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A brief history of the development of the football headgear

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A BRIEF HISTORY OF THE DEVELOPMENT OF THE FOOTBALL HEADGEAR

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by

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CHAPTER I

THE PROBLEM

Introductory statement. The aim of this study is to set forth an accurate account of the development of football headgear. It is a written record of the birth of such equipment, for the protection of football players from serious injuries, to the present day.

The materials of this work were secured from various sources. Of primary importance was the great volume of data so graciously and freely given by both Doctor and Mrs. Amos Alonzo Stagg of Stockton, California. Coach Stagg has a pictorial history of Yale and Chicago University games and football teams from 1876 to 1932, which this investigator was permitted to peruse for hours during two summer sessions. In addition to this valuable visual information, an almost complete set of, what by 1921 became, Spauldings National Collegiate Athletic Association Football Rule Book was available. This set of books begins with a copy for 1884 and was then known as Spauldings Official Football Guide. An unusual amount of authoritative information was also forthcoming from Mr. Stagg's very alert and retentive memory. Other sources were found giving some background or interesting sidelights. This investigator's personal

experience as a player, coach, and director of athletics has been very helpful with this work.

The major sporting goods companies of the United States have all made valuable information available and given helpful suggestions.

Especially helpful were representatives of the Rawlings, Riddell, Spaulding, and Wilson Companies. Others who supplied most recent data and research information were Doctor Floyd R. Eastwood of Los Angeles State College and Chairman of the Injury and Fatality Committee, American Football Coaches Association, and Herman P. Roth, Chief Engineer for Protection, Incorporated, of Inglewood, California.

Importance of the study. Since the inception of the game of football, it has been a recognized fact that it was and is a rigorous, rugged, and perhaps even a rough game. At times it may actually have been too rough. It has been frowned upon and even dropped in some areas at various times. It has never been too rough or too bloody for a large group of its followers--the spectators. The value of such a contact sport, played properly, to our youth has been more fully realized and accepted as the years have passed. In its earliest history it was financed by the players, or by moneys received from the gate. At present

the college teams must usually bring in enough profit from receipts by the sale of tickets to spectators to carry on the program. The trend in high school football at present is for the school boards of the various districts to finance a great deal of the program as a part of their regular process of educating our youth. Until recent years football was considered no part of the regular school educational system. It was considered entirely extra-curricular and, although under legal control of the administrators, it was not considered a necessary or needed part of the school program. This attitude of resentment was held by many of the faculty members in other departments and by some of the administrators themselves. Indicating the acceptance of football as an activity with a proper place in our educational processes, Charles E. Forsythe is quoted here on its value:

> Certainly, from an educational standpoint, athletics can be justified as having as great, or greater, possibilities for teaching citizenship, sportsmanship, character, self-discipline, health, and use of leisure time than any other school subject.[1]

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[1] Charles E. Forsythe, The Administration of High School Athletics (New York: Prentice-Hall, Inc., 1948), p. 79.

With football accepted fully by the American public and to a large degree by school administrators, the history of one of the most important pieces of protective equipment becomes all the more interesting and valuable. As the game of football is to be played, and it undoubtedly will be, the safest possible headgear is of the greatest importance. Coaches the country over have been and are cooperating in every way with the sporting goods companies to help them provide for the market adequate protective gear of all kinds for all of our athletes. Coach Everett Dean of Stanford University quotes from the National Association of Basketball Coaches' Creed, as follows:

> I believe in and will support all reasonable moves to improve athletic conditions, to provide adequate equipment and to promote the welfare of an increased number of participants.[2]

Most authorities accept the philosophy of Don Seaton who advises no football at all unless special and effective effort is made to supply sufficient protective equipment of the best quality and greatest protective value for all players. He goes on to say that probably the one most

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[2] George R. Edwards, University of Michigan, National Association of Basketball Coaches' Creed, as quoted in Everett S. Dean, Progressive Basketball Methods and Philosophy (New York: Prentice-Hall, Inc., 1950), pp. 3-4.

important piece of football equipment, from a safety standpoint, is the player's helmet.[3]

Previous research and study in this field. Research launched by the American Football Coaches' Association and Football Rules Committee of the National Collegiate Athletic Association in 1947 has helped a great deal in providing data that has made possible the production of safer and more efficient headgear.[4]

Danford made a recent survey of protective equipment in a number of Wisconsin schools and summarized the improvements needed. In the case of headgear he recommended reconstruction based upon a study made of the research on crash helmets made by the American and English armies. This was to extend the back to better protect the base of the skull and neck.[5]

In 1942 Doctor Augustus Thorndyke, an authority on athletic injuries, remarked that the football rules

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[3] Don Cash Seaton, Safety in Sports (New York: Prentice-Hall, Inc., 1948), pp. 220-22.

[4] Minutes of the 1947 Meeting, American Football Coaches' Association and Football Rules Committee, National Collegiate Athletic Association.

[5] Loc. cit.

committee and the manufacturers of athletic equipment need to undertake more research in the designing and regulating of protective equipment.[6]

Prior to 1942 many of the devices were questioned as to safety to opposing players. Many of the materials used were felt to be actually dangerous. Thorndyke mentions the steel hinged knee brace along with shoulder pads and helmets.[7]

An unusual list of data regarding the equipment of a player playing a specific position was listed in 1933. The center's headgear should be given special attention. Possibly if the conditions warrant, the rules should prohibit use of the hands on the head and neck of the center. This would improve his offensive play, a phase of the game now handicapped, and also afford him more in the way of safety. Actually the center in all formations except the "T" must take position with his head down looking backward through his legs with little or no chance to protect himself.[8]

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[6] Augustus Thorndyke, Athletic Injuries (Philadelphia: Lee and Febeger, 1942), p. 48.

[7] Ibid., p. 49.

[8] Allen W. Stevens and Winthrop M. Phelps, The Control of Football Injuries (New York: A. S. Barnes and Company, 1933), p. 75.

Considerable improvement was made in helmets by John T. Riddell in the late thirties and early forties. His helmet was finally developed to a point of comparative safety in the late forties and could compete on an equitable basis with all the latest innovations until 1953. This type helmet has been put on the market in both plastic and leather shells with adjustable suspension.

Extensive research in plastic and rubber-plastic combination shells has been done by the major sporting goods companies. These rubber-plastic shells with a dual rubber inner padding are the very latest in football headwear and are along the lines recommended by the various organization advocating research in this field.

It is the purpose of this work to show in the following chapters the progress made in head protection. This has been made possible by: first, competition among the sporting goods companies for business; and second, the wish of coaches, parents, and administrators to protect the health and lives of the players. This only helps to prove the old adage, "necessity is the mother of invention."

CHAPTER II

THE EARLY DAYS, 1876-1900

Little has been written on the history of football helmets. A pictorial history of this evolution is available through the graciousness of Mr. Amos Alonzo Stagg. This private collection starts with a picture of the 1876 Yale football team and carries on down through the years to 1943. Evidence gathered from this collection, and the work of various writers closely related to this subject will be cited here.

Mr. Stagg, in an effort to be of service to the armed services during World War II, wrote a short paper on this subject.[1] In his collection of pictures, Mr. Stagg has a fine picture of the Yale team of 1876 wearing tasseled caps, which were definitely for looks. This first headwear was not primarily for protection, but it did afford some as it acted as a buffer. It was advertised later as a toboggan toque. In the account of the Princeton versus Stevens Institute Game at Princeton, November 8, 1879, the mention of caps is made:

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[1] Amos Alonzo Stagg, "The Evolution of Protective Devices for the Head in Playing Football," a letter written to the armed services by Mr. Stagg, Stockton, California, February 8, 1943.

> Pracy suffered a terrible fall on his head and for a minute was about to faint; off came skull caps and he was fanned, while someone yelled 'run for some water.' 'I'm only dizzy,' said Pracy, and in a moment he was hard at work again.[2]

Rule number thirty-seven of the 1884 Football Rules forbids certain uses of the first hats. This is the first mention of anything pertaining to headwear in the official rules.

