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THE EFFECTS OF SYSTEMATIC BEHAVIORAL
FEEDBACK ON THE PRACTICE
BEHAVIORS OF ATHLETES

DISSERTATION

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By

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To my parents who supplied many of the reinforcers along the way.
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CHAPTER I

INTRODUCTION

The emergence of scientific inquiry into the realm of sport and physical education is causing practitioners to reevaluate many formerly accepted truths concerning athletic competition. It is no longer acceptable for coaches and physical educators to rely on intuition and past experience when making decisions regarding matters concerning their athletes. Subjective judgments made by coaches regarding the training of their athletes have been, and continue to be, based on tradition and filled with inaccuracies, myths, and misconceptions. Recent research has refuted some of these inaccuracies and replaced them with principles of human athletic performance based upon sound scientific theory and practice.

In a recent paper analyzing coaching behavior and practice time, Darst, et al. (1978) suggest "that most of today's athletic coaches ... tend to coach in a manner quite similar to the way they were coached during their playing careers." In describing today's athletic coaches, Darst states:

that minimal attention has been given to the needs, interests, and characteristics of participants, various learning theories, current research on teaching and coaching, variables that affect the teaching-learning process, and specific behaviors that are used by successful coaches. (p. 1)
Despite recent findings, coaches and physical educators remain hesitant to change established coaching procedures.

In a paper entitled "A Direction for Contemporary Sport Psychology," Rushall (1976) states that "there are very few attempts to use empirically verified principles of behavior in a concerted, directional manner in sports." (p. 4) From the time the above-mentioned paper was published until today, numerous studies attempted to study the behaviors of individuals involved in sports in an objective, systematic fashion. Although these initial research attempts at applying behavioral principles to sporting environments have shown promise, much investigation is yet to be done on the area of behavioral control in sport.

One area of research in sport that has received attention is the objective observation of coach and athlete behaviors during practice. Data compiled by Rushall (1975) over a period of time revealed that athletes, in a wide variety of sports, spend the majority of their practice time emitting behaviors that have little or no effect in improving athletic performance in their sport. The majority of time is spent performing managerial tasks; e.g., taking roll call, waiting in line for a chance to perform, talking to other athletes, or performing some activity unrelated to the sport. If an athlete's performance is to improve in his/her sport, attention must be placed on time utilization in practice.

A number of observation instruments have been designed to assess teacher and pupil behavior in the natural setting (Cheffers, 1974; Siedentop and Hughley, 1975; Shrewsberry, 1978; and Cobb and Roberta,
In addition to learning environments, psychologists have employed observation instruments with the purpose of coding the behavior of individuals in everyday life situations (Patterson, Ray, Shaw and Cobb, 1969). Data obtained from these instruments can provide accurate, reliable information regarding the frequency of different behaviors that individuals emit in natural environments.

Only recently have researchers adopted observational instruments in sport and physical education environments (Tharp and Gallimore, 1976; Darst, et al., 1977; Smith, et al., 1977). Both coaches and athletes have been observed, and data obtained using these instruments have revealed objective and systematic information regarding the behaviors emitted by participants in sporting environments.

Tharp and Gallimore (1976) studied the coaching behaviors of a known basketball coach using an observation instrument. Darst, et al., 1977 used a twelve-category observation system to systematically record the behaviors emitted by a football coach during practice. Both of these studies yielded data concerning the type and frequency of behaviors emitted by each coach. The observational systems used for existing studies have, however, been restrictive in nature. Both systems used a limited number of behavior categories in which the focus of activity and the possibility for coding interpersonal interactions were not included.

The Coaching Behavior Assessment System (CBAS) developed by Smith, Smoll, and Hunt (1977) codes and analyzes the behaviors of coaches in
naturalistic settings. The CBAS consists of twelve behavioral categories. When used correctly, the CBAS can objectively record coaching behaviors during practices and games.

Rushall (1977) designed two observation schedules for sport and physical education environments. One schedule systematically and objectively categorizes coach/teacher behaviors and the other categorizes athlete/pupil behaviors. The coach observation schedule categorizes only seven behavior categories with twelve behavior possibilities. Behaviors are recorded in five-minute blocks which reduce the ability to analyze data in any depth. The small number of behavior categories combined with the time block recording system reduces the accuracy of the data and the number of conclusions that may be drawn from data collected using such an instrument.

This researcher feels a comprehensive observation instrument for use in sport and physical education environments which systematically classifies athlete behaviors may prove successful in improving athletic performance in practice and competition.

Statement of the Problem

The purpose of this study was to assess the effects of systematic feedback with information generated from an athlete observation system on the practice behavior of athletes. Feedback is defined as information an individual receives about the adequacy or appropriateness of a response as a consequence of that response. The basic premise in behavioral research is that behavior is controlled by its consequences. Behavioral control is achieved through the manipulation of environmental events.
Significance of the Study

Sport coaches and physical educators are constantly seeking new methods of improving athletic performance. One way of helping to accomplish this goal is to objectively study the behaviors athletes emit during practice. The behaviors athletes emit during practice are particularly important because they influence (in varying amounts depending upon the individual athlete) the behaviors the athlete will emit during competition.

A large amount of an athlete's practice time is spent emitting behaviors which have little or no positive effect on the athlete's skill performance; e.g., waiting in line for a turn, talking to another athlete, arranging equipment, etc. (Rushall, 1975). The rest of the time is spent emitting behaviors which are low or have no effect on improving athletic performance. It would therefore be advantageous to design a system which would increase the amount of practice time the athlete spends emitting behaviors which are highly productive and reduce the amount of time an athlete spends emitting behaviors which have low or no productivity. Productivity levels refer to the potential each behavior has for affecting positive change in an athlete's behavior.

In the past, research in sport and physical education has been directed toward the teacher/coach with the hope that any changes in the behavior of the coach will have a direct influence on the behavior of the athlete. If the terminal goal in any intervention program is to positively change the behavior of the athlete, then direct intervention with the athlete may prove a more effective and efficient approach.
The feedback intervention proposed in this study deals directly with the athlete. This researcher feels that it is desirable to move away from traditional coach-centered competitive athletic environments towards athlete-centered structures. Motivation may increase if athletes feel they have more influence in making decisions concerning their athletic endeavors. The athlete as he/she matures, will be less dependent upon the coach as a behavior change agent and more capable of choosing a course of action for him-/herself and fellow athletes.

McKenzie (1972) compared coach-controlled and athlete-controlled organization effects on the behaviors of swimmers. The conclusion drawn from the study was that when swimmers are responsible for controlling each others' behaviors, athlete behavior control is achieved more readily than when compared to positive reinforcement from coaches.

In a paper dealing with athlete motivation Rushall states:

The situation which exists generally in sports is that the motivational contingencies which support athlete behaviors are not coach-controlled and are far from optimal. (p. 3)

Traditionally, the majority of feedback provided for athletes concerning their skill performance has come from coaches. As the ratio between coach and athlete increases and as we gain more knowledge concerning the potential feedback has for effecting positive behavior change in athletic environments, focus may shift toward the athlete as potentially the most effective behavior change agent.

This study was conceptualized with the intent of increasing the research available concerning the application of feedback for improving athletic performance.


**Delimitations**

This dissertation is delimited to the study of the practice behaviors of three intercollegiate wrestlers, three female intercollegiate volleyball players, and three competitive gymnasts. The possibility that the subjects might discontinue their sport or get injured during the study exists.

