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Interactionist Strategies for Assessing
Personality and Behavior Differences Among
Female Intercollegiate Athletes and Nonathletes

A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy
at Virginia Commonwealth University

by

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Acknowledgements

This dissertation is dedicated to the memory of Sandra Karmazin Stewart whose impact on my life is ever strong.

I sincerely thank Mom, Dad and Wendy for your ever present support and encouragement throughout this whole project. I also sincerely thank my committee: Barbara Fuhrmann, Phyllis Hornbuckle, John Mahoney and Lee Porach. Especially, I thank you, Dr. Thomas, for your support and expertise as Director of this dissertation. And, Shirley Jones, typist supreme, many thanks. Finally, I thank my friends who always knew I would finish - your encouragement was a blessing.

Frances Stewart

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ABSTRACT

Thirty six female intercollegiate team athletes and 40 female non-athlete control subjects were studied in a two-experiment investigation designed to explore the personality patterns of female athletes; to measure any differences in performances of the experimental and control groups attributable to changing conditions, i.e., solo, coaction and competitive; and to explore the interactions of personality variables and performance. The previous research on personality, with Cattell's Sixteen Personality Factor Inventory and female athletes, is not plentiful and frequently in conflict. No previous research could be located that employed controlled competitive conditions with athletes--male or female. In Study 1, the team athletes were found to be more tough-minded (I-) and more group dependent (Q_2 -) than controls. The athletes were also found to be more tough-minded, group dependent, assertive (E+), venturesome (H+), and practical (M-) than Cattell's female college normative group. In a post-hoc analysis, the controls were found to be different from test norms on four scales. Discussions of the sometimes conflicting results is offered. A post-hoc discriminant analysis was also performed and discussed. The factor scales which were found to discriminate, in order of appearance, were Q_2 , A, I, B, M, and Q_4 .

In Study 2, all subjects were administered one of the three experimental conditions on a stationary bicycle--competition, coaction (performance with another), and solo performance. An ANOVA applied to the 2 x 3 design found the conditions to be significant but not the subject groups or inter-

actions of subject groups and conditions. A sub-analysis showed the competition condition to be significantly different from each of the other two conditions.

To investigate the interactions between personality and performance, a regression analysis was performed to test which of the 16PF scales best predicted competitive performance. Ten variables accounted for 23.8% of the variance at the .01 level of confidence. The variables, in order of appearance, were factors I, Q₁, A, H, B, C, Q₂, E, Q₃, and M.

Since the use of t-tests with groups of athletes has proven fruitless, it is recommended that future research in the area of sports personality use a different methodological approach. The only exception would be if the groups of athletes are highly unique (for example, fencers only) and at the highest levels of successful competition. The discriminative analysis procedure appears to hold some promise as does the application of a complex motor task under controlled conditions. Finally, the study of interactions of personality variables with varying conditions of performance seems to offer a promising area for further investigations.

INTRODUCTION

Within the last decade, society has witnessed rapid changes in cultural, educational and judicial attitudes regarding female athletic participation. The result has been a gradual growth in women's sports programs and a measurable increase in available competitive opportunities for women. One of these opportunities is intercollegiate athletics for women.

Comparatively little is known about personality variables in this emerging group (Malumphy, 1968; Dayries & Grimm, 1970; O'Conner & Webb, 1976). While there is a personality profile for male athletes,

it is almost impossible to establish this type of (personality) profile for female athletes. In many respects, they tend to be similar to male athletes. Nevertheless, it is still difficult to obtain a definite profile of this particular group because of the diversity within each research project resulting from the use of different tests, the variations in age and number of subjects, and the groups to which they are compared (O'Connor & Webb, 1976).

Many people including teachers, administrators, fans, developmental psychologists, and particularly coaches want to know what personality factors would be ideal for the competitive situation/athlete, male or female, and how to measure these factors. "If indeed athletes can be differentiated from non-athletes and across various sports, this information would be extremely useful to coaches. Assessment techniques could be developed for the screening of athletic potential and athletes could be matched with the sport or sports with which they are most highly compatible" (Fisher, Horsfall, & Morris, 1977).

One of the ways to investigate this situation is to study the personality factors of the female intercollegiate athletic population and to study

how the members of this group vary under competitive conditions. Therefore, this will be a two experiment study. Study 1 is an investigation of the personality characteristics of female intercollegiate athletes, those who participate in team sports, and a control group of nonathletes. Study 2 is a study of how female college students, divided into team sports athletes and nonathletes, vary under conditions of competition, coaction (performance in the presence of another performer), and solo performance.

A handicap when studying personality factors is that different investigators use different instruments. It would be ideal for comparison if all researchers used the same tool. In the absence of uniformity, the test instrument must be selected with great care. A test instrument with a history of plentiful research is a better tool than another test without the plentiful research. R. B. Cattell's (Cattell, Eber, & Tatsuoka, 1970) Sixteen Personality Factor Questionnaire (16PF) is a test with such a history and so was selected for this study as an appropriate research tool. "It is one of the most widely used measures in physical education and athletics and has been established as an acceptable or legitimate measure" (Hammer & Tutko, 1974).

The scales of the 16PF measure 16 source traits. "By source traits, one means the main 'simple structure' factors found by thirty years or more of research on unitary traits....They constitute central concepts in personality theory, and many predictive equations and 'natural history' laws have begun to accumulate about them" (Cattell et al., 1970). The primary source traits covered by the 16PF can be seen in Table 1.

Personality research, especially sport personality, has utilized assessment devices which embody factor theory as their main premise (Fisher et al., 1977). Cattell's 16PF inventory is based on the assumption

TABLE 1

The Primary Source Traits Covered by the 16PF Test

| Factor | Low Score Direction | High Score Direction |
|----------------|-----------------------------|----------------------|
| A | Reserved | Outgoing |
| B | Less intelligent | More intelligent |
| C | Affected by feelings | Emotionally stable |
| E | Humble | Assertive |
| F | Sober | Happy-go-lucky |
| G | Expedient | Conscientious |
| H | Shy | Venturesome |
| I | Tough-minded | Tender-minded |
| L | Trusting | Suspicious |
| M | Practical | Imaginative |
| N | Forthright | Shrewd |
| O | Self-assured | Apprehensive |
| Q ₁ | Conservative | Experimenting |
| Q ₂ | Group dependent | Self-sufficient |
| Q ₃ | Undisciplined self-conflict | Controlled |
| Q ₄ | Relaxed | Tense |

of factor theory and trait approach. Historically Cattell has assumed that internal dispositions or traits are "...relatively stable and so enduring that they override environmental or situational influences" (Fisher et al, 1977). Therefore, the scores of an individual on the 16PF would be expected to remain fairly constant between test administrations. However, the trait approach is being modified by some in the area of sport psychology (Fisher et al., 1977).

The opposite end to the trait approach is the dynamic or situational approach which asserts that personality characteristics are malleable and change according to the situation. Mischel's (1969) social learning theory takes this position by maintaining that behavioral variation is primarily a function of the situation in which a person is placed. Neither approach has been found to supply the majority of the variance in trying to explain individual differences (Fisher et al., 1977). A current trend is to take an interactionist approach--then one can explain the variance by trait (person), by state (situation), and by the interaction of the two. Of course, part of the behavioral variance will still remain in the unexplained residual. This investigation, a two study design, will afford a look at person, situation, and interaction.

STUDY 1 - PERSONALITY FACTORS

LITERATURE REVIEW

History of Women's Intercollegiate Athletic Participation

In the 1920's, sports were added to the curriculum in some women's colleges. The majority reaction was negative and the sports were quickly labeled as unbecoming and improper (Newcombe, 1977). Apparently the prevailing thought was that the evils inherent in aggressive competition were "too much" for women. Therefore, the programs that did survive were "educational" in nature and emphasis and the most "ladylike" or "feminine" sports (e.g. gymnastics, tennis, swimming) were the most encouraged.

Traditionally our society has reinforced a "feminine" stereotype for women which includes characteristics such as being dainty, "cute", graceful, and pretty. Women engaging in sports such as tennis, gymnastics, and swimming seem to fit into this stereotype. By the 1960's the sports programs themselves were run by physical educators who held strong non-competitive philosophies. "Even when sex roles were gradually modified, female athletes were steered toward leotards, tennis dresses, swim suits, etc." (Newcombe, 1977).

However, another force came along in the late 1960's and the early 1970's---social change. It seems now that,

Achievement obstacles, social stigma, and stereotyping are disappearing as more and more girls and women are becoming active in sports. The popularity of physical activity among females has been influenced by televised sports programs such as professional tennis and golf, the Olympic Games, and other events in which women participated (Klafs & Lyon, 1973).

Also, "the second family care is helping the middle class housewife out of

the home and into increased physical activity" (Newcombe, 1977). It seems as though athletic activity in general is being established as a desirable attribute of the female social culture--as a right and not as a privilege.

