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# The Effect of Grip Strength in Relation to Success in High School Wrestling

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THE EFFECT of GRIP STRENGTH in RELATION to

SUCCESS in HIGH SCHOOL WRESTLING

(TITLE)

BY

JOHN L. CUTLIP

**THESIS**

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## CHAPTER 1

### INTRODUCTION

#### Preliminary Statement

For many years numerous wrestling coaches have expressed conflicting opinions about the most important attribute of a successful wrestler. The writer has had the opportunity to talk with various wrestling coaches throughout the State of Illinois concerning this controversy. There have been many arguments in support of dynamic strength, flexibility, grip strength, endurance and stamina, each of which has been mentioned as the single most important attribute which relates to the success of a wrestler.

The writer believed that grip strength was very important to a successful wrestler.

#### Purpose of Study

It was the purpose of this study to compare the combined right and left grip strength of wrestlers who competed against each other in the same weight class in high school wrestling in Northern Illinois, and to measure the correlation between total grip strength of each wrestler, and the success of each wrestler based upon a won or loss record.

### Need for Study

Many wrestling coaches believe that overall strength is the most important aspect of a successful wrestler. Because of the continuous use of the hands in wrestling, the writer felt that grip strength would be a very important, if not the most important, attribute of a successful wrestler.

### Limitations

The assumption that grip strength is the most important determining factor in the success of young men taking part in wrestling is limited in this study to the Rochelle Township High School wrestling team, and eight other schools in Northern Illinois during the 1966-67 season.

The writer did not include other variables. The following variables were purposely excluded; age, years of experience, loss of weight previous to a match, injuries that might have occurred to a wrestler prior to a match, social environment, rank in class, and illness.

### Definitions

1. Stainless steel hand-dynamometer - A hand-dynamometer is a device which measures the grip strength from 0 to 160 pounds.
2. Successful wrestler - A successful wrestler was one who had won more than fifty per cent of his matches in competition with other wrestlers in his weight class.



3. Bi-Serial Correlation - A Bi-Serial correlation may be used when one variable is expressed as a mutually exclusive or contradictory group, and the other variable is continuous.
4. Total grip strength - The total grip strength of the left and right hands were combined to find total grip strength.
5. Rapid loss of weight - A loss of weight by vigorous workouts, running, cutting down the intake of water, diet, and steaming in a shower room.

## CHAPTER II

### REVIEW OF RELATED LITERATURE

The writer found ample literature relating to grip strength, but only a small portion was related to the grip strength of high school age wrestlers.

Clayne Jensen defined strength as moving against force; therefore, he implied that it was important to superior athletic performance.<sup>1</sup> Some leading physical educators claim that it is the most important single factor in performance.<sup>2</sup>

Harry L. Sievers conducted a study at Iowa State University in 1934 to find a series of motor tests to measure potential wrestling ability. In trying to arrive at certain areas of testing, he interviewed and corresponded with as many wrestling coaches and wrestlers as possible. Tabulation of his replies indicated that both the coaches and the wrestlers considered strength,

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<sup>1</sup>Clayne Jensen, "The Significance of Strength in Athletic Performance," United States Track Coaches Association, (June, 1966), p. 32.

<sup>2</sup>Charles H. McCloy, and Norma D. Young, Tests and Measurements in Health and Physical Education (New York: Appleton-Century-Crofts, Inc., 1954), p. 4.

particularly of the shoulders and arms, to be the most desirable attribute of a good wrestler.<sup>1</sup>

The Athletic Fitness Index (short form), the Sustained Grip on Hand Dynamometer, and the Front and Back Leaning Rest were among the tests used by Sievers.

Subjects were ranked subjectively on the basis of excellence of wrestling performance within their weight class. Rankings of competitive spirit for use with the sustained grip tests were obtained and validated in the same manner.<sup>2</sup>

Sievers believed that a record of sustained grip on a hand-dynamometer might have some relationship to competitive spirit. After some experimentation, it was decided to use two-thirds of the right grip score or two-thirds of the left grip score, depending on the strongest grip.

In calculating the results of the sustained hand grip, Sievers discovered that the more successful wrestlers had a longer sustained grip than did the less successful wrestlers.