If a player when offside interferes with an opponent trying for a fair catch, by touching him or the ball, or waving his hat or hands, the opponents may have a free kick, or down, where the interference occurred.[3]

Mr. Stagg states, "No one used head protection during the period that I was playing football at Yale from 1884 to 1889."[4]

New rules were made in 1888, which directly changed the type of play, permitting tackling below the waist. According to Mr. Stagg this caused the development of, "The first protective covering for the head was the rubber nose guard in 1889. The nose guard was held in place by an

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[2] Parke H. Davis, Athletics at Princeton, A History (New York: Frank Presbrey Company, 1940), pp. 293-94.

[3] Football Rules and Referees Book, American Intercollegiate Association (Boston: Wright and Ditson, 1884), p. 14.

[4] Stagg, op. cit., p. 2.

elastic band around the forehead."[5]

By careful study of pictures of the earlier periods, a noticeable change takes place in the covering head. In a picture of Yale playing Michigan in 1890, one tasseled cap and one baseball-visored cap was visible, and, in addition, several nose guards stood out. In 1891 a head band was seen to be worn by six players, but these were only discernable in the photograph under a magnifying glass. This single band was followed in 1892 by a band plus a strap over the top of the head to hold it in place. Then in 1893 came the crossed straps on top holding the head band with one or two earlaps attached.

> The lower tackling sometimes bruised the ears and in the early nineties, someone invented a protection for the bruised ear. This idea met a need and the sports outfitters took it up in 1893, I think, by manufacturing a head band with ear protectors which were held in place with crossed straps over the top of the head.[6]

In 1899 or 1898 a cupped sole leather was placed in the straps holding the ear protectors which formed an open crown. In 1898 the first solid crown with earlaps appeared. Helmets were originally made of leather. They had no padding or lining. As greater protective cushioning was apparently needed, cotton felt lining was added.

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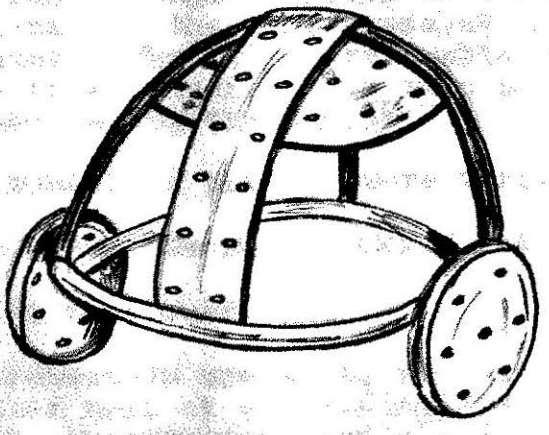
5 Stagg, loc. cit.

6 Ibid., p. 3.

The first evidence other than from Mr. Stagg's pictures of the full heavy crown, in writing, comes in 1899 and the Spaldings' Guide lists.

> Spaldings' special new head harness. Heavy sole leather crown filled with air holes and lined with lambs wool padding. Ear protectors heavily padded with felt. Used by the leading colleges and is the best and most practical head harness yet made. No. 50, each $4.50; No. 35, each $2.25.[7]

Lambs wool would be rather warm and uncomfortable worn next to the head, but it was used because it would absorb the shock. Some of the championship Chicago players of 1899 wore these hats.[8]



1896

Many other items of protection and apparel were listed in these guides: leather collarbone protectors,

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[7] Spalding Official Football Guide 1899.

[8] Personal interview with Mr. Stagg at Stockton, California, in June, 1952.

cotton jerseys, elbow pads, nose masks, shin guards, knee pads, and others. These items were all priced on a comparable basis with the headgear.

Mr. Stagg at this point adds that with the increased number of boys playing football, sporting goods manufacturers increased in number and these vied with one another in creating special protective devices for the market.[9]

Walter Camp, one of the early historians, player, and the editor of Spalding's Athletic Guide for many years, makes an early mention of caps in his book of 1903:

> The caps ran through a series of changes from a little skull-cap to the long tasseled affairs called toboggan toques. The only serviceable innovation was a cap with a broad visor, to be worn by the backs and halfbacks when facing the sun.[10]

Though a number of players wore various bands and earlaps prior to 1903, the rule books first mention them as head protectors in that year:

> If head protectors are worn, no sole leather, papier mache, or other hard or unyielding material shall be used in their construction, and all the other devices for protection must be arranged and so padded as, in the judgment of the umpire, to be without danger to the other players.[11]

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9 Stagg, Letter to the armed services, op. cit., p. 3.

10 Walter Camp, Walter Camp's Book of College Sports (New York: The Century Company, 1893), p. 160.

11 Spalding Official Football Guide, 1903.

Under the compilation of facts in the evolution of American college football gathered together by the late Parke H. Davis for the National Collegiate Athletic Association in 1940, we find the first reference to the appearance of football helmets: "In 1896 helmets first appeared."[12]

The last advertising prior to listing head protectors was found in 1895 where mention is made to football caps.[13]

The first advertising of football headgear available to this research worker was found in the 1896 Football Guide. This was the original version of protectors that has finally developed into what we have in the way of helmets in American football today.

This advertisement, as are many of those to follow, is found in the back pages of the Spalding Official Football Guide. There are no pages listed in the advertising sections, but by thumbing through they will be found in all but one or two of these catalogs.

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12 Park H. Davis, The Evolution of American College Football (New York: American Sports Publishing Company, 1934), pp. 305-77.

13 Spalding Official Football Guide for 1895.

Spalding's Football Goods

Head Harness

Especially intended for protection to ears. The harness is made of specially tanned leather, the padding for ears of soft material and open in center to allow same to entirely surround ear and rest against the head.

No.		Each
5	Protector for one ear	$ 2.00
25	Protector for both ears	$ 2.50[14]

In the 1897 book there were three new models made with college names to attract players from lesser teams to the style of school they admired. Three of these are listed below:

No. 30	Princeton style	$ 2.50
No. 35	Boston style	$ 2.50
No. 40	Chicago style	$ 1.25[15]

Mr. Stagg stated that with tackling below the knees prohibited at that time, and with little mass play, helmets were not too necessary. The Chicago style was a padded canvas hat with felt-lined ear pads.[16]

This early period was one of trial and error in many respects. There was very little competition among the few sporting goods companies. Football was comparatively

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14 Spalding Official Football Guide for 1896.

15 Spalding Official Football Guide for 1897.

16 Personal interview with Mr. Stagg at Stockton, California, June 26, 1952.

new with little or no publicity on injuries and even fatalities. Tackling had been restricted to above the waist so that hitting hard knees with the head was not at all common.

CHAPTER III

1900-1932

Early in the nineteen hundreds football head harness began to look and be a little more like that we see today. Exterior appearances at least were more in line with what we call the helmet in modern days. Many radical changes were made and were heralded as the answer to the head injury problem. Coaches, trainers, and parents have struggled to avoid these injuries since the game gained the position of a major activity in school and professional athletics that it holds today. The very life of football has been threatened at numerous times during its history, and especially in 1905. This was a rough year with eighteen deaths from injuries received while playing the game. Only three of these deaths were in collegiate play. The Chicago Tribune made this nation-wide survey to see if the game should continue.[1]

A number of teams dropped football entirely for the 1906 season, while others turned to Rugby.[2] The question

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[1] Amos Alonzo Stagg, Touchdown (New York: Longmans Green and Company, 1927), p. 253.

[2] Spalding Official Football Guide, 1906, p. 147.

was so widely discussed that President Theodore Roosevelt, feeling that the game had too many good features to be banished, used his influence to save the sport.[3]

A number of conferences including the Big Ten advocated a big reform in the game of football to put it back on a more equitable basis with the rest of our educational processes, or to drop it entirely.[4] They adopted a set of eight regulations for participation in and for control of intercollegiate athletics.[5] The National Rules Committee made seven modifications in the rules of major importance to settle the game down and to take the pressure of the administrators off their necks.[6]

They struggled along for several years, but as a result of all the turmoil and various reforms, football problems were finally more or less threshed out by 1906.[7]

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[3] Stagg, op. cit., pp. 254-55.

[4] Letters on file with Big Ten Conference Minutes, March 10, 1906; cited from Carl D. Voltmer, A History of the Western Intercollegiate Conference (New York: George Banta Publishing Company, 1935), p. 18.

