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A Comparison of Two Methods of Leading off Second Base in Baseball

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A COMPARISON OF TWO METHODS OF LEADING OFF SECOND BASE IN BASEBALL

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BY

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I wish to express special thanks to my wife, Wanda, who has made this thesis possible by her belief in me and her understanding.

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CHAPTER I

INTRODUCTION

Techniques employed in teaching baserunning in the game of baseball have not changed significantly for a number of years. There has been little experimentation and few innovations to improve this skill of the sport; hence the search for a quicker and improved method of reaching home plate from second base when a scoring opportunity exists was undertaken.

THE PURPOSE OF THE STUDY

The purpose of this study was to determine which of two methods would enable the baserunner to reach home plate quicker when a runner was on second base and a scoring opportunity existed.

DEFINITION OF TERMS

The two methods being compared in this study are defined as Method A and Method B.

Method A. - Method A refers to leading off second base five feet to the left field side of the base path and eleven feet, four and three-eighths inches on an angle of twenty six degrees from second base toward third base.[1]

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[1] Method A is legal and within Rule 8, section 4, article 2a of the 1965 National Alliance Edition of Baseball Rules, (Chicago: National Federation of State High School Athletic Associations), p. 34, which states: a runner is out when he runs more than three feet away from a direct line between bases to avoid being tagged or to hinder a fielder while the runner is advancing or returning to a base or to get a running start after a fly is touched.

Method B. - Method B refers to leading off second base ten feet toward third base on a straight line directly between the two bases.

Swing. - The term "swing" as used in this study is defined as the arc taken by the runner after he has rounded third base.

Round Out. - The term "round out" refers to the arc taken by the runner ten to fifteen feet before reaching third base to improve the angle of approach.

LIMITATIONS OF THE STUDY

Since game conditions were not present when the experiment was conducted, this may have had some effect on the effort exerted by the test subjects.

The increased risk of being picked off second base when employing Method A was recognized by the writer. However, a safe lead will vary with individuals depending upon their quickness and reaction time to the move of the pitcher. Therefore, the writer was not concerned with the variable in leadoffs since the distance the runner may lead off second base during a game is determined by the position of the shortstop and second baseman. The distance between second base and home plate was standardized at 170 feet, excluding the leadoff, for both Method A and Method B.

No attempt was made by the writer to control the "swing" or the "round out" of the test subjects since this differs with individuals depending upon their speed and sense of balance.

Other factors which may have had an effect on the experiment included the amount of warmup taken by the test subjects, the physical

condition of the test subjects, the mind set of the individuals, and the fatigue resulting from previous trials.

NEED FOR THE STUDY

The method used in leading off second base may mean the difference between scoring a run or being thrown out at the plate and winning or losing a ball game. Therefore, the method which gets the baserunner to home plate quickest must be considered by coaches. Due to the lack of experimental evidence to dispute the methods now being used, this study was undertaken to determine whether Method A or Method B should be employed when baserunners attempted to score from second base.

DESIGN OF THE STUDY

The subjects for the experiment were members of the 1965 Eastern Illinois University non-varsity baseball team and the 1965 Charleston High School baseball team. These groups were selected on the basis of availability and because they represented a recognized form of organized baseball.

The timing device used in this study was an Athletic Performance Analyzer, manufactured by the Dekan Timing Device Company, Glen Ellyn, Illinois. The Analyzer is powered by standard 120 volt AC electrical current. The equipment is designed for the purpose of measuring movement, reaction, or both by the recording of time intervals. The unit contains the timing mechanism, delay starting circuits, signaling device, and the manual controls. The unit provides precise timing without the common faults of human error and is accurate to 1/100th of a second.

Each subject ran four trials of Method A and four trials of Method B, though they were not run in successive order. As the first runner completed his sprint of the first trial of Method A, he went to the end of the line of subjects. He was given a minimum of ten minutes as a recovery period before making his second trial of Method A. A minimum of ten minutes was provided between each trial for the purpose of recovery. After all subjects completed four runs using Method A, Method B was conducted in the same manner. The experiment took place on a regulation baseball field. Each subject wore baseball spikes for the best possible footing.