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<sup>1</sup>Harry L. Sievers, "Measurement of Potential Wrestling Ability", (unpublished Master's thesis, Iowa State University, Ames, 1934), p. 1.

<sup>2</sup>Ibid. p. 2.

In conclusion, he stated that wrestling ability may be judged with a reasonable degree of accuracy from results of three tests; The Athletic Fitness Index, the Sustained Grip Test, and the Front and Back Leaning Rest.<sup>1</sup>

William Andrew Tomaras conducted a test in 1946 at the University of Illinois which involved 15 subjects who had a mean age of 22 years 7 months. The 15 subjects were members of the varsity wrestling squad at the University of Illinois.

Strength measures in this study were: right grip, left grip, back pull, and leg push, total strength, and total strength per pound of body weight. Tomaras pointed out in his study that collegiate wrestling required more than strength and that it develops more than strength.

Tomaras stated that wrestlers are usually stronger than other athletic groups but this is not the "whole story" concerning amateur wrestling.<sup>2</sup>

He points out in his study that even though the total strength of the wrestlers was improved, the right and left grip strength were not increased. Gains represented by back pull, total strength, and

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<sup>1</sup>Ibid. p. 7.

<sup>2</sup>William A. Tomaras, "The Effect of Wrestling Upon Physical Fitness" (unpublished Master's thesis, University of Illinois, 1948), p. 96.

strength per pound of body weight were significant at the two per cent level, although gains for the individual grips were not significant.<sup>1</sup>

In relationship to right and left grip, boys who competed in basketball, track, swimming and football all ranked ahead of wrestlers. However, in strength per pound, the wrestlers were first, followed by football players, swimmers, track athletes, and basketball players.<sup>2</sup>

In 1957, Harold J. Nichols conducted a test in which twenty-one members of the freshman and varsity wrestling squads of Iowa State College were subjects. It was decided to make the experiment more applicable and the data more meaningful to the sport of wrestling by bringing about the rapid loss of weight through the means normally employed by wrestlers and in the amounts necessary for them to make weight.<sup>3</sup>

The experimental group consisted of the varsity team who took part in a rapid weight reduction program. The control group consisted of members of the freshman and reserve squads who did not lose weight by the rapid loss method.

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<sup>1</sup>Ibid. p. 97.

<sup>2</sup>Ibid.

<sup>3</sup>Harold J. Nichols, "Some Physiologic Effects of Rapid Weight Reduction in Wrestling" (unpublished Doctoral dissertation, University of Michigan, 1957), p. 3.

The results showed that the combined right and left grip strength was greater when one was losing weight by hard, vigorous workouts. Grip strength was greater during weight loss than when not losing weight. The increase in grip strength when reducing weight is in line with findings that muscular power and endurance are often increased during the early periods of a fast.<sup>1</sup>

Walter Kroll concluded in a study in 1958 that strength is not of great importance to success in wrestling. Although the successful wrestlers showed statistically significant difference in some areas of testing over the unsuccessful wrestlers, the results were not significant. He claimed that part of the apparent superiority may be due to the fact that the successful wrestlers were approximately three-fourths of a year older and more experienced than the unsuccessful wrestlers.<sup>2</sup>

Kroll stated that although strength and speed are naturally desirable in any wrestler, "setting up" an opponent and skillful execution of a continuous series of attempts at take downs are more important.<sup>3</sup>

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<sup>1</sup>Ibid. p. 7.

<sup>2</sup>Walter Kroll, "Selected Factors Associated With Wrestling Success," Research Quarterly, Vol. 29, No. 4. (December, 1958), pp. 396-401.

<sup>3</sup>Ibid. , p. 402.

Arnold W. Umbach and Warren R. Johnson stated in their book that:

Certain writers have emphasized the importance of neck, arm and shoulder strength, particularly in Olympic wrestling. A very strong grip is almost universally considered to be a very important asset in wrestling.<sup>1</sup>

Neil R. Johnson conducted a test in 1959 on a group of college men who participated in wrestling for six weeks. He concluded that no increase in grip strength, elbow flexion strength, or neck extension strength took place. His test did show gains in leg extension strength, elbow extension strength, and hip flexion strength.<sup>2</sup>

Rasch, Pierson, O'Connell, and Hunt conducted a total proportional strength test to members of a college physical education class in wrestling in 1960, and to the members of a college wrestling squad before and after training for six weeks. The same test was administered to participants in the 1960 AAU wrestling championships, and to the visiting 1959 Japanese champion wrestlers. No significant changes were found in the mean scores of the physical education class or college squad before or after training.

