

THE EFFECTS OF NUTRITION EDUCATION SESSIONS RELATED TO DIETARY IRON  
ON THE DIETARY IRON INTAKE OF HIGH SCHOOL WRESTLERS

A Thesis Presented  
to  
The Graduate Faculty  
University of Wisconsin-La Crosse

---

In Partial Fulfillment  
of the Requirements for the  
Master of Science Degree

---

by  
Marcella J. Loprinzi  
March 25, 1987

#### ABSTRACT

Loprinzi, Marcella. The effects of nutrition education sessions relating to dietary iron on the dietary iron intake of high school wrestlers. M.S. in Adult fitness/Cardiac Rehabilitation, 1987. 47 p. (A. Freeman)

This study compared the iron intake of high school wrestlers before and after the participation in three nutrition education sessions relating to dietary iron. The nutrition education sessions consisted of "The Basic Food Groups", "What is Iron Deficiency?", "How Iron Deficiency Affects Wrestling Performance", "Sources of Foods High in Iron", "Methods of Prevention of Iron Deficiency", "How to Increase Iron in the Diet", "Label reading for Iron Determination", "How Iron is Lost from the Body", "Signs and Symptoms of Iron Deficiency", "Vitamin Supplements", and "Assertiveness". All education sessions included supplemental handouts pertaining to topics presented. The iron intake was measured by a three day dietary recall on food record sheets by the Ss before and after the education sessions. The results were measured on the Nutrition Data Base Computer System. The Ss consisted of 24 Logan High School and Aquinas High School wrestlers of La Crosse, Wisconsin. The subjects ranged in ages from 14 through 18. A t-test for two dependent groups was used to analyze the iron content results. There was a significant difference ( $p < .01$ ) between the iron content of the Ss of the experimental group before and after exposure to nutrition education sessions relating to dietary iron. There was no significant change ( $p > .01$ ) in the iron content of the control group. It was concluded that nutrition education sessions relating to dietary iron could have a positive effect on the dietary iron intake of high school wrestlers.

UNIVERSITY OF WISCONSIN - LA CROSSE  
College of Health, Physical Education and Recreation  
La Crosse, Wisconsin 54601

Candidate: Marcella Jean Loprinzi

We recommend acceptance of this thesis in partial fulfillment  
of this candidate's requirements for the degree:

Master of Science in Adult Fitness/Cardiac Rehabilitation

The candidate has completed her oral report.

<u>Dr. Alan Freeman</u> Thesis Committee Chairperson	<u>March 25, 1987</u> Date
<u>David W. Bango</u> Thesis Committee Member	<u>March 25, 1987</u> Date
<u>Ken Davis, PhD</u> Thesis Committee Member	<u>March 25, 1987</u> Date

This thesis is approved for the College of Health, Physical Education  
and Recreation.

<u>John C. Mitchem</u> Dean, College of Health, Physical Education and Recreation	<u>April 21, 1987</u> Date
<u>Howard C. Rose</u> Dean of Graduate Studies	<u>April 29, 1987</u> Date

### Acknowledgements

I would like to acknowledge Dr. Freeman, the chairperson of the committee for my thesis. His patience, understanding, time and friendship made the project easier and more enjoyable to complete. I would also like to thank Dr. Davis for helping me with my writing style, proofreading and for all of his extra time he found for me in his busy schedule. I would like to thank Dr. Bange for his help with the statistics of this project as well as his proofreading of the paper.

This paper would have never been possible without the compliance of the coaches, Mr. LeClaire and Mr. Damon, as well as the wrestlers who participated in this study, they were great individuals to work with.

## TABLE OF CONTENTS

CHAPTER	<u>PAGE</u>
I.	INTRODUCTION..... 1
	Purpose..... 2
	Need for Study..... 2
	Hypotheses..... 3
	Assumptions..... 3
	Delimitations..... 3
	Limitations..... 4
	Definition of Terms..... 4
II.	Review of Related Literature..... 6
	Introduction..... 6
	Dietary Iron..... 7
	Education Programs..... 11
	Wrestling Practices..... 13
	Summary..... 14
III.	METHODS AND PROCEDURES..... 15
	Introduction..... 15
	Pilot Study..... 15
	Subject Selection..... 16
	Testing Procedures and Data Collection..... 16
	Initiation of The Tests..... 18
	Data Analysis..... 19

IV.	RESULTS AND DISCUSSION.....	21
	Introduction.....	21
	Subjects.....	22
IV.	RESULTS AND DISCUSSION CONTINUED.....	
	Dietary Iron Characteristics.....	22
	Discussion of Results.....	26
	Summary.....	26
V.	SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND	
	PRACTICAL IMPLICATIONS.....	27
	Summary.....	27
	Conclusions.....	27
	Recommendations.....	28
	Practical Implications.....	29
	REFERENCES.....	31
	APPENDICES	
	A. Food Record Sheet.....	34
	B. Informed Consent Form.....	35
	C. Letters to Coaches.....	36
	D. Nutrition Education Sessions.....	38
	E. Nutrition Education Session Handouts.....	45
	F. Letter of Permission from School District.....	46
	G. Nutrient Analysis.....	47
	TABLES	
	1. Means and Standard Deviation for Age of Subjects.	22
	2. Means and Standard Deviations for Iron Content...	23
	3. Iron Content of Experimental Group.....	24
	4. Iron Content of Control Group.....	25

CHAPTER I  
INTRODUCTION

Wrestling is one of the oldest sports known to man and presently includes amateur participants ranging from elementary school age to middle age. Many of the complaints concerning wrestling are relative to the dietary habits among amateur wrestlers. The role of nutrition in athletic performance has gained increased recognition in recent years. This is especially true in relation to the mineral iron. One study has reported that few teenage athletes ever approach adequate intakes of iron (Alford & Bogle, 1982). Amateur wrestlers who are still physically growing and maturing tend to be iron deficient during the wrestling season. However, through a balanced diet and with adequate knowledge, amateur wrestlers have been able to maintain sufficient iron status during the competitive season (Hecker, 1982).

It is important that wrestlers be informed of their dietary needs and why proper nutrition is so vital to their health and performance. The importance and need for nutritional guidance for wrestlers has been documented in several studies (Douglas & Douglas, 1984; Miles, Collins, Holbrook, Patterson & Bodevell, 1984; Pate, 1983; Smith, 1976a; Wideman & Hagen, 1982). Because of the concern of the many people involved in wrestling, it was decided to undertake a study to identify the changes of dietary iron intake of amateur wrestlers after exposure to nutrition education sessions.

### Purpose

The purpose of this study was to determine if nutrition education sessions on the topics relating to dietary iron would have an effect on the dietary iron intake of high school wrestlers. The results and outcomes of the study could establish a basis of nutrition education for wrestlers by coaches and/or educators.

### Need for Study

The increased concern about dietary habits of amateur wrestlers has given rise to the implementation of nutrition education programs for wrestlers. It has been suggested that dietary iron deficiency could be the result of improper diets and/or weight loss in wrestlers (Houston, Marrin, Green & Thompson, 1981). In rapidly growing young men, low iron storage has been attributed to an increased demand for iron due to growth and/or low iron content in the diet (Ehn, Carlmark & Høglund, 1980). It has also been suggested that nutritional education sessions can be beneficial for high school wrestlers as well as other athletic populations (Douglas & Douglas, 1984). With the prevalence of amateur wrestlers subjecting their bodies to dehydration, starvation diets and inappropriate weight loss methods, there was a need to determine if nutrition education sessions relating to dietary iron had effects on amateur wrestlers' dietary habits.

### Hypotheses

The following research hypothesis was made in this study:

Nutrition education sessions relating to dietary iron would increase the amount dietary iron ingested by high school wrestlers.

The following null hypothesis was made in this study:

Nutrition education sessions relating to dietary iron would not change the dietary iron intake of high school wrestlers.

### Assumptions

The following assumptions were made in this study:

1. Subjects were healthy individuals.
2. Subjects were honest with their dietary intakes for the course of the study.
3. Subjects were capable of accurately estimating serving sizes of foods for the food record sheets.
4. Subjects maintained regular dietary habits during course of the study.