Bred by the women's liberation movement and influenced by irate mothers and particularly fathers of athletically talented daughters, "the women's athletic rebellion is keeping pace with the torrents of social change" (Weber, 1974). In 1974, the Association for Intercollegiate Athletics for Women (AIAW) authorized the first athletic scholarships (tuition and fees, not room and board). In 1975-76, over 60,000 women participated in college sports and 16 sports had national championships. During the school year 1976-77, 840 public and private colleges and universities gave scholarships in 19 sports with monetary awards ranging from \$200 to full (tuition and fees) scholarships (Newcombe, 1977). In 1978, the AIAW had 825 active member schools. The organization estimated that in the school year 1977-78 more than 100,000 women took part in intercollegiate sports, compared with 170,000 men (Phillips, 1978). In January, 1979, the AIAW, in a continuing trend toward establishing policies similar to its all male counterpart, the National Collegiate Athletic Association (NCAA), authorized full scholarships to include room and board. In January, 1980, and again in 1981, the NCAA, in recognition of the increased status of women's athletics, has made attempts to take over the governance of women's athletics. The implications of the NCAA's attempts is that women's athletics at the intercollegiate level has come of age. With an increase in status of women's athletics comes an increase in status of women athletes.

Personality and Athletics

There are many ways to define personality - on a continuum from a

social learning point of view to a biophysical viewpoint. Some theorize personality as dynamic, some passive, some theorize that personality is somewhere in between dynamic and passive. Constitutional theory is one approach to personality. In this approach, physical make-up and expected behavior are viewed as related. For example a tall, coordinated looking woman is asked to try out for the basketball team. Sheldon's somatypes are an example of this approach.

Social learning theory asserts that the environment is the most important agent of personality development. One learns from interactions with the environment (including others) and the impact of the learnings affects behavior. Therefore personality characteristics will depend upon the specific situation. From this viewpoint, a field hockey player would exhibit personality characteristics on the field she would not exhibit at the dinner table.

Factor theory, from which Cattell theorizes and from which the 16PF is developed, expects behavior to be consistent and predictable from situation to situation. "Certainly the prediction of athletes' behavior is a highly intriguing idea and one in which coaches and sport psychologists alike are interested" (Fisher, 1976). Most of the literature in sport personality is based on factor theory and the 16PF is the most used instrument.

Studies on Personality Traits and Female Athletes--16PF

The earliest research identified by the author in which women athletes were studied using the 16PF is Peterson, Weber, and Trousdale's (1967) investigation of 97 women athlete volunteers--38 in an individual sports group from the 1964 Olympic Games (swimming, diving, riding, fencing, canoeing, gymnastics, track and field), and 59 in a team sports group

from the 1964 Olympic volleyball team and the 1964 top ten Amateur Athletic Union (AAU) basketball teams. These investigators administered Form A of the 16PF and found significant differences between the two groups on seven factors--E, H, I, M, N, Q₁, and Q₂. Individual sportswomen were found to be more assertive (E+), venturesome (H+), tenderminded (I+), imaginative (M+), forthright (N-), experimenting (Q₁+), and self-sufficient (Q₂+) while team sportswomen were on the other end of those same characteristics and viewed as more humble (E-), shy (H-), tough-minded (I-), practical (M-), shrewd (N+), conservative (Q₁-), and group dependent (Q₂-). When compared to norms for equivalent age and education, both athlete groups "...were intellectually brighter [B+], more conscientious [G+], aggressive [E+], and perservering [G+]..." (Peterson et al., 1967).

Malumphy (1968) researched the personality and background of women participating in intercollegiate sports competition. Her 77 athlete subjects were: 15 in individual sports (tennis, golf, fencing, competitive swimming, and archery); 16 in a "subjectively-judged" sports group (synchronized swimming, gymnastics); 28 in team sports (basketball, field hockey, softball); and 18 in "team-individual" sports (a combination of a team sport and an individual sport, for example, one who plays basketball and tennis). Forty-two nonparticipant controls were also studied. All subjects came from the five largest state universities in Ohio. The 16PF was administered and significant differences were found to exist between groups on five of the 16 factors--A (reserved/outgoing), G (expedient/conscientious), H (shy/venturesome), I (tough-minded/tenderminded), and M (practical/imaginative). "The individual and subjectively-judged were more alike and also more similar to the nonparticipants than to the other two groups. The team and team-individual groups tended to

be alike and dissimilar to the other three groups" (Malumphy, 1968). However, overall there were more similarities than differences found between all groups - the groups only differed on five scales and no differences were found on 11 scales.

The groupings of subjects in these first two studies are different on several dimensions. One is level of competition and another is intercollegiate status. Peterson et al.'s (1967) subjects were either a member of the United States Olympic Team or a member of a nationally ranked top 10 AAU basketball team. The AAU offered the national collegiate championships in basketball before the AIAW was organized. These athletes were at the highest level of competition that one could reach as an amateur. Some were college athletes, some were not. Malumphy's (1968) athletes were intercollegiate juniors and seniors with at least two years participation in their sport. These women were all college students and not at the highest level of amateur competition. Another dimension was the geographical diversity of the subjects. Peterson et al.'s athletes came from all over the country and Malumphy's athletes came from the five largest universities in Ohio. The Peterson et al. sample is geographically more representative of the population of college female athletes. Yet another difference is the way the two studies grouped their subjects. Peterson et al. used two groups of subjects--individual sports athletes and team sports athletes. Malumphy used those two groups and three more--individually judged, team-individual, and nonparticipant controls. Any of these differences between the two studies might contribute to variation in results. In spite of these major differences in level of competition, geographical diversity, and construction of subject groups, both studies seem to indicate that team athletes tend to be more tough-minded (I-), shy (H-), and practical (M-) than at least some of their comparison groups.

Williams, Hoepner, Moody, and Ogilvie (1970) administered the 16PF (Forms A and B) and the Edwards Personal Preference Schedule (EPPS) to compare the personality traits of 30 champion level women fencers against the college norms for these instruments. The subjects were competing in the Amateur Fencers League of America 1968 National Championships and ranged in age from 18 to over 40. The fencers scored significantly higher on factors B+ (intellectually bright), E+ (assertive), M+ (imaginative), N+ (self-sufficient) and lower on A- (reserved). They conclude that it is possible to identify a fencing "sport-type" (Williams et al., 1970). Once again, the way the subjects were grouped in this study was very different from the way subjects were grouped in the first two studies. For the first time all the subjects participated in the same sport--an individual sport. It is still an amateur sport and it is a high level group of competitors who came from all over the United States. These athletes were compared to college norms while the previous two studies compared their subject groups to each other. Due to all these differences, it is difficult to make any meaningful comparisons.

Mushier (1972) conducted a cross-sectional investigation of competitive female lacrosse players at junior high, high school, college, adult, and national levels to study their personality traits. She suggested, "perhaps competitive sports do not influence an individual's personality, but rather the individual who already possesses certain characteristics is attracted to certain competitive activities--a self selection concept" (Mushier, 1972). Using the 16PF, she tested 62 college athletes who were a random sample drawn from the total population of competitive lacrosse programs (junior high, senior high, college and adult levels) and compared them to, in Mushier's (1972) words, "its appropriate norm." The college sample was significantly more intelligent

(B+), happy-go-lucky (F+), expedient (G-), suspicious (L+), forthright (N-), and experimenting (Q_1 +) than its norm (probably Cattell's female collegiate normative group).

When the comparison of ages and levels of competition was performed in this study, the findings were not exactly alike but strikingly similar among the different levels. Mushier suggests that this finding lends credence to her assumption that certain personality types self-select certain competitive activities. She cautions that these are mean profiles. Mushier's (1972) study does identify a lacrosse female athlete personality, as Williams et al. (1970) found a fencing sport-type. The Mushier study does not compare meaningfully to the other previously described studies, because the other studies grouped subjects differently and found different scales significant.

Joesting and Whitehead (1976) compared the personality characteristics of 16 members of a women's intercollegiate golf team with 29 "women's studies" (WS) students. They further divided the golf team competitors into "stars" (coach nominated) and average team members. The stars and women's studies students were significantly different on the factors H (WS more venturesome), I (WS more tough-minded), and M (WS more imaginative). There were no significant differences between WS and average team members.

O'Connor and Webb (1976) examined and compared four groups of intercollegiate women athletic competitors (13 basketball, 9 tennis, 6 gymnastics, 13 swimming) and a noncompetitive control group of 14 to see if a "sportswoman" personality could be defined. With Form A of the 16PF they found significant differences between the five groups on the four factors of B (intelligence), Q_1 (conservative/experimenting), Q_2 (group dependent/self-sufficient), Q_3 (undisciplined/controlled). The sports groups, excepting basketball, all scored well above the norm on intelligence.

For factor Q_1 , the swimming, tennis, and control groups were more experimenting than the basketball group; and the control group scored significantly higher than the gymnastics group. For factor Q_2 , the basketball, swimming, and control groups were all significantly more self-sufficient than the tennis group. And for Q_3 , both the basketball and swimming groups scored higher (more controlled) than either the tennis or gymnastics groups. Also, the control group scored significantly higher than the gymnastics group on Q_3 . These results are not totally consistent with previous studies.

Inconsistencies in studies attempting to delineate an "athletic" type or types are commonplace in the literature. As has been suggested by Vanek and Cratty...this lack of congruency may be attributable to factors such as lack of representative sampling, inadequate sample size, and non-standardization of the various personality measures (O'Connor & Webb, 1976).