[5] Carl D. Voltmer, A History of the Western Intercollegiate Conference (New York: George Banta Publishing Company, 1935), p. 19.

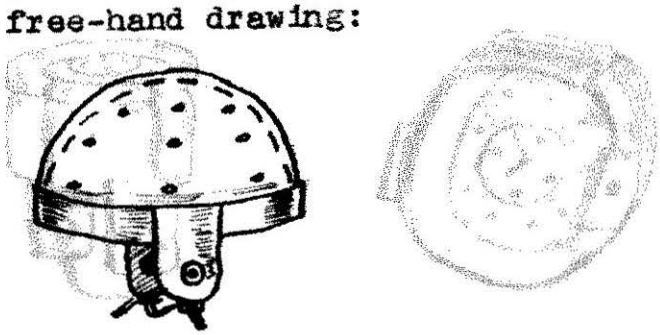
[6] Spalding Official Football Guide 1906, pp. 93-95.

[7] Voltmer, op. cit., p. 21.

Since the investigator's earliest contact with the game of football in 1906, much has been said of the suspended crown in the football headgear. There have been statements by several advertisers that they have had the first good and authentic suspension device. In going back further contradictions of this can be found. Pictures and advertisements available to this worker show a helmet of this type in 1900:

> Spaldings No. 60 Double Crown Head Harness.
> The latest improved protection for the head; made of the heaviest English oak tanned leather shell, well ventilated. The innerlayer of lighter suspended leather protects the entire crown of the head, breaks the force of any blow received, and while it is the lightest weight head harness made, it is at the same time the strongest.
> No. 60 each $5.00
> No. 50 each $4.00
> No. 30 each $3.00[8]

Pictures show this inner crown to be sewn securely to the outer crown shell just above the earflaps. The earflaps remained padded with felt to surround the ear, but still rest against the side of the head. This hat is illustrated below with a free-hand drawing:



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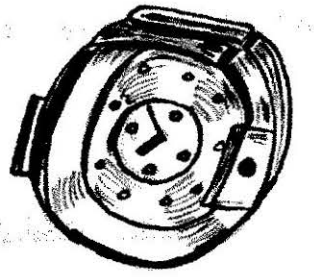
8 Spalding Official Football Guide, 1900.

This helmet was patented in March 11, 1902, by the Spalding Company.[9]

The next major change came the year following the patenting of the double-crown helmet, or in 1903. The price of the new helmet was set at the same figure as the number 60 mentioned in the preceding page. Here the prices ranged all the way from a high of $5.00 to a low of $1.25. Listed below is the description of the 1903 innovation, Spaldings Pneumatic Head Harness:

> Spaldings No. 70 Pneumatic Head Harness (Patented). It is made of soft black leather with an inflated crown. The Pneumatic part of the head harness is sufficient to give ample protection with space left for ventilation through heavy wool felt lining. In every respect it is made in accordance with the official rules. Heavily endorsed by prominent players and trainers who have examined it carefully and thoroughly. When ordering specify head size of hat worn.[10]

Pictures show a valve stem for inflation of this type helmet lying in the crown of the hat. The earflaps remained the same as others previously mentioned. Two free-hand drawings of this helmet appear in the figures below:



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9 Spalding Official Football Guide, 1902.

10 Spalding Official Football Guide, 1903.

There was one picture in Mr. Stagg's collection that shows a player wearing a helmet very similar to this one advertised by Spaldings in 1903. This picture was taken in 1901, and the helmet worn may have been manufactured by a competitor at an earlier date.

In 1906 the newest advertising drifted away from either the suspended or pneumatic crown. The newest theory was put forth to antiquate anything previously sold or worn by any of the players of that day. This follows the modern pattern or trend to find something new that can be claimed as the only safe protective gear so that an entirely new set may be sold to all.

> The Number A. Each $5.00
> We have now made our head harness extra long so as to protect the base of the brain and strapped in front so as to protect the region adjacent to the temples. This head harness gives the ultimate in protection to all the more vital areas and should prevent many injuries so prevalent in the past.[11]

Number A was the newest innovation, and when it first came out it sold for $5.00 as listed above. It was still number one in 1910 and with three others appears in the free-hand drawing on page 21.[12]

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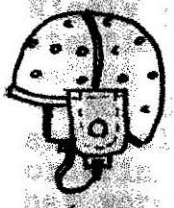
11 Spalding Official Football Guide, 1906.

12 Spalding Official Football Guide, 1910.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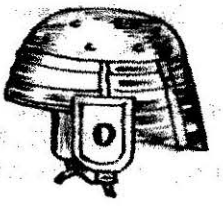
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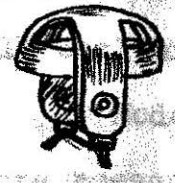
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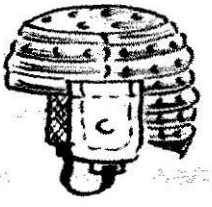

B

It would possibly afford enough interest here to quote the full advertisement of one company's helmets from a 1910 catalog:

Spalding Head Harness
Patent Applied for

Our Head Harness really protects. They are endorsed by the most prominent trainers in this country. All Spalding Head Harnesses conform exactly to Rules of Intercollegiate Association. We are the originators of the special back extension on Head Harness No. A. Firm tanned black leather, molded to shape, perforated for ventilation, leather sweat band and well padded. Adjustable chin strap. Presents a perfectly smooth surface, and, while giving absolute protection is one of the coolest and lightest made. Each $4.00 or $43.20 Doz.

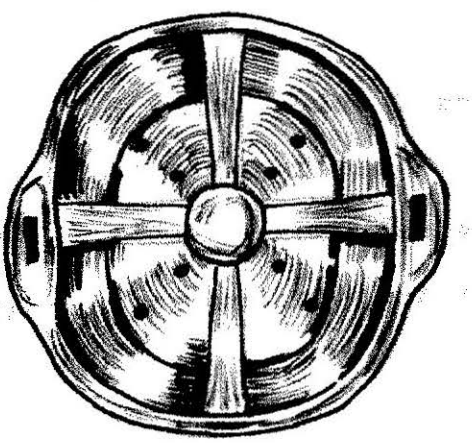
No. B. Soft black leather top and sides, soft leather ear pieces, adjustable chin strap. Top padded with felt, leather sweat band and well ventilated. Sides stitched and felt padded with canvas lining. Each $3.00 or $32.40 Doz.

No. C. Soft black leather top, well ventilated; moleskin sides and ear pieces, elastic chin strap. Nicely padded with felt, leather sweat band and substantially made. Each $2.00 or $21.00 Doz.

No. D. Brown canvas, nicely padded, but very light and cool to wear. Each $1.00 or $10.00 Doz. When ordering any of the above Head Harness, specify size of hat worn.[13]

Model D is very similar in style and construction to many of the late "90" helmets, except for wide top strap with the exterior continuing down for earflaps. Those on all earlier models were separate flaps sewn on.

Model A looks quite similar to a great many of the more reasonably-priced helmets of the present time, or at least of the 1940's. Since World War II there have been many changes and in the old familiar strain, they are much more handsome and afford near perfect protection to our players.



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13 Spalding Official Football Guide, 1910, loc. cit.

In 1916 the strap suspension was adopted for the first time, and this was to remain a prevalent feature in all better helmets until the very latest models in about 1949-1950.

> With this head harness the top of the head rests against firm elastic strapping which keeps it away from the top of the head harness. The guard itself is made of firm brown leather, felt padded and perforated for ventilation. There is an elastic adjusting head band, but size of hat worn should be mentioned when ordering. Each $5.00. Pat. October 3, 1916.[14]

There were very few changes during the next five years but prices began to move upward with most of the helmet styles listed. Some of the prices of models previously quoted will be listed here to bring this work up to 1925.

No. M. $8.75, an increase of $3.50
No. H. $7.50
No. P. $6.00, old Princeton

No. W. $5.00
No. B. $4.25
No. C. $3.00[15]

The old crossed strap Model D seems to have disappeared entirely now for the first time since the 1890's.