### Delimitations

1. All subjects were male high school students 14 to 18 years of age attending either Logan High School or Aquinas High School in La Crosse, Wisconsin.

2. Subjects were participants on the wrestling teams of the respective schools.
3. Subjects kept food records for three days; one day of the regular week, one weekend day and one wrestling match day.
4. The food record sheets were done for two three-day sessions.
5. Three nutrition education sessions were performed for two weeks and each session was 25 minutes in duration.

#### Limitations

Subjects may not have prepared or picked out their meals which were recorded during the specific time period. The subjects' parents or guardians may have prepared and/or picked out the meals.

#### Definition of Terms

Dietary Iron Deficiency Anemia - a condition that reduces the concentration of hemoglobin as well as the size of red blood cells. Characterized by general fatigue, sluggishness and loss of appetite (Williamson, 1981).

Food Record - a recording of food eaten for three different days. These days were one weekday, one weekend day and one wrestling match day. Quantities of food were estimated with common household measures such as cups and spoons (Singleton & Rhoades, 1984).

Nutrition Education Sessions - three nutrition education sessions relating to dietary iron and dietary iron deficiency anemia. The sessions also consisted of basic food habits, physiological functions of dietary iron on the body and detrimental effects of poor nutrition on the body and its functions (Singleton & Rhoades, 1984).

Nutritionally Adequate Diet - a diet that provides sufficient nutrients and energy to meet metabolic needs for function of the body (Miles et al., 1984).

Heme Iron - dietary iron from meat products only. A very absorbable form of dietary iron (Simpson, Morris & Cook, 1981).

Non-heme Iron - dietary iron from plant products and some meat products. Not as absorbable as heme iron (Simpson et al., 1981).

Max  $\dot{V}O_2$  - maximum amount of air one can take in, use and transport to the body cells, extract from the cells and utilize by the cells (Woodson, Wills & Lefant, 1978).

RDA - Recommended Daily Allowance of the nutrient iron. For wrestlers of this age the RDA is 18 mg of iron (Simpson et al., 1981).

CHAPTER II  
REVIEW OF RELATED LITERATURE

Introduction

The purpose of this study was to determine if nutrition education sessions relating to dietary iron would have an effect on the dietary iron intake of high school wrestlers. The nutrition education sessions provided a basis for the use of nutrition education in high schools interested in this area of education for their athletes.

A review of related literature revealed studies pertaining to dietary iron deficiency in young male athletes and nutrition education for athletes. However, there was a limited amount of research in the areas of nutrition education programs and dietary iron deficiency relating specifically to high school wrestlers.

The literature reviewed, relating to dietary iron deficiency anemia and nutrition education relating to athletes, has been divided into four subheadings. The sections are in the following order: dietary iron, education programs for high school wrestlers, wrestling practices, and a summary of the related literature.

## Dietary Iron

The literature on dietary iron has been divided into three subheadings. These sections are in the following order: absorption of dietary iron, iron loss and physiological effects of dietary iron deficiency anemia.

Iron, a trace mineral present in the largest amount in the body, is an essential component in the energy metabolism of every body cell. This nutrient is highly concentrated in the red pigment of muscles and blood (Smith, 1976a). Iron is an essential constituent of hemoglobin, myoglobin and several respiratory enzymes and thus, according to Steen and McKinney (1986) plays a vital role in energy production. The recommended daily allowance (RDA) of iron is 18 mg for active young males (Alford & Bogle, 1982; Pike & Brown, 1984).

### Absorption of Dietary Iron

Dietary iron is in two forms in so far as mechanism of absorption into the body is concerned. These two forms are classified as heme iron and non-heme iron. About 40% of the iron from animal tissue, such as meat, fish and poultry, is in the heme iron form, while all of the iron in plant products is in the non-heme form (Simpson et al., 1981).

According to McWhinnie and Mack (1982) heme iron is more absorbable in the body than the non-heme iron. Simpson et al. (1981) reported that both forms have increased absorption when combined with ascorbic acid. When this combination takes place, heme iron is absorbed 33% more and non-heme iron is absorbed close to 8% or more than it would be without

the ascorbic acid. Moore and Dubash (1951), (as cited in Pike and Brown 1984) pioneered the study of the benefits of the ascorbic acid in citrus fruits juices when combined with iron containing foods. They stated that the absorption increased two-fold. This is hypothesized to occur because the ascorbic acid maintains iron in a more reduced, soluble form in the body. Meat, fish and poultry, when combined with other iron containing foods, have been shown to increase iron absorption two to four times its original rate. Specifically, the iron in vegetables is said to increase in absorption two times as much when combined with meat, fish or poultry. Both of these effects are much more beneficial than the fortification of iron alone (McWhinnie & Mack, 1982).

The absorption of iron is said to be inhibited by various factors. In a study involving 20 adults, a significant decrease in iron absorption was cited when the subjects were given 7.5 grams of natural wheat bran. The interference of this process was due to the phytate content of the bran. Simpson et al. (1981) also indicated that phosphates inhibit the absorption of iron even more than the phytates in bran. Disler, Lynch, Charlton, Torrance, Bothwell, Walker & Mayet (1974) reported that tannins in tea and polyphenolic compounds in coffee significantly decrease the absorption of iron.

Rich sources of iron are foods such as nuts, legumes, dried, uncooked fruits such as raisins, apricots and dates, and leafy green vegetables. More valuable sources are lean, red meats, liver, meat substitutes, oysters and shellfish (McWhinnie & Mack, 1982).

### Iron Losses

In a series of papers by Bell and Cowan, 1961; Brune, Magnusson, Pettersson and Hallberg, 1986; Clement and Assmundson, 1982, and Schoene, Escourrou, Robertson, Nilson, Parsons and Smith, 1982, it was reported that normally .5 to 1.0 mg of iron are lost daily through the skin, nails, hair, sweat, and urine. Iron is also lost in sloughed off skin and gut cells, with minor quantities passed through the metabolic system with bile into the small intestine. Very intense training, in which large amounts of sweating occurs, can cause significant amounts of iron to be lost. Practices such as wearing rubber suits while exercising and excessive use of saunas, can also enhance the loss of iron (Pate, 1983; Schoene et al., 1982). Extreme sweating by athletes such as runners, ice hockey players and wrestlers, as well as workers with heavy physical work loads, has been shown to cause the loss of one to three liters of fluid per day, according to Ehn and colleagues in 1980. This can mean an extra iron loss of 0.4 to 1.0 mg per day. The majority of iron loss in male athletes is probably through sweat according to Brune et al., 1986. It has also been said that large amounts of aspirin consumed can cause some internal bleeding and can account for a .5 to 1.0 mg iron loss a day (Smith, 1976a). This aspirin is used by athletes for aches and pains, inflammation of injuries and headaches.

### Physiological Effects of Dietary Iron Deficiency Anemia

Individuals who do not take in enough iron or who have high rates of iron loss can develop dietary iron deficiency anemia. This is

characterized by general sluggishness, fatigue and loss of appetite (Katch & McArdle, 1983). In a study by Davies, Chukweuneka & Van Haaven (1973) 33 males, aged 17-40 years of age, were tested and divided into two groups; anemic and non-anemic. The anemic subjects had higher heart rates during maximal aerobic exercise along with a significantly higher minute ventilation than the non-anemic subjects. The results of the study indicated that iron deficiency anemia causes a marked reduction in maximal aerobic power and increases cardiac output. Gardner, Edgerton, Barnard & Bernauer (1975) showed that subjects with iron deficiency anemia had higher peak exercise heart rates and post-exercise lactate levels and were less able to complete a five minute stepping task.

Hallberg and Magnusson (1984) conducted a study with 43 middle and long-distance runners, between the ages of 19 and 46. The results showed that the runners had lower iron status than the 100 healthy, age-matched, non-athletic controls. Woodson (1984) noted that lower hemoglobin concentrations negatively affected  $VO_2$  max and exercise performance in normal subjects. Woodson, Willis & Lenfant (1978) used 11 anemic males, 20-27 years of age, to perform a maximal aerobic test. The results displayed a rise in cardiac output, ventilation and decreases in  $VO_2$  max and performance. Stewart, Steel, Toyne & Stewart (1972) showed that none of the 42 athletes used in their study were classified as anemic, but most had iron status in the lower half of the normal ranges.