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<sup>1</sup>Arnold W. Umbach and Warren C. Johnson, Successful Wrestling (St. Louis, Missouri: The C. V. Mosby Co., 1953), p. 34.

<sup>2</sup>Neil R. Johnson. "The Effectiveness of Wrestling Compared To Standard Weight Training Procedures For The Development of Strength" (unpublished Master's thesis, Pennsylvania State University, 1960), p. 17.



Championship-level wrestlers were stronger than non-wrestlers, but not significantly stronger than those less proficient. The visiting Japanese team did not differ significantly from Americans in hand strength.<sup>1</sup>

Some students of wrestling have emphasized the importance of a strong grip. A powerful grip does not appear to be characteristic of American wrestlers, although the Japanese were outstanding in this respect. A number of the AAU contenders stated that their grip was weak as a result of injuries to the hands sustained in wrestling. Neither collegiate nor championship-level wrestlers in the United States display outstanding grips.<sup>2</sup>

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<sup>1</sup>Philip J. Rasch, William Pierson, Eugene O'Connell, and M. Briggs Hunt, "Effect of Training For Amateur Wrestling on Total Proportional Strength Scores," Research Quarterly, Vol. 32, No. 2. (May, 1961), p. 201.

<sup>2</sup>Ibid. p. 203.



## CHAPTER III

### GATHERING OF DATA

Letters of inquiry were sent to twelve head wrestling coaches in Northern Illinois in September of 1966. A description of the study was included in the letter<sup>1</sup> along with a postcard which was to be returned, indicating if the wrestling coach was interested in participating in the study. All but two of the schools responded with an affirmative answer.

A follow-up letter was sent in November, 1966, to the schools taking part in the study. In this letter the writer described the procedures to be followed by all the schools involved in the study on the date of the meet.

The writer contacted each school by telephone two days prior to its meet and again reminded the coach to adequately prepare all of the members of his squad for the grip test to be administered immediately before the meet.

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<sup>1</sup>See Appendix B

All testing was done by the writer approximately forty minutes before the meet was to begin. During this time the writer prepared his sophomore and varsity squads for the grip test. A towel was provided for each boy to dry his hands if he had been perspiring. After drying his hands, the wrestler was instructed to hold the hand-dynamometer away from his body, eliminating any chance of applying pressure against his leg or body. Each individual was instructed to squeeze the hand-dynamometer as hard as he possibly could. After completing the grip test with both hands, each boy was given another opportunity to squeeze the hand-dynamometer. The best grip was then recorded. Upon completing the test with both squads, the writer visited the dressing room of the opponent. The same procedure was again followed, with scores being properly recorded.

Immediately following the matches, the writer completed the test by checking the score book against the win or loss of each contestant. All twelve weights were completed in this same manner.<sup>1</sup>

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<sup>1</sup>See Appendix A.

## CHAPTER IV

### ANALYSIS OF DATA

#### Introduction

1. The writer tried to find out if there was a statistical significant difference in grip strength between winners and losers at each weight class.

2. The writer wanted to find out if a relationship between total grip and the success in wrestling existed as measured by won and loss status at the .01 level of confidence.

#### Reliability

No test-retest was conducted with the hand-dynamometer, but care was exercised in administering the test. Each subject was given a towel to dry his hands after receiving thorough instructions in holding the hand-dynamometer. All subjects were given two trials, with the best grip being recorded. All subjects were exhorted to do their best in gripping the hand-dynamometer.

#### Analysis of Data

1. All grip strengths were arranged by weight classes and won and loss records.

2. The grip strengths were then punched into IBM cards according to the weight classes.

3. A  $t$  ratio program developed by DiPietro, et al.<sup>1</sup> was employed to determine if a statistically significant difference in grip strength existed at each weight class between winners and losers of matches.

