A GENERAL STUDY OF AGGRESSION IN ATHLETIC GROUPS

Thesis

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High school football, tennis and basketball players were examined for possible differences related to expressed aggression responses as measured by the Edwards Personal Preference Schedule. The null hypothesis that no significant differences on aggression scores exist between- and within- athletic groups was adopted for this study. Utilizing an univariate one-way analysis of variance, no significant differences on aggression mean scores were observed between groups. In the within-group comparison between offensive and defensive football players and also between tennis players categorized as winners or losers, no significant differences on aggression scores were observed. And, finally, when making the comparison of the sample means with normative data no significant differences were found. This study concluded that athletic groups are not distinguishable among themselves relative to aggression scores. It was further concluded that position played or winning and losing had no significant effect on aggression scores for football and tennis players respectively.

INTRODUCTION

Some coaches, physical educators, and psychologists have long felt that a relationship existed between sport participants, and certain somatotypes and personality traits. Although significant relationships have been found between sports and personality, there remain many unexplored areas. For example, do competitive sports provide a medium through which participants are able to redirect pent-up aggression in a socially acceptable manner? Or, on the other hand, do contact competitive sports and interschool rivalries foster aggressive habits and attract people who are highly aggressive in their nature? Is there a difference in the expressed aggressiveness of sport participants and nonathletes, between participants of contact and noncontact sports or between levels of performance within each sport? And finally, what are the effects, if any, of winning and losing in competition upon the expressions of aggression of athletes?

Theories about the nature of aggression differ so sharply from one another that psychologists would disagree on the possible answers to each of the above questions. However, a better understanding of aggression, its implications and manifestations, may ultimately decide the survival of our species.

There is little agreement as to just what aggression, violence or aggressive personality mean or how their concepts should be defined, let alone precisely measured. Comparing findings of different tests in this area is hazardous. For example, Cattell and Johnson (Megargee, 1972), while discussing their findings on the personalities of sport champions, discovered that some of the terms each was using in his respective test

had opposite meanings. Meanings of some personality dimensions have no doubt been altered by cultural changes but there remains tremendous disagreement among the theoretical positions. Perhaps a brief explanation as to why there is so much diversity of opinion in this area will be meaningful.

One of the fundamental problems in studying aggression and violence is the fact that authorities cannot agree on a definition of the terms that is satisfactory to all. Buss (1961) has defined aggression as "... a response that delivers noxious stimuli to another organism". This definition is inadequate in the sense of excluding behavior that is intended to injure other organisms but fails to do so. Kaufmann (1965), on the other hand, implies that an act cannot be aggressive unless its originator expects that his act will deliver some noxious stimulation to the recipient. However this concept leaves out the person with repressed hostility which ultimately leads him to accidentally or conveniently contrive or commit an aggressive act.

In addition, the problem of legality is a significant one. Violence, as defined by the National Commission on the Causes and Prevention of Violence (Megargee, 1972), is the "... overtly threatened or overtly accomplished application of force which results in the injury or destruction of persons or property or reputation, or the illegal appropriation of property". Criminal executions, injuries resulting from football, or even parental physical discipline could be included in the above definition. Though some might object to classifying these socially sanctioned functions with criminal violence, the alternative is to classify the Roman gladiator contests as non-violent, or war as socially sanctioned aggressiveness.

Another problem is that different theorists use different words to describe the same basic variable. For example, there is some place in every theoretical system for personality variables that act as a check upon the overt expression of aggression. The problem is that to the anthropologist it is a "taboo" (Bandura and Walters, 1970), to the ethologist "an innate inhibitory mechanism" (Lorenz, 1970), to the psychoanalyst the "superego" (Freud, 1929), and to the learning theorist a "conditioned inhibitory response" (Wolpe, 1958). Problems such as this one exist throughout the field of personality studies on aggression.

Most human behavior, including aggressive behavior, is performed on a fairly routine basis. In most situations the individual, when confronted with an aggression eliciting situation, can make any one of a number of different responses. A person who is threatened can fight, run away, or make some conciliatory gesture (Cartwright, 1974). If he chooses to attack he can do so verbally or physically, with vigor or with restraint. Typically, the individual selects the response that appears to offer the maximum satisfaction and the minimum dissatisfaction in that particular situation (Megargee, 1972).