For the first time in some years the rules themselves refer again to proper protective gear and state in rule three:

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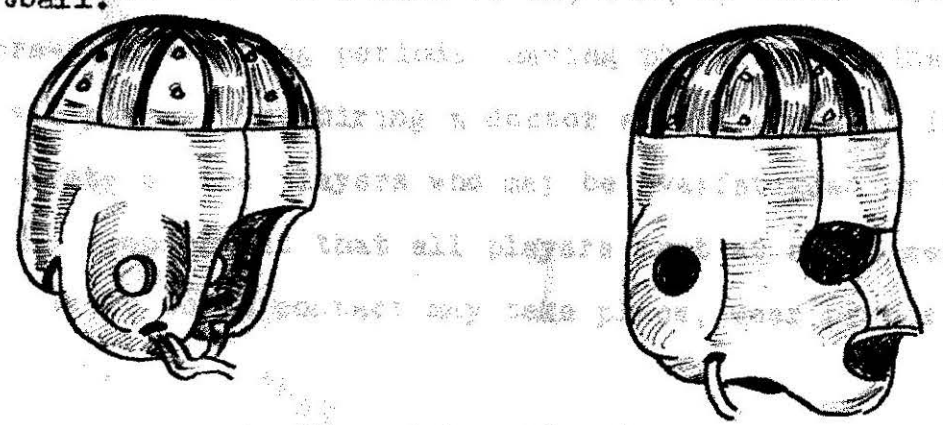
14 Spalding Official Football Guide, 1916.

15 Spalding Official Football Guide (New York: American Sports Publishing Company, 1921).

> If head, hand or wrist protectors are worn, no sole leather, papier mache or other hard or unyielding substance shall be used in their construction.[16]

The 1926 Spalding Catalog presents the last change of any consequence until the modern era. It is labeled Model S.O., or Stick-on Helmet. It has the patented web strapping for shock absorbing, and an extra long felt padded back with a new lace adjustment at the back. It was supposed to hold to the head without the use of a chin strap. It was advertised as very popular with the big colleges, and was priced at a modest $9.00.[17]

This, then, was the end of the really evolutionary period in the history of football helmets. From this time until the present there has been a veritable industrial revolution in the production of protective equipment for football.



1932

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16 Spalding Official Football Guide (New York: American Sports Publishing Company, 1924), p. 9.

17 Loc. cit.

CHAPTER IV

THE MODERN ERA, 1933-1952

The trend during this period has placed a greater and greater emphasis on safety, security, and sanity for those who participate and are associated with the great American game of football. A great deal of time has been spent in preparing and providing proper protective equipment for the players. Large sums of money have been spent in research to discover new materials and new types of construction for greater protection of the head of the football players, boxers, wrestlers, and for the members of the armed forces in the several branches of the service. There has been a strong movement on the part of most coaches and administrators to decrease the number of injuries by rules pertaining to pre-game training periods, having physical examinations for all players, requiring a doctor at all games to insure the safety of the players who may be overfatigued or injured, and the requirement that all players must at all times, when in games or where contact may take place, wear proper equipment.

In addition to a number of references made to such action, it is felt that a few more such statements may well be used here to further strengthen the case. Charles E.

Forsythe makes several remarks on this point:

> The second safety essential in an athletic program is adequate playing equipment for the members of a team. This factor is one of first consideration for football especially. Nearly every one of us has seen a frail high school boy on some small-school football team with possibly no headgear, insufficient shoulder, hip, and thigh pads, and improper shoes. After each tackle that he made, we wondered if he would ever get up, and when he did were impressed with the remarkable recuperative powers of the youthful body and its ability to withstand shock.[1]

This authority goes on to say:

> If an improper or insufficient equipment for football is available, for safety's sake, eliminate football from the program.[2]

This is a program that has reached a point of recognition in many of our smaller schools in California. Two schools--Cloverdale and Geyserville--in Section II of the North Bay League in Sonoma, Marin, and Napa Counties, have abandoned football entirely.[3] In the Valley League six-man tackle football has been adopted. This latter in a small school gives a smaller number of boys an

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[1] Charles E. Forsythe, The Administration of High School Athletics (New York: Prentice-Hall, Inc., 1948), p. 274.

[2] Loc. cit.

[3] North Bay League, Minutes of Administrators' meeting, June 3, 1942.

opportunity to gain the educational benefits derived from football at a minimum cost.[4]

Forsythe further states under football safety suggestions:

> 2. Insist on property fitting equipment, especially pads, helmets, and shoes.
> 10. Require that helmets be worn during all scrimmages and games.[5]

In 1933 the National Rules Committee recommended that all players wear head protectors,[6] and in 1939, while many players had preferred to go without headgear, as it psychologically hampered their freedom, there was a change made in the rules to read: "All players must wear head protectors."[7]

And in a later portion of the same rule it says:

> The Committee considers as 'confusing' the use of head protectors or jerseys (or attachments) which are so similar in color to the ball that they give the

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[4] Valley League Minutes of Administrators' meeting for January, 1940.

[5] Forsythe, op. cit., pp. 281-88.

[6] Spalding Official Football Guide (New York: American Sports Publishing Company, 1933).

[7] Spalding Official Football Guide (New York: American Sports Publishing Company, 1939), rule 5, section 3, pp. 18-19.

> wearers an unfair and unsportsmanlike advantage over their opponents. If such head protectors are worn, the solid color must be broken by at least two cross stripes of a markedly contrasting color at least one inch in width.

The loose helmet of a similar color to the ball at times was propelled into the line of scrimmage, where opposing players would be likely to attempt to recover it, thinking it was the ball. This was not only an unsportsmanlike act, but often caused injuries to occur to the player without his protective gear, and also to the players who piled up getting at what they considered a loose ball.

This type of subterfuge was highly frowned upon by that outstanding coach and avid advocate of sportsmanship, Amos Alonzo Stagg.[8] As players and students under Mr. Stagg, we often were instructed that fair play and sportsmanship were paramount factors in becoming good and successful men, if not always entirely essential to winning a contest with another team.

Research work done by the John T. Riddell Company of Chicago in the late thirties and early forties has brought to use among many football teams of today the safety suspension helmet. This helmet is now sold by three of the

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[8] Conference with Mr. Amos Alonzo Stagg at Stockton, California, July 7, 1952.

major sporting goods companies along with Riddell who first patented it.[9] A short survey of its origin and development will be included here at this time.

Prior to World War II, John T. Riddell, who had then had seventeen years of experience as a football coach in Michigan and Illinois, started work on a new plastic helmet with a new type head suspension. He believed this new suspension would only be practical in a shell with a fairly rigid outer surface. That the plastic industry was just getting well underway at this time, just prior to World War II, was indeed fortunate. This material gave him the needed rigid outer shell, with the result that he was able to introduce this invention before the war.

The points involved were supposedly simple as, with the proper head size, the adjustment at the top of the suspension properly fastened and with a tight chin strap the head was held away from the outer surface of the helmet with the result, they hoped, football injuries of the head would be relatively few from there on. This helmet was used by the army at West Point prior to World War II.

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[9] C. N. Sparrow, The Riddell Suspension Helmet (Chicago: John T. Riddell, Inc., 1951), p. 10.

It can be here stated that this helmet did help reduce the number of head injuries to the wearers at that time. However, the plastic outer shell was very hard. The edges were not covered, and it was felt that some injuries were being caused to the opponents of the wearers of this type of plastic headgear. There was a great deal of controversy over the plastic outer shell. There was no criticism of the suspension as it was merely an improvement of various types that had been tried at earlier times with several innovations, making it possible to get a new patent.

The numerous stories appearing in daily papers, magazines, and on the radio eventually brought the matter to the attention of the Collegiate Football Rules Committee, the High School Federation Football Rules Committee, as well as the National Professional Football League. The latter outlawed the use of this helmet in 1947 but rescinded their ruling at their meeting in May, 1949. This helmet was the subject of conversation at the Collegiate Football Rules Committee meeting at Savannah, Georgia, in 1947,[10] and also at the High School Rules Committee meeting at

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[10] National Professional Football League Minutes, May 3, 1949.

