

COACH'S DILEMMA: RUN VERSUS PASS

by

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Thesis submitted to the faculty of the
Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of
MASTER OF SCIENCE in EDUCATION
in
Health and Physical Education

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April, 1987
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(ABSTRACT)

The decision of run versus pass is of major importance to a football coach. This study focused on four situations: second down and short medium yardage for a first down; second down and long medium yardage for a first down; third down and short medium yardage for a first down; and third down and long medium yardage for a first down.

Plays were taken off of a computer printout from the 1985 Virginia Tech Football team's statistics. Percentages of success and failure were taken to determine if a pattern could be established as to whether run or pass was more successful. These percentages were tested against a null hypothesis which stated that there would not be any difference in the success rate of run versus pass.

Strength of schedule was taken into consideration. A Spearman rho (rank) correlation coefficient was computed for opponents' pre-season and post-season ranking.

The study established that there was a significant difference in the success rate by using the run in the second down and short medium situation. This was also found to be true in the third down and short medium situation.

ACKNOWLEDGEMENTS

I would like to take this space to recognize the support of the following people:

Ann and Mark Vaught--my wife and son, who have sacrificed so much and given me so much support during the past two years.

Dr. M. L. Driscoll--committee chairperson, academic advisor... her knowledge and guidance have helped me immensely the last two years.

Coach Tom Fletcher--friend, fellow coach, committee member, who helped me get the job as graduate assistant at Virginia Tech and has taught me so much about coaching football.

Dr. Larry McCluskey--committee member, research expert... an excellent teacher and very knowledgeable sports fan who helped me stay on the right track during my research.

Virginia Tech Athletic Association--for allowing me to come to Virginia Tech as a graduate assistant and for making me feel right at home as one of the family. I am proud to have been associated with such first class people.

Wayne Donald--friend, computer expert, who helped me compile the data and worked closely with me during the 1985 football season.

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Chapter I

INTRODUCTION

In recent years offensive football has shown a definite trend toward a wide open attack with emphasis on the passing game. While this trend is desirable the passing game should not be overemphasized to the neglect of the running game, which is fundamental to winning football (Small, 1980). Only when a team has developed a proper run-pass balance in the attack will there be the needed flexibility for consistent success. Teams that neglect the running game are often very exciting but not very successful.

Purpose

Run versus pass in college football has been debated by coaches and fans for many years. This study focused on four situations considered to be the toughest for play selection in football: second down and short medium yardage for a first down; second down and long medium yardage for a first down; third down and short medium yardage for a first down; and third down and long medium yardage for a first down. The study attempted to determine if there was a higher percentage rate of success by using the run or using the pass in the four previously stated situations.

Hypothesis

The null hypothesis that this study attempted to investigate is as follows: there will be no difference in the success rate of run versus pass. The hypothesis will be tested in each down and distance situation previously mentioned.

Significance

After compiling all of the statistics, this study should lay the groundwork for determining success patterns of run versus pass in the situations to be studied. Hopefully, this information can ease the pressure of decision making in these situations. Also, the study could possibly increase the success percentage of the play by determining which alternative is the best, run or pass.

Definitions

Success on second down - declared when the team achieves a gain to within one yard of a first down or makes a first down.

Failure on second down - declared when the yardage necessary to come within at least one yard of a first down or better is not achieved.

Success on third down - declared when the team makes the required yardage needed for a first down.

Failure on third down - declared when the yardage necessary for a first down is not achieved.

Short medium yardage - three to five yards.

Long medium yardage - five to seven yards.

Significant difference - declared when the difference in the success percentage between run and pass is ten percent or more.

Success rate - percentage of time that run or pass meets standards set to be declared a success.

Limitations

All plays used in this study were initiated from between the twenty yards lines of the field. Plays that took place inside of the twenty yard lines were not be used. The last two minutes of each half of play were excluded. Plays that occurred while the point difference was fifteen or more were also excluded. These limitations were being placed because of the strategy changes that occur in these situations.

Chapter II

REVIEW OF LITERATURE

Introduction

Decision making for a coach can be likened to that of a business manager. This chapter will review decision making from a business management point of view. Several decision making styles and models will be discussed, including the Japanese model of decision making.

Also discussed will be statistical studies on football teams. These studies may provide practical and valuable assistance to the coach in preparing strategies to be used and may also help in the decision making process.