Reviews of 16PF Studies

Several authors have reviewed many of the research studies into personality and athletes. Kane (1972), in a major review of his own research concerning the athletic personality, offers support for the existence of an athletic type. According to Kane, whose subjects were mostly British, male athletes were characterized by high scores on trait measures of dominance, social aggression, leadership, toughmindedness, stability, and confidence. Kane's results reveal a similar profile for female athletes, except that women tend to score lower on emotional stability or emotional control. Kane (1978) stated:

While reviewers have found difficulty in coming to unequivocal or generalized conclusions there is a tendency for the male athlete to be described in terms of extraverted and stable dispositions (such as high dominance, social aggression, leadership, tough-mindedness and emotional control) and for women athletes to be shown as relatively anxious extraverts.

He further states that by using multivariate analyses he can significantly correlate the characteristics of tough-minded, stable extraversion to

general athletic ability.

Ogilvie (1976) has reviewed many studies, his own and others, where the 16PF was administered to explore the relationship between personality and athletic success. Where success is defined by continuing to the higher levels of competition, he found the more successful male and female athletes are characterized as more emotionally stable (C+), tough-minded (I-), conscientious (G+), self-controlled (Q₃+), relaxed (Q₄-), trusting (L-), and outgoing (A+). These are mostly studies with male athletes, but female subjects are also represented.

Butt (1976) points out that Ogilvie and Kane have conducted two major, independent research programs which employ variations in the subject groups and sports, "...but also Kane is perhaps more influenced by British results where Ogilvie et al. are perhaps more concerned with American results" (Butt, 1976). She is postulating that possible confounding difference between their two profiles might be due to the cultural differences between the British and American people. Also, variations in the subject groups and sports upon which Kane and Ogilvie are basing their conclusions might be causing the differences.

Ogilvie (1976) states, "the reliability of our statements about the personality structure of successful athletes has been greatly reduced by our failure to control for such factors as culture, educational level, age, and sex. Of particular significance to this review has been the failure to control for team versus individual sports."

Williams (1978), also reviewed all of the studies cited in this literature review and a few additional studies. She concludes that the studies support the notion that there are specific "sport types;" that there are differences between individual and team sports athletes; and that studies conflict in the ability to lend credence to the thought

that sports women differ cross culturally.

Although one should be suspect of generalizations formed from a limited number of studies, particularly in light of the acknowledged methodological and interpretational limitations, certain dispositions appear to be frequently associated with the skilled and champion-level female athlete. Whereas passiveness, submissiveness, dependence, higher emotional stability, and lower achievement and aggressive needs are characterized in the normative female; the successful competitor generally tends to be more assertive, dominant, self-sufficient, independent, aggressive, intelligent, reserved, achievement oriented, and to have average to low emotionality (Williams, 1978).

Summary of the Literature for Study 1

Results of personality studies with female athletes as subjects report conflicting results. Male athletes have been found to be emotionally stable, aggressive, outgoing, less anxious and more controlled when compared to normative groups used to standardize personality tests (O'Connor & Webb, 1976). Female athletes do not have such a clear profile although many believe they seem to be similar to male athletes (O'Connor & Webb, 1976; Kane, 1972; Ogilvie, 1976).

Previously published studies used different numbers of subjects, subjects at different levels of competition, and variation in subject groups. Different authors reviewing the same studies draw different conclusions. Some studies compared athletes' scores to test norms, some to controls. One compared one specific sports athlete (golf) to test norms and to a women's studies group. Some studies compared individual athletes to team athletes while another divided the athletes into subjectively judged and team-individual groupings in addition. One study compared four specific sports groupings to each other. There appears to be little agreement among researchers concerning the personalities of female athletes with two possible exceptions. First, the more unique the female athlete (e.g. fencers only, lacrosse only) the more likely a

characteristic personality profile is to emerge. Second, at the highest levels of competition, a sports personality may be identified. However, even these are tentative conclusions, suggesting the need for additional research and replication.

STUDY 1 - PERSONALITY FACTORS

RATIONALE AND HYPOTHESES

Since studies on personality and female athletes report conflicting results and use a variety of methodologies and subjects, the role of these personality variables needed to be assessed in a female inter-collegiate athletic population.

Hypotheses

Personality traits of team athletes versus controls or versus norms:

1. Onscale A, athletes were hypothesized to score significantly higher (more outgoing) than controls or norms in accord with Malumphy (1968), Kane (1972), and Ogilvie (1976).
2. On scale C, athletes were hypothesized to score significantly higher (more emotionally stable) than controls or norms in accord with Kane (1972) and Ogilvie (1976).
3. On scale E, athletes were hypothesized to score significantly higher (more aggressive, assertive, competitive) than controls or norms in accord with Peterson et al. (1967), Williams et al. (1970), Kane (1972), and Mushier (1972).
4. On scale I, athletes were hypothesized to score significantly lower (more tough-minded) than controls or norms in accord with Kane (1972), Mushier (1972), and Ogilvie (1976).
5. On scale Q₄, athletes were hypothesized to score significantly lower (more relaxed and less anxious) than controls or norms in accord with Kane (1972) and Ogilvie (1976).

STUDY 1 - PERSONALITY FACTORS

METHOD

Subjects

The subjects were 76 female students enrolled full time at Virginia Commonwealth University. There were 36 women who had participated in at least one season of an intercollegiate varsity team sport (field hockey, volleyball, basketball); and 40 women who had never participated in an intercollegiate sport. All subjects were volunteers solicited from the rosters of varsity sports, undergraduate psychology classes, undergraduate physical education classes, and postings in the residence halls. One hundred and one potential subjects began testing and 25 cases were discarded. Of those discarded, 16 were male, five athletes were individual sports participants, and three controls did not complete testing.

The mean age for the 36 team athletes was 19.9 years and they ranged from 17 to 25 years of age. There were three black and 33 white athletes. There were 13 first year college students, eight sophomores, 13 juniors, and two seniors. As a group they were in the early-middle of their college careers. The athletes represented seven different groupings of academic majors with 14 in physical education, seven in arts and sciences, five in education other than physical education, three each in mass communications and business, and two each in the fine arts and "undecided."

The 40 subjects in the control group ranged in age from 17 to 26 years with a mean age of 21.1--very similar to the athletes. Eight of the 40 were black, a higher percentage (20%) than the athletes (8%). There were 12 first year college students, 17 sophomores, eight juniors, and three seniors. The controls, like the athletes were in the early middle of their college careers. For academic major, nine were in business, seven in physical education, six each in mass communications and pre-professional programs, three each in education other than physical education and arts and sciences, two in the administration of justice, and one each in the fine arts, social work, a professional program, and undecided.

Of the 36 team athletes; 18 played volleyball, 7 played basketball, and 11 played field hockey. For number of years in their sport: 18, 6, 10, and 2 athletes were respectively in their first, second, third, and fourth years of participation. Eight had participated in a second varsity sport and three of those eight in a third sport. Fifteen of the athletes had been granted partial athletic scholarships.

Procedure

When the subjects reported to the experiment, they were met by the experimenter or an assistant and given the following instructions:

This is an investigation of motor performance and personality factors. You will be given a brief personal questionnaire, a personality inventory with 105 items, and a motor task to perform on a stationary bicycle. Your individual results will be kept confidential. If you fill out the envelope provided, you will be sent the results of the study when the project is complete.

Please do not discuss the conditions of your motor task with anyone until data collection is finished. If you are still willing to participate, please sign the consent form now being handed to you (see Appendix 1).

Form C of the 16PF was administered to subjects usually before experimental conditions were applied. If more than two subjects came at the same testing period, some performed the motor task before taking the 16PF.

After completion of the personal questionnaire, the 16PF, and the motor task, subjects were thanked for their participation and reminded that they were not to discuss the conditions of their motor task and that they would be sent experimental results if they had filled out their envelope.

Design and Analysis

A t-test between the means was applied to each of the 16 factors (scales) of the 16PF to compare the differences between groups. The groups consisted of the 36 team athletes and the 40 controls. Also, team sports athletes were compared to Cattell's female college normative group ($N = 1120$) by use of t-tests between the means for each of the 16 scales.

STUDY 1 - PERSONALITY FACTORS

RESULTS

The purpose of Study 1 was to investigate the personality characteristics of female intercollegiate team sports athletes and nonathlete controls as measured by the 16PF. A t-test between the means was applied to the raw scores of the team athletes and controls on each of the 16 factor scales of the 16PF. Factor I (tough-minded/tender-minded) was found to be significantly different for the two groups ($t = -2.01$, $p < .05$) and factor Q_2 (group dependent/self-sufficient) was also found to show significant differences ($t = -2.05$, $p < .05$). Means and standard deviations for all factors may be seen in Table 2. The team athletes were more tough-minded and group dependent. The results for factor I were predicted, the results for factor Q_2 were not. The two groups were expected to significantly differ on factor C (affected by feelings/emotionally stable), factor E (humble/assertive), and factor Q_4 (relaxed/tense), but did not.