The independent variable for the study is the feedback given to each athlete after practice regarding the behaviors he/she emitted during practice.

The dependent variables are the behaviors each subject emits during practice as recorded on The Ohio State Athlete Observation Code.

**Limitations**

1. The study is limited to the practice behaviors of nine athletes.

2. This study is based on the following assumptions: a) the subjects are representative of athletes in their respective sports as defined in Chapter III, b) they are capable of understanding the meaning of the feedback given to them, c) athlete behaviors are observable and measurable, d) high inter-observer reliability increases the probability that the subject's behavior was altered and not the coder's, e) after repeated interventions with feedback given to each subject following practice, changes occurring following intervention are a result of the intervention, f) positive behavior change in practice may have a positive effect on athlete behaviors emitted in competition.
3. This study is limited to the duration of time during which the subjects are available for observation.

4. This study is limited to a given number of days of observational recording in each environment.

Definitions

**Activity** A period of time that athletes spend in physical motion which is related to the goals and objectives of the sport.

**Behavior** Observable and measurable responses of an organism to internal and external stimuli.

**Baseline** The level at which behavior is occurring before attempts are made to modify it.

**Dependent Variable** A measured variable in an experimental design.

**Description** Each definition contained in the activity focus and behavior categories; e.g. game scrimmage, inactivity.

**External Validity** The extent to which the results may be generalized.

**Feedback** Information an individual receives about the adequacy or appropriateness of a response as a consequence of that response.

**Independent Variable** The manipulated variable in an experimental design.

**Internal Validity** The degree to which the experimental manipulation causes any changes in behavior by the subjects.

**Interval Recording** A type of observational recording which measures the occurrence of non-occurrence of behavior within specified time intervals.

**Intervention** The introduction of an independent variable in an attempt to modify behavior.

**Non-Productive Behaviors** Behaviors which have no effect or a detrimental effect on athletic performance.
**Observation** The act of trained observers watching and coding behaviors of athletes.

**Observational Recording** A measurement tactic which subjectively records behaviors which are observable and measurable.

**Observer Drift** The tendency of an observer to alter previously defined coding procedures. This may be due to time, or interpretations made by the observer which are not in keeping with original instructions.

**Percentage** A fraction or ratio with one hundred fixed and understood as the denominator.

**Productive Behaviors** Behaviors which have a high probability of positively influencing subsequent athletic performance.

**Productivity** The potential each behavior has for affecting positive change in an athlete's behavior.

**Reactivity** Interference or the intrusiveness of the observer himself upon the behavior being observed. Weick, 1968.

**Reliability** Percent of agreement of observers on what they have observed in the same subject during the same session. Hall, 1971.

**Validity** The closeness an instrument comes to measuring what it was intended to measure.

**Summary**

This introductory chapter presented a brief overview of current research endeavors in sport and physical education. The roles of both coach and athlete in practice settings were discussed. The study's problem was outlined as was the significance of the study. The chapter concluded by stating the delimitations and limitations of the study and by listing definitions relevant to the comprehension of the study.
CHAPTER II

REVIEW OF LITERATURE

Intensive investigation by numerous researchers has clearly demonstrated the role of feedback in effecting behavior change (Hull, 1952; Skinner, 1953; Spence, 1956; Gagne, 1965; Fitts and Posner, 1967; Locke, 1968; Annett, 1969; and Whaley and Mallot, 1971). Learning is facilitated when the subject receives some form of feedback to indicate the adequacy of a response. Feedback has been proven effective in improving performance in various settings with a variety of subjects. The effectiveness of feedback has been demonstrated in classroom settings (Broden, Hall, and Mitts, 1971; Cooper, Thompson, and Baer, 1970; Moore and Schaut, 1975; and Kepler, 1977), in clinical practice (Wallace, Hiron, Baker, and Hudson, 1975; Dana and Graham, 1970), in the treatment of phobias (Leitchenberg, Atras, and Thompson, 1968), and in job performance (Catano, 1976; Koch, 1976). The implementation of feedback has also been found to enhance activation and goal setting (Arnold, 1976; Latta, Schwander, and Patten, 1976 and Erez, 1976). The acquisition of visual motor skills of slow learning children have been enhanced by feedback (Parker, Cook, Rosenfeld, and Todd, 1973). Parents have been trained to use social consequences effectively through the use of feedback (Herbert and Baer, 1972).
The body of this paper will describe such studies and clarify issues regarding the implementation of feedback for affecting behavior change. The purpose of this chapter then is to present the research to date concerned primarily with the topic of feedback. Various types of feedback and their effects on performance in a variety of circumstances will be investigated.

The phrases performance information and knowledge of results are used synonymously with feedback in some texts and disciplines. For the purpose of this study, feedback shall refer to the information one receives concerning the adequacy of a response to a particular stimulus.

The Effects of Feedback on Performance

This section deals specifically with the effects of giving feedback under a variety of conditions, on motor and academic performance.

Numerous studies show that the use of feedback to indicate the adequacy of a response improves subsequent performance (Arps, 1920; Elwell and Grindley, 1938; Bilodeau, Bilodeau, and Schumsky, 1959; Mitchell, 1969; Newell, 1974; Lay, 1974; Van Houten, Hill, and Parsons, 1975; Donohue and Ratliff, 1976).

Pioneer studies in feedback research by Arps (1920) and Elwell and Grindley (1938) concluded that performance tasks involving hand movements were positively influenced when the subject was continually provided with feedback. When feedback was withdrawn, no improvement in performance occurred.
Since these early research attempts at studying the relationship between feedback and performance, numerous studies have reinforced the conclusions drawn by Arps and Elwell and Grindley.

Using isometric strength as the dependent variable, twenty-two male college students were tested for maximum grip strength of the dominant hand with a tensiometer (Berger, 1967). On a subsequent day, half of the subjects were given no feedback concerning their grip strength and the other half were given the test while being allowed to observe the dial. After a 15-minute rest the test was reversed so all subjects performed under both conditions. The results indicated that the mean grip strength when subjects were allowed to observe the dial during the test was significantly (p=.01) higher than when feedback was not provided.

Donohue and Ratliff (1976) investigated the effects of 1) contingent reward candy, 2) loss of candy, and 3) feedback on children's discrimination learning. The results indicated that the performance of the group provided with feedback was significantly higher than the performance of the groups rewarded or denied candy. The authors felt that feedback served to focus attention on relevant aspects of the task while candy distracted the subject's attention to relevant cues. Using a Backman ladder test, Lay (1974) tested college males to determine their skill learning. Subjects were divided into three groups: 1) subjects receiving specific verbal feedback, 2) subjects receiving general feedback, and 3) subjects receiving no feedback. The results indicated that feedback significantly
influenced the amount of gross motor skill learning and final gross motor skill performance.

Although an impressive body of research concludes that feedback does improve subsequent performance in a variety of tasks, Wrisberg and Schmidt (1975) demonstrated that extrinsic post-response error information was not a necessary condition for subjects to acquire a motor response. Blindfolded, twenty-four subjects were required to move a lever to a stop and to attempt to replace the lever in the correct location with the stop removed. Each subject repeated the task twelve times. No feedback was given to the subjects concerning the accuracy of their responses. The researchers postulated that the subject acquired a recognition memory for the correct location over the course of practice. When the subject moves to the stop at the beginning of the trial, feedback resulting from this experience is stored. As practice continues, increased experience with this target location strengthens and forms the recognition memory, representing the feedback qualities of the correct location. Subjects in later trials move more effectively to the target location, hence they improve with practice and without external feedback. The experiment then showed clearly that subjects can reduce their errors without post-response feedback if the standard is presented on every trial.

