THE EFFECT OF STARTING BODY POSITION ON VELOCITY IN RUNNING

A Thesis

Presented to

the Department of Physical Education

Kansas State Teachers College of Emporia

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

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by

Kenneth C. Graber

May 1971

William A. Harper

Approved for the Major Department

Approved for the Graduate Council

ACKNOWLEDGMENTS

I would like to take this opportunity to thank Dr. William A. Harper for his guidance and encouragement, Dr. Dorothy Martin for the use of the Dekan Timer, and to all my professors who made this study possible.

Acknowledgment is also expressed to my wife, Judy, and my daughters, Toni and Cindy, for their patience and kindness while this study was in progress.

K.G.

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Chapter 1

THE PROBLEM AND DEFINITION OF TERMS USED

The contention has long been made that the start of a sprint determines to a great extent the total time required to run from one point to another. According to one author, "There is a high positive correlation between starting time and sprinting time; therefore, a fast start is conducive to a fast sprint (2:375)."

Many studies have shown the effect of the four point starting position on the velocity in sprint running. However, most of these studies used a mechanical aid such as starting blocks and a varied foot placement. There is little evidence of the relationship between the body position itself and the effect it has on the velocity in sprint running. A need therefore arises to establish the effect of body position without mechanical aid in determining which body position would be most advantageous in starting a sprint.

Purpose

The purpose of this study was to investigate the effect of starting body position on the velocity in running.

Problem

The problem of this investigation was to determine

the effect of the two, three, and four point starting stance body positions on the velocity in running for five and thirty yards. More specifically,, is there a relationship between starting stance body position and velocity in running?

Hypothesis

There is no significant difference between starting stance body position and the velocity in running.

Assumptions

1. Each subject had the same advantage in making a natural or uncoached start.

2. Each subject was honest in revealing his past experience regarding methods and techniques he had learned about running and starting.

Definition of Terms

1. Body Position - general distribution of body mass while in a stance.

2. Stance - initial preparatory body position taken by the runner.

a. Two-point Stance - only the feet will be in contact with the starting surface.

b. Three-point Stance - both feet and either hand will be in contact with the starting surface.

c. Four-point Stance - both feet and both hands will be in contact with the starting surface.

3. Starting Time - when the first foot or hand leaves the starting surface.

4. Sprint - to run at top speed; a short period of intense work.

5. Velocity - change in distance per unit of time along a straight line.

6. Speed of Movement - change in distance per unit of time in any direction.

7. Acceleration - rate of change of velocity per unit of time.

8. Reaction Time - time between starting signal and response of runner.

9. Chronometer - clock which is especially constructed for measuring time with a high degree of accuracy.

Limitations

1. The total population of freshmen boys was of a limited number.

2. It was not possible to control the previous experience of the subjects in regard to running and starting.

Delimitations

1. This study was conducted at Inman High School, Inman, Kansas.

2. Only Freshmen boys enrolled in physical education were eligible for use in this study.

3. This study concerned itself only with velocity in running.

Method

The method used in this study was of the experimental single sample type. Thirty inexperienced subjects performing under their own control were used in this study. The only previous experience found among the group was the training they received in elementary school with the sprinter's stance aided by some form of starting blocks.

The only instruction given was the explanation of the testing equipment and the definition of the three starting positions used. For this study the Dekan Timer was used since many studies showed that a chronometer of this type was most accurate in measuring movement time.

The five and thirty yard distances were selected for the following reasons: 1) the distance of five yards lends itself to making comparisons with other similiar studies; and this distance made it possible to study the rate of acceleration, and 2) thirty yards was within the range that most sprinters achieve their maximum speed in sprinting.

It should be noted that this study was dealing with the speed of movement (velocity) and not reaction time. Even though reaction time and movement time are significantly related this study eliminated the reaction time factor by allowing the subjects to control their own starting time.

This study took place during the first three weeks of the 1970-71 school year. Each subject performed three starts from each of the three different starting positions

or a total of nine starts for each distance. A total of five hundred forty starts were performed by the entire group.

Chapter 2

REVIEW OF THE LITERATURE

The problem of this investigation was to determine the effect of the two, three and four point starting stance body positions on the velocity in sprint running for five and thirty yards.

The vast and varied literature which could claim relevance to this present investigation includes research related to movement time and reaction time, body position, and speed of movement. However, most of these studies use some form of mechanical aid, study only specific areas of the body, or test movement in more than one direction. As the purpose of this investigation was to determine the effect of starting body position on the velocity in sprint running, the review of literature included only research specific to this concern.

The review of literature will be divided into two main sections. The first section will concern itself with body position specific to gravity and balance, hand and foot spacing, and hip elevation. And the second section will report the literature on movement time and reaction time.

BODY POSITION

It is clear that within the broad area of running one can focus solely upon the methods used to get the runner into a running position. In discussing the question concerning starts with a number of coaches of various backgrounds, it was evident that they disagree as to the best position or stance to assume when starting a race or sprint. And it was seen that even the existing literature is not in common agreement as to the best starting position or stance.