Decision Making

In many ways a head football coach is very similar to a manager running an organization. Managerial work encompasses many diverse activities. However, the essence of management is decision making (Simon, 1976). The success of everything else that occurs in an organization depends upon the manager's ability to make intelligent and productive decisions. Similarly, the decision of run versus pass by a coach can have a great deal to do with the success of the team.

The most obvious definition of decision making is extremely simple: the selection of one alternative from various alternatives or courses of action that can be pursued (Webster, 1984). Which alternative is appropriate depends a great deal on the setting within which the decision making occurs.

The Organizational Perspective

Probably the greatest limits on a manager's discretion in decision making are created by the nature and needs of the organization in which he is working. Typically an individual manager or coach has little control over these factors (Harrison, 1975). Therefore, the decision making process will be examined from the viewpoint of an organization.

Goals and Policies

Top management normally establishes several goals it desires the organization to attain. The organization then establishes policies or general guides to action that are designed to help accomplish these goals and also formulates rules and procedures to carry out the policies. Goals, policies, and rules impose organizational limits on the kinds of decisions managers can make (Chelladurai, 1985).

Time Factors

Generally, managers in an organization work at a furious pace. They spend brief amounts of time on various activities and are often interrupted by unexpected problems. Henry Mintzberg concluded that this portrait of managerial work applies to all levels in the organization (Mintzberg, 1973 & 1975). However, managers at different levels in an organization spend different amounts of time on decision making. While many problems confronting top managers require at least one year before a final decision can be made, the football coach is not afforded the same luxury. His decisions must be made in a matter of seconds, many times with his success or failure at stake.

Japanese Model of Decision Making

Coaches may seek input from their assistants when faced with a major decision. In Japan, group decision making is much more important than decision making by one manager. When the Japanese company is confronted with a problem, a low level manager or group of low level managers are assigned the job of finding and developing solutions. A proposal is developed and presented to higher levels of the company for suggestions and approvals. Refinements in the proposal are made at each level. When the proposal has been approved at all levels in the department, it is passed on to

managers in other departments concerned for their approval. When the proposal has been approved at all levels, it is quickly implemented (Hanami, 1979).

Japan's managerial style has evolved from the country's unique cultural problems. Japan is very small, and does not possess abundant natural resources. To overcome these disadvantages, Japanese leaders have traditionally emphasized the belief that all parts of the society are closely intertwined (Odaka, 1975).

While the Japanese style of decision making is not as prominent in the United States, it is becoming increasingly popular for dealing with complex problems. This technique can be and is used by football staffs in the United States as they prepare game plans. However, during the course of a game, decisions must be made in a short period of time which does not enable assistant coaches to formulate a plan to present to the head coach.

Decision Making Models

Individuals who study decision making look at it from two points of view, normative and descriptive. The normative model of decision making focuses on the way managers should make decisions; the descriptive model emphasizes the way managers actually do make decisions (Simon, 1976).

Being idealistic, the normative model would be perfect for the football coach faced with a big decision of run versus pass. In this model, the manager is assumed to understand all of the alternatives he can pursue to accomplish a particular goal. From these, the manager supposedly chooses the most desirable alternative.

However, many managers and coaches deviate from the normative model. Based on the actual study of managerial behavior, Herbert Simon (1976) put forth a descriptive model, called administrative man. According to this model, the manager cannot possibly be aware of all the alternatives he might pursue, nor all the goals he might pursue, nor all the goals he might wish to accomplish. Rather, the manager reduces the complexity of each problems so as to make a decision. Typically, the manager will examine only four or five alternatives that are minimally acceptable, and choose one of them. Thus, the manager chooses a solution that will be adequate rather than taking additional time and effort to find the best possible solution.

Charles Lindbloom (1959) supports this view of decision making, for he argues that the manager "muddles his way" through a problem to find an acceptable solution (Lindbloom, 1959). According to Lindbloom, the manager operates in steps: he makes a change, interprets the feedback, makes

another change, and so on. In essence, the manager is making non-programmed responses to problems that are difficult to solve.

If a football coach were to use the normative model as described by Lindbloom, the chances of success would be minimal. Choosing a minimally acceptable alternative is out of the question when the outcome of a game is on the line. Choosing an adequate-only solution could lead to total disaster and possible subsequent loss of job for a football coach. While the decisions made by a coach are limited to short amounts of time, the best possible decision must be made at that time, based on the available information.