4. From mean, and standard deviation data already determined by the computer, a biserial correlation was determined as suggested by McCloy and Young.<sup>2</sup>

### Findings

#### Statistical Significance of Grip Strength Differences Between Winners and Losers.

The success or failure (won or loss) of 462 wrestlers competing at 12 Illinois high school weight classes (95, 103, 112, 120, 127, 133, 138, 145, 154, 165, 180, and heavyweight) was recorded.

Table I reveals the means of the winners and losers at each

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<sup>1</sup>A. J. DiPietro, Roy Meyerholtz, and Richard Le Due "Correlation Analysis for an Unfixed Number of Variables (cards)," (Charleston: Eastern Illinois University, July 15, 1964).

<sup>2</sup>Charles H. McCloy, and Norma D. Young, Tests and Measurements in Health and Physical Education (New York: Appleton-Century-Crofts, Inc., 1954), p. 437.

weight class and also the statistical significance of the obtained  $t$  ratios for each of the 12 weight classes. A  $t$  ratio of 3.29 and 1.96 was needed to denote statistically significant differences at the .001 and the .05 level of confidence respectively.

Table I indicates that in nine of the twelve weight classes, the winners grip was stronger than the losers. At the 95 and 103 pound weight classes, a level of confidence was reached at .001. The weight class at the 145 and 165 pound levels were statistically significant at the .05 level of confidence.

#### Relationship Between Grip Strength and Success as Measured by Winning or Losing.

The biserial correlation was used to express the relationship between a continuous variable (12 weight classes) and a dichotomous variable (winners and losers). A biserial correlation of .143 was needed to be a statistical significant relationship at the .01 level of confidence.

Table II shows that a relationship between winning wrestling matches and grip strength was indicated at eight of the twelve weight classes.

#### Summary of Findings

1. Even though there was as much as 15 pounds difference in the 112 lb. weight class, a statistically significant difference

**TABLE I**  
**MEAN GRIP STRENGTH DIFFERENCE AND  $t$  RATIOS**

<b>Weight Class</b>	<b>Winners Mean (lbs.)</b>	<b>Losers Mean (lbs.)</b>	<b>Difference (lbs.)</b>	<b><math>t</math> ratio</b>
95	132.94	101.78	31.55	3.71*
103	163.43	134.76	28.67	3.91*
112	178.15	162.77	15.37	1.93
120	183.00	183.47	.47	.05
127	199.79	190.82	8.96	1.13
133	199.63	190.21	9.42	.92
138	203.23	203.35	.10	.01
145	215.47	195.26	20.21	2.01**
154	211.15	211.68	.52	.05
165	234.00	215.17	18.82	1.99**
180	237.50	231.23	6.25	.55
Unlimited	242.25	235.15	7.10	.64

\* Significant at the .001 level of confidence

\*\*Significant at the .05 level of confidence

**TABLE II**  
**RELATIONSHIP BETWEEN GRIP STRENGTH AND SUCCESS**

Weight Class	Biserial Correlation
95	.6759*
103	.7357*
112	.3124*
120	-.0120
127	.1891*
133	.1922*
138	.0002
145	.4011*
154	-.0136
165	.4185*
180	.1519*
Unlimited	.0131

\*Significant at .01 level of confidence



was not observed. At the 95 lb. weight class, and the 103 lb. weight class, the statistical difference was well beyond the .001 level of confidence.

2. The biserial correlation was statistically significant at eight of the twelve weight classes at the .01 level of confidence.

### Discussion of Findings

During the first week of practice, the writer tested each member of his squad with the hand-dynamometer. All members of the Rochelle Township High wrestling squad increased both the right hand and left hand grip; in many situations by as much as twenty pounds, by the end of the season.

The heavyweight class, which has no limitation on weight, does not indicate clearly an interpretation pertaining to this study. At least in five matches in the heavyweight class, there was a difference of as much as sixty to one hundred pounds. This difference in weight was enough to offset any strength difference.

The dominant hand was stronger ninety-five per cent of the time, and in fifty-two situations, the dominant hand was stronger by 15 pounds.



## CHAPTER V

### SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

#### Summary

The study was undertaken with the intent of finding out the relationship of the total grip strength of a high school wrestler to his success in interscholastic competition; success was identified in terms of winning or losing a match.