What determines the net strength of a response? Megargee (1972) has named three broad classes of factors that interact to determine response strength. The first of these is instigation to aggression, which Megargee postulates as the sum of all the factors that motivate an individual to commit a violent or aggressive act. This includes not only a desire to injure the victim but also any desire for other outcomes that the violent act might effect. Different theorists have referred to this as aggressive motivation, drive, need for aggression, or predisposition to respond aggressively (Kaufmann, 1965). Megargee

lists the second factor as inhibition against aggression. This is the sum of all the internal factors acting against a particular aggressive act directed against a particular target. The third variable, situational factors, encompasses those immediate environmental factors that may facilitate or impede aggressive behavior. This might include the presence of others advocating aggression, aggressive gestures or behavior on the part of the antagonist (Megargee, 1972).

There are currently several hypotheses of aggressive instigation. A brief review of these should be helpful. One hypothesis (Ardrey, 1966) postulates that aggression is an innate characteristic of the human organism. Another hypothesis is that aggression is due to various environmental factors (Montagu, 1968 and Scott, 1962), while a third emphasizes a social learning approach (Toch, 1967), i.e., how an individual perceives aggression or violent behavior as a means of satisfying other needs such as dominance or sex.

In the tradition of Freud; Lorenz (1966), Morris (1967), Ardrey (1966), and Tinbergen (1953) have popularized the widely held view that aggression is an innate human drive that requires expression. Ethologists differentiate between interspecific and intraspecific aggression. Whereas one can readily understand the basis for interspecific aggression it is more difficult to comprehend intraspecific aggression. "Unless the special interests of a social organization demands close aggregation of its members, it is obviously most expedient to spread the individuals of an animal species as evenly as possible over the available habitat and intraspecific aggression accomplishes this" (Lorenz, 1966, p. 27). Lorenz has even suggested that intraspecific aggression

is the foundation of love because the need for territorial defense will lead a male and female to ally for mutual protection and the rearing of offspring. Lorenz (1966) has further suggested that man and other animals are born with aggressive instigation; that fighting apparently reduces this instigation, but if fighting does not occur, instigation accumulates to such an extent that the individual actually seeks out opportunities to engage in aggressive behavior. Ardrey (1966) has indicated that animals aggress against each other not for the sake of injuring one another, but rather to accomplish some other aim, such as territorial defense or for food.

Ardrey also argues (1966) that humans, like many other animals, have an inborn need to defend their territory. He goes even further and postulates that aggression is the natural response of one human to another, and he defines this as enmity. To support his amity-enmity hypothesis, Ardrey (1966), cites observations of prairie dogs, howling monkeys, lemurs, blue geese and smooth-billed ani, plus the unifying effect Arab hostility has had on the Israeli nation. It must be noted, however, that since there is no body of scientific knowledge pertaining to Ardrey's theory, he must be read with caution.

Tinbergen (1953, 1968) has taken a more balanced stand than either Lorenz or Ardrey on the question of human aggression. He describes the complex ways heredity and environment interact to produce overt behavior. He has used models of fish of different shapes and colors (Tinbergen, 1968) introducing them into the tanks of male sticklebacks to determine the propensity to attack as a function of other internal and external conditions, such as the level of male sex hormone and water conditions. He concluded that territorial intrusions or extreme population density is associated with aggressive behavior. Experiments like these have demonstrated the

complex interrelations of the determinants of aggressive behavior and the danger of attributing a behavior to a single factor.

In contrast to the genetic theories offered by European behavioral scientists, American psychologists, trained in a more behavioristic stimulus-response tradition, have emphasized environmental causation. Scott (1958, 1962), and among others Montagu (1968), have attacked the innate view vigorously. Scott (1958) has concluded that whenever aggressive behavior is observed "the chain of causation in every case can be traced back to the outside", and therefore a possibly dangerous human potential can be controlled by external means. Interestingly, both Lorenz (1966) and Scott (1958, 1970) suggested that sports can contribute importantly to the peaceful expression of otherwise dangerous aggressive tendencies.