In employing both methods, the subject assumed his lead-off position from second base placing his left foot on a pedal switch which set the timing unit on first contact. The runner started his run when he was ready, thus eliminating the variable of reaction time to a set signal. When the runner raised his left foot to take a cross-over step, the clock started on release of contact from the pedal. As the runner completed the sprint from second base to home plate, he stopped the clock by stepping on a switch mat placed on the plate. The time was recorded; the clock was reset; and the next subject made his trial run.

CHAPTER II

REVIEW OF RELATED LITERATURE

In reviewing literature on baseball, the writer found little research undertaken in the important phase of baserunning. Related research reveals completed studies have considered running to first base from home plate after a hit, or comparing the cross-over step with the lead-out step when stealing second base.

Baseball coaches should attempt to determine the baserunning assets of each individual player and realize the risks inherent in running the bases. James Smilgoff, baseball coach at Taft High School, Chicago, Illinois, states, "The ideal baserunner is a student of the game. The assets of the ideal baserunner are speed, a knowledge of the opposition, a quick-thinking mind, and the courage to act."[1] "In general, baserunning is always in the field of calculated risks. Unless the risk is a necessity in winning the game, it should not be taken. When necessary, a team should be taught to go all out to win by running those bases hard."[2]

The writer realizes that baserunning always involves some risk. It is also understood that all baserunners will not possess the ideal

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[1] James Smilgoff, "Run Those Bases," Athletic Journal, XXI (March, 1951), p. 8.

[2] Ibid., p. 58.

qualities of the baserunner mentioned by Smilgoff. The above references are important since they point out that neither Method A[3] nor Method B[4] provides a technique that reduces the risk to zero.

The writer found that many baseball authorities, as represented by successful baseball coaches, are in agreement with the method used in leading off second base, the technique used in touching third base, and the method of approaching third base.

Dave Curran, baseball coach at Manhattan College, advocates taking a lead directly toward third base as the pitcher assumes his stretch.[5] Archie Allen, baseball coach at Springfield College, maintains the leadoff should be short and in a direct line toward third base.[6] Virgil Ledbetter,[7] coach at Howard College, Burmingham, Alabama, and O. H. Vogel,[8] coach at State University of Iowa, have similar viewpoints on how the leadoff should be taken.

Smilgoff states, "A common mistake made by baserunners is that of backin away from a direct imaginary line between the bases and running at an angle to the next base, thus increasing the distance of the run."[9] Ethan Allen, baseball coach at Yale University

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[3]Supra., p. 1. [4]Supra., p. 1.

[5]Dave Curran, "Running the Bases," Scholastic Coach, XXXIII (February, 1964), p. 24.

[6]Archie P. Allen, "A Philosophy of Baserunning," Journal of Health, Physical Education, and Recreation, XXXIII (March, 1962), p. 33.

[7]Virgil Ledbetter, Coaching Baseball, (Dubuque: Wm. C. Brown Company, 1964), p. 166.

[8]O. H. Vogel, Ins and Outs of Baseball, (St. Louis: The C. V. Mosley Company, 1952), p. 266.

[9]James Smilgoff, Winning High School Baseball, (Englewood Cliffs: Prentice Hall, Inc., 1955), p. 94.

and former major leaguer, asserts that the lead is usually taken in the base path but leaves the decision for the position of the lead to the baserunner or coach.[10]

Danny Litwhiler, baseball coach at Michigan State University and another major leaguer, is one of two references which contend: "His lead from second base should be taken on the outfield side of the base path instead of on the base line."[11] Carol Gast, baseball coach at North High School, Omaha, Nebraska, makes reference to the leadoff by saying, "In making the lead-off, a runner might back away from a direct line to the next base. The runner should take care not to get back too far."[12] Neither make mention of the distance from the base path the runner should assume his lead.

As indicated by these experts, there is no mention of what the distance of the leadoff from second base should be. Ethan Allen did say, "A safe lead, of course, is one that permits returning to the base without being caught by a throw from the pitcher."[13] Curran emphasises that the runner would find the proper lead through practice and experimentation.[14]

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[10]Ethan Allen, Baseball Play and Strategy, (New York: The Ronald Press Company, 1959), p. 219.