Biloxi, Mississippi, in the same year. The matter was again brought before these two latter rule-making bodies in 1948 at their meetings in Palm Springs, California, and at the Stevens Hotel in Chicago.[11] No action was taken to ban the use of this plastic hat, although many groups discarded it.[12] In 1949 Rawlings of Saint Louis and MacGregor Goldsmith of Cincinnati were licensed to use the patented suspension features of the helmet. It was at this same time, peculiarly enough, that most of the objections to this type helmet died away. The licensed companies, however, installed the suspension unit in leather outer shells of their own manufacture. While some teams discarded the plastic helmet in 1947 to 1949, many well-known football coaches who had actual experience with this suspension-type helmet felt that it had reduced head injuries in football. Some of the leading coaches who endorsed this helmet were Coach Munn of Michigan State, Coach Sanders of U.C.L.A., Coach Fesler of Pitt., Ohio State, and Minnesota, and Coach Tatum of Oklahoma and Maryland.

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[11] National Federation of High Schools Rules Committee, Stevens Hotel, Chicago, Illinois, 1948 Minutes of Meeting.

[12] Loc. cit.

Several doctors and other authorities have supplied statistics showing that this helmet reduced head injuries and lowered medical expenses as against the older types of conventional helmets. Doctor Harry McPlue's research does not appear conclusive to this investigator.[13] A second reference in this field is Coach C. L. Abbott of Tuskogee Institute, who was associated with the American Football Coaches Committee on injury and fatality.[14] The third source was Father Thomas Furphy of Northwest Catholic High School in Philadelphia, who did work on medical expenses.[15]

The booklet on the modern Riddell helmet shows several improvements have been incorporated.[16] The shell of the helmet is now made of soft but extremely tough thermoplastic. It is so flexible that it will bend on impact but not break. This helmet now has a smooth surface

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[13] Doctor Harry McPlue, Letter to John T. Riddell, Inc., copy of December, 1949.

[14] C. L. Abbott, Letter to John T. Riddell, Inc., copy of March, 1950.

[15] Father Thomas Furphy, Letter to John T. Riddell, Inc., copy of January, 1951.

[16] John T. Riddell, Your Boy Needs Lots of Protection (Chicago: John T. Riddell, Inc., 1952), pp. 1-4.

with no sewn edges to cut or tear an opposing player. The surface is now such that players can cut their initials in it with their fingernails. The old fear of injuries to opponents seems to have been remedied. This type headgear, whether sold by one or another of the major companies, has been accepted and kept in use even though there are some newer techniques that have brought other advantages. This model now sells at a trade price of $16.95.

Seaton relates that: "Helmets were constructed with hammocks to keep the head from making contact with the top surface."[17] He goes on to say: "The new type of composition headgear with the cradle straps has not proved satisfactory as hoped."[18] Still further: "The ideal headgear has not been developed to date."[19]

A survey of protective equipment in a number of Wisconsin schools was made in 1947 and the improvements recommended are listed here:

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17 Don C. Seaton, Safety In Sports (New York: Prentice-Hall, Inc., 1948), p. 220.

18 Loc. cit.

19 Ibid., p. 221.

> Reconstruction of our football headguards based on a study of the research on crash helmets made by the American and English Armies, also extend these in the back to protect the neck. Such research was launched by the American Football Coaches Association and Football Rules Committee of the National Collegiate Athletic Association in 1947.[20]

Seaton also stated that a new type of helmet with a bakelite shell was being developed. This was not much improvement over the previous composition hat as it was too hard and frequently cracked. It has since been abandoned.

The latest and most highly popular innovation is the new plastic rubber helmet shell which made its appearance in large numbers in the 1950 season.[21] This new helmet was put on sale by Spalding, Rawlings, Wilson, and possibly other minor companies as well. About this plastic rubber helmet, James Butz, of Wilson's Sporting Goods Company, says:

> Football's biggest worry, fatalities resulting from head injuries, are well on their way toward being alleviated, thanks to a new helmet developed by Wilson Sporting Goods Company.[22]

Through an eighteen-year period including 1949, 69 per cent of all deaths in football resulted from blows to the head. Here, contrary to other reports, statistics are

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[20] Ibid., p. 222.

[21] Ibid., p. 223.

[22] James Butz, Wilson News Service (Chicago, 1949), p. 2.

quoted indicating that the over-all percentage of fatal injuries caused by blows to the head have been increasing during the period studied. This would indicate that the game was being played with a great deal more vigor, or that the type of helmets used before 1949 were not satisfactory.[23]

During the course of this time (1947-1949) Wilson's especially were working on a combination of rubber and plastic with the idea in mind that something could be devised which would absolutely distribute the shock of any blow through the head and upper part of the body in such a way as to prevent fatalities and serious injuries.

For the first time evidence is found here of tests being made of these materials on something other than players, men, or something solid. When the amount of plastic and rubber to be included in the ingredients of this shell was reached, special headdresses to fit different types of cattle were constructed. As the animals came down the slaughter chute from the pens of the stockyard, these headdresses were put on them and the tests began. In order to slaughter these cattle, a long cylindrical air

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[23] Robert Cromie, "Design Football Helmets to Curb Head Injuries," Chicago Daily Tribune, Chicago, Illinois, January 4, 1950, p. 1.

hammer with a plunger that rotates up and down in the center is used. This test proved to the company that the new plastic rubber certainly distributed the shock throughout the body much better than any other materials in use, or that had been tested by them previously.[24]

In the January, 1949, meeting of the American Football Coaches Association, the Committee on Injuries and Fatalities, met and recommended that only helmets padded on the inside would be selected for use, this, of course, was to make certain that the problem of head injuries would be reduced.[25]

With these recommendations of the Committee on Injuries and Fatalities were added those of a group of Chicago physicians who had made a similar survey. They suggested that a helmet should be designed to provide more protective coverage to the base of the skull, a better fit to the individual head, sufficient sponge rubber cushioning to prevent the surface of the helmet from contacting the wearer. The various manufacturers took these suggestions from the physicians, coaches, trainers, and reports of

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24 William Knapp, Rubber Plastic Helmets (San Francisco: Wilson Sporting Goods Company, 1951), p. 3.

25 Minutes of Meeting of the American Football Coaches Association, Committee on Injuries and Fatalities, January, 1949.

experiments on their own, as well as those of the several universities and the data collected by the Army Air Force in their development of crash helmets.[26] It seems that here there was a cooperative movement not to get an exclusive model to sell, but to get the very best hat to protect the players. So that all the companies would feel confident and proud in selling this item with the adoption of the new plastic rubber shell, the first step was taken. This shell was solid to shield the wearer from hard blows, was pliable enough not to break, and possessed sufficient resiliance to retain its shape. The surface is completely smooth. All sharp or rough projections have been done away with to prevent injuries to opposing players and to prevent the wearer from becoming entangled with his opponents while playing at top speed. Serious injuries, such as broken necks, have at times been sustained by a player on a line plunge; for example, when a projection on the helmet hung upon some part of the opposing player's equipment.

This helmet like the old SO (stick-on) model and the new Riddell suspension stay on well, although it is

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[26] Rawling's Roundup, Design Verus Head Injuries (St. Louis: Rawling Manufacturing Company, 1950), 1:3-4.

recommended that a chin strap be used. The plastic furnishes the firmness necessary to maintain the shape of the helmet. The rubber strengthens the mixture and gives the helmet its outstanding characteristic of resiliency and flexibility. During cold temperatures the rubber enables the mixture to retain these characteristics. This is true of temperatures down to and below zero, which was not true of the purer plastics previously used. Molded in one piece, the shell is virtually indestructible. No part of it should wear out in years and it is not breakable.