The best known and most thoroughly explored theory of environmental causation was originally proposed by a group of psychologists at the Institute of Human Relations at Yale University in 1939 to question the cathartic value of aggressive behavior. Dollard, Doob, Miller, Mowrer and Sears (1939) took as their point of departure the assumption that aggression is always a consequence of frustration. They postulated that the amount of frustration was a function of three factors: (1) The drive strength of the frustrated goal response, (2) The degree of interference with the frustrated response, and (3) The number of frustrated response sequences. This important principle conveyed two things: first, that frustration can remain active over a period of time; and second, that the frustration from different events can summate (Dollard, Doob, Miller, Mowrer, and Sears, 1939). Pastore (1952) suggested that the

more arbitrary the frustration the greater the resulting instigation to aggression. Studies by Thibaut and Coules (1952) and Worchel (1957) suggested that the subjects who believe they will have an opportunity to counteraggress suffer less frustration. It has also been suggested (Berkowitz, 1958, 1960) that another factor that might influence instigation to aggression was whether or not the frustration was anticipated. According to this, if a football team suffered defeat, their frustration would be less if they had anticipated that they might lose than if they had been quite confident of victory. In studying the effects of competition upon expressions of aggression, there has been limited evidence that considers the important variable of winning and/or losing (Epstein and Taylor, 1967; Husman, 1955). Layman (1970) has indicated that competition must be regarded as a frustrating experience especially for the loser. Johnson and Hutton (1955), utilizing projective techniques, studied collegiate wrestlers before and after an important competition and found aggression changes apparently related to winning and losing. Martin (1975) concluded that losing a competition was a frustrating experience, more so for individual athletic events than for team participants and that winning has aggression reduction value for both types of participants.

There have been two main criticisms leveled at the frustration-aggression hypothesis. The first concerned the notion that frustration <u>always</u> leads to aggression. The second being that <u>only</u> frustration can elicit aggression. (Megargee, 1972).

The last theory reviewed is the social learning theory which focuses on the social factors that influence the learning of aggressive habits.

These include child rearing principles, reward and punishment contingencies, and ritual aggression. Football and military training are particular types of social learning designed to transform a random selection of young men into disciplined aggressors.

Confusion in the terms and theories of aggression as they relate to sports competition is illustrated by the following considerations which show something of the complexity of the problem. In an effort to test the cathartic and frustration-aggression theories, Husman (1955), studied collegiate boxers, wrestlers and long distance runners, as well as controls, before and after a season's competition. He found evidence from situational test results supporting both theories. Also the boxers, a top team, were the least aggressive of the athletes.

After a hard scrimmage full of overt, aggressive behavior, football players may give no evidence of a decline in aggressive tendencies (Stone, 1950). But the circumstances of any scrimmage, such as not being noticed by the coach when playing well, being sharply criticized, being worked harder or kept later than usual, can make it more frustrating and thereby, perhaps aggression eliciting (Stone, 1950).

It is also possible to heighten overt hostility between groups, schools and cities by introducing athletic competition between them (Sherif, 1966). But when the nature of competition is manipulated with a controlled reward and punishment system as in the International Swedish games, hostility can be lowered and socialization increased (Johnson and Buskirk, 1974).

By and large, personality studies have focused upon comparing athletes in different sports with each other and with nonathletes, and comparing athletes at different levels of excellence. In studies where

athletes have been compared to the "normal" population or so-called nonathletes, differences in personality traits have been reported in most cases (Henry, 1941; Thune, 1949; Lakie, 1962). Johnson, et al. (1954), Booth (1958), and Cattell (1960) have indicated that certain traits, need for affiliation and achievement, distinguish athletes from other groups. Studies of weightlifters by Harlow (1951) and Leithwood (Singer, 1969) yielded data that suggested differences in personality between them and the general population. On the other hand, other studies such as those of Keogh (1959), Singer (1969), and Berger with Littlefield (1969), have described few, if any, distinguishing personality characteristics among athletic groups or between athletes and nonathletes.

Rather typically, earlier evidence that athlete personalities reflected marked compensatory motivation found no support in Darden's (1972) research. Perhaps, as Cooper (1969) noted in his review, athletes have an especially high need to achieve, but control groups of individuals equally devoted to other activities have not been used.