Research Related to Balance and Gravity

A major scientific contribution has been in recognizing that gravity acts on all parts of the body simultaneously. It is also known that gravity is the major modifier of posture in man. The force of gravity pulling on the body downward is resisted by the antigravity muscles which hold the body in an upright position over the base of support. When gravity acts upon all body parts so that the body is held in equilibrium, all gravitational forces have been neutralized and the mass of the body becomes concentrated about one point. The center of gravity then is the single point around which the total weight of the body is balanced (1:135-136).

For example, without a firmly balanced football stance it is difficult for the human being to start with speed, drive with power, or maintain a consistent effort

after the initial movement has been made. There is little point in teaching the elements of various football blocks unless the platform from which the block is launched is solid. A correct stance however, will promote the use of a balanced position during the time interval between starting and contact and will thereby result in a more efficient type football block (22:194-195).

Since there is some degree of transfer in learning gross motor skills, a firmly balanced stance could be of utmost importance because of possible transfer to various other situations requiring immediate speed and power, such as that needed when leaving the starting blocks in sprint running. Nelson found that the initial learning of the track start for instance, seemed to have had a favorable effect on learning the football stance (14:364).

Specific to running speed and the effects of gravity, Beck concluded that the longer a runner can keep his center of gravity flowing in an upward motion the faster he can run. Running follows an up and down pattern in regard to the center of gravity. Beck found that if a runner can keep his center of gravity flowing in an upward motion over a longer period of time than he allows for the downward motion, he will be able to run faster (1:135-136).

Deshon and Nelson concerned themselves with the relationships of velocity of running and separated these relationships into three factors. These factors were:

A. The angle to which the leg is raised in front of

the body.

B. The length of two strides (a cycle).

C. The angle the leg makes with the ground at point of touchdown.

The findings of this study indicated that statistically significant intercorrelations existed between all variables except between mean angle of leg lift and mean angle of leg at touchdown (4:51-55). This study agreed with some of Beck's findings but also presented a need for further study into cause and effect relationships between the different factors of running.

Over the years many ideas have risen as to the best methods and techniques of running. However, more recently the big question seemed to be that of the best method to start a sprint race with recent ideas focused on the outcome of the total race rather than just on the starting time or reaction time. After reading the three studies mentioned above it was quite apparent that more research is needed in the area of running as many questions have arisen which are yet unanswered.

Research Related to Hand and Foot Spacing

Tuttle found that when making a comparision between the use of starting blocks and holes in the track, the elapsed time between the stimulis and the breaking of the contact of the back foot is shorter where the starting blocks are used (23:117).

Evidencing similar interests, Slater-Hammel found that when the weight of the body was distributed over the feet, the body reacted faster than when the weight is directly over the balls of the feet. Reaction time also tended to be faster when the knees were in a bent position (20:91-96).

Cotton and Denning supported Slater-Hammel with the finding that when they tested ten male students using the upright stance with four different variations, the knees bent, feet flat was the best stance for optimum reaction-movement time. The four variations were: 1) knees bent, feet flat, 2) knees bent, weight on balls of feet, 3) knees straight, feet flat, and 4) knees straight, weight on balls of feet (3:196-199).

Fitch found the weight forward body position produced smaller mean times when compared to weight back body position. He concluded that the smaller mean was an indication of superior starting speed when all intergroup factors which could affect the result were held constant (6:72-89).

Wilkinson held that in order to move straight ahead with the greatest possible facility the football lineman should place considerable weight on the supporting hand of the three-point stance. Most split "T" coaches felt that the hand should support the same amount of body weight as carried by the feet (25:246). The trend today appears to be back to the two-point and four-point stances due to the

new and varied offenses and defenses used by innovative football coaches.

Robinson's research disagreed with that of Wilkinson, in that Robinson contended that the best stance for all around starting ability was the staggered two-point stance. Robinson compared the two-point staggered stance with the three-point stance and the two-point parallel stance. He concluded that when the runner started in a straight-ahead position the two-point staggered stance was significantly faster (17). Robinson was dealing with the starting times only and no consideration was given to the effect of these starting positions to any distance beyond the starting line itself.

Even though the center of gravity determines to a great extent the stance used by the sprinter, Rosenfield found that there was no significant relationship existing between the weight of the individual and the speed of charge of the individual (18).

Research Related to Hip Position

One other factor concerning body position not mentioned thus far is the factor of the hip position. Hip position is important from the standpoint that it does affect the gravity line in the body. The hip position will also determine to a great extent weight distribution on the different areas of the body. Most studies which used the element of the hip position also used some form of

mechanical device to help the runner start the sprint. The position of the hips has become an issue and many coaches feel that it is a very important part in determining the success or failure of most of their sprinters.

White, in a study on hip elevation in relationship to starting time, concluded that when the angle of elevation of the hips was lessened so as to approach a trunk position paralleling the track, starting time was significantly increased. On the other hand, when the angle of the elevation of the hips was increased from the normal position the starting time was significantly shortened. Normal position for this test was ten degrees above parallel (26:128-133).

Sigerseth and Grinaker found that the medium high hip starters could do what the bunched and elongated starters were not able to do. The medium high hip starters were able to stimulate all the muscles innervated through extensor reflex resulting in a significantly faster speed trial measured between twenty and fifty yard timers. The final conclusion was that sprints from the medium starting positions produced the lowest mean times for each of five different distances when starting blocks were used (19:599-600).