Vroom and Yetton Model

Victor Vroom and Philip Yetton (1973) have developed a normative model of decision making that could be of some benefit to a football coach. Vroom and Yetton argue that there are five styles of decision making a manager can use, all based on the degree of subordinate participation necessary to choose an alternative. These styles are:

- 1) Autocratic method #1: You solve the problem or make the decision yourself, using information available to you at the time;
- 2) Autocratic method #2: You obtain the necessary information from your subordinates; you may or may not

tell them the problem. The role your subordinates play in making the decision is clearly one of providing the necessary information to you rather than generating or evaluating solutions.

- 3) Consultative method #1: You share the problem with relevant subordinates individually, getting their ideas and suggestions without bringing them together as a group. Then you make the decision, which may or may not reflect your subordinates' influence.
- 4) Consultative method #2: You share the problem with your subordinates as a group, collectively obtaining their ideas and suggestions. Then you make the decision, which may or may not reflect your subordinates' influence.
- 5) Group method: You share the problem with your subordinates as a group. Together you generate and evaluate alternatives and attempt to reach agreement on a solution. Your role is essentially that of chairman, you do not try to influence the group to adopt your solution, and you are willing to accept and implement any solution that has the support of the entire group (Vroom & Yetton 1973, p. 13).

While all five styles could benefit a manager of a business, the group method would be ideal for the coach who

has an excellent staff and highly values their input. A head coach should be very similar to a chairman of a committee. He delegates authority, listens to input from others, and makes sure a consensus is reached on most solutions. While the coach has final word, the staff's input is always taken into account. This method is excellent for decisions that are not required in a short period of time. However, in a game the time factor would probably prevent this method from being used.

Computer Football Analysis

The popularity of football in the United States has brought about the development of computer systems to aid the coaching staff in making analysis of the game plays. Professional and college football teams use computer programs to accumulate tendency statistics about plays used during a game. The coaching staff of a football team will analyze the plays of both the offense and defense of their opponents as well as the plays of their own team. These tendency statistics may provide useful information for the football coach.

William Witzel developed one of the first football play analysis systems for the Washington Redskins (1968) and implemented his system for other pro teams. National Football League teams now use computer programs to analyze

plays. The programs are modified to incorporate changes to satisfy the coaching staff.

Dr. Frank Ryan, well known quarterback for the Cleveland Browns in the 1960's, developed one of the most sophisticated football play-analysis systems (Ryan, 1973). It is a generalized report generating program for application in football strategy analysis. The concept is based on the fact that football possesses a number of easily identifiable characteristics, such as down, distance, field position, relative score, offensive formations, defenses, weather, and personnel, all of which are directly related to the decision-making processes of the game. The overall purpose is to obtain as much information as possible concerning the specific strengths and weaknesses of an opponent. Ryan indicates that most football teams normally follow similar patterns of play when confronted with similar situations, modified by predetermined strategies (1973). Thus, for planning purposes in football it is important that detailed information concerning both the opponent and the home team be known to coaches.

Former Chicago Bears quarterbacks Virgil Carter and Robert Machal examined successful plays resulting from a given situation (Carter & Machal, 1971). Carter and Machal stated that quantitative evaluation of a strategy in any

competitive sport requires a metric on the value of the states which may be reached through alternative strategies. Their work is a preliminary attempt to construct such a metric for football. The expected value of possession of the football, first and ten, at any point on the playing field was computed, and the results were applied to some strategic and evaluative considerations (Carter & Machal 1971, p. 541-545).

Summary

Different management strategies of decision making were presented in this chapter. In addition, statistical studies related to football were included.

Chapter III

PROCEDURE

Introduction

This chapter discusses the procedure to be used in this study. It discusses the acquisition of the data and it explains how the subject was analyzed and evaluated in order that the null hypothesis could be retained or rejected.

This study focused on four situations considered to be the toughest for play selection in football. These are: second down and short medium, 3-5 yards, for a first down; second down and long medium, 5-7 yards, for a first down; third down and short medium, 3-5 yards, for a first down; and third down and long medium, 5-7 yards, for a first down.