Other researchers have examined possible personality differences between outstanding and average athletes in a given sport. One study utilized two projective techniques to study twelve non-contact and contact sport athletes of national champion caliber (Johnson, Hutton and Johnson, 1954). Their distinguishing characteristics included extreme and readily vented aggressiveness, and winning was interpreted to be something of a psychological necessity. Olgivie and Tutko (1965) also found high and readily expressed aggression and "their need to be on top" to be salient characteristics of Olympic champions. Olgivie's review of the literature led him to identify dominance and aggression

as being typical of high level competitors. He reported (1965) finding clear-cut differences between the top Olympic medalists and those only slightly below them in performance. Additionally, La Place (1954) reported certain trait differences between major league baseball players, minor leaguers, and the general population.

Kroll (1967) with wrestlers and Kroll and Carlson (1967) with karate participants found no differences in personality on the Cattell 16 P. F. Test when highly skilled and lower skilled groups were compared. Sperling (1942) observed no differences between varsity and intramural performers and Schendel (1965), utilizing various-aged subjects; noted no psychological trait differences between athletes rated as substitutes, regulars, and outstanding. More recently, Staub and Davis (1970) seem to have found effective ways of distinguishing personality traits of high versus lower levels of competition in football. Williams, Heopner, Moody and Ogilvie (1970) have found similar results with fencing champions. For the most part, it would appear that, within a given sport, published research indicates the highly skilled have not been significantly distinguished from the lesser skilled athlete in personality.

Various sport players have also been the subject of the comparison as to possible personality differences. Whereas Slusher (1964) found differences between the high school sport groups tested, Lakie (1962) reported similar personalities for college athletes representing wrestling, basketball, football, golf, tennis, and track.

In general, data from most of the studies are conflicting. Perhaps the answer to the discrepancies lies in the differences in personality instruments used, the nature of the subjects or the scope of the particular study involved.

The purpose of this study is to investigate some of the relationships involved among sample mean aggression scores as measured by the Edwards Personal Preference Schedule (EPPS) between and within various athletic groups. Four hypotheses were tested in this study. They are as follows:

HYPOTHESIS I: There will be no significant differences on aggression score means between football, tennis, and basketball players.

HYPOTHESIS II: There will be no significant differences on aggression score means between offensive and defensive football players, i.e. aggression scores are not a function of position played

HYPOTHESIS III: There will be no significant differences of aggression score means between tennis players categorized as winners and losers.

HYPOTHESIS IV: There will be no significant differences between either of the athletic group mean scores and the normative mean score for their age group as given by Edwards (1959).

METHOD

Subjects

Subjects were obtained at the Furman University Youth Clinic in Greenville, South Carolina, at the Appalachian State University Football Camp in Boone, North Carolina, and from the 1977 Boys National Clay Court Tennis Championships in Greensboro, North Carolina. Permission was obtained from coaches and individual subjects to administer the Edwards Personal Preference Schedule (EPPS) . The test was given to 32 football players, 29 tennis players, and 14 basketball players.

All of the subjects were male 11th or 12th grade high school students. Each of the subjects was 16-17 years of age with the mean age of the football players being 16.24, the basketball players 16.77 and the tennis players 16.37.

Instrumentation

The EPPS, which has been used in several previous studies of athletes (Singer,1969 and Martin, 1975), was designed to measure 15 relatively independent personality variables. The EPPS represents a departure from the classical personality inventory in item form and construction and variables measured. It was chosen as the testing instrument for this study because it is a forced choice test. The Edwards inventory contains 225 pairs of statements and the subject is forced to select one of two statements which is more characteristic of himself. This tends to minimize the influence of social desirability associated with making a response, for rather than a yes-no technique of response, the two descriptions in each of the questions represent different personality traits. However, it should be noted that the forced choice format makes the resulting scores slightly interdependent. They tend

to have small negative intercorrelations because the sum of the 15 scores is a fixed quantity (Edwards, 1959). This could be a slight disadvantage for persons wishing to use the scales separately.

Items from each of the 15 scales are paired off twice against items from the other 14. Also, 15 items are repeated in order to obtain an estimate of the respondent consistency. A score of 9 or below on the consistency scale indicates that the subject responses are too inconsistent to be considered a valid indicator of his personality traits (Edwards, 1959).

Scale construction data has shown test-retest reliability coefficients to be between .74 and .88 (Edwards, 1959). While internal consistency estimates ranged from .60 to .87, no reliability estimation for the measure of profile stability was reported. Finally, the median proportion of consistent responses in the norm group was approximately .78 (Edwards, 1959).