A convincing body of research exists linking teacher and student behavior change with feedback. The following pages will present specific examples of how the systematic implementation of feedback in teaching environments can successfully modify the behavior of both students and teachers.
Operant conditioning techniques have demonstrated success in improving children's behavior (Bushell, Wrobel, and Michaelis, 1968; Walker and Buckley, 1968; Lovitt and Curtiss, 1968, 1969; O'Leary and Drabman, 1971).

Three studies used a reversal design to improve the classroom behavior of students using feedback (Kirby and Shields, 1977; Drabman and Lehey, 1974; and Van Houten, Hill, and Parsons, 1975).

Kirby and Shields (1972) measured the effects of an adjusting fixed-ratio schedule of immediate praise and correctness feedback on the arithmetic response rate of a seventh grade student. The intervention produced increases in the student's arithmetic response rate and attending behavior. When the treatment was removed, decreases in arithmetic response rate and attending behavior occurred. Reinstating the treatment again produced increases in both behaviors. The results demonstrated the effectiveness of praise and immediate correctness feedback for affecting desirable changes in a child's classroom behavior.

Another behavior-based program employed the use of positive and negative feedback to change the inappropriate classroom behavior of a 10-year-old girl (Drabman and Lehey, 1974). Independent observers recorded the number of positive and negative comments made to the subject by her teacher and her peers during classroom hours. The intervention consisted of ratings by the teacher four times every class session concerning the level of appropriateness of the subject's classroom behavior. The intervention phase brought apparent increase
in the amount of positive comments the subject was receiving from her classmates. The disruptive behavior of the subject's classmates also decreased as did the negative comments made by the teacher to the subject. This study illustrated how a relatively inexpensive, uncomplicated, and time-conserving behavioral procedure can effectively change undesirable classroom behavior in an efficient manner.

Van Houten, Hill, and Parsons (1975) improved the story writing performance of children in a classroom situation. Baseline composition rates were found for each subject. The implementation of feedback improved the performance of the subjects' composition rates. Public posting of performance improved scores even further when combined with feedback. As a result of the combined intervention the rate of comments by peers regarding academic performance increased significantly. A second experiment by the same researchers investigated the effects of a performance feedback system on reading and language skills of fifth grade students. The system consisted of timing (announcing time limits), feedback (regarding accuracy of performance), public posting, and praise. Using a multiple baseline across two behaviors the system significantly improved performance on both tasks.

Two feedback studies employed atypical children as subjects. Levy (1974) studied the effect of social reinforcement and feedback on the performance of an accuracy motor task. Using a Lafayette Pursuit Rotor, eighty educationally-mentally retarded individuals were divided into two groups, one group receiving feedback following its performance and the other group receiving no feedback. The dependent variable was the number of seconds the subject could track a light beam moving in a
circular fashion, with a stylus. The group which received feedback showed significantly better improvement over the group which did not receive extrinsic feedback.

Sixteen hyperactive boys and sixteen control subjects were compared in their ability to encode and correctly spell words under three feedback conditions: 1) no feedback, 2) positive feedback (nickels), and 3) negative feedback (horn sounded for time off task) (Worland, 1976). The dependent variable for the two groups were the amount of time on task and the amount of work correctly completed. The results indicated that the hyperactive subjects were on task more often when negative feedback rather than positive was given. Negative feedback, however, increased the errors in the spelling task. The control subjects were equally responsive to positive, negative, or no feedback. The results seem to indicate that while negative feedback can reduce off task behavior for hyperactive boys, it can also decrease the accuracy of the work. Further research will need to be pursued if generalizations are to be made concerning the effects of negative and positive feedback on the performance of a variety of populations.

The majority of studies dealing with behavior change in teaching environments have sought to change the behavior of the teacher. The following section will outline numerous studies which have used feedback as a tool for affecting teacher behavior change.

Feedback to teachers regarding their effectiveness as lecturers was provided by students in numerous studies. Geller (1975) installed a feedback panel into every student desk in a lecture hall. The indicator lights on the panel informed the instructor when the majority
of students did not understand the material being presented or when the material was being presented at too fast or too slow a rate. Overall and Marsh (1975) also demonstrated how student feedback can positively change the instructional effectiveness of college professors. One half of the instructors in a college computer course were given feedback from their students on their teaching effectiveness in the middle of the term. The other half received no feedback. The lecturers who were provided with feedback received higher student evaluations at the termination of the quarter than did those lecturers receiving no feedback. In addition, a positive relationship existed between instructors receiving feedback and students' subsequent achievement. Students who were taught by teachers receiving feedback had a greater desire to pursue further computer course work than students with teachers who did not receive feedback. One must be careful in attributing the results to the intervention alone. Extraneous variables may have influenced the results.

A unique study employing descriptive feedback of a middle school homeroom class on the behaviors of nine of their teachers, proved successful in effecting subsequent behavior change (Kepler, 1977). Teachers were given descriptive information about their behavior within the classroom environment based upon observational data and comments made by their students regarding discipline and student/teacher interaction. The teachers reacted favorably to this form of feedback and expressed a desire to continue its implementation. After feedback had been provided by the homeroom class, subsequent teaching behaviors were positively effected.
A master's thesis (Metzler, 1976) examined the effects of an intervention strategy upon student teacher verbal feedback behaviors. The baseline feedback rates of the five subjects was recorded using event recording. The intervention consisted of three parts: 1) information feedback reading sheet which emphasized the importance of feedback in learning, 2) feedback sessions with the supervisor, and 3) establishing behavioral goals for each of the target behaviors. A multiple baseline design was used. The intervention package caused a change in the student teacher feedback rates. The greatest change occurred in the amount of positive skill feedback given to each class by the subjects. The five student teachers increased their frequency of positive skill feedback on the average of 1.4 occurrences per minute over the mean baseline rate.

Hughley (1973) investigated the effect of directed information feedback on the teaching behaviors of four student physical education teachers. Using an eight-category observation code, the baseline rates of each of the subject's teaching behaviors were recorded. The intervention consisted of instructions, cueing plus reinforcement, graphic feedback, and goal setting strategies. A multiple baseline design across subjects revealed that the feedback package was effective in providing desirable changes in the teaching behaviors of student physical education teachers. More specifically, positive teacher reactions to an appropriate skill attempt by a student or to student behavior other than skill attempts, increased in frequency as a result of the intervention package.
Another study sought to change the teaching behaviors of seven student physical education teachers using systematic behavioral feedback (Rushall and MacEachern, 1977). Using an eight-category observation schedule, the teaching behaviors of each subject were observed and recorded using interval recording. Replications of a reversal experimental design were used to assess the effects of providing objective behavioral feedback contingent upon the teaching behaviors of each subject. After baseline data had been recorded, the experimental treatment was implemented. Sizeable changes occurred in the behavior of all the subjects. The feedback which each subject received regarding their teaching behaviors caused changes in behavior in the directions specified as desirable by all subjects. When the second baseline condition was introduced, behavior rates returned to their original levels. Systematic behavioral feedback, then, seems to be a viable procedure to implement into teacher training programs when behavior changes are desired.