A t-test between the means of the raw scores of the team athlete subject sample and Cattell's female college normative group (the population) was also applied to each of the 16PF scales (see Table 3). The team athletes were significantly different from test norms on factors E ($t = 3.12$, $p < .01$), athletes more assertive; H ($t = 2.20$, $p < .05$), athletes more venturesome; I ($t = -4.42$, $p < .001$), athletes more tough-minded; M ($t = -4.18$, $p < .001$), athletes more practical; and Q_2 ($t = -2.67$, $p < .05$), athletes more group dependent. The

TABLE 2

T-tests Between Mean Raw Scores of Subject Groups on 16PF Scales

| Factor | Team Athletes ^a | | Controls ^b | | <u>t</u> | <u>df</u> | <u>p</u> |
|----------------|----------------------------|-----------|-----------------------|-----------|----------|-----------|----------|
| | <u>M</u> | <u>SD</u> | <u>M</u> | <u>SD</u> | | | |
| MD | 7.75 | 2.23 | 7.70 | 2.39 | 0.09 | 74 | 0.925 |
| A | 9.00 | 2.39 | 9.53 | 1.74 | -1.10 | 74 | 0.274 |
| B | 4.91 | 1.11 | 4.68 | 1.46 | 0.81 | 74 | 0.422 |
| C | 7.33 | 2.73 | 6.93 | 2.56 | 0.67 | 74 | 0.502 |
| E | 6.44 | 2.70 | 5.90 | 2.51 | 0.91 | 74 | 0.365 |
| F | 7.53 | 2.20 | 7.30 | 2.13 | 0.46 | 74 | 0.648 |
| G | 7.56 | 2.27 | 7.35 | 2.10 | 0.41 | 74 | 0.683 |
| H | 7.36 | 2.98 | 6.63 | 2.64 | 1.14 | 74 | 0.257 |
| I | 5.97 | 2.22 | 7.00 | 2.23 | -2.01 | 74 | 0.048* |
| L | 5.22 | 1.91 | 5.68 | 1.98 | -1.01 | 74 | 0.315 |
| M | 4.19 | 2.15 | 4.80 | 1.99 | -1.28 | 74 | 0.206 |
| N | 4.14 | 2.11 | 3.78 | 2.28 | 0.72 | 74 | 0.474 |
| O | 7.33 | 2.55 | 7.65 | 2.88 | -0.51 | 74 | 0.615 |
| Q ₁ | 5.75 | 2.42 | 6.33 | 2.13 | -1.10 | 74 | 0.274 |
| Q ₂ | 2.89 | 1.94 | 3.90 | 2.32 | -2.05 | 74 | 0.044* |
| Q ₃ | 7.22 | 2.09 | 6.95 | 2.34 | 0.53 | 74 | 0.596 |
| Q ₄ | 6.81 | 2.05 | 7.40 | 2.25 | -1.20 | 74 | 0.235 |

* $p < .05$ ^aN = 36^bN = 40

TABLE 3

T-tests Between Mean Raw Scores of Athletes Subjects and
Cattell's Norms

| Factor | Team Athletes ^a | | Norms ^b | | difference | df | t |
|----------------|----------------------------|-----------|--------------------|-----------|------------|----|-----------|
| | <u>M</u> | <u>SD</u> | <u>μ</u> | <u>SD</u> | | | |
| MD | 7.75 | 2.23 | 7.46 | 2.38 | 0.29 | 35 | 0.779 |
| A | 9.00 | 2.39 | 8.90 | 2.24 | 0.10 | 35 | 0.251 |
| B | 4.91 | 1.11 | 4.85 | 1.59 | 0.07 | 35 | 0.362 |
| C | 7.33 | 2.73 | 6.82 | 2.44 | 0.51 | 35 | 1.129 |
| E | 6.44 | 2.70 | 5.04 | 2.31 | 1.40 | 35 | 3.121** |
| F | 7.53 | 2.20 | 6.93 | 2.19 | 0.60 | 35 | 1.633 |
| G | 7.56 | 2.27 | 7.02 | 2.51 | 0.54 | 35 | 1.415 |
| H | 7.36 | 2.98 | 6.27 | 2.62 | 1.09 | 35 | 2.199* |
| I | 5.97 | 2.22 | 7.61 | 2.59 | -1.64 | 35 | -4.420*** |
| L | 5.22 | 1.91 | 5.66 | 2.01 | -0.44 | 35 | -1.391 |
| M | 4.19 | 2.15 | 5.69 | 2.32 | -1.50 | 35 | -4.176*** |
| N | 4.14 | 2.11 | 4.73 | 2.08 | -0.59 | 35 | -1.679 |
| O | 7.33 | 2.55 | 7.58 | 2.73 | -0.25 | 35 | -0.580 |
| Q ₁ | 5.75 | 2.42 | 6.24 | 2.34 | -0.49 | 35 | -1.215 |
| Q ₂ | 2.89 | 1.94 | 3.75 | 2.32 | -0.86 | 35 | -2.665* |
| Q ₃ | 7.22 | 2.09 | 7.31 | 2.16 | -0.09 | 35 | -0.253 |
| Q ₄ | 6.81 | 2.05 | 7.08 | 2.46 | -0.27 | 35 | -0.802 |

* $p < .05$

** $p < .01$

*** $p < .001$

^a_N = 36

^b_N = 1120

results on factors E and I were hypothesized. The significant results on H, M, and Q_2 were not hypothesized. The data did not support the hypothesized differences on factors A, C, and Q_4 .

Three factor scales, E, H, and M, were found to differentiate this team athlete sample from Cattell's norms but not between the athletes and controls. This seems to indicate that the tested controls were different from Cattell's normative group. In order to test how similar the control sample was to Cattell's female college normative group, a t-test between this sample and the population mean was performed (see Table 4). The factors scales which evidenced significant differences were A, E, M, and N.

Factors E and M were common findings to both tables 3 and 4--they found the team athletes and the controls to be different from test norms. Factors E and M did not differentiate between athletes and controls in Table 2. Factor H emerged as a significant factor only between athletes and test norms. Factors A and N emerged as significant factors only between controls and test norms.

A post-hoc discriminant analysis procedure was applied to the same data to test which 16PF factors, as a group, best discriminate between the team athletes and nonathlete controls (see Table 5). The factors scales which were found to significantly ($p < .01$) discriminate, in order of appearance, were Q_2 , A, I, B, M, and Q_4 . Athletes were more group dependent, more reserved, more tough-minded, brighter, more practical, and more relaxed.

Cattell et al. (1970) offer two methods to handle the scores obtained from the 16PF. One is to work with the raw scores, Cattell et al. recommend the use of raw scores when comparing experimental and

TABLE 4

T-tests Between Mean Raw Scores of Control Subjects and
Cattell's Norms

| Factor | Controls ^a | | Norms ^b | | difference | df | t |
|----------------|-----------------------|-----------|-------------------------|-----------|------------|----|----------|
| | <u>M</u> | <u>SD</u> | <u>μ</u> | <u>SD</u> | | | |
| MD | 7.70 | 2.39 | 7.46 | 2.38 | 0.24 | 39 | 0.635 |
| A | 9.53 | 1.74 | 8.90 | 2.24 | 0.63 | 39 | 2.274* |
| B | 3.68 | 1.46 | 4.85 | 1.59 | -0.17 | 39 | -0.749 |
| C | 6.93 | 2.56 | 6.82 | 2.44 | 0.11 | 39 | -0.260 |
| E | 5.90 | 2.51 | 5.04 | 2.31 | 0.86 | 39 | 2.168* |
| F | 7.30 | 2.13 | 6.93 | 2.19 | 0.37 | 39 | 1.100 |
| G | 7.35 | 2.10 | 7.02 | 2.51 | 0.33 | 39 | 0.996 |
| H | 6.63 | 2.64 | 6.27 | 2.62 | 0.36 | 39 | 0.851 |
| I | 7.00 | 2.23 | 7.61 | 2.59 | 0.61 | 39 | -1.730 |
| L | 5.68 | 1.98 | 5.66 | 2.01 | 0.02 | 39 | 0.048 |
| M | 4.80 | 1.99 | 5.69 | 2.32 | -0.89 | 39 | -2.829** |
| N | 3.78 | 2.28 | 4.73 | 2.08 | -0.95 | 39 | -2.648** |
| O | 7.65 | 2.88 | 7.58 | 2.73 | 0.07 | 39 | 0.154 |
| Q ₁ | 6.33 | 2.13 | 6.24 | 2.34 | 0.09 | 39 | 0.253 |
| Q ₂ | 3.90 | 2.32 | 3.75 | 2.32 | 0.15 | 39 | 0.409 |
| Q ₃ | 6.95 | 2.34 | 7.31 | 2.16 | 0.36 | 39 | -0.972 |
| Q ₄ | 7.40 | 2.25 | 7.08 | 2.46 | 0.32 | 39 | 0.899 |

* $p < .05$

** $p < .01$

^aN = 40

^bN = 1120

TABLE 5

Summary Table for Discriminant Analysis
of Subject Groups on 16PF Scales

| Step | <u>Action</u> | | Variables in Analysis | Wilks' Lambda | Significance |
|------|----------------|---------|--------------------------|------------------|--------------|
| | Entered | Removed | | | |
| 1 | Q ₂ | | 1 | 0.946 | 0.05 |
| 2 | A | | 2 | 0.880 | 0.01 |
| 3 | I | | 3 | 0.845 | 0.01 |
| 4 | B | | 4 | 0.814 | 0.01 |
| 5 | M | | 5 | 0.768 | 0.01 |
| 6 | Q ₄ | | 6 | 0.745 | 0.01 |

control groups in research. However, when one wants to appreciate the outcome magnitude of one score directly with another score, Cattell recommends that standard score norms are desirable. The 16PF uses a ten point scale range in which each unit is called a standard ten-point score or "sten." Cattell points out that these sten scores are not s-stens, stens based on calculated raw score standard deviations but n-stens which are normalized stens. They result from an area transformation of the raw scores designed to produce a more nearly normal distribution. The advantage of the n-sten is that it agrees with the assumption that equal interval scale units are those which give a normal distribution.