According to Edwards (1959), an individual having a high need for aggression would be one who attacks contrary points of view, tells others what he thinks about them, criticizes others publicly, makes fun of others, tells others off when disagreeing with them, seeks revenge for insults, and becomes angry or blames others when things go wrong.

Procedure

The EPPS was administered to the football and basketball samples during their first day of camp and to the tennis sample during the registration phase of the tournament. In each case the test was administered during early evening hours. The instructions attached to the test booklet were read to each sample prior to administration of the test. The subjects were not briefed as to the purpose of the test other than to tell

them that the data was needed for completion of a thesis project. No debriefing was conducted but subjects were apprised of the confidentiality of the results of their tests.

Seven of the initial subjects whose consistency scores were 9 or below were eliminated, one each from the football and tennis samples and five from the basketball sample. The EPPS was then scored for each of the remaining subjects and the aggression score extracted from each individual profile. An univariate one-way analysis of variance was calculated using the data presented in Table 1 to determine possible significant differences in the responses of the football, tennis, and basketball samples. The .05 level of confidence was the criterion for rejection of the null hypotheses.

Two sub-studies were also conducted. A comparison of the mean aggression responses was made between offensive and defensive football players, and between tennis players who advanced to the semifinals of a local championship and those that lost their first two matches in the same tournament. The purpose was to test for differences related to either position played or to winning and losing. Finally, the mean scores of the three samples were compared with a normative mean and standard deviation reported by Edwards (1959) for high school youth.

RESULTS

The univariate one-way analysis of variance comparing the mean aggression scores of each group yielded an F value of 1.80 (Table 4) which was not significant at the .05 confidence level. Therefore Hypothesis I, that there would be no difference of aggression score means between football, tennis and basketball players, was not rejected. The sample means and standard deviations along with the normative mean and standard deviation scores for 15-19 year olds (Edwards, 1959) are listed in Table 1.

As indicated in Table 5, a t test yielded a nonsignificant value of 1.598 in the comparison of the offensive and defensive football sample mean scores. Therefore the hypothesis that there would be no significant difference of aggression score means between offensive and defensive football players was not rejected.

The t test shown in Table 6, comparing the mean scores of the winning and losing tennis players, yielded a value of 1.285, which was not significant. Therefore Hypothesis III, that there would be no significant difference in the mean scores of tennis players categorized as winners and losers, was not rejected.

Finally, Hypothesis IV was not rejected when a one sample t test comparing the sample means with the normative mean (Table 7) yielded a value of 1.77, which was not significant at the .05 level.

DISCUSSION AND CONCLUSIONS

Overall, it is difficult to arrive at a specific pattern of aggression for any of the participant groups involved in this study. Between-group comparisons, yielding no significant differences in aggression scores, were expected to contrast different team sport members more effectively. Within-group comparison results in the tennis sample are in line with Kroll's data (1967), as he also was not able to distinguish between higher-and lesser-skilled athletes. Although Ogilvie's (1967) data apparently separated the outstanding from the average athlete, confirming research is lacking. The within-group study examining aggression responses of football players related to position played yielded no significant differences in the scores of offensive and defensive players. Although one might expect that such a distinction could be made the lack of previous studies in this area and the results of this study do not support such a hypothesis.

Perhaps the most serious limitation of this study was the size of the samples tested. Several trends were evident:

1. The football and especially the tennis sample means were higher than the normative mean.
2. The difference between the offensive and defensive football players mean scores as well as the winning and losing tennis players mean scores was noticeable.

But perhaps, because of the small sample sizes these trends should be investigated further. It is noteworthy that the data plot and 95% confidence interval (Table 2 and 3) reveals that 95% of the tennis sample scores, as an expression based on the sample mean, fall above the normative mean of 12.79, and that 95% of the football sample scores, as an expression based on the sample mean, fall between 11.5 and 15.0. This

evidence indicates also that the small size of the samples could have been a factor in the results of this study.

Another limitation of this study was the fact that the basketball and tennis subjects volunteered for testing after permission to test had to be sought on an individual basis. This could quite possibly effect the randomization of the sample since one might expect the type of subject responding positively to my request i.e. volunteering, to possess characteristics which could bias their responses on an instrument measuring personality variables.