An innovative feedback system was implemented in an early field experience for 21 physical education majors (McMillan, 1978). The peer feedback system utilized involved observing and recording the teaching behaviors of interns, converting the raw scores into percentages and plotting the percentages on graphs. Each intern selected target teaching skills that they wished modified and then interns set a criteria level of performance for each target teaching skill. The peer feedback system proved successful in changing in the desired direction, 69% of the 71 behaviors intervened upon. This study demonstrated that feedback does not necessarily have to come from supervising personnel
to be effective. A vast resource lay virtually untapped in the utilization of peers as behavior change agents in a wide spectrum of learning environments.

A limited number of studies have concluded that when feedback is combined with setting a performance standard (goal setting), performance will subsequently improve (Kazdin, 1974).

A study by Erez (1977) investigated whether feedback would facilitate individual differences in self-set goals. Two groups of forty-three college students served as subjects. The experimental group was told how it performed on a number comparison task compared to all other subjects. The second group received no feedback. The group receiving feedback obtained a significantly higher relationship between self-set goals and the subject's actual performance. This group also set higher goals than did the group not receiving feedback.

Another study related to goal setting and feedback revealed that feedback contributed to improved performance whether or not a performance standard was set (Kazdin, 1974). However, the study also concluded that feedback may especially contribute to improved performance when a standard is provided for performance.

Kim and Hamner (1976) investigated the effect of evaluative and non-evaluative feedback and goal setting on performance and satisfaction in a large company. Four experimental groups received either extrinsic feedback plus supervisory set goals, intrinsic feedback plus self-generated goals, both intrinsic and extrinsic feedback plus self-generated goals, or goal instructions only. Extrinsic feedback is
feedback provided from an outside source; e.g., another person, an instrument or device, etc. Intrinsic feedback is information an individual receives from having performed a task. The information does not come from external sources but rather from one's own resources.

This extensive study revealed that goal setting alone will improve performance without feedback. However, goal setting plus feedback was a superior condition to goal setting alone. The highest level of performance was when intrinsic and extrinsic feedback were combined with goal setting which again indicates that feedback has a positive impact on performance.

This chapter has thus far demonstrated how feedback can change the behavior of individuals under a variety of circumstances. The following section will deal with the literature available concerning the implementation of feedback in vocational settings.

A study designed to assess the effects of videotape feedback and roleplaying in decision-making counseling was performed by Wallace, et al. (1975). They found that subjects who roleplayed decision-making counseling and viewed videotaped feedback of their interviews with clients were superior (as determined by judge's ratings), to counselors who were taught by the traditional approach (lectures and assigned readings), and counselors who were given only a filmed instructional model of a counselor engaged in decision-making counseling.

Two studies concluded that the presentation of feedback to employees in an industrial setting markedly improved their work-related performance (Catano, 1976; Koch, 1976). The first study
(Catano, 1976) decreased the number of errors made by employees when filling out data forms by publicly posting each form. The second study (Koch, 1976) provided daily feedback to work teams regarding the quality of their working performance. Marked improvements in product quality were associated with the feedback which each team received from the management regarding the quality of their performance.

The implementation of a feedback system increased the daily use of operant training methods by attendants in a state institution for retarded children (Panyan, Boozer, and Morris, 1970). Prior to the investigation, attendants were given a four-week course in the use of operant techniques. The study involved the staff and residents from four halls within the institution. During the time the baseline and feedback conditions were implemented, staff members from each hall were instructed to conduct a prescribed number of sessions to develop self-help skills in residents of the institution; e.g., washing and dressing. The staff were asked to maintain daily performance records for the residents involved in the training program. During the feedback conditions the percentage of requested sessions which were conducted by the staff were posted weekly in the halls. In addition, the halls were ranked with respect to the percentage of requested sessions conducted. The above figure was publicly posted as well. A multiple baseline design across subjects revealed marked improvements in the percentage of sessions conducted in each hall by the attendants.

An innovative study by O'Brien and Azrin (1970) significantly decreased the slouching behavior of individuals with a vibro-tactile
stimulation feedback device attached to the shoulder. This behavioral
device emits a mild stimulation to the shoulder every time the subject
participates in slouching behavior. A previous study of this nature
(Azrin, Jones, and Flye, 1968) used auditory feedback to decrease
stuttering rates of subjects. Auditory feedback was found to be less
effective than vibro-tactile stimulation in producing behavior changes
in the desired direction. The preceding two studies are only examples
of how feedback can be used as a therapeutic procedure for modifying a
wide spectrum of behaviors. Future research in this area will likely
result in a more thorough investigation of the potential feedback has
as a therapeutic procedure for modifying maladaptive behavior.

Numerous studies have proven effective in affecting positive
group behavior (Zajonc, 1962; Pryer and Bass, 1959; Maier and Hoffman,
1960). Group cohesiveness was positively affected in a study by
Mears (1976). Subjects were divided into one of five groups and were
instructed to complete a highly-repetitive task which involved group
cooperation and written communication only. Half of the group received
feedback at the end of each trial concerning the group's performance
and half of the groups received no feedback concerning their
performance. The findings in this study revealed that feedback
positively affected members feelings toward the group but did not
affect the attractiveness of the job.

The studies reviewed in the preceding section convincingly
demonstrate the importance of feedback for improving performance.
Different forms of feedback were presented which were found to improve the subject's performance on a variety of tasks including academic, motor, and discrimination.

Types of Feedback

This section will outline studies using various types of feedback (visual, auditory, and verbal) for affecting behavior change.

Goldstein and Rittenhouse (1954) used two tasks, each of which involved projecting light on a target. Feedback was presented in three forms: 1) a buzzer sounding continuously during trials when the subject was on target, 2) verbal statements at the conclusion of trials informing the subject of the proportion of time he was on target, and 3) tuition, which consisted of statements concerning the subject's specific error tendencies plus proportion of time on target. The researchers found that the introduction of the buzzer produced an immediate sharp rise in scores and that removal of the buzzer produced a sharp decline in scores. The verbal and tuition treatments produced scores which were more gradual than those related to the buzzer feedback.

A study by Battig (1954) investigated the effect of several different feedback cues on a lever positioning task. Sixty male subjects were divided into six groups by matching. All groups performed the standard task on the first and last of the ten sessions respectively designated as the pretest and posttest. The groups were differentiated by their tasks during the middle eight sessions. Each
subject performed 60 trials per session. The six groups were as follows: Group A (standard practice) performed the standard task throughout the training period. Group A' (no practice) did nothing during the middle eight sessions. Group B (verbal stimulus) was given verbal directions concerning where to move; e.g., six units left, four units forward. Group C (verbal response) described verbally how it would move the stick to reach the target position. Group D (kinetic response) attempted to move the stick to the correct position without any extrinsic cues. Group E (verbal stimulus-kinetic response) moved the stick in response to verbal descriptions given by the experimenter.

The results indicated that only the verbal stimulus group had consistently higher scores than the standard practice group. All other groups produced inferior scores when compared to the standard practice group. This suggests that visual cues are most important for this type of motor skill, and that the elimination of visual cues impairs skill acquisition.

Malina (1969) studied fifty-five high school males on an overarm throwing task. Each subject was assigned to one of five groups: 1) control (no practice), 2) speed information feedback only, 3) accuracy information feedback only, 4) speed-accuracy information feedback, and 5) no information feedback. Each subject received twelve trials which consisted of throwing a ball twenty times at a target located thirty feet away. An analysis of variance revealed marked differences between the five groups. Improvement or reduction in
performance was specific to the type and completeness of feedback provided. For example, accuracy scores were more affected by withholding accuracy than speed was by withholding speed. Both speed and accuracy improved under the practice condition in accordance with the respective type of feedback provided.