[11]Danny Litwhiler, Baseball Coach's Guide to Drills and Skills, (Englewood Cliffs: Prentice Hall, Inc., 1963), p. 169.

[12]Carol Gast, Skill on the Diamond, (Dubuque: Wm. C. Brown Company, 1953), p. 139.

[13]Ethan Allen, loc. cit., p. 219.

[14]Curran, loc. cit.

William Lai, baseball coach at Long Island University, in his Baseball Check-list states:

> .....
> 6. Eliminate wide turns when going for more than one base.
>
> .....
> e. Tag portion of base closest to pitching rubber.
> f. Do not break stride.[15]

When touching third base, Ethan Allen coaches his baserunners to touch the inside corner of the base and in so doing, not to break their stride.[16] Smilgoff advocates hitting the base in stride and turning as short as possible.[17] Others advocating the use of a short turn, which means hitting the inside corner of the base, include Gast,[18] Ledbetter,[19] Litwhiler,[20] and Curran.[21]

The writer maintains that more important than touching the inside corner of the bag when rounding third base is the fact that the runner should not break stride by using a shortened step, or by lengthening the last stride. This consumes time by forcing the runner to make compensations in his speed.

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[15]William Lai, "A Baseball Check-list," Scholastic Coach, XXVI (February, 1957), p. 16.

[16]Ethan Allen, Running the Bases," Scholastic Coach, XXVI (April, 1957), p. 7.

[17]Smilgoff, "Run Those Bases," p. 11.

[18]Gast, loc. cit., p. 135.

[19]Ledbetter, loc. cit., p. 116.

[20] Litwhiler, loc. cit., p. 170.

[21]Curran, loc. cit., p. 25.

The manner in which the runner approaches third base has an effect on the sharpness of the turn. Smilgoff notes, "As the runner approaches third, he rounds out and looks for a signal and voice call from the coach stationed there."[22] Gast says, "He should swing out of the base path to his right if he has to make a turn at any base."[23]

Ethan Allen advocates running toward the bag and rounding out to approach the bag for the run home.[24] Litwhiler maintains, "The runner should have enough bend or arc in his path to make the turn without using the cross-over step."[25] Lai believes in a short arc before reaching the base with the weight of the runner to the inside of the diamond.[26]

The related literature indicates that many baseball coaches employ Method B when having their baserunners assume a le d from second ase. Very few of the authorities support the theory involved in Method A. The studies also indicate that third base should be touched on the inside corner; the runner should make a short turn; and the runner should not break his stride when touching the base.

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[22]Smilgoff, "Run Those Bases," p. 57.

[23]Gast, loc. cit., p. 143.

[24]Ethan Allen, Baseball: Major League Technique and Tactics, (New York: The Macmillan Company, 1954), p. 201.

[25]Litwhiler, loc. cit., p. 168.

[26]Lai, loc. cit.

CHAPTER III

PRESENTATION OF DATA

Fifty one subjects ran four trials of Method A[1] and four trials of Method B[2] for a total of 204 samples of each method. The data for Method A are presented in Table 1, page 11, and Table 2, page 12. The times for each subject, with but a few exceptions, are not consistent. This indicates a variable in the "swing" taken by the runners which cannot be controlled due to the difference in speed and balance of each subject.

The data for Method B are presented in Table 3, page 13, and Table 4, page 14. The inconsistency of these times also illustrates the uncontrollable variable of the "swing".

The raw times indicated that Method A would enable the baserunner to reach home plate quicker than would Method B. A comparison of the mean time of Method A, which was 7.37 seconds for 204 trials, with the mean time of Method B, which was 7.65 seconds for 204 trials, indicated that Method A is quicker than Method B.

The raw times and the mean times did not in themselves provide conclusive evidence that Method A was quicker than Method B. Therefore, the T test, as illustrated by Merle W. Tate,[3] was used to determine

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[1] Supra., p. 1.

[2] Supra., p. 1.