The second big problem in construction of the required protection lay in the inner layers of material that should be used. In addition to the requirements for the shell, the total headgear must absorb as much of the shock as possible and then uniformly spread the remainder of the blow over the largest possible area of the head at the slowest possible rate. This should be done to soften a sharp jolt, which actually is a sudden severe change in either the direction in which the head is moving, or the velocity with which it moves, or both. It was brought to the manufacturer's attention by the various physicians and brain specialists who had agreed to work with them on this operation, that the brain floats in the skull somewhat like the yolk of an egg is suspended in its white. An egg

yolk may be broken by a severe jolt without breaking the shell. In the same way, a severe jolt can cause fatal damage to the brain without fracturing the skull, or leaving any outward appearance of injury to the head.[27]

The proper padding for this helmet was finally arrived at. It departed entirely from the strap and light padding varieties of the past. The shell of the helmet is completely supported away from the wearer's head by a composite type rubber padding which measures approximately one half inch at its thinnest point and as much as three quarters of an inch at the thickest point. The padding is of a composite construction since it consists of two types of sponge-like rubber. One is a noncompressible rubber which offers two advantages. It absorbs and distributes shock and cannot be completely compressed. This is due to the fact that nitrogen gas has been trapped within the cellular construction. This multitude of tiny individual inflated cells are so constructed that a severe blow will not squeeze the gas out of the rubber and allow it to completely flatten. The principle in this is quite similar to that of an automobile tire. In addition to the cellular type rubber, the remainder of the padding is composed of a

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27 Knapp, op. cit., p. 2.

latex foam rubber which compresses readily on shock. This portion of the padding easily absorbs the shock of the lighter jars which cause the greater majority of head injuries sustained on the gridiron. Also its ready compressibility permits the helmet to readily adjust itself to various head shapes encountered in any given head size.[28]

The thickness of both the shell and this rubber padding have been adjusted to correspond to the weak spots, or areas, in the bony skull of the human. The base of the skull, the area behind the ears, and the temples, are thinner than the top of the skull, for example.[29]

A football player on a line plunge, or a head-on tackle, the designers point out, will be protected in three ways. First, the shell will deflect, and thus absorb, some of the energy of the blow. Secondly, the latex foam padding then will compress and absorb an additional amount of the energy. The cellular-type rubber will reduce its share of the blow, and at the same time prevent the shell of the helmet from contacting the head of the player.[30]

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[28] Ibid., p. 8.

[29] Ibid., p. 9.

[30] Ibid., p. 10.

The over-all shape of this new helmet has been arrived at only after an extensive study of composite head models constructed for the United States Army Air Force, in accordance with measurements made on many thousands of individuals. These composite head models represent the average shapes found in given head sizes. The rubber-plastic helmet extends down far enough on the head to protect both the forehead and the base of the skull. It does not interfere with either vision or freedom of movement of the head, while, at the same time, it provides protection to the greatest possible portion of the head. All the major companies have their helmets sized. Only Wilson has changed the size of the outer shell to four different sizes.[31] It appears logical that a better fit could be obtained in a size seven and one half with a larger shell to give room for the proper amount of padding. Better fitting protectors and neater appearance should be an advantage.[32] This model sells at a trade price of $15.95 at present.

Two years have passed since the collection of data

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[31] Ibid., p. 5.

[32] John A. Havey, Protection for the Future in the Helmet of Today (Chicago: Wilson Sporting Goods Company, 1950), p. 8.

first started on this history. Through conferences held with representatives of the major sporting goods companies, requests that any further information on further changes be made available to this worker were made. Contact with these companies in the past month reveals no further information. If there has been additional advance made, it is not as yet for publication. As the market is at present very highly competitive, any newer innovations would very likely be unavailable until they were on the market for sale.

CHAPTER V

SUMMARY

The type of football protective head harness first worn was born of a twofold need. The first was to protect a sore ear or head from further bumps and bruises. A sore ear is a painful thing and may become cartilaginous from continual mutilation. Secondly, the earlier player invented the head band and earflaps to prevent the ears from becoming deformed as are those of Strangler Ed Lewis of wrestling fame. Many athletes developed such injuries which were unsightly and commonly called cauliflower ears. This type of deformity was frowned upon to a large degree by their wives or girl friends and as the latter always had a marked influence on the male human, a need for some preventative was felt.

Bleeding from the top of the ear and the nose has always been enjoyed by a great many of the more rabid fans, but this indication of manliness was curtailed, not because the men were soft physically, but because of the reasons listed above.

As early as 1888 tackling below the waist was legalized. This caused players who really tackled low, and there were some each year, to feel the need for some

sort of protective cushion between the head and the knees of the player being tackled. It has been the experience of this investigator that with adequate protection for the head, one would drive into an opponent with reckless abandon, with no thought of turning the head away or of possible injury. As player and coach of high school, college, and professional football for some twenty-six years, this has been proven by the reaction of the players time after time with one two or three exceptions to prove the rule. This psychological factor is certainly an element in the history of injuries. Keeping the head close to the victim actually affords better protection from other players, both teammates and opponents who flying this way and that, try to assist one or the other of the two first making contact. The inexperienced boy, especially without a helmet, will hold his head away to prevent injury in making a tackle. Some one else closing in rapidly might practically tear it off in passing or butting the same object.

Another reason for injuries should be listed here. For many years there was no association between the number of injuries occuring and a time factor. After extensive research by various committees and research workers, these facts have been established. More injuries occur:

1. Before the regular game season begins, or when the players are not properly conditioned.

2. During the early moments of the second half when the athletes are not properly warmed up.

3. In the waning moments of a hard game when the players are exceptionally fatigued.

4. When proper and adequate protective gear is not available for all players.[1]

Rules of the national associations and the local leagues are not in effect or pending to correct number one above. Unless the player has three weeks of preliminary training prior to the first or following game, he is not eligible to play. Coaches are now required to cut their oratory a little short and bring their team back to the field early for a more complete rewarming-up period. In the North Bay League, they are given an extra three minute warm-up period after the fifteen minute half-time rest period has passed.

Doctors are required at each bench to check injured players and they are the judge of whether the player is capable of proper play without danger of further injury. The fans no longer admire a coach who lets his boys play so long they stagger about and are no longer effective.

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1 Minutes of meeting of the American Football Coaches Association, Committee on Injuries and Fatalities, January, 1949.

They prefer someone with energy who is trying to play, even though he may not be as capable as the tired boy was originally.

With more publicity and education, the administrators, coaches, and the taxpayers have come to realize that good equipment, including the best in headgear is invaluable. The original cost may be greater, but it truly affords protection and is not just a token for effect. Good equipment has been proven superior, not only in the quality of protection, but also in durability and longevity.

The early development of head protectors was not amazing or unusual in comparison to the progress made in America in many fields. The reoccurrence of styles, and the fact that history repeats itself is also present in this field. The suspension helmet, of a less scientific nature, of course, occurred first in 1900. The double-crown head harness was definitely an improvement over all original models, but it finally disappeared from use only to reappear in a new form in 1916. The rebirth of suspension, after sixteen years, was definitely an improvement over the 1900 model with firm elastic straps to keep the head away from the outer crown. Still, a short head or long head might be difficult to fit. There were different head sizes, but not depths. In the late thirties, John T. Riddell started his work as previously mentioned, and just prior to World War II

it was put on the market. This suspension crown was made adjustable at the top to all heads, long, short, or medium, and solved the inner defect of earlier models listed above, but the outer shell was still far from adequate.

With the improvement of the outer shell, and the invention of the plastic rubber combination, helmets are now comparatively good protection. With either the dual rubber padding, or the adjustable scientific suspension in the helmet, strides have been made in the direction of safety.

Prices of protective headgear have not advanced in recent years at a ratio equal to other commodities on the market today. As previously stated, competition is very keen at the present time. All the major sporting goods companies offer and display to the purchasing public, identical or similar models at all price levels. The new tendency toward buying athletic equipment on bid has further reduced prices. The companies now feel they must sell quantity as well as quality in order to make a profit. Although the margin of profit has decreased per item, there seems to be no set minimum price someone will not go below. The plastic rubber helmet was offered on bid by the various major companies to the Sir Francis Drake High School, San Anselmo, California, in 1953, and to other schools in that

area. Prices for the same model, all specifications being met and equal, changed as much as 30 per cent. The top price asked was $15.95 and decreased through the following range: $14.50, $13.90, $11.95, $11.20, and as low as $10.80, (this for an identical item in all respects).

It cannot be honestly said that the solution has been arrived at. Great improvement has been accomplished, yes, but a great deal more research is being made and will be continued. There are still some head injuries, although they have decreased in number. The improvement of helmets is not alone responsible for this condition. Better training of players and coaches alike have had their effects. This latter point is not true in all schools, cases, or areas, but has become generally accepted.