All contestants within a specific weight group were studied in a similar manner with a purpose to identify the successful wrestlers. The writer corresponded with 12 coaches in Northern Illinois who allowed their wrestlers to serve as subjects in the study. Four hundred sixty-two subjects were tested, and the total grip strength ranged from 65 pounds to 300 pounds.

The wrestlers gripped the hand-dynamometer with the right hand and left hand before each meet. The total sum of the right and left hand grips was then compared with the results of the wrestling match that followed on that same day.

The data was analyzed in two ways. A biserial correlation was used to determine if a statistically significant difference in grip strength existed between all wrestlers with stronger grips

and all wrestlers with weaker grips as it related to winning and losing a match.

A t ratio test was used to determine if a statistically significant difference in grip strength existed at each weight class between winners and losers of matches.

### Conclusions

The winners in the 95 pound weight class, and the 103 pound weight class had significantly stronger grip strengths at the .001 level of confidence. The winners in the 145 pound weight class, and the winners in the 165 pound weight class were significantly stronger at the .05 level of confidence.

The biserial correlation was statistically significant at eight of the twelve weight classes at the .01 level of confidence.

The grip strength of a successful wrestler is important in winning or losing, but grip strength alone is not the only attribute of a successful wrestler.

### Recommendations

1. The writer feels that similiar tests, conducted with the inclusion of one or more variables such as age and experience would be very helpful to wrestling coaches.

2. A similiar test be conducted with high school wrestlers at the State Tournament level.

3. A test at the junior high, senior high, and the college level and compare the data.

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## **APPENDIX A**

**TABLE III**  
**GRIP STRENGTH OF 95 POUND WEIGHT CLASS**

Match No.	Winners	Losers
1	101	55
2	86	85
3	125	117
4	125	86
5	117	85
6	161	120
7	169	161
8	150	70
9	155	90
10	140	127
11	164	146
12	112	34
13	146	86
14	117	116
15	134	116
16	132	115
17	132	118
18	150	65
19	111	92



**TABLE IV**  
**GRIP STRENGTH OF 103 POUND WEIGHT CLASS**

Match No.	Winners	Losers
1	160	155
2	171	95
3	155	122
4	171	155
5	122	95
6	181	126
7	163	160
8	164	112
9	178	144
10	198	145
11	166	148
12	152	148
13	166	120
14	148	95
15	164	160
16	149	168
17	163	143

**TABLE V**  
**GRIP STRENGTH OF 112 POUND WEIGHT CLASS**

Match No.	Winners	Losers
1	101	55
2	86	85
3	123	117
4	125	86
5	117	85
6	161	120
7	169	161
8	150	70
9	140	90
10	155	127
11	164	146
12	112	84
13	146	86
14	117	116
15	134	116
16	132	115
17	132	118
18	150	65
19	111	92

TABLE VI  
GRIP STRENGTH OF 120 POUND WEIGHT CLASS

Match No.	Winners	Losers
1	204	180
2	186	130
3	218	142
4	140	178
5	200	198
6	185	206
7	188	168
8	186	212
9	200	129
10	150	196
11	190	187
12	207	182
13	165	216
14	155	185
15	213	201
16	212	156
17	166	209
18	166	212
19	156	209

**TABLE VII**  
**GRIP STRENGTH OF 127 POUND WEIGHT CLASS**

Match No.	Winners	Losers
1	173	188
2	174	156
3	201	195
4	270	206
5	270	220
6	199	160
7	200	172
8	200	199
9	201	270
10	270	199
11	184	170
12	172	160
13	186	172
14	190	212
15	219	196
16	162	208
17	174	214
18	182	164
19	186	234
20	180	158
21	180	190
22	222	210
23	180	135
24	176	129
25	171	208
26	204	200
27	232	205
28	232	204
29	205	200

**TABLE VIII**  
**GRIP STRENGTH OF 133 POUND WEIGHT CLASS**

<b>Match No.</b>	<b>Winners</b>	<b>Losers</b>
1	210	178
2	178	157
3	198	213
4	164	224
5	206	200
6	232	221
7	163	197
8	147	250
9	192	186
10	242	188
11	228	232
12	214	136
13	214	100
14	227	196
15	208	210
16	175	187
17	184	152
18	210	186
19	184	201
20	152	186