In a study by Steen & McKinney (1986) 42 college wrestlers between the ages of 18 to 23 years were analyzed for food intake by dietary recall for four days. The diets were assessed during pre-season, mid-season and post-season. During each season the wrestlers kept a four-day food record covering two days before a match, match day and the day following a match. These diets were analyzed for energy and nutrient intake with a computerized nutrient data bank. Included in the nutrient recall was the nutrient iron. The results showed that many of the wrestlers consumed less than two-thirds of the RDA for iron in the pre-season, mid-season and post-season.

Iron deficiency with or without anemia is an undesirable condition which can greatly affect physical performance. When iron loss exceeds intake, the body draws on its stores to correct the imbalance. A persisting imbalance will eventually lead to iron depletion and finally to anemia (Steen & McKinney, 1986). Iron is an important nutrient for physical functions as it affects the oxygen-carrying capacity of the blood. Williamson (1981) found that anemic subjects had markedly prolonged recovery times after performing standardized workloads on bicycle ergometers. Even moderately anemic subjects had a decrease of 20% in their  $\text{VO}_2$  max tests. Iron repletion in iron anemic subjects has shown to improve physical performance (Hunding, Jordal & Paulev, 1981; Schoene et al., 1982; Smith, 1984).

### Education Programs

Sports programs should provide athletes with nutrition counseling that emphasize eating a variety of foods as well as foods high in iron content (Parr, Bachman & Moss, 1984). Nutritional guidance, based on good nutritional principles, can contribute to both the health and performance of an athlete. These programs of counseling can cause dramatic diet changes and also help improve an athlete's performance in competition as well as academics (Parr et al., 1984; Singleton & Rhoades, 1984). An athlete should be advised to record the entire food intake for a period of 3-4 days and have a nutritionist evaluate the diet. This assessment of food intake, especially iron intake, is important so that action can be taken to maintain iron stores and help prevent anemia (Miles et al., 1984). On a balanced diet, wrestlers can maintain proper iron status as shown by Wideman and Hagen (1982). Douglas and Douglas (1984) reported that 30 high school athletes, including wrestlers, improved their iron intake in foods after counseling sessions. Singleton and Rhoades (1984) cited, 88.6% of students in grades 9-12 in one high school felt that nutrition education was important for education in the schools. This study also showed that the knowledge of proper nutrition for this age group was very poor.

The accuracy of food records depends largely on the effort and honesty of the subjects as well as the subjects' abilities to estimate

quantities of foods. It has been shown that the method of food records appears to be a fairly accurate estimate of an individual's food consumption over a short period of time (Singleton & Rhoades, 1984).

If subjects are recommended to take iron supplements they should be taken during or after a meal. High iron in the diet may limit the absorption of other essential nutrients, so high doses of iron should not be recommended. All athletes should be encouraged to first include iron rich foods in their diets before supplementation of iron is implemented (Slavin & Lampe, 1985). Regular monitoring of iron in athletes, including biochemical evaluations and dietary assessments, is recommended to ensure optimal performance. Depending on the results of the assessments, appropriate intervention should follow, involving nutrition counseling and iron supplementation when necessary (Steen & McKinney, 1986).

#### Wrestling Practices

Most wrestlers must lose weight to be able to compete at a certain weight class. Reducing weight through crash dieting and erratic eating behaviors can arrest growth and can cause a significant decrease in physical performance (Smith, 1976b). Most wrestlers reduce weight by the use of saunas, exercising in plastic suits, induced vomiting, spitting and the use of diuretics and catharics. Thus, the body becomes dehydrated, energy metabolism is compromised and endurance is limited. These factors cannot be corrected in the few hours between a weigh-in and a match (Wideman & Hagan, 1982).

It is common practice for wrestlers to lose up to 10% or greater percentages of bodyweight over a few days to meet a lower weight class. Weight loss before competition is generally accomplished by decreasing food and water and in the final stages acute dehydration is employed. This dehydration was shown to decrease maximal strength in four wrestlers in a study done by Houston et al. (1981). The latter study was also associated with decrements of  $\text{VO}_2$  max. Muscle concentrations were markedly decreased during weight loss and were not replenished during a three hour re-hydration period. Maintaining or getting to a bodyweight below normal leads to low calorie diets and thus it is extremely difficult for athletes to achieve adequate iron intake (Slavin & Lampe, 1985).

#### Summary

Many researchers have investigated the physiological responses of dietary iron deficiency anemia and reported negative effects to be shown toward performance. It was also reported that these negative effects can be somewhat reversed if the athletes replenish their bodies with iron in an ample amount of time with dietary sources. Education programs have been shown to help these individuals modify their eating habits and help correct and/or prevent anemia.

## CHAPTER III METHODS AND PROCEDURES

### Introduction

The methods and procedures of the study has been divided into separate divisions which include: pilot study, subject selection, testing procedures and data collection, initiation of tests, and data analysis. There are three subheadings under testing procedures and data collection: dates of data collection, food records and nutrition education sessions.

### Pilot Study

A pilot study was conducted on 15 high school wrestlers from Onalaska High School in Onalaska, Wisconsin. This pilot study was done to determine if high school wrestlers could completely and correctly fill out the food record sheets with the initial instruction. These wrestlers were instructed on how to fill out food record sheets and were shown food models and complete instructions by the investigator. These wrestlers were asked to record two meals. The meals were the evening meal on day one and breakfast of day two. The sheets were returned and collected by the investigator on day two. The results of the pilot study showed that the wrestlers could accurately fill out the food record sheets as instructed.

### Subject Selection

Twenty-four male high school wrestlers, 14-18 years old, from Logan High School and Aquinas High School volunteered for this study. Aquinas High School was randomly chosen as the control group in which no nutrition education sessions were administered. Logan High School was randomly chosen as the experimental group and nutrition education sessions were administered to the subjects.

The food record sheet was used in this study (see Appendix A). The results were analyzed with the Nutrition Data Base System which is based on US Department of Agriculture measurements of the nutrient content of foods as well as commercially available products. The food record sheets consisted of food intake for a time span of three days.

### Testing Procedures and Data Collection

#### Dates of Data Collection

The study was conducted during the weeks of November 17, 1986 to December 19, 1986. This consisted of food record sheet distribution, initiation of tests and collection of data.

#### Food Records

On the day before the first scheduled week of food recording, both the Logan Wrestlers (L.W.) and the Aquinas Wrestlers (A.W.) were

instructed on how to fill out the food record sheets. This was explained with demonstrations of the sheet itself by the investigator. Food portion estimations were demonstrated with visual aids, plastic food models from the four food groups and serving size cups, dishes and spoons. The wrestlers were instructed to record all food and beverages during the recording period, being as specific as possible about the amount ingested. An explanation was given on which three days of the week were to be recorded on the food record sheet; one weekday, one weekend day and one wrestling match day.

#### Nutrition Education Sessions

For purposes of conducting this research, three 25-minute nutrition education sessions were developed. These sessions were held within a two week period. The sessions were held the week following the first food recording week. The sessions were held in a classroom in Logan High School and were held after practices at 5:00 o'clock in the evening. During the week following the final nutrition education session both L.W. and A.W. again filled out the food record sheets for the three required days.

The education sessions were broken down into different topic areas. Day one consisted of the topics "The Basic Food Groups", "What is Iron Deficiency?", and "How Iron Deficiency Affects Wrestling Performance". Day two consisted of "Sources of Food High in Iron", "Methods of Prevention of Iron Deficiency", "How to Increase Iron in the Diet",

"Label Reading for Iron Determination in Different Foods" and "How Iron is Lost from the Body". Day three consisted of "Signs and Symptoms of Iron Deficiency", "Vitamin Supplements", and "Assertiveness" (see Appendix D).

The first day of the education sessions the wrestlers were told what topics would be covered for all of the nutrition education sessions. At the beginning of each session the wrestlers were given handouts pertaining to the subject matter (see Appendix E). During and after the sessions the wrestlers were able to ask questions to clarify any misunderstandings pertaining to the discussion of the session.

The parents of the wrestlers were informed of the nutrition education sessions their sons were to be involved in through a newsletter by the high school. This newsletter was sent to the parents' home before the study began.