Protective gear has changed from nothing to unwieldy and cumbersome equipment. It has then been streamlined parallel to industry. Its history has been somewhat a protective armor. Perhaps in the future with further study and additional research, a material elastic enough, sufficiently durable and strong enough to cover and protect the whole head, jaw, and neck to the shoulders, will be found. More work has and is being done, but as yet no products have reached the schools at a mass production price. Doctor Charles Lombard and Herman Roth of the Department

of Aviation Medicine, University of Southern California, are among those doing outstanding research work in this field.

> These men and their staff have made preliminary electronic and speed movie research on (1) the efficiency of various types of helmets; (2) the helmets worn by players fatally injured as a result of blows to the head.[2]

The twenty annual studies made by this group have resulted in rule changes such as, elimination of the "flying wedge" on the kickoff and the "dead ball rule" (when a player's hands or knees touched the ground the ball was declared dead), and they keep emphasizing the one real need that exists for better headgear liners and suspensions.[3]

Considering all portions of the head, there are more injuries to the back than any other portion: the back of the head, 136 per cent; the right side, 6.82 per cent; the left side, 10.2 per cent; the right front, 1.18 per cent; and the left front, 4.6 per cent.[4]

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[2] Twentieth Annual Survey of Football Fatalities, Prepared for American Football Coaches Association and Football Rules Committee, National Collegiate Athletic Association, January 10, 1952, Cincinnati, Ohio, p. 2.

[3] Loc. cit.

[4] Ibid., p. 3.

> Anatomically it is known that the sides of the skull are thin structurally and thus cannot withstand as heavy a traumatic blow. Further these data should indicate head areas that need to be better protected by improved headgear construction.[5]

> The reports show that over the twenty year period traumatic blows to the head are the direct cause of seventy and nine-tenths per cent of all fatalities studies.[6]

Since 1948 this body under the chairmanship of Floyd S. Eastwood has continually recommended scientific research, using electronic measuring devices, with little or no work actually being done. Doctor Charles Lombard has clearly defined the area of needed research. To repeat, it includes test materials in order to establish the best substance for liner and shell, and the best type of suspension for the head.[7]

Recent studies on industrial helmets have given Doctor Lombard and his associates further data that can be adopted to improve the present football headgear.

Some of the 1950 recommendations were restated in 1952 after Doctor Lombard remarked:

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[5] Twentieth Annual Survey of Football Fatalities, loc. cit.

[6] Loc. cit.

[7] Ibid., p. 4.

There seems to be little reason for making new recommendations as those submitted in 1950 are only infrequently if ever put into practice.[8]

1. The day is past for only the acceptance of this annual report--its implementation is the next step.

2. The adequate warm-up is to be provided before any player enters the game.

3. The teaching of tackling in simulated game situations emphasizes the elimination of contact between a player's head and his opponent's knee or thigh.

4. Knee pads or padding of the knees of pants are required by rule as standard equipment. The best protective material available today should be used.

5. Inspect the head suspensions in all old headgear. Discard helmets in which the head suspension cannot be made to keep the head from coming into contact with the crown when the top of the head sustains a blow. Check, and repair, if necessary, these suspensions before every practice and game.

6. Be sure that adequate absorptive materials are present in newly purchased headgear as follows:

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[8] Twentieth Annual Survey of Football Fatalities, loc. cit.

a. Between head suspension and crown of helmet

b. Between head suspension and back of helmet shell

c. Between head suspension and side and front of helmet shell

7. Pass no restrictive legislation at the present against any type of present headgear shells. The two prevailing types of helmets have been equally involved in football fatalities during the past three years.[9]

It is apparent from the above points that those doing research for this work find no helmets of complete satisfaction. It is implied that some negligence may have been present in not inspecting and repairing old headgear. It also seems imperative that protective padding be applied to the knees to protect opposing players' heads.

Out of this recommendation of the National Collegiate Athletic Association for further research also came a request for these additional supervisory practices:

1. The presence of a physician at every football game,

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[9] Twentieth Annual Survey of Football Fatalities, loc. cit.

2. Keeping badly injured players out of play, especially if injuries were head injuries,

3. Providing trained stretcher bearers,

4. The elimination from the game of "head-on" tackles.[10]

Some of the data given above from the Report on Fatalities was mentioned as early as 1939 by Eastwood in Safety in Athletics, a book published by co-authors at that time. The rules asked for head guards on all players during games. Eastwood went a little further and said:

> The practice of using 'live bait' should be discontinued when practicing tackling. The tackling dummy should be used instead.
>
> Headguards should be provided for all players when any contact work is going on. The tackling dummy should be continually inspected so that the dummy is easily released when hit by the player.[11]

Again it is pointed out that head injuries are most likely to be the cause of deaths. Therefore, all coaches should carefully observe all the safety procedures in providing equipment, and immediate care should be given to athletes when a head injury does occur.

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[10] Ibid., p. 6.

[11] Frank S. Lloyd, George G. Deaver, and Floyd R. Eastwood, Safety in Athletics (Philadelphia: W. B. Saunders Company, 1939), pp. 66-67.

Through the combined efforts of Doctor Floyd R. Eastwood of the Los Angeles State College, Chairman and Representative of the American Football Coaches Association; Doctor Charles Lombard, Associate Professor, Department of Aviation Medicine University of Southern California; and the Air Corps of the United States Navy, some of the latest research data is now available.

The summary and conclusions of one important test are quoted here to establish possible reason for a new liner material for football headgear not yet on the market as such but used by the armed services quite extensively.

Summary and Conclusions

1. Voluntary tolerances to impact blows to the head of humans have been determined while using available protective headgear to reduce or minimize the local bruising effects.

2. Voluntary limits were always found to be other than the effects of acceleration upon the head (or brain), i.e., neck pain, local bruising, et cetera.

3. Accelerations of equal pendular masses shows that the human voluntarily tolerated up to 34 G from a top blow, 38 G from a frontal blow, 25 G from a blow to the side of the head and 35 G from a back blow.

4. The averages of voluntary tolerances showed for the top 23 G for an impact of 6.0 foot-pounds at 5.8 feet per second at 4,800 Gps; for the front 22 G for 4.1 foot-pounds at 4.9 feet per second at 5,600 Gps; for the side 20 G for 5.7 foot-pounds at 5.6 feet per second at 3,500 Gps; and for the back blows 18 G for 4.9 foot-pounds at 5.2 feet per second at 3,700 Gps.

> 5. An approach has been made to this multifaceted problem of head injury in an attempt to study the effect only one factor, namely impact acceleration. Some data has been obtained but the need for much more is indicated.[12]

Another article recommends for use a new material for the inner liner of football helmets. This material is cellular cellulose acetate with criss-cross saw cuts into which foam rubber is molded. The foam rubber is also molded over the surface of the material.

By selection of the proper spacing and shape of the cuts, the advantages of the foam rubber used and thickness of the rubber in relation to that of the cellular material, a resulting product has been formulated having energy-absorbing characteristics which are controllable throughout a fairly wide range. Such a material has already been applied successfully to the "Toptex" helmet made by Protective Equipment Company, Inglewood, California. This headgear is now being supplied to the Air Force, Army Ground Forces, and Naval Aviation.[13]

A little more descriptive of the reaction of this cellular cellulose acetate is a portion of another article

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12 Charles F. Lombard, and others, "Voluntary Tolerance of the Human to Impact Accelerations of the Head," Journal of Aviation Medicine, 20:116, April, 1951.

13 "New Helmet Protection Theory Advanced," Aviation Week, January 24, 1949.

on new crash helmets:

> At this point, a new concept was injected into construction of the lining material. It was to use a non-resilient, energy-absorptive material having a definite structure which would be deformed or destroyed upon the application of compressive forces, resulting in energy absorption without the development of high restrictive forces. In other words, this material would absorb the blow of the head against it, and retard its deceleration by breaking down its structure. There would be no 'kick-back,' as is the case when a resilient material such as rubber absorbs a blow.[14]

The current method of preparing this plastic for use and which is believed to offer production possibilities, is to channel cellular cellulose acetate blocks almost through their thickness with saw cuts in a waffle pattern. Onto this is molded foam rubber by a process developed by Barton H. Thompson[15] of Molded Products, Hollywood, a leading rubber and plastic technologist for the motion picture studios. This waffled CCA (cellular cellulose acetate) and rubber material is flexible and allows the CCA to yield under impact forces. As now applied in the helmet shell, blocks of the waffle cut CCA, of a thickness appropriate to their location, are used to line the entire surface of the shell.