A dissertation by Park (1973) studied the effect of videotape feedback, verbal feedback, and verbal combines with videotaped feedback upon the psychomotor performance of ninety retarded adolescents. The task was envelope stuffing, and each subject was put into one of three groups: 1) videotape only, 2) verbal feedback only, and 3) videotape plus verbal feedback. The dependent variables were the ratings of performance skill for the first and last trial plus the number of envelopes completed in 90 minutes. The results showed that the verbal feedback group performed significantly better than the two other groups in ratings of skill performance. However, scores for the most practically significant dependent variable, number of envelopes stuffed, showed no difference between the three groups.

Another study compared the difference of 1) mental practice, 2) conventional feedback, 3) conventional videotaped feedback, and 4) videotaped feedback or perception and performance during the early learning of a gross motor skill (Whitehead, 1974). Each of the sixty female seventh-grade subjects were assigned to one of the four conditions. All subjects participated in an initial instructional phase which consisted of a videotape of a gross motor skill being performed correctly and sixteen practice trials of the skill (dive forward roll).
Following this the subject was allowed to analyze her performance. After each practice trial the subject was given thirty seconds of prescribed feedback. When all subjects had completed the instructional procedure, a panel of judges analyzed each subject's performance of the gross motor skill. Differences in performance between feedback treatment groups were not statistically significant, indicating that the implementation of all three feedback treatments did not have any differing effects on final skill performance.

McClintock and Van Avermaet (1975) performed another experiment to assess the effects of various forms of feedback on simple and complex tasks. The subjects were 225 male children in the second, fourth, and sixth grades. Within each age group, subjects were randomly assigned to one of three motivational conditions. Unlike other studies, the groups consisted of: 1) subject recording scores on sheets and placing scores on a blackboard so comparison with others was possible, 2) subject recorded his/her own score on a sheet, and 3) no recording of scores. The researchers concluded that recording scores on sheets combined with recording on the blackboard produced superior performance as compared to an individualistic orientation induced by self-recording. Likewise, self-recording produced superior performance over the no feedback condition.

Similar results were found by Van Houten and Van Houten (1977). These researchers analyzed the effectiveness of posting individual performance scores and team performance scores of a reading task in a special education classroom. The researchers found that superior
academic performance occurred with posting both individual and team scores compared to posting just team scores.

Two studies assessed the effects of positive and negative feedback on subsequent performance in an academic setting. Nelsen (1974) taught reading acquisition to sixty-four kindergarten children for eleven weeks. Then positive verbal feedback was given following correct responses, and negative verbal feedback was given following incorrect reading responses on phonics and sight recognition tasks. Negative verbal feedback for incorrect responses was found slightly more effective than positive feedback for improving reading skills. Similar results were found by Witte and Huntermark (1975) investigating the effect of feedback on short-term retention of ninth graders. Halfway through the retention task one half of the subjects were praised for their performance and one half were criticized for their performance. The findings of this study were similar to those found in Nelsen's study. Short-term retention increased for those subjects who were criticized following their performance but did not increase for those subjects receiving praise following their performance.

In a detailed study comparing cognitive feedback with outcome feedback, Lindell (1976) concluded that providing information about task characteristics (cognitive oriented feedback) leads to higher levels of achievement when compared to outcome feedback (feedback about performance without information about task characteristics).

Several studies have investigated quality of feedback as a factor in affecting behavior change. Various researchers have concluded from
their studies that the more precise feedback is, the better subsequent motor skill performance will be (Shapiro, 1977).

Gill (1975) investigated the effect of varying feedback precision levels on the performance of a motor task and concluded that feedback precision level did not effect actual performance. Contrary to other research concerning this topic, she found that extremely precise feedback had detrimental effects on skill performance. A similar study by McMahon (1973) investigated whether subjects who were given detailed feedback on their scores in an ability test would attain a higher grade point average and have higher test anxiety. Results indicated that the dependent variable, grade point average, yielded no significant difference between feedback and no feedback groups but test anxiety were higher for those subjects receiving feedback. The time difference between giving feedback to subjects and receiving a grade point average score drastically reduced the internal validity of the study.

From the studies reviewed, one is hard pressed to draw any conclusions concerning the superiority of one type of feedback over the others. In separate studies, visual, auditory, and verbal feedback were all found to be superior in improving performance when compared to each other. One study found no difference between the three types of feedback. The research reviewed in this section does, however, indicate that public posting of scores and self-recording is superior to self-recording alone. Two studies indicated that negative feedback is more effective in improving academic performance than positive
feedback. The studies relating to precision of feedback are again inconclusive. Further research concerning types of feedback for affecting positive behavior change, is needed before any major conclusions may be drawn.

The Effects of Delay of Feedback

This section will present research dealing with the effects of delaying feedback on subsequent performance. The effects of giving irregular feedback will also be discussed as will the effects of the type of activity during the post-feedback interval.

Early research efforts at determining whether delay is giving feedback following performance were conflicting.

Lavery (1964), in a study involving throwing magnetized pellets at a target over the shoulder, sought to determine whether delaying feedback to subjects would deter performance. Twenty male subjects, divided into two groups (immediate feedback and feedback given one trial later) were allowed eighty throws on ten consecutive days. Performance on the throwing task revealed that delaying feedback by one trial resulted in slower skill acquisition but better retention. The researchers also concluded that specific feedback during training results in further retention of the skill in the absence of feedback.

The results of the Lavery study were substantiated by Greenspoon and Foreman (1956). Greenspoon and Foreman postulated that since delay of reinforcement has been found to influence the rate of human verbal learning and rate of animal learning significantly, similar effects
may be demonstrated by delaying feedback in human motor learning situations.

Forty subjects divided randomly into five groups were required to trace a line three inches long when blindfolded. Feedback was given as "long" when over $3\frac{1}{4}$ inches and "short" when less than $2\frac{3}{4}$ inches and "right" when in between the two distances. Fifty trials were awarded each subject with a thirty second inter-trial interval. The control group received no information. The effect of the treatment was highly significant (p .001). The authors concluded that the results of the experiment demonstrated the efficiency of immediate feedback in the learning of a motor task. Learning does not occur when feedback is lacking.

Careful scrutiny of this study by this researcher brought forth serious reservations concerning the internal validity of this study. Subjects were required to keep their hand and arm free of the table after tracing. This procedure must have been quite tiring and certainly would cause one to question the methodological procedures used in this study.

This study has also been under heavy criticism by Bilodeau and Ryan (1960). Bilodeau and Ryan replicated the study by Greenspoon and Foreman allowing one half of the subjects to return their hands to their laps following each trial. The other half were required to keep their hand and arm off the table between trials as did Greenspoon and Foreman. Bilodeau and Ryan found that when subjects were allowed to rest their hands between trials, no difference in performance occurred when feedback was immediate or delayed.
Bilodeau and Bilodeau (1958) undertook five well controlled studies investigating delay of feedback on performance and concluded that delays by seconds, hour, day, and week produced no significant difference in lever-pulling and knob-turning tasks. The overall conclusion that must be drawn from the above studies is that strong evidence exists that performance will not be adversely effected if feedback is delayed before the onset of the next trial.

The following two studies are concerned with the effects of giving feedback on subsequent performance. Conclusions drawn were consistent.