A brief survey was conducted with the wrestlers at the end of the sessions to determine how many of the wrestlers fixed their own meals during the wrestling season. More than 75% of the wrestlers fixed all of their own meals. The other wrestlers made at least one of their own meals.

#### Initiation of the Tests

Before the tests could be initiated it was necessary to get permission from The School District of La Crosse for Logan High School

Wrestlers to participate in the study (see Appendix F). For the participation of Aquinas High School Wrestlers verbal permission was required from the school principal. Both of the coaches were sent letters to inquire if there was interest in the study (see Appendix C).

After the subjects had filled out the informed consent forms (see Appendix B) and had an understanding of how to use the food record sheets, two sheets were distributed to each subject. The A.W. and L.W. were informed that their individual results would be confidential and withdrawal from participation in the study was allowed. The subjects were asked to give their best efforts in the recordings of their food intakes for three days.

The L.W. then attended the three nutrition education sessions for two weeks following the food recording week. During the week following the last nutrition education session both A.W. and L.W. again did a three-day food record sheet. The food record sheets were turned into the investigator when completed.

#### Data Analysis

The wrestlers filled out and completed the food record sheets and turned them into the investigator. The foods ingested were broken down into their simplest possible components. The subjects were encouraged to use measuring cups and spoons. However, a certain amount of estimation was unavoidable.

Each of the food record sheets were individually entered into the Nutrition Data Base System for iron status and the status of related nutrients. After entering the coded food items and corresponding

amounts, a complete report of the following information was provided: 1) the mean kilocalories ingested and the RDA suggested number, 2) the mean percentage of carbohydrate, fat, protein and alcohol ingested and their respective gram and caloric amounts, and 3) the amounts of fourteen additional nutrients ingested, their suggested RDA's and excesses or deficiencies of any of them. The nutrient iron was included in this analysis (see Appendix G).

The means and standard deviations were calculated for both the control and experimental groups pre-test and post-test. The before and after record sheet results were compared and analyzed with a t-test for two dependent groups and tested at a significance of  $p < .01$ . For the control group a significant level of  $p > .01$  was selected. The nutrient iron was analyzed and compared.

CHAPTER IV  
RESULTS AND DISCUSSION

Introduction

The intent of this study was to determine the effects of nutrition education sessions relating to dietary iron on the dietary iron intake of high school wrestlers. All 24 subjects filled out two sets of three-day dietary recall sheets. Thirteen subjects from Logan High School participated in three nutrition education sessions relating to dietary iron. These sessions were taught by the investigator. The other 11 subjects from Aquinas High School did not participate in any type of nutrition education sessions. This chapter presents data collected using food record sheets to compute dietary iron intake, statistical analysis of the data and a discussion of the relevant findings. A t-test for two dependent groups was used for both sets of subjects to determine whether significant differences existed between the dietary recalls of both groups. A significance level of .01 was selected as indicating there was a positive effect from the education session. For the control group, a significance level of .01 was also selected, but it would have been almost impossible to reject  $H_0$  at any level of significance for the control group.

The results and discussion of this study have been divided into four subheadings. The sections are in the following order: subjects, dietary iron characteristics, discussion of results, and a summary of the chapter.

### Subjects

The subjects involved in this investigation were 24 male high school wrestlers. The subjects were volunteers.

Table 1 presents the age of the subjects.

Table 1. Means and Standard Deviation for age of subjects.

Subjects	Age range yrs	mean age	S.D.
male	14-18	15.83	2.69

The subjects were not required to state their weight or height.

### Dietary Iron Characteristics

Two sets of dietary intake patterns were interpolated from three-day food record sheets, which the subjects completed on their own for one weekday, one wrestling match day and one weekend day. These food record sheets were completed before and after the three nutrition education sessions. The Nutrition Data Base computer program was used to analyze the food record sheets and provided average daily amounts of the iron ingested by each wrestler. The means and standard deviations for iron content before and after the sessions by each group is presented in Table 2. The table shows that the mean iron content for the experimental group increased from 7.57 mg pre-test to 11.25 mg post-test, while the mean iron content for the control group slightly decreased from 10.75 mg to 10.51 mg.

Table 2 presents the mean iron content in mg of the wrestlers.

Table 2. Means and Standard Deviations for Iron Content

	EXPERIMENTAL GROUP		CONTROL GROUP	
	X	SD	X	SD
BEFORE SESSIONS	7.57 mg	2.93	10.75 mg	3.77
AFTER SESSIONS	11.25 mg	2.47	10.51 mg	3.39

All of the wrestlers, from both the control and the experimental groups, had iron contents in their diets that fell below the RDA of 18 mg for young men before and after the sessions. In the experimental group, all but two wrestlers increased their dietary iron intake. The two wrestlers who decreased, did so by 2.1 mg of dietary iron. Three wrestlers increased their dietary iron content between .5 mg to 2.1 mg. Nine wrestlers increased their dietary iron content in the range of 4.7 mg to 7.4 mg, as seen in Table 3. The wrestlers from the control group ranged from slightly increasing their iron content to 2.0 mg to slightly decreasing their iron content by .4 mg. Only one wrestler maintained the same iron content throughout the food recordings. These results are summarized in Table 4 for the control group.

Table 3 presents the iron in mg for the experimental group.

Table 3. Iron Content of Experimental Group

EXPERIMENTAL GROUP				
Subject number	Before Sessions	After Sessions	Difference	D <sup>2</sup>
1	11.6	13.7	+ 2.1	4.41
2	3.7	10.2	+ 6.5	42.25
3	4.4	11.8	+ 7.4	54.76
4	12.3	10.2	- 2.1	4.41
5	7.3	5.2	- 2.1	4.41
6	9.6	15.5	+ 5.9	34.81
7	9.9	10.4	+ .5	.25
8	2.8	8.6	+ 5.8	33.64
9	8.3	13.0	+ 4.7	22.09
10	5.2	11.8	+ 6.6	43.56
11	5.4	12.3	+ 6.9	47.61
12	8.1	13.3	+ 5.2	27.04
13	9.8	10.3	+ .5	.25
N = 13			47.9	318.91

Statistical Hypothesis

$$H_0: \mu_D = 0$$

$$H_1: \mu_D > 0$$

Decision Rule:

Reject  $H_0$  at .01 level of significance if  $t$  is greater than 2.681 given  $df = 13 - 1 = 12$ .

Results:

$$t = \frac{D - \mu_D}{s_D / \sqrt{n}} \quad t = \frac{3.68 - 0}{.95} = 3.874$$

Interpretation:

The mean daily iron content of high school wrestlers increased after participation in nutrition education sessions relating to dietary iron.

Table 4 presents the iron in mg for the control group.

Table 4. Iron Content of Control Group

CONTROL GROUP				
Subject Number	Before Sessions	After Sessions	Difference	D <sup>2</sup>
1	12.5	12.9	+ .4	.16
2	16.5	14.5	-2.0	4.00
3	5.1	5.5	+ .4	.16
4	8.9	9.2	+ .3	.08
5	6.3	6.3	0.0	0.00
6	15.5	15.0	- .5	.25
7	11.6	10.2	-1.4	1.96
8	8.7	9.0	+ .3	.09
9	6.2	6.5	+ .3	.09
10	12.2	11.4	- .8	.64
<u>11</u>	<u>14.7</u>	<u>15.1</u>	<u>+ .4</u>	<u>.16</u>
N = 11			-2.6	7.60

Statistical Hypothesis:

$$H_0: \mu_D = 0$$

$$H_1: \mu_D > 0$$

Decision Rule:

Reject  $H_0$  at .01 level of significance if  $t$  is greater than 2.764 given  $df = 11 - 1 = 10$ .

Results:

$$t = \frac{D - \mu_{D_{hyp}}}{s_D} = \frac{-2.6 - 0}{.25} = -10.4$$

Interpretation:

The mean daily iron content of high school wrestlers does not change significantly when they do not participate in nutrition education sessions relating to dietary iron.  $H_0$  cannot be rejected at any level of significance.