Contrary to the findings of Sigerseth and Grinaker, Dickinson found that the bunched start allowed the sprinter the fastest start. The bunched start used a very high hip position with the feet spaced very close together (5:12-19).

It must be pointed out, however, that the bunched start was good only in making a fast start. Due to the fact that Henry found the maximum velocity of the sprinter was achieved somewhere between fourteen and thirty yards the bunched start has failed to remain the best start out of the blocks (10:409-422).

MOVEMENT TIME - REACTION TIME

Many studies have been reported which concerned themselves with movement and reaction time. Much of this research reported that separation of movement time from reaction time is very difficult. To solve this problem of separation, most researchers treated movement time and reaction time as though they were a single unit rather than as two distinct parameters. Because of this failure to distinguish between these two factors, researchers test many different body positions and movement directions rather than undertaking a close examination of the movement time and reaction time relationship.

For the interested reader however, Grose (7:10), Lotter (13:47), and Smith (21:88) found, in separate studies, that by changing the body position or the direction of motion that reaction time was affected to some extent. Additional studies by King (12:308), Henry (8:440), and Kerr (11:55) in the areas of knee extension, factorial structure, and arm movement, added support to the studies mentioned above by showing that within the different areas

of the body certain individual differences can have an affect on reaction time.

Even so, Henry has suggested that there is really no relationship between movement time and reaction time. However, it must be stated that there are those who would disagree with Henry (15:71-109).

For the purpose of this study, movement time in terms of velocity in running was the object of measurement. The study was interested only in the velocity or straight forward motion of the subject. The literature presented in this section included only those studies which dealt with velocity in terms of movement time and reaction time.

Owens completed a study in which he reported that whenever initial movement is to be made in a forward direction the sprinter's type stance should be employed. A sprinter's stance was defined as a stance in which both hands and feet made contact with the starting surface prior to the actual start. Owens also concluded that the differences in speed of movement caused by variations in hand and foot spacing were highly significant. In the final analysis of this study, Owens concluded that the stance proved to be of much greater importance for speed of movement than did individual differences (15:71-109).

This finding agreed with those of both Henry and Beck who suggested that individual differences in ability to react quickly and ability to move quickly are almost unrelated. Henry went on to say that reaction time was

uncorrelated with the speed in sprints. He reported that reaction time was of very little importance in sprinting since it was uninfluenced by block spacing (9:301-318).

There were, however, researchers who disagreed with Henry's statement that there was no relationship between speed in running and reaction time. Westerlund and Tuttle, for example, concluded that at a distance of seventy-five yards there was a coefficient of correlation between speed in running and reaction time of .863 (24:301-318).

More recently, another study has added support to Westerlund and Tuttle and further opposition to Henry. Pierson completed a study of the movement time and reaction time from childhood to senility, in which he concluded that reaction time and movement time were significantly related (16:277).

Henry found however, that if the block spacing was held constant, the speed in sprinting was significantly related to how closely the individual approached the ideal start. The ideal start was defined as: "Early development and maintenance of full maximal thrust with each leg until the respective blocks are cleared as a necessary result of forward motion." Although the rear leg developed considerably more maximum force than the front, the latter contributed twice as much to the block velocity because its impulse had a longer duration. From this Henry concluded that leg length was not important in determining the best block spacing and was unrelated to fifty yard sprinting

ability (9:301-318).

SUMMARY OF RELATED LITERATURE

In summary, the studies cited indicated various factors which might be taken into consideration in determining the best starting body position to be used in starting a sprint, race, or any forward movement requiring power and speed. The review can be summarized in the following points:

1. A firm balanced stance was of utmost importance in both football and track.

2. The neutralization of gravity in both the areas of starting and running added to the degree of success of the sprinter.

3. Existing literature was not in common agreement as to the best starting position or stance.

4. When body weight was distributed over the feet rather than on the balls of the feet the reaction-movement time was faster.

5. With the use of starting blocks the medium high hip position produced the most favorable results.

6. Velocity in sprinting is achieved somewhere between fourteen and thirty yards, with the average being about twenty-two yards.

7. There was much conflicting discussion as to the relationship between reaction time and movement time and the effect of both areas on total sprinting time.

Chapter 3

PROCEDURES

The purpose of this study was to investigate the effect of starting body position on the velocity in running of freshmen athletes at Inman High School. The Dekan Performance Analyzer was used to measure the velocity of thirty subjects over a distance of five and thirty yards from the two, three and four point stance body positions.

This chapter is divided into four sections: 1) nature of subjects, 2) orientation procedures, 3) facilities and instrumentation and 4) testing procedures.

Nature of Subjects

The thirty subjects chosen for this study were members of the 1970-71 freshmen class at Inman High School, Inman, Kansas. They were all male and their ages ranged from 13 to 15 years of age. The subjects were considered inexperienced, that is, they had received no formal instruction regarding the two, three and four point stance body position prior to the conduct of this investigation. The only experience these students had was in the grade school track program where the four point stance with starting blocks was used. Within this program they were taught to start with the aid of starting blocks and no

formal instruction was given in regard to the two, three or four point stance. Therefore, the two, three and four point stances were new experiences with regard to foot spacing and body balance. All subjects were enrolled in physical education classes at the high school. Running a distance of thirty yards did not pose a problem since most of the subjects were accustomed to some type of running in the physical education program.