An ingenious study by Bilodeau (1956) involved 336 men, each required to displace a force of twenty pounds using a lever arm. The task was to learn to make the lever, which the subject controlled with his arm, displace to a score corresponding to forty-five. Each subject could see a one hundred unit feedback display apparatus which pointed to the displacement score. The experimenter, however, was capable of unknowingly controlling the subject's score on the feedback display so as to change the true results. Groups for the experiment were differentiated by the number of trials over which feedback was delayed. Delays were 0, 1, 2, and 3 trials in experiment I and 0, 2, and 5 in experiment II. Bilodeau convincingly demonstrated that delay in giving accurate feedback increased the error tendency of the subjects relative to the 0 trial delay. As trial delay increased, errors in the lever displacement task were more prominent.

A more recent experiment assessed the effects of delayed irregular feedback on unskilled and skilled keying performance (Long, 1976).
Delayed, irregular feedback decreased the speed in which the keying task was done for both skilled and unskilled subjects. Skilled subjects, however, eliminated their errors after initial exposure to the delay which suggests a learning process had taken place for the skilled subjects but not for the unskilled ones. Long (1975) in a similar study, investigated the effects of increasing the length of time intervening between depressing a key and the activation of a printer mechanism. He found that as delay time was increased, key performance deteriorated as reflected by speed and accuracy. Furthermore, efficiency of performance was decreased by the delay to both visual and auditory feedback and output rate of the teletype. These results are in keeping with other studies investigating the effects of giving accurate feedback on motor performance.

Finally, Magill (1977) considered the effect of the length and the type of activity during the post-feedback interval on the acquisition of a serial positioning task. Post-feedback interval is the time between feedback administration and the next response. Three conditions, verbal tracking, and no activity served as the interpolated activities during the post-feedback interval. The two lengths of the post-feedback interval were 12 seconds and 60 seconds. Each of the 105 male subjects were given 20 trials. Interestingly, the study revealed that varying the length of the post-feedback interval did not effect the rate of acquisition of the task.

The studies outlined in this section force the research to draw three conclusions. First, performance will not be adversely affected
if feedback is given to a subject any time between trials; e.g., right after performance or just prior to the next performance. Second, irregular, inaccurate feedback adversely effects subsequent performance. Finally, varying the length of the post-feedback interval (the time between feedback administration and the next response) does not effect the rate of acquisition of a motor task.

The Application of Feedback in Sport and Physical Education Environments

For many years physical educators have been aware of the importance of feedback for improving athletic performance. Only recently, however, has the application of feedback been studied in a scientific and systematic fashion.

Athletes receive feedback from intrinsic and extrinsic sources. When a swimmer changes his/her underwater pull from a straight arm to a bent arm pull thereby increasing his/her speed, he/she is receiving intrinsic information about the proper mechanics of the arm pull. Likewise, when a diver smacks his/her front torso on the water after having completed a dive, the diver is receiving intrinsic feedback concerning the correctness of the entry. Videotape replay and coaches' comments are examples of extrinsic feedback sources given to an athlete following performance in an effort to improve subsequent attempts.

Numerous studies have demonstrated the effectiveness of videotape feedback for improving sport skill acquisition. Watkins (1963) used videotape replay as an aid to correcting baseball batting faults. Burkhard, et al. (1967) investigated the effect of film on the learning
of motor skills in karate. Thompson (1969) found that immediate external feedback through the use of a graph-check-sequence camera, facilitated the learning of golf skills. Videotape feedback of one's own performance was also found to improve the swimming performance of three to six-year-old emotionally disturbed children (Neufeld and Neufeld, 1972). DeBacy (1970) improved the accuracy of self-assessment of a golf swing by providing each subject with videotape replays of their performance.

A doctoral dissertation (Kraft, 1972) studied the effects of teacher feedback and videotape recording on bowling skills. Three treatment groups consisting of 1) teacher feedback only, 2) videotape recording with self-analysis, and 3) a combination of teacher feedback and videotape recording were compared. The results indicated a significant difference in the improvement of bowling skills, favoring the combination of teacher feedback and videotape recording. No difference existed between the teacher feedback and videotape self-analysis group.

Another study compared videotape feedback with a lecture-demonstration program of instruction on the learning of skill and form in target archery (Beverly, 1973). Three experimental groups were compared in this study. Group I received a standard lecture-demonstration program of instruction while Group II received the same program of instruction plus videotape replay of each shot every class session. Group III received the same treatment as Group II but videotape replay was provided every second class period. All three methods
of instruction significantly increased the level of skill and form in archery. Videotape feedback, however, was found superior to the lecture-demonstration in improving skill performance. No difference in skill existed between receiving videotape every class period as compared to every other class period. Videotape feedback of every class session, however, was superior to feedback given every other class session in improving form in archery.

James (1971) investigated the effect of videotape feedback compared to verbal feedback in learning beginning trampoline. One half of the 11-year-old male subjects received videotape feedback after practice on the trampoline and the other half of the subjects received verbal feedback after every skill attempt. Some superiority existed in skill performance of the group receiving videotape feedback over the group receiving verbal feedback.

Similarly, Lloyd (1969) sought to determine the effect of audio and visual feedback on learning ground strokes in tennis. This extensive study involved 138 college students and four experimental conditions. Subjects were pre- and post-tested using a backboard tennis test to assess their skill. Subjects in the first three groups received slow motion pictures of their performance, constructive criticism of their performance while viewing the film, and a film loop of a highly skilled tennis player hitting ground strokes. This "package" intervention was given once to each group but at different stages in the study (fifth, eighth, and eleventh weeks). The fourth group served as the control and did not receive feedback. The results of the study revealed that the slow-motion feedback given to each
subject at selected stages of the learning period did not contribute
to the learning of the gross motor skill. Judging a ground stroke
in tennis by bouncing a ball off a backboard is not specific to the
effectiveness of a stroke in a game situation. Another variable which
may have reduced the internal validity of the study was the one week
duration of time between being filmed and observing the film. A
previous section in this chapter has stressed the importance of
receiving feedback prior to the next trial if improvement in motor skill
performance is desired. Rigorous scientific standards need to be
maintained by persons doing research in sport and physical education.

Mitchell (1969) devised a study to assess the interaction of
augmented feedback upon the performance of a tennis serve. Three
dependent variables of speed, form, and accuracy were measured. The
augmented feedback group received 1) serve-by-serve evaluation of the
ratings given by each of the judges observing form, 2) a decision as
to whether the served ball had landed in the court area, and 3) if the
ball was judged fair, a report on the speed of the ball in miles per
hour. The non-augmented feedback group received no information about
their performance except what they could perceive on their own. Both
feedback groups were pre- and post-tested and an analysis of variance
was applied to the data. Significant differences between the non-
augmented and augmented conditions of feedback were computed. This
thorough study indicated that the augmented feedback group was able
to exhibit better form and superior accuracy when compared to the group
receiving no augmented feedback.
Zebas (1975) investigated the effects of monetary reward and feedback upon the performance of the standing broad jump of thirty high school girls. Each subjects were assigned at random to one of three groups: 1) videotape feedback, 2) one dollar monetary reward, and 3) no reward or feedback. Results indicated that neither feedback nor reward effected the distance jumped. The validity of the study is again suspect. The relatively few practice and experimental trials allotted to each subject may have hidden any effects the independent variables had on the subject's skill performance.

A recent study investigated two types of feedback in teaching swimming skills to handicapped children (Fueyo, et al., 1975). The researchers found that faster skill acquisition was associated with task-specific praise and corrections rather than non-task-specific praise. Task-specific praise may be defined as verbal praise given to an individual as a consequence of certain, predetermined behaviors. Non-task specific praise is given to an individual regardless of the emission of predetermined target behaviors.