The research from this study did not lend support to a particular theory of aggression. Contrary to Martin's (1975) findings that winning supported the catharsis theory of aggression for intercollegiate basketball players, losing may have the opposite effect on tennis players. Perhaps they experience an increase in extrapunitive aggression after losing a contest. A possible explanation might be that since the tennis player is solely responsible for his success or failure, he is less apt to rationalize his loss on extraneous factors. The tennis player might be somewhat more ego-involved in this activity than the basketball player.

Perhaps the most significant finding in this study was the culmination of the literature review and the results into the thought that:

1. Aggression is not a unidimensional phenomena.
2. That theories of aggression and violence must be examined more thoroughly.
3. And, finally, that knowledge of these theories with their implications must be of prime importance to coaches and physical educators.

Few of the studies examined attempted to test theories of human

aggression. Those empirical studies that did focus on aggression were generally not designed to test theories. Investigations that did focus on important theoretical issues generally employed mild aggressive behavior or used non-human subjects. A paramount need is for research attempting to determine whether the hypotheses derived from such studies apply to human violence.

If theories of aggression were examined and deductions made from them about certain aspects of violent behavior, then the accuracy of these predictions might be empirically determined. If studies testing predictions based on different theories of aggression were carried out, confirmation of a number of predictions would add to the confidence in a theory.

Investigators who wish to study the dynamics of aggression will thus have to be patient and tolerant. Laboratory studies of such phenomena as vicarious catharsis should be supplemented by field investigations of sporting events, while hypotheses derived in the field should be tested in the laboratory whenever possible.

Given the variety of theories and approaches, a prescription for the elimination of undesirable aggression cannot be written. This means that a variety of programs will have to be tried. Perhaps one reason there is such a variety of theoretical positions and such diverse data is that aggression is not a unidimensional phenomenon. It appears that the concept of a violent person is no more homogeneous than the terms nonviolent or normal person.

The aggression-eliciting aspect or the aggression-reduction value of sport participation is not a simple matter. In discussing

the benefits of competition, coaches and physical educators should emphasize the importance of permitting aggressive behavior within limits, so that the participants develop self-control and emotional maturity rather than complete uninhibited aggression. In addition, coaches should be aware of the theories of aggression and make clear to athletes the distinction between reactive and instrumental aggression as noted by Layman (1970).

Coaches have become increasingly more concerned about the psychological aspects of sports and sport personalities. Perhaps with better developed personality instruments and more acceptable means of representing athletic groups and respective skill levels, personality differences, if they do exist, will become more apparent.

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APPENDIX A

TABLE 1

Aggression Scores for Each Subject on the EPPS, By Group Category

FOOTBALL PLAYERS		TENNIS PLAYERS		BASKETBALL PLAYERS	
1.	6	1.	5	1.	6
2.	6	2.	8	2.	7
3.	7	3.	9	3.	9
4.	8	4.	9	4.	9
5.	8	5.	10	5.	10
6.	9	6.	10	6.	11
7.	9	7.	10	7.	11
8.	10	8.	11	8.	12
9.	10	9.	11	9.	12
10.	11	10.	12	10.	13
11.	11	11.	12	11.	13
12.	11	12.	13	12.	14
13.	11	13.	13	13.	16
14.	12	14.	14	14.	19
15.	12	15.	14		
16.	12	16.	15		
17.	12	17.	15		
18.	13	18.	15		
19.	13	19.	16		
20.	14	20.	16		
21.	14	21.	17		
22.	14	22.	17		
23.	15	23.	18		
24.	15	24.	18		
25.	16	25.	19		
26.	17	26.	20		
27.	18	27.	21		
28.	19	28.	22		
29.	19	29.	24		
30.	21				
31.	22				
32.	25				

SUMMARY

	FOOTBALL	TENNIS	BASKETBALL	NORM
MEAN	13.13	14.28	11.57	12.79
STANDARD DEVIATION	4.67	4.53	3.44	4.59

POOLED STANDARD DEVIATION: 4.42

TABLE 2

INDIVIDUAL DATA SCORE PLOTS

	LEVEL			
	ALL DATA	FOOTBALL PLAYERS	TENNIS PLAYERS	BASKETBALL PLAYERS
-	1	1		
-	1		1	
-	4	2	2	
-	5	2	2	1
18.0+	3	1	2	
-	7	2	4	1
-	11	5	5	1
-	14	6	4	4
-	14	6	5	3
9.0+	6	2	2	2
-	5	3	1	1
-	4	2	1	1