The subject used in this study was the 1985 Virginia Tech football team offensive unit. The unit had a record of six wins and five losses in 1985. Throwing the ball an average of forty-two times per game early in the season, Virginia Tech lost four out of the first five games. Throwing the ball an average of twenty four times per game, the team had a record of five wins and one loss over the last six games.

A sequential play list for the 1985 Virginia Tech offense was used for this study. The printout showed

every play that the offense used during the eleven game 1985 season in the order that they were run. It listed down and distance, type of play, and the results of the play.

The study compiled from the printout all second down and short medium yardage for a first down, second down and long medium yardage for a first down, third down and short medium yardage for a first down, and third down and long medium yardage for a first down. Percentages of success and failure using run and pass were then taken to determine if any pattern could be established as to whether one is more successful than the other in the four situations. Success percentages were taken to determine whether or not there was a significant difference from the null hypothesis. A significant difference was declared when the difference in the success percentage between run and pass was ten percent or more.

Another area taken into consideration in this study was the strength of Virginia Tech's schedule. A computer rating devised by Jeff Sagarin was used. Sagarin is a 1970 Massachusetts Institute of Technology mathematics graduate with more than twenty years of experience rating college and professional teams.

A Spearman rho (rank) correlation coefficient was also computed to correlate Virginia Tech opponents' pre-season and post-season ranking assigned to them by Sagarin.

Summary

This chapter discussed the procedure that was followed, the acquisition of the data, and the analysis of the data. Percentages of success and failure were taken from a sequential play list to test the null hypothesis. The procedure for determining the strength of schedule was discussed. A Spearman rho (rank) correlation coefficient was also discussed.

Chapter IV

RESULTS

Introduction

The results of the steps outlined in Chapter III are discussed in this chapter. As previously stated, data was compiled from a printout showing sequential plays for the 1985 Virginia Tech offense. Success percentages were taken from this data for the runs and the passes for the four areas to be studied and tested against the null hypothesis previously given.

Data Analysis

Second Down and Short Medium (3-5) Yardage. Virginia Tech ran the ball 78% of the time in the second down and short medium yardage situation with a success rate of 76% (Table 1). The ball was thrown in this situation 22% of the time with a success rate of 33%. The success rate of 76% using the run meets the tolerance levels established in this study and is considered a significant difference. Therefore, the study will reject the null hypothesis in this situation as there is a significant difference in the success rate of run versus pass.

Second Down and Long Medium (5-7) Yardage. In this situation, the run was used 76% of the time with a success

Table 1
Final Study Results

	Run%	Success %	Pass %	Success %
2nd - (3-5)	78%	76%	22%	33%
2nd - (5-7)	76%	46%	24%	54%
3rd - (3-5)	33%	63%	67%	50%
3rd - (5-7)	36%	38%	64%	36%

rate of 46% (Table 1). The ball was passed in this situation 24% of the time with a success rate of 54%, which is not considered a significant difference by the standards previously set. The study will retain the null hypothesis as there is no significant difference in the success percentage using the run versus the pass.

Third Down and Short Medium (3-5) Yardage. Run plays were successful on third down and short medium yardage 63% of the time (Table 1). Pass plays in this situation also were quite effective, having a success rate of 50%. The success rate of 63% using the run is significantly different from the success rate of the pass (50%); therefore, the study will once again reject the null hypothesis. The success rate using the run is considered to be significant.

Third Down and Long Medium (5-7) Yardage. The null hypothesis will be retained in this situation as there is no significant difference in the success rate of using the run versus using the pass. The difference of 2% does not meet the tolerance levels previously established (Table 1).

The study has established that there is a significant difference in the success rate by using the run in the second down and short medium situation and in the third down and short medium situation for the 1985 Virginia Tech football team. This significant difference in the success

rate should ease the decision of run versus pass in these two situations for Virginia Tech.

The following figures further illustrate the results obtained from the printout of plays. Figure 1 shows the ratio of runs to passes in each of the four situations studied. In the second down and short medium situation there were twenty-one runs and six passes. In the second down and long medium plays there were forty-one runs compared to thirteen passes. The third down and short medium yardage plays had eight runs versus sixteen passes and the third down and long medium yardage plays had eight runs compared to fourteen passes.

Figure 2 shows the success and failure percentages using the run for the situations studied. In the second down and short medium yardage plays, the run was successful 76% of the time. On second down and long medium yardage plays, the run failed 54% of the time. The run was successful 63% of the time in the third down and short medium situation and failed 62% of the time in the third down and long medium situations.