Orientation Procedures

Each subject was tested individually during the first three weeks of the 1970-71 school term. The investigator, serving as head football and track coach and familiar to all subjects, explained and demonstrated the different stances and the purpose of the test. Explanations were given with the use of pictures and diagrams (see Appendices A,B,C,D and E). The investigator also used a senior athlete to help demonstrate the different stances. All subjects were present at an initial meeting at which time the explanation of the starting positions and the demonstrations were given. This meeting was held to give all subjects equal advantage in understanding all instructions.

Each subject was instructed that he would take his start from a three by three foot square. He was to assume a comfortable position within the limits of the stance and whenever he was ready he could start his run over the prescribed distance for the day. The subjects served as their

own controls in both making their start and in assuming their comfortable position. It was assumed that each of the six stances within the trials specific for that stance were similar, that is, the various body positions within the two, three and four point stance were similar.

An explanation was also given as to the working procedure of the timing machine and the method to be used to start the clock at the start of each run (see Appendix F). It was made very clear to all the subjects that they were competing against the clock and themselves and that there would be no starting signal.

Facilities and Instrumentation

The five and thirty yard running test was administered in the gymnasium at Inman High School. The tests were given between the hours of 1:10 and 2:05 o'clock, Monday through Friday. The gym floor was constructed of hard-wood maple and was also used for the varsity basketball team.

The time was recorded on an Athletic Performance Analyzer which is manufactured by the Dekan Timing Device Company, Glen Allyn, Illinois. This electrical clock was capable of measuring time to 1/100th of a second and its uses were limited only by the imagination of the operator. The analyzer used in this study was made up of one timing clock, 18 inches by 30 inches stop mat and starting switch (see Appendix G). The starting switch was of the type that would allow the clock to start on any forward movement of

the runner. The stop mat would stop the clock as soon as the runner touched its surface. The machine operated on any standard 110 volt A.C. line.

The subjects were required to wear some type of tennis shoe, no spikes or cleats being allowed. Once a certain type of shoe was chosen it was worn for the entire test. The subjects were not allowed to run bare footed. Each subject wore a "T" shirt and some type of gym trunks. The researcher was assisted by two assistant coaches, one of which served as the recorder of the time, the other was overseer at the finish line.

Testing Procedures

For the purpose of this study the two, three and four point stance body positions were used as a base from which a distance of five and thirty yards was run. As the testing began the subject was again shown examples and pictures of the three different starts to be used within the study. Each subject was given a chance to try out the different positions within the three by three foot square before the testing began. Each subject was also given one pre-trial within each start to enable him to familiarize himself with the working of the Dekan Timer. After the subject expressed his understanding of the procedures he was tested using a random selection to establish the type of start and distance to be run for the first test (see Appendix H).

The timing equipment was set up so that the

researcher was stationed near the starting square and the timing machine itself. Within the three by three foot square the starting switch was moved to fit the position of the runner. In the three and four point starting positions the runner started the clock by releasing the starting switch with either hand as he began his run. With the two point stance the switch was activated when the back foot moved forward releasing pressure from the switch (see Appendix I). The switch itself operated on a lever that started the clock when pressure was released. As long as the lever was pushed into the starting box the time was not recorded, but when the lever was released the time on the clock was activated. The time on the clock stopped when the subject stepped on the stop mat that was placed exactly five feet or thirty feet from the starting line (see Appendix J). The stop mat itself was designed so that any pressure anywhere on the mat would stop the clock at once. The mat had a two inch metal border around it but for the purpose of this test the border was placed within the five or thirty yard running distance.

Each subject was given three starts at each distance and for each of the three different starting positions. This made a total of eighteen starts that each subject was required to take during the testing period. Each subject was allowed to take only three starts for any one testing session that was held. After each run the time and distance of the run were recorded by one of the assistant

coaches.

Since the subjects were not allowed to view each other in the testing situation, each subject presented a new and different approach to the test as well as to the three different starting body positions used in this study.

Chapter 4

ANALYSIS OF DATA

The purpose of this study was to determine if a relationship existed between the two, three and four point starting stance body positions and the velocity in running five and thirty yards. The mean time from three starts given for each position at distances of five and thirty yards was used as data for this study. The t test for significance between groups at distances of five and thirty yards was employed for the statistical computation in this investigation.

STATISTICAL ANALYSIS OF TIMES FOR FIVE YARDS

The two point stance resulted in a mean sprinting time of 1.15 seconds with a standard deviation of 9.15 and a range of .99 seconds to 1.37 seconds. The three point stance produced a mean sprinting time of 1.28 seconds with a standard deviation of 13.25 and a range of 1.08 seconds to 1.61 seconds. The four point stance yielded a mean sprinting time of 1.28 seconds with a standard deviation of 11.81 seconds and a range of 1.07 seconds to 1.64 seconds.