### Discussion of Results

The findings of the present study were similar to those obtained by other researchers such as Slavin and Lampe, 1985. The initial iron intake of both groups of wrestlers was deficient. After the three nutrition education sessions were initiated by the investigator, the iron content in the experimental group increased significantly (Table 3). Although the wrestlers dietary iron intake increased significantly, the wrestlers remained deficient, still failing to reach the RDA of 18 mg of iron per day. The control group's dietary iron content did not change significantly (Table 4). This study did not take into account the socioeconomic background of either group of wrestlers.

### Summary

The purpose of this study was to determine the effects of nutrition education sessions relating to dietary iron on the dietary iron intake of high school wrestlers. The nutrition education sessions used in this study appeared to have a positive influence on the dietary iron intake of high school wrestlers. The subjects increased their dietary iron consumption after participation in the sessions. Based on the results of the present study, it appears that with the methods described, nutrition education sessions relating to dietary iron could be used to increase the nutritional status and knowledge about the nutrient for high school wrestlers, coaches and educators.

## CHAPTER V

### SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND IMPLICATIONS

#### Summary

The purpose of this study was to determine if nutrition education sessions relating to dietary iron had an effect on the dietary iron content consumed by high school wrestlers. The statistical tool utilized in this study for comparing the two groups was a dependent t-test. A comparison was made between iron content ingested before and after participation in nutrition education sessions relating to dietary iron for the experimental group. A comparison of the latter was also made for the control group, without participation in nutrition education sessions.

#### Conclusions

The results of this study indicated the following conclusions:

1. There was a significant increase ( $p < .01$ ) in the experimental groups' iron content after participating in the nutrition education sessions, therefore the research hypothesis was accepted.
2. There was no significant difference ( $p > .01$ ) in the control groups' iron content with no participation in the nutrition education sessions, therefore the null hypothesis could not be rejected.

### Recommendations

The following recommendations are made in regard to future studies:

1. It is suggested that four groups of high school wrestlers instead of two groups be used as subjects in the study.
2. Further research is needed on college-age wrestlers and their dietary intake. A comparison of high school wrestlers to college wrestlers is suggested.
3. Since dietary recall may be sometimes inaccurate in determining specific iron content in the diet, it is suggested that invasive blood samples be drawn from the subjects and various tests be done to determine more accurate iron content in the body.
4. It is suggested that Vitamin C content with each meal be measured to more accurately measure the absorption of iron in the diet.
5. A similar study be conducted with a larger sample of subjects and for a longer period of time.
6. A similar study using questionnaires along with the dietary recall sheets be conducted to determine which educational sessions ranked the most informative to the wrestlers.
7. A similar study be done with the parents of the wrestlers participating in the nutrition education sessions.
8. A similar study be conducted comparing the iron intake of wrestlers with other athletic teams, such as football.
9. A similar study be done comparing wrestlers to non-athletes.

10. A similar study be conducted comparing female athletes with male wrestlers.
11. A similar study be done with determination of the weight changes of the wrestlers as well as dietary intake.

#### Practical Implications

This study has shown that wrestlers in the population researched are deficient in the nutrient iron. This is an important factor for optimal performance in wrestling because iron is necessary for the oxygen carrying capacity of the blood to the muscles. Although the experimental group in this study significantly increased their dietary iron intake after nutrition education sessions, they were still deficient from the RDA of 18 mg by approximately 7 mg. The control group was deficient by approximately 8 mg.

The investigator of this study feels there is a strong need for more nutrition education in the school systems for athletes as well as non-athletes. Simple modifications can be made in individuals' dietary habits without increasing calories as demonstrated in Appendix D. This study did not take into account that the wrestlers may have been drastically decreasing their body weight, although it was believed that some of the wrestlers had decreased their weight because of the timing of the study. If the study had included the weight change of the athletes iron intake may have been even more deficient.

The findings of this study appear to have certain practical implications for coaches, educators and/or guardians of high school wrestlers or other sports in which there is a decreased food intake

occurring during the season.

1. Coaches and educators should be well informed of nutritional considerations of their athletes and try to implement nutrition education sessions, relating to iron as well as other nutritional elements, into the athletic practices.
2. Coaches and educators should also inform the guardians of the athletes of the nutritional considerations of the athletes by meetings or newsletters with the appropriate information included.
3. The investigator determined that use of food record sheets agreed with Singleton and Rhoades (1984) as a fairly accurate method for determining food and nutrient content for high school aged athletes.

## References

- Alford, B. B., & Boglo, M. L. (1982). Nutrition during the life cycle. Englewood Cliffs, New Jersey: Prentice Hall, Inc.
- Bell, & Cowan. (1961). Low hematocrits during basic training: Athlete's anemia? The New England Journal of Medicine, 43, 1191-1192.
- Bruno, M., Magnusson, B., Persson, H., & Hallberg, C. (1986). Iron losses in sweat. The American Journal of Clinical Nutrition, 43, 438-443.
- Clement, B., & Assundson, C. (1982). Nutritional intake and hematological parameters of endurance runners. The Physician and Sportsmedicine, 10 (3), 37-43.
- Davies, C. T. M., Chukweuneka, A. G., & Van Haaven, J. P. M. (1973). Iron deficiency anemia: Its effect on maximum aerobic power and responses to exercise in African males aged 17 to 40 years. Clinical Science, 44, 555-562.
- Disler, F. B., Lynch, S. R., Charlton, R. U., Torrance, J. D., Bothwell, T. H., Walker, R. B., & Mayet, R. (1974). The effect of tea on iron absorption. Gut, 16, 193-200.
- Douglas, P. D., & Douglas, J. G. (1984). Nutrition knowledge and practices of high school athletes. Journal of the American Dietetics Association, 84(10), 1198-1202.
- Ehn, L., Carlmark, B., & Hoglund, S. (1980). Iron status in athletes involved in intense physical activity. Medicine and Science in Sports and Exercise, 12(1), 61-64.
- Gardner, G. W., Edgerton, R., Barnard, J., & Barnauer, E. M. (1975). Cardiorespiratory, hematological and physical performance of anemic subjects to iron treatment. The American Journal of Clinical Nutrition, 28, 982-988.
- Hallberg, L., & Magnusson, B. (1984). The etiology of "sports anemia". Acta Medica Scandinavica, 216, 145-148.
- Hecker, A. L. (1982). Nutritional conditioning and athletic performance. Primary Care, 2(3), 545-555.
- Houston, M. E., Marris, D. A., Green, H. J., & Thompson, J. A. (1981). The effects of rapid weight loss on physiological functions in wrestlers. The Physician and Sportsmedicine, 2(11), 73-79.

- Hunding, A., Jordal, R., & Paulav, P. (1981). Runner's anemia and iron deficiency. Acta Medica Scandinavica, 209, 315-318.
- Katch, F. I., & McArdle, W. D. (1983). Nutrition, weight control and exercise. Philadelphia: Lea & Febiger.
- McWhinnie, D.L., & Mack, A. J. (1982). The interaction of wheat bran and oral iron supplements. Human Nutrition, Clinical Nutrition, 36a, 315-318.
- Miles, C. W., Collins, J. S., Holbrook, J. T., Patterson, K. Y., & Bodevell, C. E. (1984). Iron intake and status for men and women consuming self-selected diets. The American Journal of Clinical Nutrition, 40, 1393-1396.
- Farr, R. B., Bachman, L. A., & Moss, R. A. (1984). Iron deficiency in female athletes. The Physician and Sportsmedicine, 12(4), 81-86.
- Pate, R. R. (1983). Sports anemia: A review of the current research literature. The Physician and Sportsmedicine, 11(2), 115-126.
- Fike, R. L., & Brown, M. L. (1984). Nutrition, an integrated approach. New York: John Wiley & Sons.
- Schoena, R. B., Escourrou, P., Robertson, H. T., Milson, K. L., Parsons, J. R., & Smith, M. J. (1982). Iron repletion decreases maximal exercise lactate concentrations in female athletes with minimal iron deficiency. Journal of Laboratory Clinical Medicine, 102(2), 306-312.
- Simpson, K. M., Morris, E. R., & Cook, J. D. (1981). The inhibitory effect of bran on iron absorption. American Journal of Clinical Nutrition, 34, 59-63.
- Singleton, N., & Rhoades, D. S. (1984). An assessment of nutrition education of students in grades 3-12. Journal of the American Dietetic Association, 84(1), 59-63.
- Slavin, J., & Lampe, J. (1985). Sports anemia. Sports Nutrition News, 4(2), 1-4.
- Smith, N. J. (1976a). Food for Sport. Palo Alto, Ca.: Bull Publishing Co.
- Smith, N. J. (1976b). Gaining and losing weight in athletes. Journal of the American Medical Association, 236(2), 149-151.
- Smith, N. J. (1984). Nutrition and athletic performance. Primary Care, 11, 33-43.