In this study, the raw scores are used in the data analysis. However, at times it is convenient to discuss the scores as converted sten scores (see Table 6).

TABLE 6

Subject Sten Scores on 16PF Scales

| Factor | Team Athletes | Controls | All Subjects |
|----------------|---------------|----------|--------------|
| MD | 5.67 | 5.63 | 5.65 |
| A | 5.72 | 6.00 | 5.87 |
| B | 5.58 | 5.38 | 5.47 |
| C | 5.92 | 5.65 | 5.78 |
| E | 6.64 | 6.23 | 6.42 |
| F | 5.89 | 5.68 | 5.78 |
| G | 5.94 | 5.73 | 5.83 |
| H | 6.31 | 5.75 | 6.01 |
| I | 4.19 | 5.15 | 4.70 |
| L | 5.22 | 5.68 | 5.46 |
| M | 4.17 | 4.78 | 4.49 |
| N | 5.11 | 4.78 | 4.93 |
| O | 5.28 | 5.53 | 5.41 |
| Q ₁ | 5.11 | 5.63 | 5.38 |
| Q ₂ | 4.83 | 5.60 | 5.24 |
| Q ₃ | 5.36 | 5.23 | 5.29 |
| Q ₄ | 5.36 | 5.78 | 5.58 |

STUDY 1 - PERSONALITY FACTORS

DISCUSSION

Cattell et al. (1970) described those who score I minus as representing "...some sort of tough, masculine, practical, mature, group-solidarity-generating and realistic (no-nonsense) temperamental dimension...I- individuals have a history of fewer illnesses and operations, more aggressiveness, and a significantly greater participation in athletics and sports." "A person at the tough-minded end of the continuum would be a person who is emotionally mature and independent-minded and has a hard realistic outlook. This person overrides his feelings, is not fanciful, does not show anxiety, and is self-sufficient.... [Behaviorally,] the tough-minded person makes a cold, realistic appraisal of the facts and does not allow himself to become involved in sentimental overreaction" (Ogilvie, 1976). As predicted, the team athletes in this study had a significantly lower mean I score than the nonathlete controls or Cattell's college normative group.

According to Ogilvie (1976), this trait of tough-mindedness is related to successful achievement in competition--the higher the level of successful competition, the stronger the trait appears in both women and men. The athlete group in the current study was not distinguished with any Olympic Team members. All three sports are Division II status of a three division system--not the highest level of competition. Some of the volleyball players and some of the basketball players were members of teams which won Division II Virginia State

Championships in their sport, but the teams did poorly in regional competition. The mean score (sten = 4.19) for the team athletes in this study was slightly below the middle range (4.5 to 6.5), as one might expect for a group of athletes who have not distinguished themselves at the higher echelons of success.

Factor Q_2 , group-dependent/self-sufficient, was also found to show a significant difference between the team athletes and controls and between the athletes and norms, with the athletes scoring in the more group-dependent direction. This result was not hypothesized. However, Peterson et al. (1967), in their study of top-level sportswomen, found their team sports competitors to be significantly more group-dependent than their individual sports competitors. On the other hand, O'Connor and Webb (1976) found their basketball (team), swimming (individual) and control groups were significantly more self-sufficient.

Factor Q_2 is one of the major factors in introversion. "The items reveal a person who is resolute and accustomed to making his own decisions alone while at the Q_2 - pole we see a person who goes with the group, definitely depends on social approval and is conventional and fashionable....In group dynamics, the high- Q_2 person is significantly more dissatisfied with group integration, makes remarks which are more frequently independent solutions than questions, and tends to be rejected" (Cattell et al., 1970).

According to the findings of this study, the team athletes were more group-dependent, a finding that makes intuitive sense. Team work is of paramount importance in the sports of volleyball, basketball, and field hockey. Intuitively, it would seem that teams that reach the higher levels of competition would be composed of women who score

higher in this direction. This has been found in Peterson et al.'s (1967) Olympic and AAU champion subjects. "When the most restrictive standards are applied in order to establish the highest order of criteria for athletic success, the significance of specific personality traits does receive considerable empirical support" (Ogilvie, 1976).

The subjects of this study were not Olympic or AAU champions. However they were significantly more group-dependent and tough-minded than the nonathlete controls or the norms. These two scales (I and Q₂) clearly distinguish the team athletes from both the control group and Cattell's normative group.

Cattell (1970) states that factor E, humble/assertive, is associated with those who choose athletics as their occupation. People who score high on E are described as dominant, assertive, aggressive, competitive and stubborn. Behaviorally they are headstrong, solemn, admiration demanding, and rebellious. "Groups averaging high on E show more effective role interaction and democratic procedure" (Cattell et al., 1970).

Peterson et al. (1967) found their combined athletes to be higher on E than norms, and the individual sports athletes to be higher on factor E than the team athletes. Williams et al. (1970) found their fencers to be higher on factor E than norms and Mushier found the lacrosse players to be higher on factor E than norms. Kane (1972) also found British sportswomen to be characterized by higher E scores. An important exception to these findings is Ogilvie (1976) who did not find E significant.

In this study, both team athletes and controls were found to be more assertive (E+) than test norms. A reason the expected difference

was not found between the athletes and controls could be a masking effect from the controls who were apparently different from the test norms. The difference were in the predicted direction with athletes ($\bar{M} = 6.64$) higher (more assertive) than controls ($\bar{M} = 6.23$) on sten scores.

For factor M, practical/imaginative, team athletes and control subjects were found to be more practical than Cattell's normative group. This study did not hypothesize results on factor M. Low M scorers are characterized as practical, careful, conventional, regulated by external realities, proper, and in occupations requiring mechanical sense, realism, and alertness (Cattell et al., 1970). Even though Peterson et al. (1967), Malumphy (1968), Williams et al. (1970) and Joesting and Whitehead (1976) all found differential M scores for their athletes, there was no similarity with the direction of these results. The sten score for athletes ($\bar{M} = 4.17$) in this study on factor M is the most deviant score from the midpoint (5.5) for any scale of the 16PF. There was no significant difference between the team athletes ($\bar{M} = 4.17$) and controls ($\bar{M} = 4.80$) although the direction is toward athletes as more practical. It is within reason to think of a team athlete as one who is conventional and who is participating in an activity requiring mechanical sense, realism, and alertness. Peterson et al.'s (1967) team athletes were more practical than their individual sports athletes, although all athlete subjects combined were not more practical than test norms. It seems safe to postulate that team athletes could be characterized as more practical.

The pattern of findings for factors E and M was the same. The team athletes and controls were different from the test norms, the

athletes were not different from controls. In both cases the direction of the difference between athletes and test norms is what would be expected, athletes more practical and assertive, but this is not substantiated by the controls used in this study.

Another finding of this study was that on factor H, shy/venturesome, the team athletes were found to be significantly more venturesome ($t = 3.23$, $p < .05$) than Cattell's norms but no significant differences were found between the team athletes and controls or between the controls and norms. This indicates that the control group could not be having any masking effects such as those tentatively suggested on factors E and M. High scorers on H are characterized as spontaneous, uninhibited, and socially bold people. Behaviorally, they are adventurous, active, responsive, genial, friendly, impulsive, and carefree. This finding was not hypothesized. Peterson et al.'s (1967) study found this factor significant, with individual sports athletes significantly more venturesome than team sports athletes; and Malumphy (1968) found her team sports athletes to be the least venturesome (therefore, most shy) of all of her five subject groups. Another reason not to expect the athletes to score in this direction is that Joesting's (1976) golf stars were found to be more shy than the comparison group of women's studies students. Although these three studies have found different results from the present study, it is easy to associate the characteristics adventurous, spontaneous, active, socially bold with one who participates in a team sport.

Factor N, forthright/shrewd, was found to show significant differences between the controls and Cattell's norms with the controls being more forthright. Factor A, reserved/outgoing, was also found

to show significant differences between the controls and Cattell's norms. The controls were characterized as more outgoing.

Since there are significant differences between the controls of this study and Cattell's normative groups for female college students on factors E, M, A, and N, it would seem that the volunteer control subjects are different from the norms. The differences appear on four of the 16 source traits--a full one quarter of the scales. Cattell's norms for the 1969 Edition of Form C of the 16PF came from a standardization sample of 1120 female undergraduate college students with a mean age of 20 years. The design for standardization called for sampling across 10 levels of community size, 10 levels of socioeconomic status, 10 regions geographically, and for race (Tabular Supplement No. 2 to the 16PF Handbook, 1972). The 40 tested controls of this study were not stratified into geographical area, socioeconomic strata, or community size. There was another difference also. Cattell's norms probably included athletes and athletes were eliminated from the current study's sample. For this last reason alone, one might argue that the significant differences between controls and the athletes in this study are more illuminating than differences between controls or athletes and test norms. However, the norms are viewed by this investigator as the better comparison group because errors due to sampling are minimized in Cattell's larger, stratified, and therefore more representative sample.