In comparing the range, standard deviation and mean sprinting time of the three stances, the three point stance produced the highest standard deviation of 13.25 followed

by the four point stance with 11.81 and then the two point stance with 9.15. The four point stance had the greatest range of .57 seconds followed by the three point stance with .53 seconds and the two point stance with a range of .38. A mean difference of .13 seconds was found between the two and three point stance as well as the two and four point stance. Between the three and four point stance there was no mean difference produced.

Between the two and three point stance a t of 4.2614 with 58 degrees of freedom was found to be significant at the .01 level. The two and four point stance produced a t of 4.7022 which is also significant at the .01 level. However, the three and four point stance comparision only yielded a t of .0926 which does not reach the .01 level or the .05 level and is therefore nonsignificant. The results are shown in Table 1.

STATISTICAL ANALYSIS OF TIMES FOR THIRTY YARDS

In comparing the three different stances for the thirty yard sprint, the researcher found that the two point stance produced a mean sprinting time of 4.72 seconds with a standard deviation of 37.02 and a range of 4.15 seconds to 5.70 seconds. The three point stance was found to have a mean sprinting time of 4.93 seconds with a standard deviation of 35.50 and a range of 4.40 seconds to 5.87 seconds. The four point stance followed with a mean starting time of 4.87 seconds with a standard deviation of 35.76 and a range

Table 1

The Significance of the Difference Between Starting Stance Body Position and the Velocity in Running for the Two, Three and Four Point Stance for Five Yards

Group	N	Mean Sprinting Time	Mean Difference	t	P
2pt - 5yds	30	1.15	.13	4.214	.01
3pt - 5yds	30	1.28			
2pt - 5yds	30	1.15	.13	4.7022	.01
4pt - 5yds	30	1.28			
3pt - 5yds	30	1.28	.00	.0926	n.s.
4pt - 5yds	30	1.28			

t needed for .05 level of significance = 2.067

t needed for .01 level of significance = 2.749

of 4.34 seconds to 6.01 seconds.

The four point stance had the greatest range with 1.67 seconds followed by the two point stance with 1.55 seconds and the three point stance with 1.47 seconds. Even so, the two point stance had the highest standard deviation with 37.02 followed by the four point stance with 35.76 and the three point stance with 35.30.

This researcher found that the mean difference between the two and the three point stance was .21 seconds. This comparison produced a t of 22.3083 which was found to be significant at the .05 level with 58 degrees of freedom. In comparing the two and the four point stance a mean difference of .15 seconds was achieved with a t of 1.6328. This t was not found to be significant. In comparing the three and the four point stance a mean difference of .06 was found with a t of -.6758 which was also found to be nonsignificant. The results are shown in Table 2.

It is clear from the above stated data that the two point stance was significant at the .05 level over the three point stance for a distance of thirty yards. However, there is no significant advantage in using the two point stance over the four point stance for a distance of thirty yards. There was also no significant difference in mean sprinting time when comparing the three and four point stances in sprinting thirty yards.

Table 2

The Significance of the Difference Between Starting Stance Body Position and the Velocity in Running for the Two, Three and Four Point Stance for Thirty Yards

Group	N	Mean Sprinting Time	Mean Difference	t	P
2pt - 30yds	30	4.72	.21	-2.3083	.05
3pt - 30yds	30	4.93			
2pt - 30yds	30	4.72	.15	1.6328	n.s.
4pt - 30yds	30	4.87			
3pt - 30yds	30	4.93	.06	-.6758	n.s.
4pt - 30yds	30	4.87			

t needed for .05 level of significance = 2.067

t needed for .01 level of significance = 2.749

Chapter 5

SUMMARY AND CONCLUSIONS

It was the purpose of this study to determine the effect of starting stance body position on the velocity in running five and thirty yards.

The subjects for this study were members of the 1970-71 freshmen class at Inman High School, Inman, Kansas. They were all male and their ages ranged from 13 to 15 years of age. The subjects ran over a distance of five and thirty yards using the two, three and four point stance body position. The time was recorded with the use of the Dekan Performance Analyzer.

The statistical computation for this study was the t test. The mean sprinting time from three starts given for each position was used as the [illegible]or analysis in this study.

FINDINGS

The analysis of the data revealed the following findings:

1. The t score between the two point stance and three point stance for five yards was 4.2614 and significant at the .01 level.

2. The t score between the two point stance and

four point stance for five yards was 4.7022 and significant at the .01 level.

3. Between the three and four point stance for five yards the t score was .0926 and not significant.

4. The t score between the two point stance and the three point stance for thirty yards was -2.3083 and significant at the .05 level.

5. Between the two and four point stance for thirty yards a t score of 1.6328 was produced and was not significant.

6. The t score between the three and four point stance for thirty yards was -.6758 and not significant.

CONCLUSIONS

Within the limitations of this study the following conclusions were reached.

1. The two point stance held significance over the three point stance for the five yard distance. This was highly significant at the .01 level.

2. The two point stance was also significant over the four point stance at the five yard distance. This was highly significant at the .01 level.

3. The three and four point stance comparison at the five yard distance was not significant.

4. At the thirty yard distance the two point stance showed significance over the three point stance. This significance was at the .05 level.

