THE EFFECT OF "OVERLOAD WARM - UP" ON THE SPEED OF THROWING

Thesis for the Degree of M. A.

MICHIGAN STATE UNIVERSITY

Randall Lee Hagerman

1956

THE EFFECT OF "OVERLOAD WARM-UP" ON THE SPEED OF THROWING

by

RANDALL LEE HAGERMAN

AN ABSTRACT

Submitted to the College of Education of Michigan State University of Agriculture and Applied Science in partial fulfillment of the requirements for the degree of

MASTER OF ARTS

Department of Health, Physical Education, and Recreation

1956

Approved Wayne D. VanHuss

RANDALL LEE HAGERMAN ABSTRACT

Title of the study. The Effect of "Overload Warm-up" on the Speed of Throwing.

Statement of the problem. To evaluate the influence of a warm-up period, in which a weighted baseball is used, on the velocity of the baseball throw.

Methodology. Eight subjects were used in this study and each served as his own control Each subject participated in two tests. T_1 was preceded by a warm-up period using a regulation baseball and T_2 was preceded by a warm-up period using a weighted ball. All subjects were tested twice on the same day, T_1 being administered in the morning and T_2 being given in the afternoon of the same day after a rest of not less than two hours.

The testing program consisted of the following: T_1--after a subject had warmed-up in his customary manner with a regulation baseball, the timing device was attached to the subject's hand and arm. He was then instructed to pitch the ball as fast as he could at the target provided. Each subject was allowed three practice throws with the timer functioning, so as to accustom himself to the device. The velocity of each of the first fifteen pitches to strike the target was recorded.

T_2--The same procedure was employed as in T_1, except that during the warm-up period a baseball weighing exactly eleven ounces was substituted for the regulation baseball. In both T_1 and T_2 the regulation pitching distance of sixty feet six inches was used.

CONCLUSIONS. 1. The results of this study show that there was no significant increase in the speed of throwing by warming-up with a weighted ball. However, the results were so near to being significant that more research in the area is a necessity.

2. Subjects expressed a feeling of relaxation and ease in throwing hard following "overload warm-up" that they felt was unique and that they had not previously experienced.

THE EFFECT OF "OVERLOAD WARM-UP" ON THE SPEED OF THROWING

by

RANDALL LEE HAGERMAN

A THESIS

Submitted to the College of Education of Michigan State University of Agriculture and Applied Science in partial fulfillment of the requirements for the degree of

MASTER OF ARTS

Department of Health, Physical Education, and Recreation

ACKNOWLEDGMENTS

The writer wishes to express his grateful acknowledgment to his advisor, Dr. W. D. Van Huss, for his professional guidance, criticisms, and valuable suggestions rendered in this study. The writer also wishes to express thanks to Dr. Van Huss for his friendly encouragement that was so necessary for the completion of this study.

Thanks are also extended to the subjects who cooperated in this study to the fullest extent.

The author also wishes to express his appreciation to Ann, who was always encouraging and cheerful when things were most discouraging.

R. L. H.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

Most baseball players swing a weighted bat or several regular bats before stepping to the plate for their turn at bat. They claim that swinging this extra weight immediately before batting makes the regular bat feel lighter than it really is and enables them to swing it faster. Similarly some pitchers (Spud Chandler, New York Yankees, and Carl Erskine, Brooklyn Dodgers) have used weighted baseballs during their warm-up period, feeling that by so doing they were able to throw the regulation ball faster.

A. T. Slater-Hammel and E. H. Andres[1] at Indiana University compared the speeds of fastballs and curve balls. The timing mechanism utilized is of interest.

So that the grasp and release of the ball would act as a switch, a ball was partially coated with DuPont's conducting silver #4817 and small copper electrodes were designed for the last phalanx of the index and adjacent fingers. When the ball was held with electrodes across the

---

[1] "Velocity Measures of Fastballs and Curve Balls," A. T. Slater-Hammel and E. H. Andres, Research Quarterly, Vol. 23, No. 1, March, 1952.

coated area of the ball it affected a closed switch. Release of the ball activated the timer. A speaker unit placed within two feet of home base and the sound waves created in catching the ball were used to stop the timer. Duration of ball flight was recorded in 1/100's of a second.

Statement of the problem. To evaluate the influence of a warm-up period, in which a weighted baseball is used, on the velocity of the baseball throw.

Need for the study. The effect of a warm-up period with a weighted bass has not been established. The question of how to get the most speed on a baseball has been a constant problem to coaches and pitchers. Many different styles of pitching have been developed in an attempt to discover some way of throwing faster. Some major league pitchers have warmed-up with weighted balls hoping that this would improve their throwing speed, yet no study has ever been made of the effects of such a warm-up period.

Limitations of the study. 1. Psychological factor. It is impossible to know if the subjects are performing at their maximum. The wire attached to the subject's arm and the electrodes on the finger tips may have had some effect on the speed of throwing.

2. Fatigue factor. Since each subject performed twice on the same day, there may have been a tendency to throw slower at the time of the second test.

Definitions. The following are defined briefly for use in this study.