To summarize, it is believed that team athletes can be characterized as tough-minded (I-) and group dependent (Q_2 -). Although there is a conflicting picture, it is also possible that the team athletes are assertive (E+), venturesome (H+), and practical (M-). Of these

five traits, only two were hypothesized--tough-minded and assertive. Traits predicted and not found were emotionally stable (C+), relaxed (Q_4 -), and outgoing (A+). It seems as though each research endeavor of this type adds more descriptive information to the possible personality traits of female athletes, yet results are very confusing and conflicting. This study controlled for possible differences between team sports athletes and nonathlete controls. This does not seem to be enough. The personalities of athletes must be further investigated by controlling for each individual sport and/or by limiting subjects to athletes who are at the highest levels of success. These two features alone seem to allow for similar results between research endeavors.

It should be pointed out that the trait approach used so far in this investigation is being questioned by two prominent researchers in the field of sports psychology (Fisher, 1975, 1976, 1977; and Martens, 1976). Fisher (1975), particularly is critical of Ogilvie's conclusions that a sports personality can be concluded from the research. Both Fisher (1976) and Martens (1976) made presentations calling for an interactionist approach to this problem of how to study the personality of athletes.

Kane (1972), when addressing methodological problems in the search for the relationship between personality and physical abilities, states the discriminant function analysis is advantageous:

The simple comparison of profile dimensions taken one at a time has the disadvantage that the profile as a whole is never considered nor is the relative importance of dimensions emphasized. The discriminative function form of analysis has the particular advantage that it takes account of the variability over the entire profile range so that, in the case of sixteen personality factors, the total personality is considered when group scores are being compared.

Only when significant 'discriminative space' exists between them, may group profiles be considered to differ (Kane, 1972).

As Kane (1972) suggested, a discriminant analysis was performed on the data. Six factors discriminated between the two groups-- Q_2 , A, I, B, M, and Q_4 (athletes more group dependent, more reserved, more tough-minded, brighter, more practical and more relaxed). Factors Q_2 and I are the two factors that run consistently through this investigation, lending more support to the postulation that group dependency and tough-mindedness are important traits in a team athlete's personality. Factor M, athletes more practical, supports the previously stated finding that the team athletes were more practical than test norms. Unfortunately, the other two factors which were also found to show differences between team athletes and test norms, E (athletes more assertive) and H (athletes more venturesome), were not found here. This adds further qualification to the already equivocal findings on E and H because these two factors only differentiated between the athletes and norms, and not between athletes and controls.

Three other factors that were found here, A (more reserved), B (brighter), and Q_4 (more relaxed) have not distinguished the athletes from either the controls or norms in the previous analyses although A and Q_4 were hypothesized in Study 1. Factor A, athletes more outgoing, is a characteristic of Ogilvie's (1976) American athlete profile for men and women athletes and of Kane's (1972) British male and female athletes. But Malumphy (1968) found this to be a factor which distinguished the team athletes in her study in the other direction--team athletes more reserved. That is the case in this study, athletes were less outgoing or more reserved than the controls. However the

sten score for athletes ($\underline{M} = 5.72$) is slightly in the outgoing direction which supports Ogilvie's and Kane's research and makes intuitive sense.

Both Ogilvie (1976) and Kane (1972) agree that Q_4 is a characteristic factor in their athletes' profiles. However, Kane describes female athletes as tense (Q_4+) and Ogilvie describes the athletes as relaxed (Q_4-). The athletes in this study were only slightly (sten $\underline{M} = 5.36$) lower than the midpoint of the scale. For factor B, the same closeness to the scale midpoint is evident. Athletes were on the bright side, but the sten mean was only 5.58.

A discriminant analysis, however, produces a set of variables, that in combination, "discriminate" between two groups. In this analysis between team athletes and controls, the interaction of variables Q_2 , A, I, B, M, and Q_4 is highly discriminant (.01 level of significance).

STUDY 2 - PERFORMANCE

LITERATURE REVIEW

Studies Involving A Competitive Motor Task

The type of motor task may easily affect a person's performance. Apparently no study has used a stationary bicycle (exercycle) task. Studies which have employed a motor task to explore the effect of competition, coaction, and audience on performance follow.

In 1969, Swingle employed a two person simple lever-pressing task under varying conditions of challenge--win 10% of the time (W_{10}), win 50% of the time (W_{50}), win 90% of the time (W_{90})--to see which of the 60 college male subjects responded more quickly. "There is a fair amount of evidence indicating that competition against other persons results in enhanced performance relative to an individual's performance in non-competitive situations" (Swingle, 1969). Negative effects as well as differential or non-significant effects have also been reported (Wankel, 1972). According to Zajonc's (1966) social facilitation theory, an increase in arousal (arousal increases with competition, observation, or coaction) could have a disruptive effect on learning because the relationship between arousal and learning is curvilinear. So, what is the relationship between arousal and performance? Arousal seems to suppress performance rates. Swingle (1969) found subjects in W_{20} responded faster under high challenge conditions. "...It is not unreasonable to assume that the high arousal associated with highly challenging situations may suppress performance, particularly when

the goal or prize associated with a win is great" (Swingle, 1969).

Wankle (1972) investigated three components of competition--rivalry, coaction, and audience. He used a simple and complex reaction time-movement time task with 160 junior high boys divided into eight groups. Wankel found that rivalry, and not coaction or audience, is a motivational component in a competitive situation. Wankel further points out that competition is dependent upon an implied or present opponent. Competition can be divided into two components--rivalry and social facilitation. Then, social facilitation can be divided into audience and coaction effects. He prefers to explain the negative effects for coaction and audience by saying that they "...appear to influence motivational level only to the extent that they affect this cognitive drive" (Wankel, 1972). In this experiment, the subjects believed the audience and/or coactors would not evaluate them.

Wolsin, Sherman and Till (1973) used a response-matching (sharing) task for male undergraduate subject pairs under conditions of cooperation or competition with fixed (manipulated) outcomes of success, neutral, or failure. The researchers were examining attribution of responsibility for outcomes of social interaction. It was found that for the neutral outcome condition there was situational attribution in both competition and cooperation; that for the success condition there was only self attribution for both conditions; and that for failure there was partner attribution with cooperation and situation attribution with competition. In other words: if they did not win or lose, subjects in both competition and cooperation said the situation was the cause; if subjects were successful, both conditions said "self" was the cause; and if subjects failed in the cooperation condition,

they said their partner was the cause, and those who failed in the competition condition said the situation was the cause.

Martens and White (1975) had 20 female undergraduates perform a manipulative maze task against five confederates in fixed outcome conditions of W_{10} , W_{30} , W_{50} , W_{70} , W_{90} . They wanted to examine "...the influence of competition on motor performance, task and opponent satisfaction, and the preference for opponents based on the proportion of contests won and lost" (Martens & White, 1975). It seems from social psychological research that a person's task performance is affected by winning and losing. The investigators found that subjects performed better in condition W_{50} . They explain their results by saying, "social comparison theory (Festinger, 1954) predicts that a person will seek to evaluate his abilities by comparing himself with others of similar ability because sharply divergent comparisons make precise evaluations of a person's abilities impossible" (Martens & White, 1975).

Gill and Martens, in their 1977 study of task type, success, and competition, say, "although opinions and speculation abound, researchers have not yet been able to specify the effect of competition on performance and intrapersonal variables such as attitudes and satisfaction." Therefore, they researched the effects of competition and "...how the type of task, or the way the individual scores are combined, affects performance" (Gill & Martens, 1977). They employed Steiner's (1972) typology which divides unitary group tasks into conjunctive tasks (which depend on the least competent group member) and into disjunctive tasks (which depend on the most competent group member). "The major concern in this study was whether individual performance differed

on the same task when the scoring system was conjunctive or disjunctive" (Gill & Martens, 1977). Subjects, 490 fifth and sixth graders boys and girls, performed in pairs on two aluminum mazes and were assigned to either a conjunctive or disjunctive scoring system and to one of three outcome conditions-- W_{80} , W_{20} , or NC (noncompetition control).

"The anticipated motivational influences of the task type and success-failure manipulations on individual performance did not materialize" (Gill & Martens, 1977). Their results for task type are in keeping with some previous findings that show audience, social reinforcement, and competition influences are limited on complex motor performance (this task) and more pronounced on simpler tasks. Individual performance was not influenced in an observable manner by the success-failure manipulation, but W_{20} teams were less satisfied with team performance and attribute causes externally more than W_{80} and NC teams.

Summary of the Literature for Study 2

Results of studies involving a motor task present a confusing and conflicting picture. One investigator says performance is enhanced with competition (Swingle, 1969), another reports nonsignificant or differential effects (Wankel, 1972). Others divide their subjects into groups of competition, coaction and/or audience as well as controls. Some find significant results, others do not. Gill and Martens (1977) report that effects of audience, social reinforcement and competition are limited on a complex motor task and more pronounced on simple tasks. None of the motor tasks were active or a sports activity. No study employed athletes as subjects.

STUDY 2 - PERFORMANCE

RATIONALE AND HYPOTHESES

Since the investigations into the role of a motor task and competition present a conflicting picture and since no one has investigated this problem with athletes as subjects, the role of task and competition needed to be assessed in the female intercollegiate athlete population.

Hypotheses

1. Subjects were predicted to have significantly better (lower) time scores in the experimental condition of coaction than the condition of solo performance in accord with social comparison theory (Festinger, 1954).
2. As opposed to the control group, athletes will not be significantly different in the conditions of coaction and competition.