5. At the thirty yard distance no other comparison of stances revealed any significant differences.

6. The two point stance proved to be superior, to some degree, at both the five and thirty yard distance.

INTERPRETATION OF DATA

The findings from this study would tend to show that the two point stance was highly superior to the three and four point stances at a distance of five yards. This finding may possibly affect several sports. For example, the football coach might be advised to now use an offensive philosophy that allows more offensive personnel to remain in the two point stance than has been the custom in the past. The coaches who like to surprise the defense and begin the action with the lineman in a standing position need no longer worry that their lineman are at a disadvantage in starting from the two point stance. But it should be kept in mind that this study was dealing with velocity, (change in distance per unit of time along a straight line), and not lateral movement. Or, as another sport possibly affected the track coach might look into the possibility of starting the shorter sprints from a two point stance with or without starting blocks. Especially this would be true on the junior high level since it is widely agreed upon that youngsters of this age have a very hard time learning to run with the use of the starting blocks. It may be interesting to note that during the 1971 track season

Junction City track coach Al Simpler experimented with the two point standup start for the 100 and 200 yard dashes, with sprinter Allan Hart using the technique most successfully.

RECOMMENDATIONS FOR FURTHER STUDY

Upon examination of this study and its conclusions, the following recommendations are warranted.

1. Undertake another study of this design using juniors and seniors on the high school level who have had two to three years experience in either track or football.

2. Compare this study to one that would be similar in nature with the addition of starting blocks for all three stance positions.

3. Design a similar study on different types of turf using the proper shoe designed for the turf.

4. Compare this study to one in which the three different stances were used where lateral movement was used to run five and thirty yards.

5. Using a similar design, compare sprint time for five, thirty, fifty and eighty yards to see if the superiority of the two point stance will remain through longer sprint distances.

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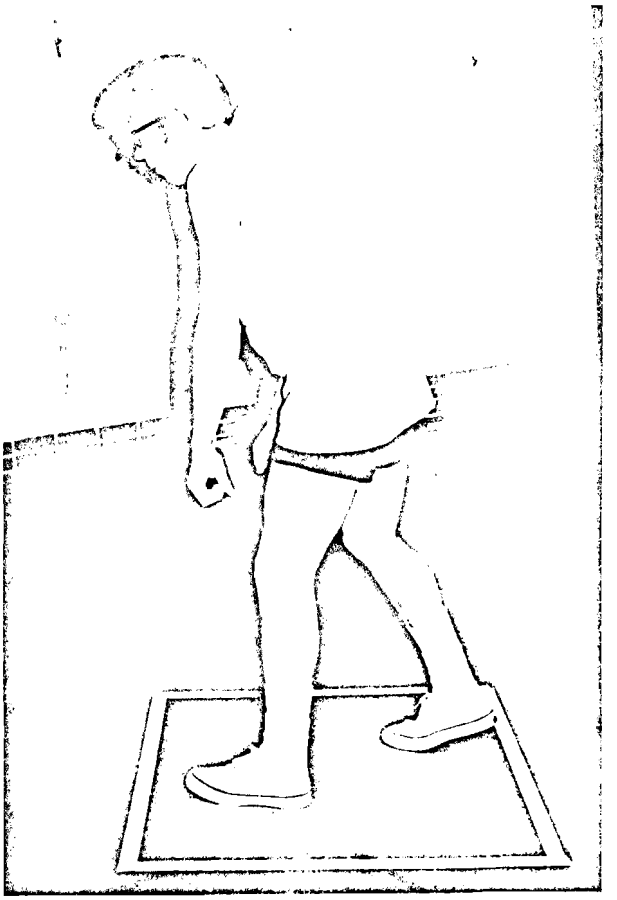
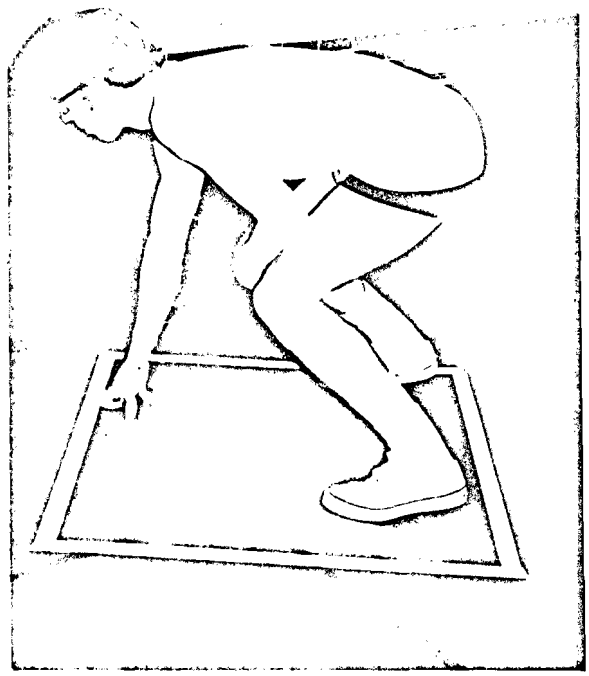
APPENDIX A