Warm-up Period. For use in this study warm-up period refers to the amount of time each pitcher will take to prepare himself to throw a baseball at maximum speed. It is an individual matter and length of time required will vary with each subject.

Overload Warm-up. In this study overload warm-up period refers to the warm-up period in which the weighted ball is thrown instead of the regulation baseball.

CHAPTER II

RESEARCH METHODS

This study is designed to determine the effect of a warm-up period with a weighted baseball on the velocity of the baseball throw.

Source of Data

Method. The experimental method of research was used. Subjects were their own controls, performing both after a warm-up period with a regulation baseball and after a warm-up period with a weighted baseball.

Selection of measures. It was decided that record should be kept of the velocities of fifteen pitches, since observation showed that this was the average number of pitches thrown in one inning of a baseball game. The velocities of fifteen pitches were recorded in the morning after warm-up with a regulation ball. In the afternoon the velocities of fifteen more pitches, by the same subject, were recorded after warm-up with the weighted ball. The regulation pitching distance of sixty feet six inches was used.

Selection of subjects. The subjects were physical education majors enrolled for the summer session of 1956 at Michigan State University. Half of the subjects were graduate students and half were undergraduates.

The experimental factor. A weighted baseball was used by each subject for his warm-up period preceding the second test. Each man was allowed all the time he desired for the warm-up period. The weighted ball was made from a regulation ball by drilling two large holes through it and filling the holes with lead. The weighted ball weighed exactly eleven ounces.

As a control each man used a regulation baseball for his warm-up exercise prior to the first test.

Testing routine. All subjects met in the morning and warmed up using a regulation baseball. Immediately after the subject's customary warm-up period the electrodes were attached to the fingers and the wire attached to his arm. Each subject was then allowed three practice throws to accustom himself to the wire. He then was instructed to throw as fast as possible at the target. Velocities of the first fifteen pitches to strike the target were recorded. Subjects were allowed to take all the time they wanted between pitches. All subjects met again in the afternoon and warmed up with the weighted ball. Each subject was allowed

to warm up for as long as thought necessary. Immediately after the over load warm-up period the electrodes and wire were attached to the subject. Subjects were allowed three practice throws to accustom themselves to the wires. Then with a regulation ball each subject was instructed to throw as fast as he could at the target. Velocities of the first fifteen pitches to strike the target were recorded.

Testing Techniques

Warm-up period. All subjects were allowed to warm-up in their customary manner and for the length of time each subject felt necessary to prepare himself to pitch at maximum speed.

Velocity measures. A special electronic device as described by Montoye[2] was constructed to measure the velocity of a pitched ball. The device was designed so that the opening of a switch started a standard electric clock, and the closing of a micro switch stopped the clock.

In order that the grasp and release of a ball would act as a switch, a regulation baseball was partially coated with an electrical conducting paint. A very thin, flexible two-strand cable, attached to the timer, was taped to the

---

[2]Montoye, H. J., et al., "An Electric Track and Reaction Timer," FIEP Bulletin, 2:1-16, 1954.

pitcher's arm and across the palm of his hand. Enough slack was left in the wire to allow freedom of movement in the pitching motion. One strand of the cable extended from the palm of the hand to the tip of the index finger and the other strand extended from the palm of the hand to the tip of the adjacent finger. The last one inch of the wire on either finger had the insulation removed so that the bare wire could act as an electrode. When a pitcher held the exposed ends of the cable across the coated portion of the ball the electrical action was that of a closed switch. Release of the ball served to open the switch and trigger the timing device. A wooden target the size of the strike zone was attached to a larger piece of plywood with four micro switches suspended between the two pieces of wood. The micro switches were balanced so that ball striking any portion of the strike zone area would stop the clock. When testing the apparatus it was discovered that a ball striking any portion of either piece of wood would trigger the micro switches and stop the clock, making it unnecessary to throw a strike to get a good recording.

Accuracy of the timing device was checked by dropping a ball 15.5 feet twelve times and computing the time lapse that should occur by the mathematical formula:

$$t = \frac{S}{\frac{1}{2} g}$$

The drop times recorded were 1.00 seconds for the first three drops and 0.99 seconds for the next nine drops. When comparing the two figures, the theoretical figure was compared to that recorded on the timing device. Per cent error was found to be 0.9%.

Statistical technique. The difference between the experimental and control groups was evaluated using the small sample "t".

CHAPTER III

PRESENTATION AND ANALYSIS OF DATA

Preceding chapters discuss the statement of the problem, needs for the study, related studies, and the methods to be used in the collection of data. This chapter will give the results of the study indicated in the procedure described in Chapter II.

The purpose of this study was to evaluate the influence of a warm-up period using a weighted ball on velocity of the baseball throw.

Methodology. The eight subjects used in this study served as their own controls. Each subject participated in two tests. T_1 was preceded by a warm-up period using a regulation baseball and T_2 was preceded by a warm-up period using a weighted baseball. All subjects were tested twice on the same day, T_1 being administered in the morning and T_2 being administered in the afternoon after a rest of not less than two hours.