[3] Merle W. Tate, Statistics in Education, (New York: The Macmillan Company, 1955), pp. 455-471.

TABLE 1. - TIMES PER TRIAL PLUS MEAN TIME OF METHOD A AS GATHERED FROM THE 1965 EASTERN ILLINOIS UNIVERSITY NON-VARSITY BASEBALL TEAM

Subject	Trial 1	Trial 2	Trial 3	Trial 4	Mean Time
1	7.00	7.10	7.29	7.43	7.21
2	7.55	7.34	7.41	7.08	7.35
3	7.35	7.03	7.26	7.36	7.18
4	7.10	8.20	6.99	7.00	7.32
5	7.43	7.31	7.25	7.38	7.34
6	7.40	7.42	7.25	7.41	7.37
7	7.05	7.06	7.45	7.22	7.20
8	7.20	7.22	6.98	6.94	7.09
9	7.07	7.35	7.06	7.12	7.15
10	7.37	7.25	7.32	7.22	7.29
11	7.65	7.45	7.28	7.74	7.53
12	7.10	7.21	7.36	7.28	7.24
13	7.12	7.03	7.k6	7.12	7.11
14	6.93	6.83	6.95	7.39	7.03
15	7.01	7.18	7.33	7.57	7.28
16	7.67	7.51	7.11	7.36	7.41
17	7.04	6.94	6.99	7.00	6.99
18	7.42	7.39	7.39	7.41	7.40
19	7.51	7.71	7.38	7.67	7.57
20	7.38	7.19	7.13	7.32	7.26
21	7.71	7.54	7.37	7.93	7.64
22	7.41	7.14	7.22	7.06	7.21
23	7.21	7.02	7.10	6.96	7.07
24	7.56	6.71	7.21	6.83	7.08
25	7.33	7.26	7.43	7.14	7.29
26	7.26	7.27	7.27	7.27	7.27
27	7.13	6.86	7.06	7.37	7.11

All scores are expressed in seconds.

TABLE 2. - TIMES PER TRIAL PLUS MEAN TIME OF METHOD A AS GATHERED FROM THE 1965 CHARLESTON HIGH SCHOOL BASEBALL TEAM

Subject	Trial 1	Trial 2	Trial 3	Trial 4	Mean Time
1	7.30	7.35	7.21	7.33	7.30
2	7.06	7.05	6.92	7.16	7.05
3	7.81	7.82	7.60	7.88	7.78
4	7.25	7.31	8.13	8.37	7.81
5	7.35	7.23	7.25	7.40	7.31
6	7.23	7.15	6.90	7.43	7.18
7	7.01	6.83	6.78	6.88	6.88
8	7.55	7.57	8.95	8.63	8.18
9	7.62	7.59	7.54	7.58	7.58
10	7.62	7.58	8.63	7.68	7.88
11	7.85	8.71	8.76	8.90	8.56
12	7.76	7.71	7.61	7.66	7.69
13	7.51	7.36	7.30	7.40	7.40
14	7.10	7.38	7.20	7.40	7.27
15	7.69	7.69	7.84	7.87	7.77
16	7.68	7.33	7.46	7.49	7.49
17	7.11	6.97	7.14	6.99	7.05
18	7.99	8.04	7.12	8.12	7.82
19	7.26	7.27	7.11	7.11	7.19
20	7.39	7.54	7.46	7.62	7.50
21	7.68	7.64	7.59	7.63	7.64
22	7.47	7.36	7.33	7.37	7.38
23	7.54	7.62	7.63	7.70	7.62
24	7.31	7.10	7.20	7.39	7.22

All scores are expressed in seconds.

TABLE 3. - TIMES PER TRIAL PLUS MEAN TIME OF METHOD B AS GATHERED FROM THE 1965 EASTERN ILLINOIS UNIVERSITY NON-VARSITY BASEBALL TEAM.