TABLE 3

INDIVIDUAL 95% CONFIDENCE INTERVAL FOR LEVEL MEANS BASED ON POOLED STANDARD DEVIATION

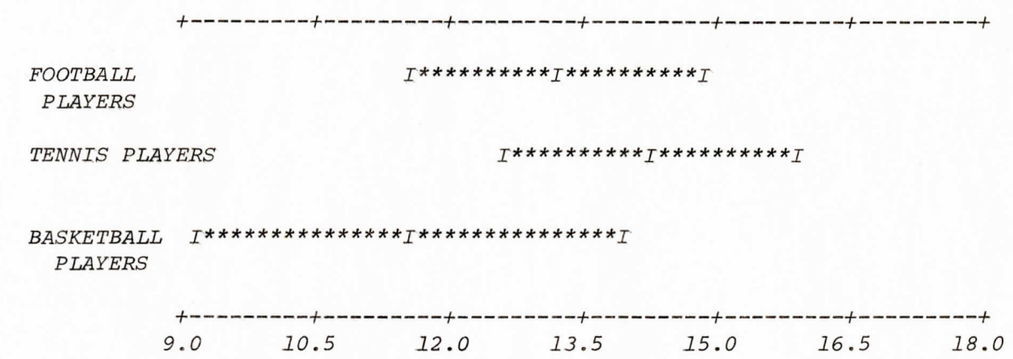

TABLE 4

ANALYSIS OF VARIANCE

DUE TO	DF	SS	MS=SS/DF	F-RATIO
FACTOR	2	70.4	35.2	1.80
ERROR	72	1404.7	19.5	
TOTAL	74	1475.1		

$F(2,72)P<.05=3.15$ NOT SIGNIFICANT

TABLE 5

TWO SAMPLE t TEST COMPARING OFFENSIVE AND DEFENSIVE FOOTBALL PLAYERS

OFFENSIVE PLAYERS
N2=13
MEAN=11.53

DEFENSIVE PLAYERS
N1=19
MEAN=14.21

$$t=\frac{mean1-mean2}{s*\sqrt{\frac{1}{N1}+\frac{1}{N2}}}$$

$$=\frac{14.21-11.53}{4.67*\sqrt{\frac{1}{19}+\frac{1}{13}}}$$

$$=\frac{2.68}{4.67*.359}$$

$$=\frac{2.68}{1.67653}$$

$$=1.598$$

TWO-TAILED TEST
t CORRESPONDS TO A=.025
d.f.=(N1+N2-2)=30

t(30).05=2.042
NOT SIGNIFICANT

TABLE 6

TWO SAMPLE t TEST COMPARING TENNIS PLAYER SCORES CATEGORIZED AS WINNERS AND LOSERS

WINNERS
N1=6
MEAN=17.83

LOSERS
N2=7
MEAN=11.57

t CORRESPONDS TO A=.025
d.f.=(N1+N2+2)=11

$$t=\frac{mean1-mean2}{s*sqrt(\frac{1}{N1}+\frac{1}{N2})}$$

t(11).05=2.201
NOT SIGNIFICANT

$$=\frac{17.83-11.57}{8.76*sqrt(\frac{1}{6}+\frac{1}{7})}$$

$$=\frac{6.26}{8.76*.556}$$

$$=\frac{6.26}{4.87}$$

$$=1.285$$

TABLE 7

ONE SAMPLE t TEST COMPARING THE NORMATIVE MEAN AGAINST THE TENNIS SAMPLE MEAN

NORMATIVE MEAN=12.79
TENNIS SAMPLE MEAN=14.28

t CORRESPONDS TO A=.05
d.f.=(N-1)=28

$$t=\frac{mean1-mean2}{s*sqrt(\frac{1}{N})}$$

t(28).05=2.048
NOT SIGNIFICANT

$$=\frac{14.28-12.79}{4.53*sqrt(\frac{1}{29})}$$

$$=1.77$$