The testing program consisted of the following: T_1--after a subject had warmed up in his customary manner with a regulation baseball, the timing device was attached to the subject's hand and arm. He was then instructed to

pitch the ball as fast as he was able at the target provided. Each subject was allowed three practice throws with the timer functioning so as to accustom himself to the device. The velocity of each of the first fifteen pitches to strike the target was recorded. T_2--the same procedure was employed as in T_1, except that during the warm-up period a baseball weighing exactly eleven ounces was substituted for the regulation baseball, which weighs not less than five nor more than five and one quarter ounces.[3] In both T_1 and T_2 the regulation pitching distance of sixty feet six inches was used.

Treatment of the data. All results were tabulated and means of T_1 and T_2 were evaluated using Student's "t".

Presentation of data. The data will be presented in tabular form and discussed as findings and statistical significance. The presentation will be divided into two categories: (1) the testing results, and (2) discussion.

(1) Testing results: Differences between T_1 and T_2. Seven of the eight subjects tested had lower mean scores for T_2 than for T_1. The differences in mean scores for individuals varied from 0.007 seconds to 0.102 seconds.[4] The

---

[3] Official Baseball Guide, Rule 1.13.

[4] Basic data will be found in Appendix.

remaining subject had a mean score of 0.590 for T_1 and a mean score of 0.596 seconds for T_2.

Individual means for T_1 ranged from 0.590 to 0.822 seconds and means for T_2 ranged from 0.596 to 0.792 seconds.

A mean of 0.692 seconds was obtained for T_1, while a mean of 0.666 was computed for T_2. The mean difference is .026 seconds, indicating that the group threw faster on the second series of throws. These data, however, when analyzed yielded a "t" of 2.06, which is not statistically significant. To be significant at the 5% level of confidence a "t" of 2.365 is necessary.

(2) Discussion: Trends. Although all subjects were tested twice in the same day, seven of the eight subjects tested showed a definite tendency toward throwing faster on the second test. It would seem that fatigue would enter in and cause subjects to throw slower on the second test. The eighth subject recorded at approximately the same mean velocity with a difference of only 0.006 seconds in the mean for his fifteen throws. It can safely be stated that there was a definite trend to hold the same velocity or to increase it slightly on the second test, even though subjects were tested twice on the same day.

Another factor that cannot be tested here is of interest. The psychological implications have not been ex-

plored. Each subject expressed a feeling of relaxation and ease of movement following the overload warm-up which they had never before experienced in their pitching motion. All felt that they could throw as hard as they wished with no feeling of strain.

CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary. The purpose of this study was to evaluate the influence of a warm-up period with a weighted ball on the velocity of the baseball throw.

Eight subjects were tested. Subjects were physical education majors at Michigan State University. Each subject acted as his own control in the experiment.

T_1 was administered in the morning after the subject had thoroughly warmed-up in his customary manner with a regulation baseball. T_1 consisted of measuring the velocity of each of the first fifteen pitches after warm-up to strike the target area.

T_2 was administered in the afternoon of the same day. Subjects warmed-up with a ball weighing eleven ounces for as long as they felt necessary. Then the velocity of each of the first fifteen pitches to strike the target area were recorded. A mean was computed for T_1 and T_2 and the difference in means was compared by using Student's "t".

Conclusions. The results of this study show that there was no significant increase in the speed of throwing by warming-up with a weighted ball. Subjects expressed a

feeling of relaxation and ease in throwing hard, following "overload warm-up", that they felt was unique and that they had not previously experienced.

Recommendations. 1. It is recommended that this study be repeated using experienced baseball pitchers for subjects. There should be several tests for each subject for each type of warm-up period. Work could be done using different weights of balls for warm-up purposes.

2. It is also recommended that a sound pick-up be used to stop the timer. The sound of catching the ball would act as the switch closing that stops the clock. This would eliminate the control factor and make it possible to record the speed of every pitch instead of recording only those that strike the target area.

3. Further research is needed into the effects of "overload warm-up." There are many other effects from this type of warm-up period, some of which may be advantageous and some of which may be deleterious to pitchers. Exploration of these should yield interesting results.

BIBLIOGRAPHY

Montoye, H. J., et al., "An Electric Track and Reaction Timer," FIEP Bulletin, 2:1-16, 1954.

Ouellette, R. C., "Effect of Quadriceps Development on Sprint Running Time," Master's Thesis, Michigan State University, 1955.

Scott, Gladys, Analysis of Human Motion, New York City: F. S. Crofts and Co., 1945.

Slater-Hammel, A. T., and E. H. Andres, "Velocity Measures of Fastballs and Curveballs," Research Quarterly, Vol. 23, No. 1, March, 1952.

Spink, J. G., Official Baseball Guide, St. Louis: The Sporting News, 1955.

APPENDIX

TABLE I

BASIC DATA

Subject	Mean T_1*	Mean T_2**
J. S.	0.822	0.792
S. A.	0.697	0.685
L. M.	0.764	0.662
D. M.	0.654	0.644
G. J.	0.651	0.644
R. H.	0.708	0.650
D. N.	0.671	0.662
R. L. H.	0.590	0.596

*Mean T_1 . . . . 0.692

**Mean T_2 . . . . 0.666