Subject	Trial 1	Trial 2	Trial 3	Trial 4	Mean Time
1	7.67	7.48	7.71	7.74	7.65
2	7.78	7.68	7.69	7.72	7.72
3	8.17	7.98	7.60	8.01	7.95
4	7.23	6.95	7.01	7.17	7.09
5	7.56	7.74	7.80	7.77	7.72
6	7.59	7.55	7.59	7.51	7.56
7	7.31	7.03	7.23	7.27	7.21
8	7.46	7.10	7.16	7.01	7.18
9	7.41	7.27	7.25	7.28	7.30
10	7.74	7.67	7.68	7.76	7.71
11	7.58	7.55	7.66	7.61	7.60
12	7.59	7.64	7.68	7.74	7.66
13	8.27	7.65	8.03	7.72	7.92
14	7.30	7.42	7.32	7.37	7.35
15	7.70	7.72	7.38	7.59	7.60
16	8.07	7.86	7.75	7.87	7.89
17	7.22	7.82	7.19	7.21	7.36
18	7.96	7.73	7.87	7.92	7.87
19	7.88	7.76	7.65	7.80	7.77
20	7.52	7.59	7.60	7.49	7.55
21	7.82	8.09	7.94	7.97	7.96
22	7.22	7.92	7.31	7.29	7.44
23	7.52	7.39	7.34	7.45	7.43
24	7.23	7.20	6.96	7.01	7.10
25	7.60	7.51	7.59	7.43	7.53
26	7.34	7.34	7.42	7.54	7.41
27	7.17	7.35	7.37	7.24	7.28

All scores are expressed in seconds

TABLE 4. - TIMES PER TRIAL PLUS MEAN TIME OF METHOD B AS GATHERED FROM THE 1965 CHARLESTON HIGH SCHOOL BASEBALL TEAM

Subject	Trial 1	Trial 2	Trial 3	Trial 4	Mean Time
1	7.38	7.70	7.64	7.39	7.53
2	7.29	7.19	6.96	7.09	7.13
3	7.85	7.85	8.10	7.85	7.92
4	8.44	8.41	8.41	8.48	8.44
5	7.44	7.41	7.45	7.44	7.44
6	7.61	7.53	7.44	7.50	7.52
7	7.29	7.12	7.15	7.13	7.17
8	8.77	8.83	8.65	9.04	8.83
9	7.75	7.76	7.91	7.98	7.85
10	8.15	8.26	7.92	8.06	8.10
11	9.07	8.86	8.81	9.08	8.96
12	7.73	7.67	7.60	7.71	7.68
13	7.45	7.42	7.35	7.44	7.42
14	7.34	7.42	7.43	7.35	7.39
15	7.92	8.03	7.99	8.14	8.02
16	7.79	7.83	7.53	7.71	7.72
17	7.17	7.22	7.15	7.18	7.18
18	8.17	8.15	8.20	8.24	8.19
19	7.34	7.48	7.35	7.30	7.37
20	7.85	7.97	7.79	7.81	7.86
21	7.92	7.81	7.73	7.77	7.81
22	7.71	7.40	7.55	7.53	7.55
23	7.80	7.90	7.82	7.81	7.83
24	7.84	7.57	7.63	7.62	7.67

All scores are expressed in seconds.

if the difference between the means of Method A and Method B was significant.

The hypothesis tested by the T test was that no real difference existed between the mean times of Methods A and B. The five per cent level of significance was selected as the basis for acceptance or rejection of the hypothesis. The T test application follows:

$$T = \frac{7.37 - 7.65}{\sqrt{\frac{(64.67 + 32.12)}{(204 + 204 - 2)} \quad \frac{(1 + 1)}{(204 \quad 204)}}} = -5.80$$

The T test rejected the hypothesis at the five per cent level and even at the lower one per cent level of significance; therefore, Method A is significantly quicker than Method B when a baserunner attempts to score from second base.

To further determine the validity of the results, the F test for the significance of the difference in variability, as explained by Tate,[4] was also applied. The F test application follows:

$$F = \frac{64.67 \;/\; (204 - 1)}{32.12 \;/\; (204 - 1)} = 2.00$$

The homogenity of variances between the sampled subjects was within the region of acceptance, thus substantiating the conclusion that Method A is quicker than Method B in enabling the base runner to reach home plate from second base.