- Steen, S. N., & McKinney, S. (1986). Nutrition assessment of college wrestlers. The Physician and Sportsmedicine, 14(11), 100-116.
- Stewart, G. A., Steel, J., Toynes, A. H., & Stewart, M. J. (1972). Observations on the haematology and the iron and protein intake of Australian olympic athletes. The Medical Journal of Australia, 2, 1339-1343.
- Wideman, F. M., & Hagan, R. D. (1982). Body weight loss in a wrestler preparing for competition: A case report. The Physician and Sportsmedicine, 14(6), 413-418.
- Williamson, M. R. (1981). Anemia in runners and other athletes. The Physician and Sportsmedicine, 9(6), 73-76.
- Woodson, R. D. (1984). Hemoglobin concentration and exercise capacity. American Reviews of Respiratory Disease, 122, 72-75.
- Woodson, R. D., Wills, R. E., & Lenfant, C. (1978). Effect of acute and established anemia on O<sub>2</sub> transport at rest, submaximal and maximal work. Journal of Applied Physiology, 44, 44-36.

APPENDIX A  
FOOD RECORD SHEET



APPENDIX B  
INFORMED CONSENT FORM

## INFORMED CONSENT

Project Title: Dietary analysis of an amateur wrestler.

Principal Investigator: Marcella Jean Loprinzi

I, \_\_\_\_\_, being of sound mind and \_\_\_\_\_ years of age, do hereby consent to authorize and request the person named above to administer to me diet record sheets. I understand these sheets are designed to measure my food consumption on four different days. I understand that I may withdraw from this study at any time.

I hereby acknowledge that no guarantees or assurances of any kind pertaining to the sheets, have been made to me. All data will be reported without reference to my identity. I have read the foregoing and understand it. All questions that I have asked have been answered to my satisfaction.

Signed: \_\_\_\_\_, on this date \_\_\_\_\_.

Witnessed by: \_\_\_\_\_, on this date \_\_\_\_\_.

APPENDIX C  
LETTERS TO COACHES

Coach Doug La Claire  
Logan High School

Dear Coach Doug La Claire,

I am a graduate student at the University of Wisconsin--La Crosse and am working on a Master's Thesis focusing on dietary habits of high school wrestlers. My committee chairperson is Dr. Alan Freeman, the wrestling coach at the University. I will be working closely with him on the paper and the results of the study. I am interested in having high school wrestlers participate in this study.

I received my undergraduate degree from Oregon State University in Physical Education with an emphasis in Exercise Science and a minor in Nutrition and Food Science. I have worked closely with the Oregon State Wrestling Team and have done various types of nutrient analyses.

The emphasis of the study would be on nutrition education sessions and how they affect attitudes toward weight loss and weight gain, food choices and various nutrient contents of high school wrestlers' diets. The study would include a three-day food recording by each wrestler, followed by three 25-minute nutrition education sessions at your convenience, with another food recording conducted again during the following week. The study would be conducted during the wrestling season tentatively from November 17, 1986 to December 15, 1986. I anticipate that this study could be implemented with little difficulty and much benefit to your team.

I am very excited about the possibility of working with high school coaches and their wrestling teams. If you are interested in this project please fill out the short questionnaire I have enclosed and return it to me in the self-addressed, stamped envelope. If you should have any questions pertaining to the study please feel free to call me at 785-0708 after 7:00 p.m.

Sincerely,

Marcella Loprinzi  
Graduate Student  
Adult Fitness/Cardiac Rehabilitation Program  
University of Wisconsin--La Crosse

References:

Dr. Alan Freeman, Ed. D. Professor, Head Wrestling Coach, University of Wisconsin--La Crosse

Kris Clark R.D., M.S. Nutrition Services Program Director, University of Wisconsin--La Crosse

Phil Wilson, Ed. D. Professor, University of Wisconsin--La Crosse  
Executive Director, La Crosse Exercise and Health Program

Coach Bob Ratigan  
 Onalaska High School Wrestling Coach

Dear Coach Bob Ratigan,  
 I am a graduate student at the University of Wisconsin--La Crosse and am working in a Master's Thesis focusing on the dietary habits of high school wrestlers. My committee chairperson is Dr. Alan Freeman, the wrestling coach at the university. I have been working closely with him on the paper. I am interested in having high school wrestlers participate in this study.

I received my undergraduate degree from Oregon State University in Physical Education and Nutrition. I have worked closely with the Oregon State Wrestling Team and have done various types of nutrient analyses.

The emphasis of the study would be on nutrition education sessions and how they affect the attitudes of food choices and nutrient contents of high school wrestlers' diets. I would like to have your team participate in a pilot study for the paper. I would only need them for 15-20 minutes, for one day. In this time span I would educate them on how to correctly fill out a dietary analysis sheet and have them fill it out within the next two days and return it to me. This would be done the week of November 10, 1986.

If you are also interested, I could give your team the nutrition education sessions sometime in January. At the end of the study you would also receive a complete report of the study.

I am very excited about working with high school coaches and their wrestling teams. If you are interested please call me at 785-0708. I will also try to contact you soon at the Middle School.

Sincerely,

Marcella Loprinzi  
 Graduate Student  
 Adult Fitness/Cardiac Rehabilitation Program  
 University of Wisconsin--La Crosse

References:

Dr Alan Freeman, Ed. D. Associate Professor, Head Wrestling Coach,  
 University of Wisconsin--La Crosse

Kris Clark, RD, MS, Nutrition Services Program Director, University of  
 Wisconsin--La Crosse

Dr Phil Wilson, Ed. D. Professor, University of Wisconsin--La Crosse,  
 Executive Director, La Crosse Exercise and Health Program

APPENDIX D  
NUTRITION EDUCATION SESSIONS

## NUTRITION EDUCATION SESSIONS

### INTRODUCTION

#### DAY ONE

1. Hello.
2. Who I am, what I want to accomplish here.
3. Topics which will be covered in these three days.
4. I am not here to tell you how to control your weight or not to lose weight.
5. Topics which will be covered in the sessions.

#### I. BASIC FOOD GROUPS

1. Meat and meat substitute group.
  - a. Two 3oz. servings
  - b. Fish, poultry, lean meat, dry peas, beans, peanutbutter
  - c. High iron foods in this group: lean meats, fish, poultry, beans and soybean products.
2. Milk and Milk products group
  - a. Two 8oz. servings
  - b. Milk, cheese and yogurt [preferably skim]
  - c. High iron foods in this group: none.
3. Whole grains and enriched bread products
  - a. Four or more servings
  - b. Bread, cereal, tortillas, muffins, rolls, pasta, etc...
  - c. Fortified products are fortified with iron.

#### 4. Fruits and Vegetables

- a. Four or more servings
- b. One citrus fruit--oranges, grapefruit
- c. One deep green leafy vegetable--spinnach, dark lettuce, broccoli
- d. One deep orange or deep yellow vegetable--carrots, squash, tomatoe
- e. Foods in this group high in iron: raisins, apricots, spinnach.