McKenzie (1972) using a notice board as the discriminative stimulus, succeeded in eliminating several inappropriate behaviors exhibited by members of a competitive swim club. A large notice board was posted in the swim area listing four of the most common inappropriate behaviors exhibited by four of the team's swimmers. Each time the swimmers exhibited one of the four target inappropriate behaviors practice a check would go beside their names. The coach provided feedback to the subjects by verbally reinforcing all appropriate
behaviors and expressing disapproval when an undesirable behavior occurred. The experimental treatment effectively reduced the frequency of the four inappropriate behaviors.

The question arises as to whether the change in behavior was due to the reinforcing or informative properties of feedback. Skinner (1969) cautioned against using reinforcement and feedback interchangeably. Rushall and Siedentop (1972) dealt with the distinction in the following manner:

It is tempting to simply suggest that feedback is a secondary reinforcer. There is no doubt that feedback does act as a secondary reinforcer .... However, the two constructs - feedback and reinforcement - have developed from entirely different theoretical frameworks, and it would be a mistake at this point in time to argue that they are synonyms ... Current levels of investigation allow one to say no more than that events normally described as feedback also possess reinforcing qualities and events normally described as reinforcers also possess informational qualities. (p. 205)

Reinforcement, when given as a consequence of certain behavior(s) is informative to the receiver and will result in subsequent performance changes. All feedback, however, is not necessarily reinforcing. An individual who is shocked every time he/she stutters will, in all probability, decrease his/her rate of stuttering during future verbalizations. Feedback, therefore, can be an effective punisher as well as a reinforcer depending upon the type of feedback and the form in which it is presented. The strength of feedback as a reinforcer depends upon 1) the motivation the individual possesses to change his/her behavior, 2) the number of reinforcers feedback has been combined with, and 3) the strength of the reinforcers feedback has been combined with;
e.g., if parent approval is a powerful reinforcer for a child and it has been paired with sport skill improvement, then feedback provided to the child as a consequence of certain athletic behaviors will be a strong secondary reinforcer.

McKenzie and Rushall (1974) employed program boards as a means of increasing the working output of competitive swimmers during practice. The rationale behind this study was that self-recording of athletic performance may provide enough feedback to reinforce desirable practice behaviors. The program boards, located at the end of each lane, allowed the athlete to check off each set when complete. By checking off a task as it was completed, the athlete received immediate feedback. The implementation of the program boards elevated work output during practice an average of 27.1 percent.

Psychologists and educators have, for many years, been aware of the potential role modeling has in affecting behavior change. Anderson (1968) investigated the effects of a model performance and feedback in the acquisition of a golf swing. Sixty subjects were randomly assigned to one of five experimental groups which varied in the amounts of feedback given (minimum, medium, and maximum) and the presence or absence of a model performance. A golf performance test revealed that the group receiving maximum feedback (proprioceptive, visual, and auditory), produced significant gains over the group receiving minimum feedback in all dependent variables. The model performance failed to facilitate learning. This finding is contradictory to the majority of modeling studies which have found modeling an effective means of positively influencing behavior. The results lend support to the
importance of corrective feedback for facilitating improved performance in athletic skills.

Summary

The purpose of this chapter was to outline the research to date dealing with the topic of feedback.

Feedback has been demonstrated to be effective in improving the performance of a wide spectrum of individuals including teachers, students, exceptional children, institutional employees, parents, and athletes. The positive effects derived from the systematic implementation of feedback are possible in institutional settings, classroom environments, vocational settings, and athletic arenas.

The research does not indicate that one type of feedback (visual, auditory, or verbal) is superior to the others. Further research is needed in an effort to define which types of feedback are most effective in changing behavior under specific sets of circumstances.

The majority of research investigating the relationship between performance and delay of feedback have concluded that performance will not be adversely effected if feedback is given to a subject any time between trials. Irregular, inaccurate feedback however, effects subsequent performance adversely.

A noticeable lack of scientific investigation exists concerning the relationship between types of feedback; e.g., auditory, and visual, and their effect on athletic behaviors in specific sets of circumstances.
Augmented feedback given to athletes has been found effective in improving subsequent skill attempts. Research is unclear as to whether eventual removal of feedback will cause the previously improved behavior to deteriorate. Again, future research attempts need to be undertaken before this problem is resolved.

Throughout this chapter, studies have been outlined which pair feedback with other interventions; e.g., goal setting, modeling. All studies reviewed concluded that feedback can effectively combine with other treatments to change behavior in the desired direction.

Although physical educators and coaches have been aware of the importance of feedback for improving athletic performance, a noticeable lack of scientific research exists regarding the application of feedback in sport and physical education.

The research to date involving the application of feedback in sport environments has dealt largely with the use of videotape feedback as an effective method of improving athletic performance. Several studies demonstrated that the use of self-recording can effectively and efficiently improve the practice behaviors of athletes.

Endless possibilities still exist for researchers to uncover innovative ways feedback can effectively change the behavior of individuals in a variety of environments.
CHAPTER III

METHODS AND PROCEDURES

Chapter III will be divided into eight categories: 1) subjects and setting, 2) materials, 3) stages of the study, 4) the observation code, 5) research design and analysis of the data, 6) reactivity, 7) reliability, and 8) validity.

Subjects and Settings

The subjects were nine competitive athletes from three separate sports. The subjects included three male intercollegiate wrestlers from The Ohio State University Varsity Team, three female volleyball players from The Ohio State University Varsity Team, and three female gymnasts who are members of the Universal Gymnasts Team of Columbus, Ohio. The wrestlers and volleyball players were observed in their practice gymnasiums at The Ohio State University campus. The gymnasts were observed in their practice gymnasium located approximately five miles from the campus.

Volleyball

Three members of The Ohio State Women's Varsity Volleyball team served as subjects. Practices were scheduled five days a week for two hours each session. Three of the five practices were devoted to
conditioning, which involved outdoor running. Data were collected during the remaining two practice sessions each week which were devoted to the improvement of volleyball skills. While data were being collected, the team's regular varsity competitive season had terminated. Practices were held with the purpose of maintaining and improving volleyball skills and conditioning in preparation for the following year. During the last three weeks of data collection, the subjects, under the direction of a new coach (a member of the Ohio State Men's Varsity Team) were preparing for national competition which would be held immediately following the completion of data collection.

The team's record for the 1978-79 competitive season was thirty-four wins and ten losses. The women ranked second in the Big 10 conference (ten universities are represented in this athletic conference), second in the region among other universities, and tenth in the nation when compared to all other colleges and universities.

In her sixth season as coach of the women's volleyball team, Sue Collins has led her players to two Big 10 championships and three Ohio intercollegiate titles. Sue has completed her master's degree in physical education and has stayed active throughout her university years as a player on the United States Volleyball Association circuit.

Subject 1

This subject has been a member of the Canadian Junior National Team and the Canadian Junior World Championship Team for the last four years. She also has experienced success in track and field having
become the 1972 Ontario Provincial Champion in relay running, the triple jump, and the long jump. Subject 1's coach says she "is an athlete that comes along only a few times in a coach's career". She is described by her coach as being determined, calm, confident and a leader during competition.

Subject 2

This athlete played volleyball for two years in high school. She has been a member of the Ohio State Team for three years and was chosen as a member of the 1978 Junior Olympic Team which gave her the opportunity to compete nationally. Her coach says she is a "top athlete on the college scene." Despite the few years this individual has had as an athletic competitor (three), she has developed her athletic skills very quickly. Her coach includes that "when she does not perform perfectly she displays extreme emotion ... which disrupts her teammates."