Figure 3 shows the success and failure percentages using the pass for the four situations studied. The pass failed 67% of the time in the second down and short medium yardage. The pass was successful 54% of the time on second

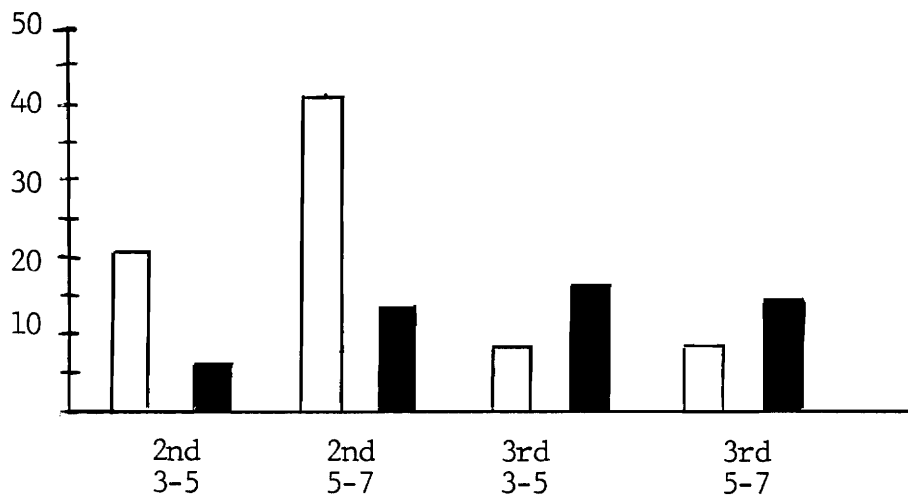


Figure 1. Run/Pass Ratio

Run Pass

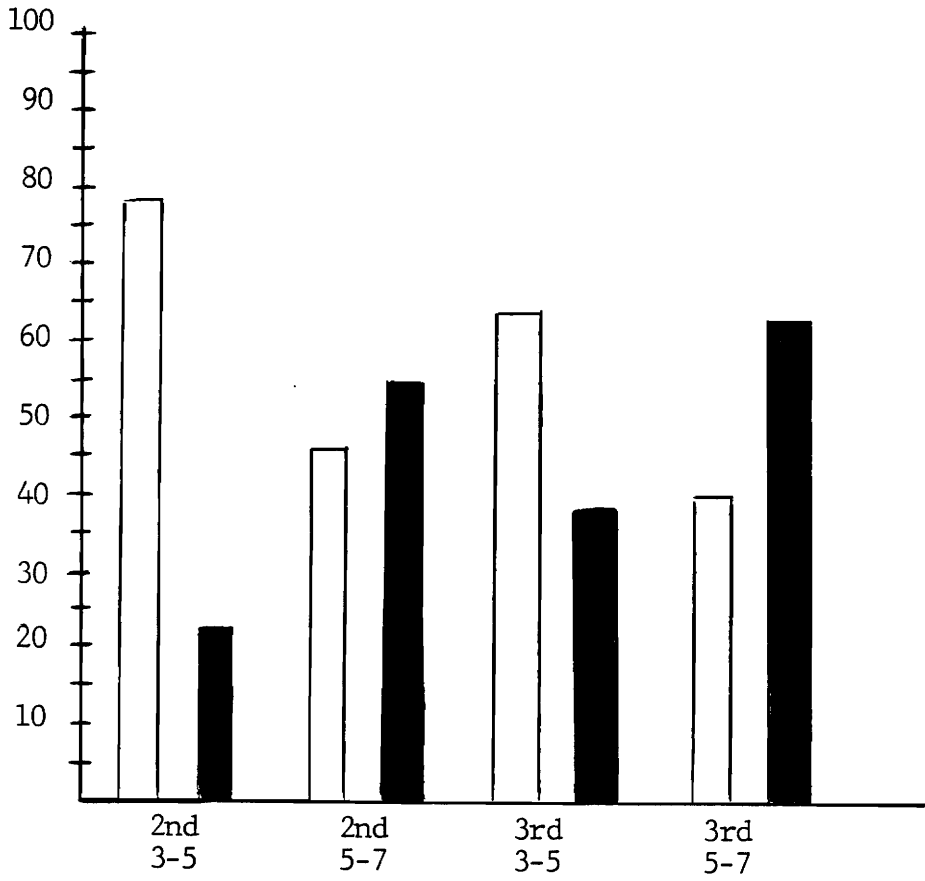




Figure 2. Success/Failure For Run

Success  Failure 

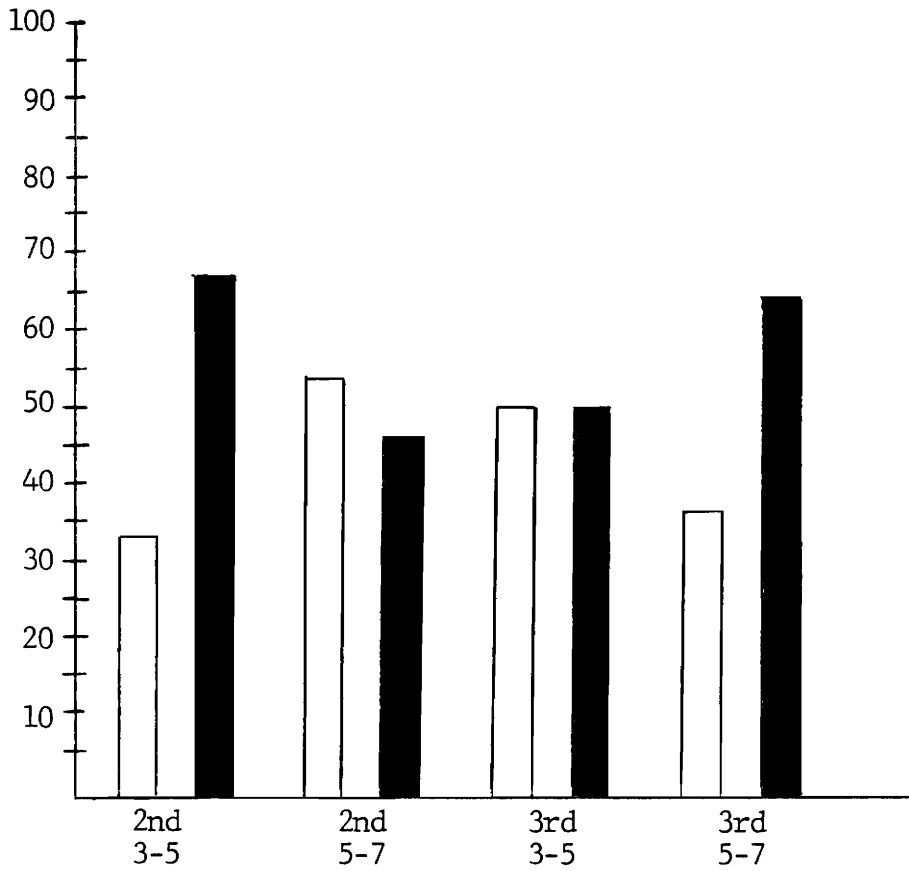


Figure 3. Success/Failure For Pass

Success  Failure 

down and long medium yardage plays. On third down and short medium yardage plays, the pass was a success 50% of the time. Third down and long medium yardage situations produced a failure rate of 64% for the pass.

While recent years have shown football to be moving toward a more wide open attack, this study definitely shows that the run can still be a highly successful weapon. The study also shows the Virginia Tech offense to be very predictable. Second down is definitely a run down for Virginia Tech. On third down and long medium yardage, Virginia Tech passed the ball 64% of the time.

The schedule Virginia Tech played was rated the 69th toughest in the country in 1985 by computer ratings expert Jeff Sagarin (1985). However, only two of Virginia Tech's opponents (Richmond and William and Mary) had schedules rated easier than Virginia Tech. Virginia Tech ended up ranked 41st in the nation in Sagarin's final rating (1986).

Virginia Tech ranked 14th in the nation in rushing offense and 74th in passing offense (NCAA, 1986). This could explain the heavy run emphasis used by Virginia Tech.