TABLE IX  
GRIP STRENGTH OF 138 POUND WEIGHT CLASS

Match No.	Winners	Losers
1	184	210
2	195	226
3	210	226
4	195	184
5	188	228
6	251	208
7	220	200
8	210	203
9	179	170
10	211	205
11	187	218
12	200	222
13	155	204
14	210	162
15	186	174
16	212	231
17	215	246
18	239	204
19	200	197
20	228	149

**TABLE X**  
**GRIP STRENGTH OF 145 POUND WEIGHT CLASS**

Match No.	Winners	Losers
1	211	210
2	194	190
3	194	211
4	190	210
5	246	230
6	243	220
7	196	194
8	300	182
9	225	200
10	194	170
11	200	108
12	233	232
13	162	155
14	208	212
15	220	210
16	185	214
17	258	185
18	186	184
19	249	212

TABLE XI

## GRIP STRENGTH OF 154 POUND WEIGHT CLASS

Match No.	Winners	Losers
1	230	225
2	222	237
3	222	230
4	225	237
5	253	245
6	181	196
7	250	242
8	200	179
9	220	192
10	236	232
11	230	212
12	232	157
13	188	228
14	244	239
15	232	228
16	216	210
17	209	155
18	215	173
19	210	205



**TABLE XII**  
**GRIP STRENGTH OF 165 POUND WEIGHT CLASS**

Match No.	Winners	Losers
1	239	237
2	236	219
3	239	236
4	237	219
5	220	228
6	240	220
7	222	185
8	202	242
9	230	222
10	260	236
11	190	214
12	245	205
13	265	239
14	215	213
15	253	115
16	203	240
17	280	138

TABLE XIII

## GRIP STRENGTH OF 180 POUND WEIGHT CLASS

Match No.	Winners	Losers
1	280	225
2	212	268
3	212	280
4	268	225
5	234	230
6	246	236
7	280	204
8	182	216
9	228	220
10	230	249
11	245	235
12	233	187

**TABLE XIV**  
**GRIP STRENGTH OF HEAVYWEIGHT CLASS**

Match No.	Winners	Losers
1	300	249
2	280	222
3	274	222
4	300	230
5	211	190
6	274	245
7	300	246
8	182	300
9	237	289
10	208	248
11	218	215
12	234	205
13	244	184
14	242	233
15	267	251
16	220	218
17	192	243
18	200	270
19	192	200
20	270	243

## **APPENDIX B**

## **SAMPLE LETTER**

936 N. 10th. St.  
Rochelle, Illinois  
Date

Dear Sir:

I am the new head wrestling coach at Rochelle Township High School. During the wrestling season in 1966-67, I hope to conduct a test measuring the effect of grip strength in relation to success in high school wrestling, and I need your assistance in order to make the test a success.

I will measure the grip strength of each of your wrestlers with a hand-dynamometer. Both the right and left grip will be measured, which will take approximately twenty minutes. Each boy will be tested twice if possible. I will measure my wrestling squad in the same manner. Immediately following the match, I will compare the twelve weight classes, and show you the results.

The results of the completed study will be made available to all the schools taking part in the study. If you would like to take part in this study, please fill out the enclosed card and mail it to me at your convenience.

John L. Cutlip

Varsity Wrestling Coach

Enclosure

## VITA

### JOHN L. CUTLIP

The writer was born in Bloomington, Illinois on September 23, 1939. It was after he moved to Clinton, Illinois in 1945 that he first became interested in athletics. While attending Clinton Senior High School, he participated and was awarded three varsity letters in each of the following sports: football, basketball, and baseball.

After graduation from Clinton High School, he enrolled at Eastern Illinois University in the fall of 1957. While attending Eastern, he earned three varsity letters in football and two in wrestling. After graduating from Eastern in 1961 with a major in Physical Education and minors in Driver Education and Business Education, he taught and coached basketball and baseball three years in Waterman, Illinois. In 1964, he accepted a teaching and coaching position in Argenta, Illinois. In 1966, he accepted a teaching and coaching position in Rochelle, Illinois where he is currently employed, as varsity wrestling coach.

He started work on the Master of Science in Education in the summer of 1964, and attended school each summer thereafter. He expects to complete all requirements for the degree Master of Science in Education in August, 1967.