Picture of Two Point Stance



APPENDIX B

Picture of Three Point Stance



APPENDIX C

Picture of Four Point Stance

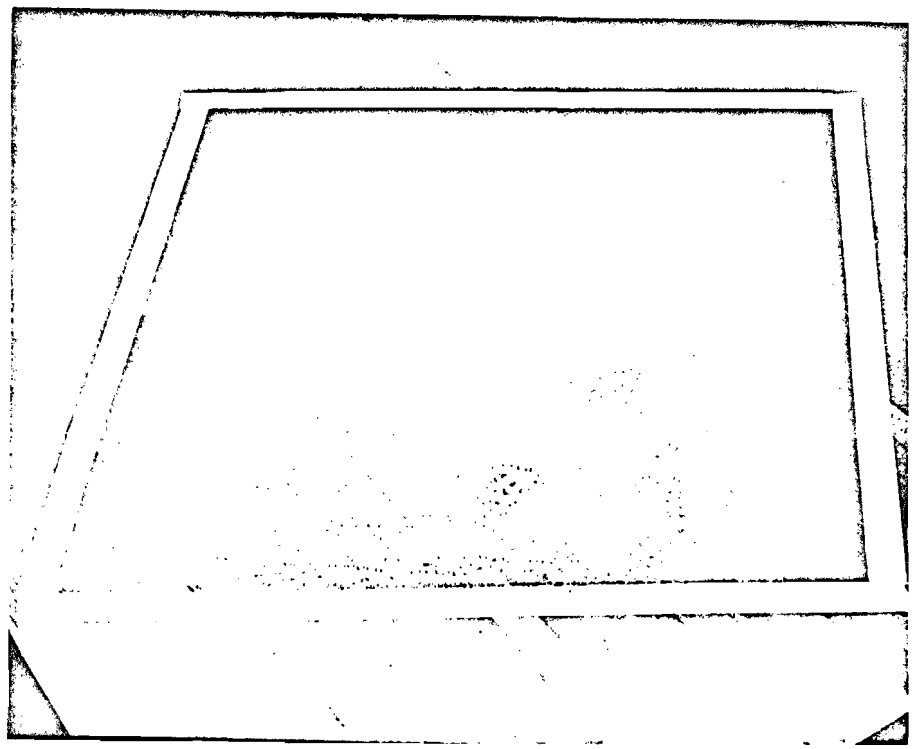
APPENDIX D

Data Card used to Record Necessary Information for Study

Name		Subject No.
Age	Order of Running	
Ht	1.	4.
Wt	2.	5.
	3.	6.
	Results	
2pt - 5yd	3pt - 5yd	4pt - 5yd
2pt - 30yd	3pt - 30yd	4pt - 30yd