STUDY 2 - PERFORMANCE

METHOD

Subjects

The subjects were the same as those in Study 1.

Procedure

The subjects, team athletes and controls, were assigned proportionately to one of three experimental conditions--competition, coaction, or solo performance (see Figure 1). The procedure used in Study 1 was followed with the following additions usually taken after the completion of the 16PF test administration.

In all conditions, subjects performed on a stationary bicycle ("exercycle"). In the competition condition, one subject performed with another subject and was given the following directions designed to induce competition between the two:

You are to imagine yourself to be competing in a bicycle race with your partner. The one who has "ridden" three kilometers first (that is the one who reaches three kilometers on the odometer first) is the winner. I will time each of you with a stopwatch. Please do not talk. Call out when you have reached three kilometers.

A subject in the coaction condition also performed next to another subject and was given the following instructions designed overtly to avoid eliciting competition:

You are to imagine yourself as riding a bicycle through the park with a friend. Imagine you are enjoying the fine weather and lovely scenery. You are to ride three kilometers (that is go three kilometers on your odometer). I will time you with a stopwatch.

| | Team Sports Athletes | Controls | Total |
|---------------------|-------------------------|----------|-------|
| Competition | 12 | 15 | 27 |
| Coaction | 12 | 14 | 26 |
| Solo Performance | 12 | 11 | 23 |
| Total | 36 | 40 | 76 |

Figure 1. Subject Groups for Data Analysis of Competitive Motor Task.

Please do not talk. Call out when you have reached three kilometers. This is not a race.

Subjects in the solo performance condition had an unoccupied exercycle next to them and were given the same instructions as the subjects in the coaction condition. There was no other "audience" in the room excepting the experimenter or assistant.

All subjects went the same distance on the exercycles--three kilometers. Time was recorded for all subjects by means of a stopwatch. The time score was the dependent measure.

Design and Analysis

A simple Analysis of Variance (ANOVA) was applied to the time scores of both subject groups in each condition to compare the differences among cells of the design.

STUDY 2 - PERFORMANCE

RESULTS

In order to investigate the role of a motor task under three controlled competitive conditions in the team athlete and control samples, an analysis of variance was applied to the dependent variable of time scores in the six cells of the design (see Table 7). The mean time scores, expressed in seconds, for each of the six groups is reported in Table 8. The results show that the application of competitive conditions was significant for all subjects taken together ($F = 19.087$, $p < .001$). All subjects in the experimental condition of coaction were expected to have significantly faster (lower) time scores than subjects in the solo performance condition. To test for this difference between conditions, a post hoc analysis for individual comparisons was performed (Weiner, 1971). The coaction condition ($M = 316.70$) was significantly different from both coaction and solo performance conditions (.05 level of confidence).

The effects for subject groups were not significant. It had been hypothesized that athletes as opposed to controls would be similar in the conditions of coaction and competition. This was not born out by the data analysis. There are no significant differences in the interaction of condition and subjects—none were predicted and none were found.

TABLE 7

Analysis of Variance for Time Scores on Motor Task

| Source of Variation | <u>SS</u> | <u>df</u> | <u>F</u> | <u>p</u> |
|----------------------------|----------------------|-----------|--------------|--------------|
| Main Effects | | | | |
| Conditions (A) | 2,022,977.000 | 2 | 19.087 | 0.001*** |
| Subject Groups (B) | 157,426.750 | 1 | 2.971 | 0.089 |
| 2-Way Interactions | | | | |
| Condition by Subject Group | 70,609.875 | 2 | 0.666 | 0.517 |
| Explained | 2,214,362.000 | 5 | 8.357 | 0.000 |
| Residual | 3,709,488.000 | 70 | | |
| Total | 5,923,850.000 | 75 | | |

*** $p < .001$

TABLE 8

Mean Time Scores for Subject Groups on Motor Task

| Condition | Subjects | |
|------------------|-------------------------------|------------------|
| | Team Athlete | Control |
| Competition | 281.17 ^a N = 12 | 345.13 N = 15 |
| Coaction | 588.75 N = 12 | 762.71 N = 14 |
| Solo Performance | 597.42 N = 12 | 627.55 N = 11 |

^aScores expressed in seconds

STUDY 2 - PERFORMANCE

DISCUSSION

The team athletes and nonathlete control subjects of this investigation were given one of three conditions on a motor task. Both subject groups performed their best (lower time scores) in the competitive condition. The competition condition was significantly different from each of the other two conditions. One would expect people to "go faster" on a bicycle if they are instructed to race than if they are instructed to take a leisurely ride in a park--the instructions for coaction and solo performance. This difference in performance seemed so obvious that it was not predicted and was not surprising that it occurred. This is in keeping with the way individuals, athletic or nonathletic, perform in competitive and noncompetitive situations (Swingle, 1969).

However, the condition of coaction was expected to be more like the competition condition than the solo performance (noncompetitive) condition because of the "mere presence" of a coactor (Swingle, 1969). The instructions were identical for coaction and solo performance for both groups, but the presence of another, on an exercycle next to each person (a possible competitor) was expected to evoke a greater effort to excel among the athletes than among the controls, though both athletes and controls were expected to ride faster in coaction than in solo performances because they had someone with whom to compare themselves. There is evidence that performance increases with audience and/or coactors (Martens & White, 1975). However, this study failed to substantiate the

findings of these investigators as no differences were found between the two conditions for either group.

Athletes' mean time scores were expected (but not found) to be similar in the conditions of coaction and competition. It seems reasonable to expect people who choose to belong to teams which have competition as their major goal would choose to compete against the person sitting next to them on a "for fun" bicycle ride. Athletes choose a complex motor activity when they choose an intercollegiate sport as their means of competition. Bicycling is a complex motor activity. The controls may or may not be competitive people, but they did not choose an intercollegiate sport as their way of expressing competition.

Why, then, did not these athletes compete against a possible rival on the other bicycle? If they were competing, it was at a similar pace that they competed versus themselves or versus an imaginary audience (solo performance condition). A possible explanation is that team athletes are expected to cooperate with their teammates. The other rider may have been identified as friend or teammate and not foe. The athlete pool at Virginia Commonwealth University is small enough that the athletes probably all know each other. Also, these team athletes have selected a specific arena for competition--their particular sport. It may be hypothesized that the conditions for competition are not evoked outside the chosen arena unless there is an explicit demand. Also, these athletes are not those at the higher levels of competition. Perhaps high level athletes are competitive in more situations than this sample. Finally, it could be that the directions were such as to minimize the anticipated performances. If these athletes were so "coachable" that they do as they are told: i.e. "compete" when they are told to and take a quiet ride when they are told to, the expected "competition" of the coaction condition might well be masked.

INTERACTIONS BETWEEN PERSONALITY AND PERFORMANCE

INTRODUCTION

The interaction approach between the personality and performance of athletes has been called for by Fisher (1976), Fisher et al. (1977), and Martens (1976). No studies were located that employed a motor task that was as complex in nature as riding an exercycle. The studies which employed a motor task to explore the effect of competition, coaction, and audience on performance were reviewed in Study 2. None of the studies had athletes as subjects. No studies designed to investigate the interaction of personality and performance were located.

While there were no hypotheses proposed at the beginning of this investigation concerning the interaction approach, the data seemed to lend itself to such treatment and the paucity of information in this area prompted a further analysis.

INTERACTIONS BETWEEN PERSONALITY AND PERFORMANCE

METHOD

Subjects and Procedure

The subjects and procedure for this investigation were the same as stated in Study 1 and Study 2.

Design and Analysis

The raw scores of all subjects on the 16 scales of the personality test and the time scores of the subjects on the motor task were subjected to a multiple regression analysis.

INTERACTIONS BETWEEN PERSONALITY AND PERFORMANCE

RESULTS

The results of a multiple regression analysis show which scales are the best 16PF predictors for faster performance scores (see Table 9). This table reflects the interaction between personality and competition. Factor I was found to be the single best predictor for competitive performance, accounting for 5.5% of the variance ($F = 4.271$, $p < .05$). The best dual predictors were factors Q_1 and I in combination ($F = 3.303$, $p < .05$) accounting for 8.3% of the variance. The next two factors added in order of best predictors were factor A and factor H. These top four factors combined accounted for 15.4% of the variance. Six additional factors (B, C, Q_2 , E, Q_3 , and M, in order) are still within the level of statistical significance ($p < .05$) and the total 10 account for 23.8% of the variance. These six combined only added 8.4% to the variance accounted for.