#### 5. Sweets, fats and alcohol

- a. eat in moderation

### II. Label Reading

1. Read labels for iron content.
2. Show them how to figure out iron content of food.

### I. HOW IRON IS LOST FROM THE BODY

1. Small amounts lost through the skin and hair
2. Very intense training, in which large amounts of sweating occurs
3. Excessive use of saunas or wearing rubber suits while exercising
4. Any activity in which large amounts of body fluid are lost
5. Large amounts of aspirin where internal bleeding occurs

### II. INHIBITORS OF IRON

1. Tannic acids--found in teas and coffee
2. Polyphenolic compounds--found in teas and coffee
3. EDTA--a food additive
4. Calcium and Phosphate salts--found in anti-acid tablets (TUMS)
5. Phovitin phosphoprotein--found in egg yolks
6. wheat bran--high fiber cereals, muffins or bread products
7. Fiber products

### III. ENHANCERS OF IRON

1. Vitamin C--found in citrus fruits, potatoes, green leafy vegetables, tomatoes, strawberries, pineapple, citrus fruit juices
2. Meat, fish and poultry factor
3. Iron fortified breads and cereals--look on the labels

## I. WHAT IS IRON DEFICIENCY ANEMIA

1. Iron is one of the body's five essential minerals
2. For young men the recommended daily allowance is 18 mg/day
3. Characterized by :
  - a. general sluggishness, fatigue and loss of appetite
4. Iron determines the oxygen carrying capacity of the blood
5. If one is iron deficient then the oxygen carried to the heart is reduced and one's performance is adversely affected.
6. During time of growth the need for iron is increased, because the muscles and bones are still growing.
7. How iron is used in the body for aerobic and anaerobic processes
  - a. visual description

## II. GOOD SOURCES OF IRON

- |                      |                                    |
|----------------------|------------------------------------|
| 1. Liver 3oz         | 12. spinach 1/2 cup                |
| 2. oysters 3oz       | 13. Iron fortified cereals 1/2 cup |
| 3. dried apricots 6  | Total cereal                       |
| 4. turkey 3oz        | 14. raisins 1/2 cup                |
| 5. dried dates 3 oz  |                                    |
| 6. pork chops 3oz    |                                    |
| 7. beef 3oz          |                                    |
| 8. bean tostada 3oz  |                                    |
| 9. beans 1/2 cup     |                                    |
| 10. hamburger 3oz    |                                    |
| 11. beef enchilada 1 |                                    |

## I. SUPPLEMENTS

1. It has been said that American athletes have the most expensive urine in the world. The reason is their tendency to use massive doses of vitamin supplements which far exceeds their needs.
2. The water soluble vitamins that the body cannot use are rapidly excreted in the urine [B vitamins and Vitamin C]
3. There is NO need for supplementation if the diet includes a proper variety of foods.
4. Vitamin supplements are a needless expense
5. Vitamin supplementation can be harmful if they are fat soluble vitamins.
  - a. These cannot be excreted in the urine and are stored in bodyfat and the liver.
  - b. These can build up and produce toxic effects, mainly with vitamins A and D.
6. Vitamin supplements are often abused by athletes under the misconception that if a little is good, more will be better.
7. Increasing energy demands only requires more kcals not an increased demand for vitamins [except for thiamin, which is adequately supplied in a normal diet]
8. A diet with 1200 to 1500 kcals will provide all the vitamins and protein any one needs.
9. Protein supplements will not increase ones size or strength
  - a. can be dehydrating and expensive.

## ASSERTIVENESS

- I. Does the wrestler feel that this nutrition education is important for him?
  - A. If so, try to modify current eating habits.
  - B. Explain to your parents why this is important to you.
  - C. Ask them how they can help you change.
  - D. Ask them if they approve of this.
  - E. This is your decision.

## COMPARISON OF DIETS

Breakfast 5.3 mg iron

wheaties

25% of RDA

25 x 18 mg = 4.5 mg iron

orange juice 60 mg Vit C

milk skim

1 pc ww toast .8 mg iron

Lunch 4 mg iron

milk skim

chicken nuggets 4 mg iron

orange 60 mg vit C

pop diet

Breakfast 3.0 mg iron

wheaties 4.5 mg iron

apple juice

milk whole

1 pc white toast .5 mg iron

Lunch 3.5 mg iron

milk whole

chicken nuggets 4 mg iron

apple

pop

---

snack1 cup raisins 5.1 mg iron

Dinner 10.2 mg iron

2 hamburgers 6 mg iron

buns 1.0 mg iron

tomstoe 20 mg vit C

lettuce dark green .6 mg iron

green peas 3.2 mg iron

24 mg iron

---

snackcandy bar

Dinner 7 mg iron

2 hamburgers 6 mg iron

bun 1.0 mg iron

lettuce iceberg .1 mg iron

---

13 mg iron

APPENDIX E  
NUTRITION EDUCATION SESSION HANDOUTS

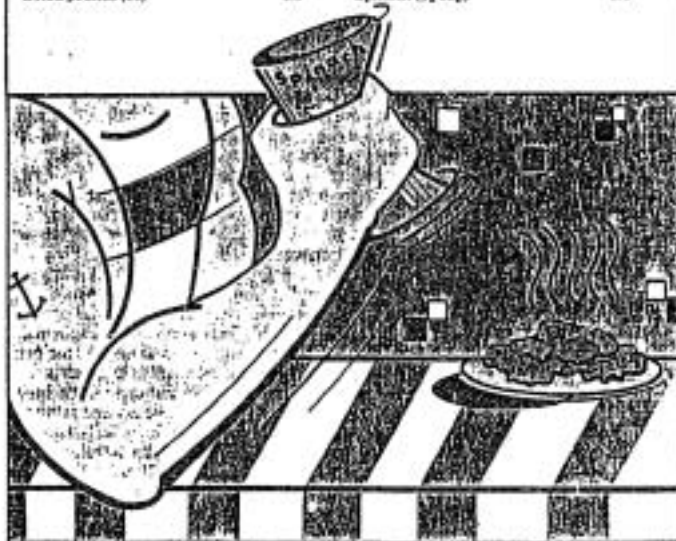


## Popeye's secret and other iron-rich foods

While some swear by spinach, 19 other foods contain even more iron. The list below features the 20 best foods and the milligrams of iron they offer. And as you consume iron-packed choices, you should also be aware of the foods you eat with them. Known as inhibitors and enhancers, certain foods affect the body's absorption of iron. By far the best enhancer: vitamin C. "A five-ounce glass of orange or grapefruit juice taken with a meal can quadruple the body's absorption of iron," says Ann Grandjean, director of the Swanson Center for Nutrition in Omaha, Nebraska, and a consultant to the U.S. Olympic Committee.

The worst inhibitor is tannic acid, a substance found in tea. Polyphenolic compounds (found in coffee), soy products, a food additive called EDTA, calcium and phosphate salts (found in antacid tablets), phovitin phosphoprotein (found in egg yolks), wheat bran and fibers in general all reduce iron absorption.

Pork liver (3 oz)	17 mg.	Bone tostada (1)	3.2 mg.
(Note: Other types of liver also contain large amounts of iron)		Kidney beans (1/2 cup)	3.0
Oysters (3 oz)	6.9	Baked beans (1/2 cup)	3.0
Dried apricots (12 halves)	6.5	Hamburger (3 oz)	3.0
Turkey (3 oz)	6.1	Soybeans (1/2 cup)	2.7
Prune juice (1/2 cup)	4.9	Beef enchilada (1)	2.6
Dried dates (6)	4.8	Raisins (1/2 cup)	2.5
Pork chop (3 oz)	4.5	Lima beans (1/2 cup)	2.5
Beef (3 oz)	4.2	Refried beans (1/2 cup)	2.3
Dried prunes (10)	3.9	Dried figs (4)	2.2
		Spinach (1/2 cup)	2.0