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[4]Tate, loc. cit., pp. 493-524.

CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The writer conducted this study to determine which of two methods would enable a baserunner on second base to reach home plate quicker when a scoring opportunity existed. Method A was defined as having the baserunner leadoff second base five feet to the left field side of the base path and eleven feet, four and three-eighths inches on an angle of twenty six degrees from second base toward third base. Method B had the baserunner leading off second base ten feet toward third base on a straight line directly between second base and third base.

An experiment was developed to gather times for both methods and subject them to comparisons. Subjects were selected from the 1965 non-varsity baseball team of Eastern Illinois University and the 1965 high school baseball team in Charleston, Illinois. The distance between second base and home plate was standardized at 170 feet, excluding the leadoff, for both methods. An electronic timing device, accurate to 1/100th of a second, was used to time the test subjects. The data gathered represented 204 trials each of both Methods A and B.

The data presented in Tables 1, 2, 3, and 4 was used to compare raw times and mean times, and for application of the T test for significant differences between the mean times and the F test

for variability of the test times for each subject. All comparisons concluded that Method A was quicker than Method B in enabling the baserunner to reach home plate from second base.

The following conclusion resulted from the experiment:

1. Method A is quicker than Method B when a baserunner attempts to score from second base. This is due to the improved angle of approach at third base and a decrease in the "swing" and "round out" taken by the baserunner when touching third base.

The following recommendations are offered as a result of the experiment:

1. Further studies should be undertaken to determine if a ratio could be suggested for the relationship between the leadoff from second base toward third base and the distance a runner should be outside the base path to obtain the best possible time when running to home.
2. Further studies should be undertaken to determine the effect a moving start would have on the conclusions of this study. The subjects started from a still position which is not generally the normal lead for a baserunner on second base.
3. Further studies should be undertaken to determine if the runner is more easily picked off second base when using Method A due to the increase in the length of the leadoff.

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APPENDIX

APPENDIX A

Test subjects from the 1965 non-varsity baseball team of Eastern Illinois University.

Bonarigo, Bob
Brothman, Bob
Burrell, Bill
Cann, Stu
Clark, Bob
Daech, Otto
Doty, Dan
Drzonek, Arnie
Endsley, Dan
Gossett, John
Henning, Mike
Jensen, Keith
Jones, Ed
Jones, Jim
Lathrop, Dan
McNary, John
Meider, Mel
O'Bryan, Jim
Pearce, Terry
Rincker, Lee
Riordan, Dennis
Scholer, Jim
Tingley, Bob
Trump, Jim
Vidoni, Dennis
Williamson, Bob
Yates, Carl

APPENDIX B

Test subjects from the 1965 Charleston High School baseball team.

Applegate, Bill
Atkins, Ed
Baker, Ken
Bell, Steve
Best, Ron
Christen, Darrel
Cole, Gary
Cooley, Randy
Cooley, Terry
Davis, Joe
Gates, John
Glosser, Phil
Ingram, Randy
Jones, Bob
Kniskern, Dave
Montray, Dennis
Paszalek, Jim
Plath, Paul
Smyser, Ron
Stuffle, Larry
Way, Allyn
Way, Kerry
Whalen, Connie
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VITA

DENNIS L. HATTIK

The writer was born in St. Elmo, Illinois, on November 15, 1937. He attended elementary school and high school in St. Elmo, participating in football, basketball, and track while in high school. The writer received his BS degree from Illinois Wesleyan University, Bloomington, Illinois, in June of 1959. He majored in physical education with a minor in social studies. From 1959 to 1962, he coached baseball, basketball, and track at Findlay High School, Findlay, Illinois. In 1962, he became athletic director, assistant football, basketball, and baseball coach at Marshall High School, Marshall, Illinois. In 1964, he received a graduate assistantship at Eastern Illinois University, Charleston, Illinois, where he assisted with basketball and baseball. He received the MS in Ed. degree in August of 1965. In the fall of 1965, he accepted a position as athletic director, basketball and baseball coach, and teacher of physical education at Red Bud, Illinois.