TABLE 9

Multiple Regression Analysis of 16PF Raw Scores
by the Dependent Variable Time Scores

| | | | | | |
|-------------------------|-----------|----------------------|-----------|-------------|----------|
| Multiple R | 0.48744 | Analysis of Variance | <u>DF</u> | <u>MS</u> | <u>F</u> |
| R Square | 0.23760 | Regression | 10 | 140,750.675 | 2.0257* |
| Adjusted R ² | 0.12031 | Residual | 65 | 69,482.614 | |
| Standard Error | 263.59555 | | | | |

| Variables in the Equation | | | | |
|---------------------------|----------|--------|-------------------------------|----------|
| Variable | <u>B</u> | Beta | Standard Error of <u>B</u> | <u>F</u> |
| I | 17.344 | 0.140 | 15.013 | 1.335 |
| Q ₁ | 27.491 | 0.222 | 14.731 | 3.483 |
| A | 23.762 | 0.176 | 17.983 | 1.746 |
| H | -31.356 | -0.242 | 15.227 | 4.241 |
| B | -47.910 | -0.222 | 27.718 | 2.988 |
| C | -20.748 | -0.194 | 14.276 | 2.112 |
| Q ₂ | -25.742 | -0.201 | 17.658 | 2.125 |
| E | -15.927 | -0.147 | 12.769 | 1.556 |
| Q ₃ | -16.410 | -0.129 | 15.359 | 1.141 |
| M | 13.124 | 0.097 | 17.711 | 0.549 |
| (Constant) | 885.103 | | | |

* $p = .05$

INTERACTIONS BETWEEN PERSONALITY AND PERFORMANCE

DISCUSSION

Factor I, tough-mindedness, emerged as the single best predictor for competitive performance in these subjects and was a factor which significantly discriminated between the athletes and controls. As discussed earlier, this trait is related to successful achievement in competition at the highest levels of competition. Thus, this should be viewed as a logical finding.

The next three factors emerging were Q_1 (conservative/experimenting), A (reserved/outgoing) and H (shy/venturesome). For factor H, the subjects ($M = 6.013$) scored in the direction of more venturesome. This trait is characterized behaviorally by one who is adventurous, active, responsive, and impulsive (Cattell et al., 1970). The mean sten score for subjects on Q_1 was 5.382 which essentially does not distinguish between the conservative/experimenting dichotomy.

Factor A was one of the traits that Ogilvie (1976) concluded was a part of the personality profile of athletes--with athletes scoring in the more outgoing direction. Also, in Study 1, it was expected but not found that athletes would be more outgoing. The mean sten score for all subjects in this study on factor A was 5.868, tentatively pointing in the outgoing direction. Behaviorally, one scoring in this direction is one who moves toward others and toward social participation (Ogilvie, 1976).

While a research of literature reveals no information as to why these characteristics should influence competitiveness, speculation might be

interesting. If one who is venturesome behaves in an adventurous, active, responsive, and impulsive fashion, these are characteristics which intuitively seem to go along with competitiveness. It certainly takes an active person to be competitive in athletics. Another speculation is that competition is one way for people to make contact with others. So, the more competitive subjects were found to be more outgoing.

This investigation into the interactions between personality and performance indicates those personality trait scales which are most associated with performance (competitiveness) to be tough-mindedness, conservative/experimenting, outgoing, and venturesome. One does not intuitively find it unreasonable to expect "experimentation" to interact with "venturesomeness"--in fact it is the venturesome who wish to experiment. If the individual is outgoing (team sports?) and able to cope with victories and defeats (tough-mindedness), one can fantasize as to why these interactions might influence the athlete. Attention to this kind of interaction calls for further investigation.

To summarize, this investigation has taken three steps. First was the description of female team athletes and controls by the use of the 16PF. Second, the role of a competitive motor task on performance, of the same subjects, was analyzed under the conditions of competition, coaction, and solo performance. And last, the interactions of personality factors and performance were explored.

Overall conclusions drawn from this controlled step-by-step investigation follow. The 16PF factor scales, by themselves and analyzed by t-tests, do not clearly distinguish the athlete group. The results of this study add more information, but not clarity, to the clouded picture that already existed. It is suggested that a different methodological approach than this one be used in the future. An investigation with the

16PF, analyzed by discriminant analysis, seems to hold more promise.

The performance section of this investigation holds some promise for future investigations. It is recommended that a debriefing questionnaire be given to subjects after the motor task is performed to find out what they thought or decided to do with the given instructions, and to find out how they viewed the other cyclist. Then, some redesigning of conditions and/or subject groups could be made. For example, a confederate might be the other cyclist or the cyclists might only perform with strangers. Using athletes as subjects for a controlled investigation apparently is new--and should be further explored.

The interactionist approach appears to offer the best methodology for future research. Not only is this a new approach but the technique offers many unique research possibilities.

APPENDIX 1

CONSENT FORM

As a participant in this research project you will be asked to respond to one brief personal data questionnaire, one 105 item personality inventory, and a motor task on a stationary bicycle (exercycle). There is no psychological risk to participants. Please understand that your individual results will be completely confidential and will be used solely for the purpose of research in the areas of sports and personality psychology. You will not be jeopardized if you choose not to participate in this study and you may voluntarily withdraw from participation at any time.

I have no known history of heart disease or other physical impairment that would make participation in this study a physical risk to me. I understand that in the event of any physical and/or mental injury resulting from my participation in this research project, Virginia Commonwealth University will not offer compensation or medical treatment.

I have read and understand the above.

Participant: _____

Date: _____

Witness: _____

Date: _____

APPENDIX 2

PERSONAL QUESTIONNAIRE

Subject number _____.

Age_____.

Race_____.

Academic major_____.

Year in college: Freshman, Sophomore, Junior, Senior.

Interscholastic Athletic competition in high school. Please list sports and the number of years of participation in each.

Which recreational sport activities do you participate or compete in regularly? Please indicate the number of hours per week in each.

Collegiate, varsity sport(s) you play:

Number of years in sport:

A. _____

A. _____

B. _____

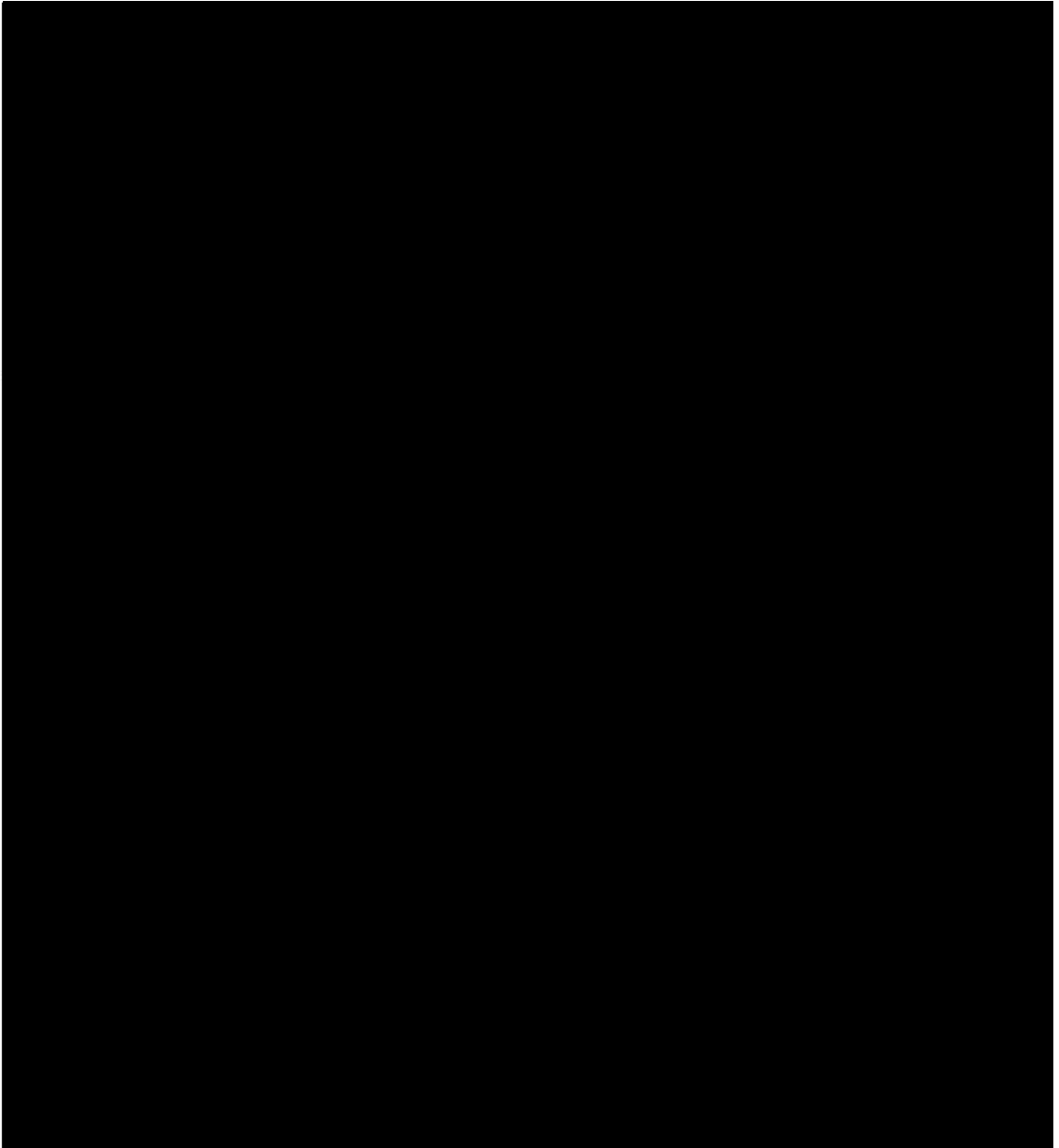
B. _____

C. _____

C. _____

Are you the recipient of an athletic scholarship? _____

Have you been selected for a collegiate athletic honor such as MVP, All-American, regional team selection, or post season team selection, or Olympic Team membership?
Please explain and designate the sport.

VITA

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