Only three of Virginia Tech's opponents were ranked higher than Tech in Sagarin's pre-season poll (1985). Four of Virginia Tech's opponents were ranked higher than Tech in Sagarin's final poll (1986). A Spearman rho (rank)

correlation coefficient was computed to correlate Tech opponents' pre-season and post-season ranking assigned to them by Sagarin. The pre-season and post-season rankings assigned by Sagarin are illustrated in Table 2. The teams had to be ranked from one to eleven in order to compute the statistics. A shared variance of .91 was computed, which shows a very strong correlation between the pre- and post-season rankings. The computation is shown in Table 3. Thus, Tech was a stronger team than the majority of their opponents. This could explain the success and heavy emphasis on the run.

Table 2

Sagarin Pre- and Post-Ranking

	Pre-Season	Post-Season
University of Cincinnati	8	6
University of Richmond	11	9
Clemson University	2	4
Syracuse University	4	3
West Virginia University	3	2
William and Mary	9	10
University of Virginia	5	5
University of Florida	1	1
Memphis State University	7	7
University of Louisville	10	11
Vanderbilt University	6	8

Table 3

Computation of the Rank Correlation Coefficient

Team	Pre	Post	D(Difference)	D ²
Cincinatti	8	6	2	4
Richmond	11	9	2	4
Clemson	2	4	-2	4
Syracuse	4	3	1	1
West Virginia	3	2	1	1
William & Mary	9	10	-1	1
University of Virginia	5	5	0	0
Florida	1	1	0	0
Memphis State	7	7	0	0
Louisville	10	11	-1	1
Vanderbilt	6	8	-2	4

p = Spearman rho correlation coefficient

ΣD^2 = the sum of the squares of the differences between ranks

N = the number of cases

$$p = 1 - \frac{6\Sigma D^2}{N(N^2 - 1)} = 1 - \frac{120}{1320} = +.91$$

Chapter V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Percentages of success and failure in four situations were taken from a sequential play list and tested against the null hypothesis. Strength of schedule was discussed, using computer ratings assigned to each opponent. A Spearman rho (rank) correlation coefficient was computed to correlate opponents' pre-season and post-season ranking.

Conclusions and Discussion

Many offensive philosophies have proven to be successful in football. It should be brought out that the 1985 Virginia Tech offense was based on the run. The run was what Tech executed best and used most as shown in the study. Coaches should use what works best for them and not just run or throw for the sake of doing so. However, a proper balance of running and passing should be used in the offensive attack. Conversely, if a defensive team is giving the pass or run to the offense, the offense should capitalize on the opportunity.

This study was an attempt to ease the play selection process of run versus pass. The study found a significant difference in the success rate by using the run in the

second down and short medium and third down and short medium yardage situations. Games are won or lost on play selection each season. But who is to decide whether or not the play selection was bad or caused the team to lose the game? Problems can come into play when trying to make this decision. Did the offense execute its assignment properly? Did the quarterback fail to see that the opponent had changed its defensive alignment? Such instances can cause a play to look as though it was a bad choice. What might be considered a great call one week is often a bad call the next week when it does not work.

The strategies and offenses used in football change very year. Those who are able to change with the times survive and keep winning. Those who stick with the same offense year after year are often times left behind. With all of the changes in football, a coach really has to be flexible and willing to adapt his strategies to fit his personnel and to fit the style of game that is being played.

Recommendations

The researching of additional data in the future could help alleviate the coaches' dilemma by showing a definite success pattern using run or pass. It is recommended that:

- 1) Data be compiled from teams that rely heavily on the pass;

2) Data be compiled from teams that rely heavily on the run;

3) Results from teams with contrasting styles be studied.

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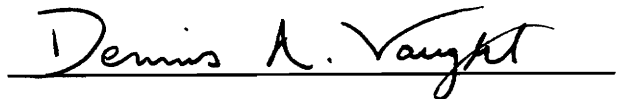
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VITA

Dennis Allen Vaught was born in Saltville, Virginia on January 12, 1957. He graduated from Patrick Henry High School in Glade Spring, Virginia in June, 1975 then received a Bachelor of Arts degree in Business and Economics from Emory and Henry College in May, 1979.

Upon completion of his undergraduate degree, he worked as an insurance agent, then as a marketing representative in the industrial chemical field. In July, 1985 he accepted a position with the Virginia Tech Football Program as a graduate assistant.

A handwritten signature in cursive script that reads "Dennis A. Vaught". The signature is written in black ink and is positioned above a solid horizontal line.

Dennis A. Vaught