# IMPORTANT VITAMINS AND MINERALS

10 Essential Vitamins	How much is needed U.S. RDA*		Why needed	Food Sources
	Children under 4 years of age	Adults & Children 4 or more years of age		
VITAMIN <b>A</b>	2500 I.U.	5000 I.U.	Helps to develop and maintain healthy eyes, skin, hair, teeth, gums and various glands. Also involved in metabolism of fat.	Whole milk, butter, fortified margarine, eggs, yellow vegetables and fruits, leafy green vegetables, liver.
VITAMIN <b>D</b>	400 I.U.	400 I.U.	Helps to form strong teeth and bones. Helps the body use calcium and phosphorus.	Vitamin D fortified milk, cod liver oil, egg yolk, tuna, salmon.
VITAMIN <b>E</b>	10 I.U.	30 I.U.	Helps to form normal red blood cells, muscle and other tissues. Protects fat from abnormal breakdown in the body's tissues.	Vegetable oils, whole grain cereals.
VITAMIN <b>C</b> (Ascorbic acid)	40 mg	60 mg	Helps maintain healthy bones, teeth and blood vessels. Also helps in formation of the protein, collagen, that helps support body structures like skin, bone and tendon.	Citrus fruits particularly; other fruits and leafy green vegetables, potatoes.
<b>FOLIC ACID</b>	0.2 mg	0.4 mg	Helps to form certain body proteins and genetic materials for the cell nucleus. Also helps in the use of substances that contain carbon, a key element in organic molecules.	Leafy green vegetables, liver.
VITAMIN <b>B<sub>1</sub></b> (Thiamine)	0.7 mg	1.5 mg	Helps to convert food to energy by promoting proper use of sugars.	Whole grain or enriched bread and cereals, yeast, liver, pork, fish, lean meat, poultry, milk.
VITAMIN <b>B<sub>2</sub></b> (Riboflavin)	0.8 mg	1.7 mg	Helps in the body's use of carbohydrates, proteins, and fats—particularly to release energy to cells.	Milk, whole-grain or enriched bread and cereals, liver, lean meat, eggs and leafy green vegetables.
VITAMIN <b>NIACIN</b> (Nicotinamide)	9 mg	20 mg	Helps in the energy-producing reactions in cells present in all body tissues.	Eggs, meat, liver and whole-grain and enriched breads and cereals.
VITAMIN <b>B<sub>6</sub></b> (Pyridoxine)	0.7 mg	2 mg	Helps in the formation of certain proteins and the use of fats during metabolism. Helps to form red blood cells.	Lean meat, leafy green vegetables, whole grain cereals.
VITAMIN <b>B<sub>12</sub></b>	3 mcg	6 mcg	Helps in the building of vital genetic substances (nucleic acids) for the cell nucleus, and in the formation of red blood cells. Also helps functioning of the nervous system.	Liver, kidney, fish, milk, foods of animal origin in general.

# IMPORTANT VITAMINS AND MINERALS

5 Essential Minerals	How much is needed U.S. RDA**		Why needed	Food Sources
	Children under 4 years of age	Adults & Children 4 or more years of age		
<b>IRON</b>	10 mg	18 mg	Is an essential part of hemoglobin, the protein substance which enables red blood cells to carry oxygen throughout the body. It is also part of certain important enzymes.	Lean meat, egg yolk, liver, green leafy vegetables.
<b>CALCIUM</b>	0.80 g	1.0 g	Helps build strong bones and teeth. Also needed for activity of nerve and muscle cells, including the heart, and for normal blood clotting.	Vitamin D fortified milk, egg yolk, tuna, salmon, cheese
<b>PHOSPHORUS</b>	0.80 g	1.0 g	Helps in building and maintaining strong teeth and bones. Also helps in the quick release of energy, in muscle contraction and in nerve function.	Milk, fish, meat, whole grain cereals.
<b>IODINE</b>	70 mcg	150 mcg	Is an integral part of hormones produced by the thyroid gland, which is involved in the regulation of cell metabolism.	Seafood, iodized salt.
<b>MAGNESIUM</b>	200 mg	400 mg	Is an important part of all soft tissues and bones. It also helps trigger many vital enzyme reactions in humans.	Green leafy vegetables, whole grain enriched bread and cereals, meat.



\* Based on information provided by the Vitamin Information Bureau, Chicago, Illinois.  
 \*\* U.S. Recommended Daily Allowance.

Source: U.S. Department of Health, Education and Welfare, "Dietary Guidelines for Americans," 1980. © 1980 by the U.S. Department of Health, Education and Welfare.

VITAMIN C  
"Ascorbic Acid"

Without Vitamin C:

Wounds don't heal well.  
Gums bleed easily.  
Bones can break easily.  
We bruise more easily.  
Blood vessels can break in our eyes--causing redness.  
Teeth become loose.  
Red splotches appear on skin.  
Development of Scurvy.  
Eventual Death.

Vitamin C can be easily destroyed!  
Within 20 minutes of opening a can of juice containing Vitamin C (orange juice) the air can destroy all the Vitamin C if not protected. This is called "oxidizing." We need to cover all juices and wrap up foods with Vitamin C to preserve the vitamin content. Loss of Vitamin C does not hurt the taste of foods.

With Vitamin C:

Membranes in eyes, ears, mouth stay moist.  
Gums remain healthy.  
Healing of sores and wounds occurs at a normal rate.

Who Needs Vitamin C:

We all need Vitamin C daily because it's a water soluble vitamin. We excrete excess "C" each day and use only what the body needs on a daily basis. We cannot store Vitamin C. We need 60 mg./day in most cases. People who use antacids need more. Smokers need more because the smoking destroys more Vitamin C. Infants need more for growth.

Foods High in Vitamin C

Citrus Fruits

oranges/orange juice  
grapefruit/grapefruit juice  
lemons  
limes  
tangerines

Other Sources

cabbage  
broccoli  
tomatoes  
potato skins  
green peppers  
strawberries  
pineapple  
brussel sprouts

APPENDIX F  
LETTERS OF PERMISSION FROM SCHOOL DISTRICT

# SCHOOL DISTRICT OF LA CROSSE



HOGAN ADMINISTRATIVE CENTER  
807 East Avenue South  
La Crosse, WI 54601  
608 784-8960

READING COORDINATOR  
KAREN MURRAY

November 20, 1986

Marcella Jean Loprinzi  
400 Buchner Pl. #214  
La Crosse, WI 54601

Dear Ms. Loprinzi:

Thank you for arranging to meet with our Research and Development Committee on November 19, 1986. I am pleased to report that the committee has approved your project, Influence of nutrition Education Sessions Related to Dietary Iron on the Dietary Habits of High School Wrestlers. It is your responsibility to follow through with contacts to the Logan Senior High Principal, Doug Hoppel, and with the wrestling coach. The Research and Development Committee is looking forward to learning the results of your work.

Good luck to you in this project.

Sincerely,

Karen M. Murray  
Supervisor of Curriculum

# SCHOOL DISTRICT OF LA CROSSE



Director of Research  
Programs  
Dr. Thomas L. Morehouse

March 27, 1987

Ms. Marcella Loprinzi  
400 Buchner Place #214  
La Crosse, Wisconsin 54601

Dear Ms. Loprinzi:

This is simply an introduction of myself, having taken over research program responsibilities from Karen Murray.

I hope your project is going smoothly, and wish to remind you to prepare a finished report of your study at its close. I may then present your summary to our research committee.

Wishing you success, I am

Sincerely yours,

A handwritten signature in cursive script that reads "Thomas L. Morehouse".

Dr. Thomas L. Morehouse  
Director of Research Programs

TLM:ds

APPENDIX G  
NUTRIENT ANALYSIS

\* GENERAL SUMMARY

\*\*\* 2106 P.H. MONDAY 26 JANUARY 1987 \*\*\*

NUTRIENT		MEAN OF 3 DAY(S)	RDA	% RDA OF FOOD	% OF TOTAL CALORIES	RECOMMENDED % OF TOTAL CALORIES
CALORIES	KC	1494.3	3000.0	49.8	-	
PROTEIN	GM	59.9	56.0	107.0	16.0	12% - 20%
FAT	GM	47.3			28.5	20% - 30%
CARBO	GM	212.1			55.5	50% - 70%
ALCOHOL	GM	0.0			0.0	
-----						
VIT A	IU	2130.2	5000.0	42.6	-	
THIAMIN	MG	1.3	1.4	93.9	-	
RIBOFLAVIN	MG	1.2	1.7	71.4	-	
NIACIN	MG	9.5	18.0	52.5	-	
ASCORBIC	MG	21.5	60.0	35.9	-	
CALCIUM	MG	872.5	1200.0	72.7	-	
PHOSPHORUS	MG	1051.4	1200.0	87.6	-	
POTASSIUM	MG	1315.7				
SODIUM	MG	1337.0				
IRON	MG	11.8	18.0	65.7	-	
SAT FAT	GM	18.6				
OLEIC ACID	GM	14.9*				
LINOLEIC	GM	4.4*				
CHOLESTER	MG	89.5				

S U M M A R Y