group of twenty subjects under two different conditions. One test was given under controlled conditions, (a lighted gymnasium under normal practice conditions), and under experimental conditions (the gymnasium was darkened, the rim being the only visual object). The tests were administered at the conclusion of basketball season when the accuracy of the subjects should have been at its peak. The mean of the group under both conditions was calculated and the *t* was applied.

FINDINGS

When compared to the scores under normal conditions, the scores under controlled conditions were significantly different beyond the .001 level. The subjects, as a whole, did better in scoring baskets under lights than when lights were out, using only the rim as the target.

CONCLUSIONS

From the results of this study, the following conclusions were made. Visual cues other than the rim are used by players when shooting a basketball. The specific cues have not been determined because all cues were grouped together into one major category. Coaches should teach the participants to use these extraneous visual cues and not expect the players to pick up these visual cues only through participation. Coaches should teach the boys to learn to adjust to all possible visual cues present in each gymnasium in which they participate. Markings on the floor, which are the same in all locations, are examples of visual cues which could be used by coaches. The writer feels that coaches should be aware of the use of extraneous visual cues and any other factors important in the performance of a skill and teach these factors in order for the participant to improve his performance in that particular skill.

APPENDIX A

RAW DATA: LEFT SIDE

Subject Number	Experimental shots attempted	Experimental shots made	Controlled shots attempted	Controlled shots made
1	20	9	20	11
2	20	6	20	13
3	20	7	20	9
4	20	6	20	8
5	20	8	20	13
6	20	8	20	11
7	20	1	20	9
8	20	7	20	17
9	20	7	20	10
10	20	6	20	9
11	20	4	20	6
12	20	5	20	9
13	20	8	20	14
14	20	6	20	5
15	20	5	20	8
16	20	9	20	11
17	20	8	20	4
18	20	2	20	11
19	20	8	20	6
20	20	5	20	11

APPENDIX B

RAW DATA: RIGHT SIDE

Subject Number	Experimental shots attempted	Experimental shots made	Controlled shots attempted	Controlled shots made
1	20	3	20	9
2	20	10	20	14
3	20	9	20	9
4	20	5	20	11
5	20	11	20	14
6	20	5	20	16
7	20	1	20	8
8	20	5	20	16
9	20	5	20	16
10	20	3	20	6
11	20	3	20	6
12	20	2	20	10
13	20	8	20	15
14	20	5	20	9
15	20	8	20	16
16	20	4	20	9
17	20	10	20	11
18	20	3	20	9
19	20	6	20	7
20	20	4	20	9

APPENDIX C

RAW DATA: MIDDLE

Subject Number	Experimental shots attempted	Experimental shots made	Controlled shots attempted	Controlled shots made
1	20	8	20	12
2	20	14	20	14
3	20	4	20	4
4	20	5	20	12
5	20	5	20	15
6	20	2	20	14
7	20	2	20	8
8	20	11	20	17
9	20	6	20	15
10	20	5	20	7
11	20	5	20	8
12	20	2	20	7
13	20	13	20	13
14	20	4	20	8
15	20	2	20	6
16	20	4	20	13
17	20	3	20	4
18	20	3	20	9
19	20	3	20	6
20	20	6	20	9

APPENDIX D

RAW DATA: TOTAL

Subject Number	Experimental shots attempted	Experimental shots made	Controlled shots attempted	Controlled shots made
1	60	20	60	32
2	60	30	60	41
3	60	20	60	22
4	60	16	60	31
5	60	24	60	42
6	60	15	60	41
7	60	4	60	27
8	60	23	60	50
9	60	18	60	41
10	60	14	60	26
11	60	12	60	20
12	60	9	60	26
13	60	29	60	42
14	60	15	60	22
15	60	15	60	30
16	60	17	60	33
17	60	27	60	19
18	60	8	60	29
19	60	17	60	19
20	60	15	60	29

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