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[14] New Crash Helmet Offers Greater Protection (New York: Ziff Davis Publishing Company, 1948), p. 4.

[15] Loc. cit.

A plaster replica of a head is positioned so that there is about one quarter inch between it and the cellular cellulose acetate, and the foamed rubber is then flowed into the remaining space and into the saw-cut clots in the cellular cellulose acetate.[16]

The Aero-Medical Laboratories of the University of Southern California feel this project is ready for application to a standard commercial set-up for production and distribution. While further improvements are needed and will come, the helmet now available justifies itself on performance, and techniques as developed in the latest laboratory processes are reasonable in cost, although marked savings can be realized as production and competition are developed.[17]

The two major types of helmets of a satisfactory nature are highly recommended by a number of outstanding professional players of the present day. Among this group are Clyde (Bulldog) Turner, center of the Chicago Bears; Mac Speedie, the great end of the Cleveland Browns; and Charlie Trippi, a star of the Chicago Cardinals. Their

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16 New Crash Helmet Offers Greater Protection, loc. cit.

17 Loc. cit.

statements or choices follow. Turner says:

> Football linemen and their equipment must be rugged and durable. In using the RP helmet the past season, I have found it meets these requirements better than any helmet I've ever worn.[18]

And Speedie is quoted:

> Comfort and fit are what I desire in a helmet, in addition to protection and clear vision. I use the RP because I know it provides these important features. I wouldn't use any other helmet.[19]

The third player, Trippi, has a different choice--the Riddell adjustable suspension in a leather shell. Some call this the Navy Suspension, but it seems identical to the other.[20]

The RP (rubber-plastic) helmet is being used now almost exclusively by the Chicago Bears and the San Francisco Forty-Niners of the professional ranks. Many other teams use a large number of this same type headgear. Locally, Stanford University, University of California, and College of the Pacific and Santa Clara University use a large number of plastic rubber helmets. In other portions

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[18] Wilson's Football and Professional Advisory Staff, Wilson Sports Equipment (Chicago), pp. 3-11.

[19] Loc. cit.

[20] Loc. cit.

of the United States a number of other schools, including Kentucky, Boston College, Boston University, Nebraska, and Oregon State, use this helmet.[21]

The Riddell suspension type helmet has been approved by the National Collegiate Athletic Association and National Professional Leagues. This suspension feature is used in the better helmets other than plastic rubber and is sold by all the major sporting goods companies. Coach Biggie Munn, of Michigan State, likes the suspension, as does Coach Red Sanders, of the University of California at Los Angeles. Coach Chuck Taylor, of Stanford, likes the plastic rubber protector, while Coach Lynn Waldorf, of the University of California, has a leather helmet with the old style strap suspension for first choice because he likes leather helmets.

A great deal of other knowledge and data are no doubt available at this time. When all the new equipment reaches the market at a nominal price, and is available to smaller schools, perhaps our problems of head injuries and fatalities will be solved. Until such time as that is the case, it is recommended here that further study be made in this field.

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[21] William Knapp, Rubber Plastic Helmets (San Francisco: Wilson Sporting Goods Company, 1951), p. 10.

BIBLIOGRAPHY

BIBLIOGRAPHY

Abbott, C. L., Coach of Tuskogee Institute, unpublished letter to John T. Riddell, Inc., Chicago. Copy of March, 1950.

American Football Coaches Association and Football Rules Committee of the National Collegiate Athletic Association. Minutes of 1947-1949 meetings.

American Football Coaches Association and Football Rules Committee of the National Collegiate Athletic Association, Twentieth Annual Survey of Football Fatalities, Cincinnati, 1952. 11 pp.

American Intercollegiate Association, Football Rules and Reference Book. Boston: Wright and Ditson, 1884. 92 pp.

Butz, James, Wilson's News Service. Chicago, 1949. 15 pp.

Camp, Walter, Walter Camp's Book of College Sports. New York: The Century Company, 1893. 260 pp.

Cromie, Robert, "Design Football Helmets to Curb Head Injuries," Chicago Daily Tribune, January 4, 1950.

Davis, Parke H., Athletics at Princeton, A History. New York: Frank Presbrey Company, 1934. 362 pp.

_____, The Evolution of American College Football. New York: American Sports Publishing Company, 1940. 377 pp.

Dean, Everett S., Progressive Basketball Methods and Philosophy. New York: Prentice-Hall, Inc., 1950. 271 pp.

Edwards, George R., National Association of Basketball Coaches' Creed. Cited by Everett S. Dean, Progressive Basketball Methods and Philosophy. New York: Prentice-Hall, Inc., 1950. 271 pp.

Forsythe, Charles E., The Administration of High School Athletics. New York: Prentice-Hall, Inc., 1948). 440 pp.

Furphy, Thomas, of Northwest Catholic High School in Philadelphia, unpublished letter to John T. Riddell, Inc. Copy of January, 1951.

Havey, John A., Protection for the Future in the Helmet of Today. Chicago: Wilson Sporting Goods Company, 1950. 17 pp.

Knapp, William, Rubber Plastic Helmets. San Francisco: Wilson Sporting Goods Company, 1951. 21 pp.

Lloyd, Frank S., George G. Deaver, and Floyd R. Eastwood, Safety in Athletics. Philadelphia and London: W. B. Saunders Company, 1939. 432 pp.

Lombard, Charles F., and others, "Voluntary Tolerance of the Human to Impact Acceleration of the Head," Journal of Aviation Medicine, 20:116, April, 1951.

McPlue, Harry, of Princeton University, unpublished letter to John T. Riddell, Inc. Copy of December, 1949.

National Federation of High School Rules Committee, Minutes of Meeting, 1948.

National Professional Football League, Minutes of Meeting of May, 1949.

New Crash Helmet Offers Greater Protection. New York: Ziff Davis Publishing Company, 1948. 4 pp.

"New Helmet Protective Theory Advanced," Aviation Week, January 24, 1949.

North Bay League, Minutes of Administration Meeting, Napa, California, 1942.

Rawling's Roundup, Design Versus Head Injuries on the Gridiron. Saint Louis: Rawling Manufacturing Company, 1951. Volume 1, 16 pp.

Riddell, John T., Your Boy Needs Lots of Protection. Chicago: John T. Riddell, Inc., 1952. 9 pp.

Seaton, Don., Safety in Sports. New York: Prentice-Hall, Inc., 1948. 415 pp.

Spalding Official Football Guide. New York: American Sports Publishing Company, 1884 through 1949.

Sparrow, C. N., *The Riddell Suspension Helmet*. Chicago: John T. Riddell, Inc., 1951. 16 pp.

Stagg, Amos Alonzo, Personal Interviews, Stockton, California, summers of 1951-1952.

_____, Photographic Collection, Stockton, California, years, 1876 to 1934.

_____, "The Evolution of Protective Devices for the Head in Playing Football," unpublished letter written to the Air Corps during World War II, Stockton, California, February 8, 1943. 2 pp.

_____, *Touchdown*. New York: Longmans Green and Company, 1927. 352 pp.

Stevens, Allen W., and Winthrop M. Phelps, *The Control of Football Injuries*. New York: A. S. Barnes and Company, 1933. 241 pp.

Thorndyke, Augustus, *Athletic Injuries*. Philadelphia: Lea and Febeger, 1942. 216 pp.

Valley League, Minutes of Administrators Meeting, East Nicolaus, 1940. Courtesy of Robert Johnson, President of the League, 1951-1952.

Voltmer, Carl, *A History of the Western Intercollegiate Conference*. Menasha, Wisconsin: George Banta Publishing Company, 1935. 100 pp.

Wilson Sports Equipment, Wilson's Football and Professional Advisory Staff, Chicago, 96 pp.