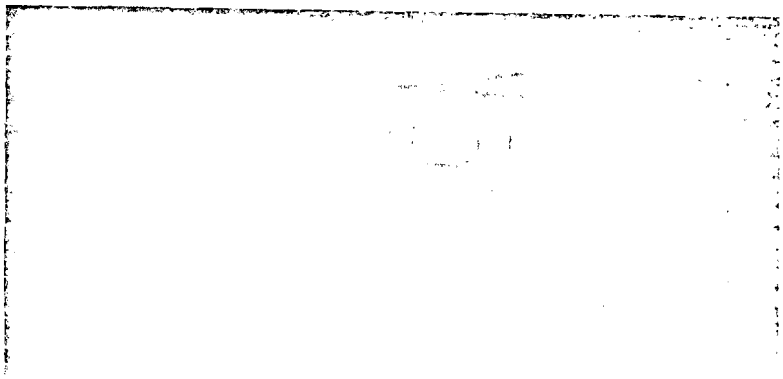
APPENDIX E

Picture of Three by Three Square



APPENDIX F

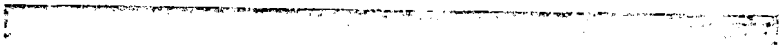
Picture of Starting Switch



40

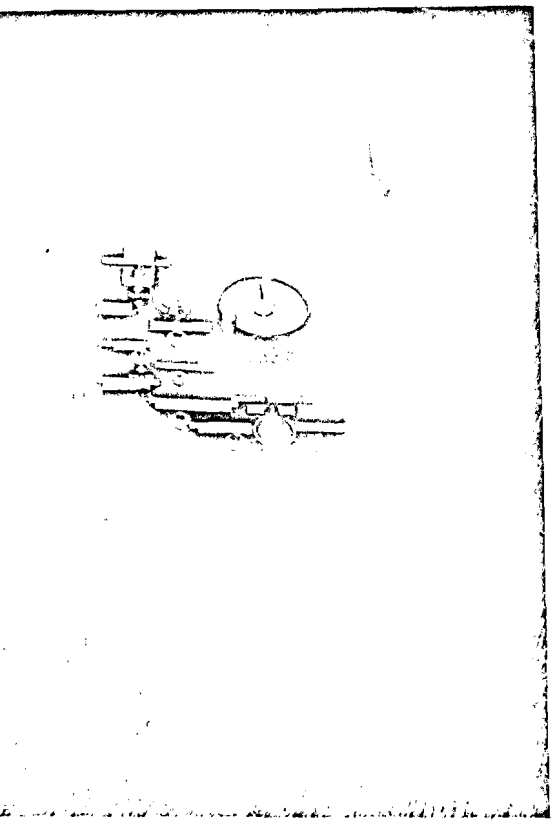
APPENDIX F

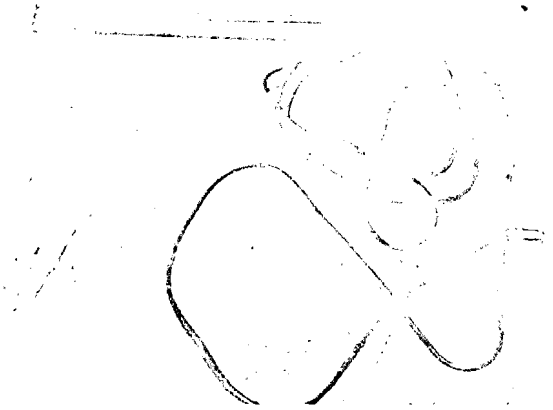
Picture of Starting Switch



APPENDIX G

Picture of Testing Machine and Stop Mat





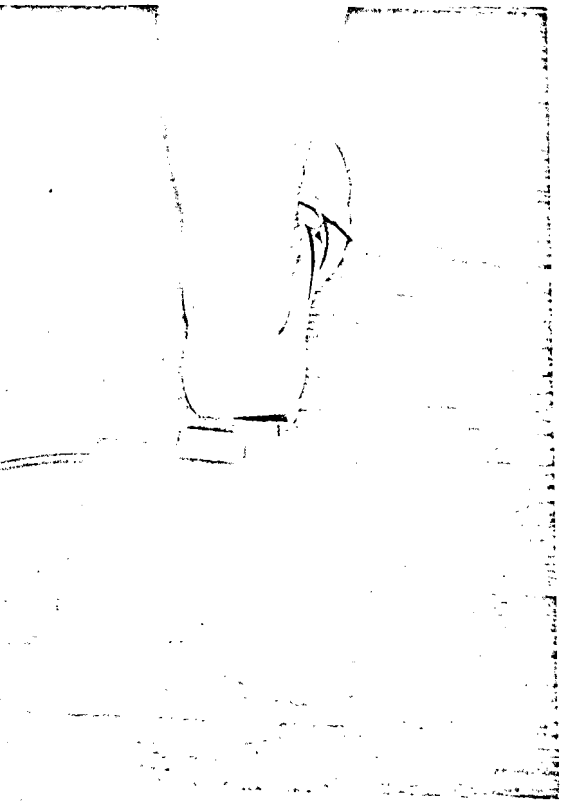
APPENDIX H

Order of Performance Sheet

Subject	2-point	3-point	4-point	2-point	3-point	4-point
	5 yards			30 yards		
A	1	2	3	4	5	6
B	2	3	4	5	6	1
C	3	4	5	6	1	2
D	4	5	6	1	2	3
E	5	6	1	2	3	4
F	6	1	2	3	4	5
G	6	5	4	3	2	1
H	1	6	5	4	3	2
I	2	1	6	5	4	3
J	3	2	1	6	5	4
K	4	3	2	1	6	5
L	5	4	3	2	1	6
M	1	3	5	2	4	6
N	6	1	3	5	2	4
O	4	6	1	3	5	2
P	2	4	6	1	3	5
Q	5	2	4	6	1	3
R	3	5	2	4	6	1
S	6	4	2	5	3	1
T	4	2	5	3	1	6
U	2	5	3	1	6	4
V	5	3	1	6	4	2
W	3	1	6	4	2	5
X	1	6	4	2	5	3
Y	6	3	5	1	4	2
Z	5	2	6	3	1	4
AA	4	1	3	2	6	5
BB	3	6	4	5	2	1
CC	2	4	1	6	3	5
DD	1	5	2	4	6	3

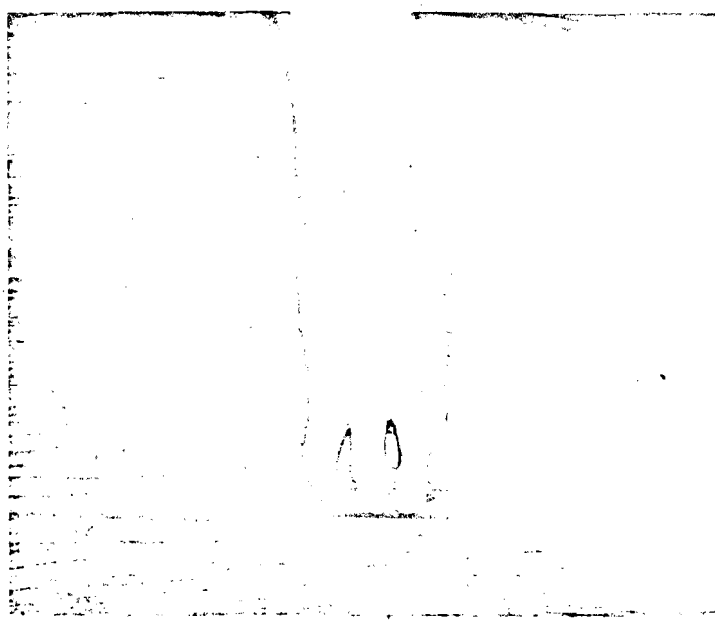
APPENDIX I

Operation of Switch from the Three Different Stances



2 pt stance

3 - 4 pt stance



APPENDIX J

Floor Layout