Subject 3

Subject 3 played high school volleyball for three years in California. She has been a member of the Ohio State team for the past two seasons. In addition to volleyball, this subject has been a member of the world championship kayaking team. Subject 3's coach describes her as being a reliable, confident performer who sets high goals for herself. Although she puts forth a good effort in competition, her performance in competition as described by her coach is inconsistent.
Wrestling

The second sporting environment studied was the Ohio State Men's Varsity Wrestling Team. While data were being collected the subjects had completed the majority of their competitive season and were preparing for the upcoming year. Practices were held twice weekly for a two-hour duration. Data were collected until the final practice of the year, which was held during exam week of spring quarter.

The wrestling team did not have a winning 1978-79 season. They ranked eighth in the Big 10 athletic conference and won ten meets and lost ten meets.

Chris Ford is in his third year as head wrestling coach at Ohio State and has been coaching wrestling for over twenty years. After a highly successful coaching career at the high school level in Ohio, Chris moved to Ashland College in Ohio to begin eleven years as head wrestling coach.

Subject 1

This wrestler began wrestling in the second grade in elementary school and has continued for twelve consecutive years. He has wrestled on the Ohio State team for the past two years and is ranked in the top five in the state in his weight class. This subject's coach describes him as possessing "superior natural abilities" and includes that he is "probably the most gifted wrestler on the team." According to his coach, this subject's major weaknesses are not being able to utilize his abilities against his opponents, his tendency to be lazy in practice, and not setting his goals high enough.
Subject 2

Subject 2 has been involved in wrestling for eight years; five years in junior and senior high school and three years on the Ohio State team. He is ranked in the top ten percent in the country in his weight class. His coach, when describing the subject, emphasized the need for this individual to improve his concentration during a match and increase his strength.

Subject 3

This athlete wrestled four years in high school and has wrestled the past three years on the Ohio State team. He has competed in the AAU wrestling championship and placed seventh in his weight class. His coach describes this individual as "very motivated and intense." He has good practice behaviors and utilizes his practice time well. This subject's major asset is his physical strength and speed. His major weaknesses, according to his coach, are lack of confidence and frustration in his performance, which often results in a match that is lost in the last thirty seconds.

Gymnastics

The final setting observed during this study was Universal Gymnasts from Columbus, Ohio. This competitive gymnastics club was formed in 1975 and has developed Class I and II teams which compete throughout Ohio and its neighbouring states. The Class II team were the state champions in 1979. Universal Gymnasts has five coaches, each of whom have had experience as competitors in gymnastics and hold bachelor's degrees from The Ohio State University.
Practices are held five days a week, three hours each session at two separate locations in Columbus. Data were collected twice a week at their gymnasium located five miles north of campus.

**Subject 1**

This ten-year-old gymnast began her gymnastics career two years ago. She was a member of the 1979 Class II State Championship team and she placed eighth in the floor exercise event in the state in her age group. The head coach at Universal Gymnasts says she is "quite content to be a good team person who contributes but is not particularly interested in individual glory." This young competitor never learns new skills easily and is somewhat hesitant when trying more difficult moves. Her coach feels her potential lies in the area of dance where she consistently demonstrates excellent form and expressiveness.

**Subject 2**

This twelve-year-old gymnast has been a competitor in gymnastics for one year. She was a member of the Class II State Championship team and placed second in the compulsory floor exercise event and was sixth all-round in both compulsory and optional events. Her coach describes her as "a coach's dream" and adds she has demonstrated superior athletic ability and "puts maximum effort into everything."

**Subject 3**

This subject has been a member of the Universal Gymnasts Team for two years. She was a member of the Class II State Championship
team and individually she placed eighth on floor exercise and
tenth all-round. This nine-year-old gymnast is now a member of
the Class I team and has not competed at this level of competition
yet. The head coach at Universal Gymnasts comments that she is
above average in athletic ability and works hard during practice
the majority of the time. She was one of the top Class II gymnasts
during the 1978-79 season and was regarded by the coaches as a strong
asset to the team.

Materials

Numerous Ohio State Athlete Observation Coding Sheets (see
Appendix B) were used to systematically record data. Each coder was
supplied with an audio cassette deck with a pre-recorded audio tape
with instructions regarding when to observe and when to record.
Earjacks were used by each coder to remove the possibility of the
tape becoming a distraction to either the athletes or the coach.
During reliability checks a double earjack was used so both
observers were observing and recording at the same time.

Subject Selection

Three sporting environments were selected for this study on the
basis of their suitability. Environments where traditionally a large
part of the athlete's practice time is spent emitting behaviors low
in productivity were preferred. This researcher met with the head
coach of each of the three teams chosen and explained the purpose and
procedures involved in the study. Each coach consented to allow four
of their athletes to participate in the study.
Coaches were asked to choose the subjects on the basis of their availability, and suitability for the study. Subjects were informed that they would be observed during practice, but the exact nature of the observations were withheld.

**Coder Selection and Training**

Coder Selection and Training

Coders were selected for this study on the basis of their interest, availability, and suitability for the study. The coders selected were all graduate students in The School of Health, Physical Education, and Recreation of The Ohio State University. Some of the coders had previous experience with observation instruments of the nature used in this study. Coders were asked to submit their schedules so suitable coding times could be arranged.

Prior to actual coding, observers learned to use the observation instrument. At least four, one-half hour training sessions were used to familiarize observers with the system. By the end of the training session, observers were capable of defining each descriptor precisely. Before actual data collection, coders were required to code the behaviors of athletes practicing in at least two of the three sporting environments. Two observers coded the same environment and were located far enough apart so as not to influence each other's decisions. After each training session, observers compared their results and discussed discrepancies in data to clarify definitions. An overall reliability of eighty-five percent was obtained by each coder at least two consecutive sessions before any actual coding occurred.
Coders were also required to practice giving written and verbal feedback to the researcher following data collection in an acceptable fashion according to the procedures outlined in this chapter. Coders received practice in tabulating percentages for productive and non-productive behavior groups before the intervention was implemented.

Baseline

Each subject was observed using the observation code until a stable baseline was achieved. A stable baseline was obtained when a noticeably consistent trend occurred in an athlete's practice behaviors. No feedback was provided during the baseline stage. The subjects were not told of the exact purpose of the study but were informed that they were involved in a study designed to assess a new instrument for use in athletics. During the baseline period, coaches were asked to fill out one Coach's Evaluation Form (see Appendix F) for each subject. This form provided the researcher with information regarding the athlete's strengths and weaknesses in practice and competition in their particular sport.

Each subject was also asked to fill out an Athlete Information Sheet (see Appendix G). Information obtained on this sheet from each athlete provided the researcher with background information regarding the athlete's participation in his/her sport. Information obtained in both the Coach's Evaluation Form and the Athlete Information Sheet were used to describe each subject in the Subjects and Setting section of Chapter III.
Prior to data collection each subject was asked to sign a consent form (see Appendix G) which gave the researcher permission to apply the intervention to the consenting subjects. Parents of the gymnasts were informed of the nature of the study and were asked to sign the consent form as representatives of their children’s interests.

**Intervention**

After the subject’s behaviors had been observed and recorded a sufficient time to show a trend, the intervention was employed. The intervention consisted of giving each athlete feedback concerning how he/she utilized his/her practice time.

In addition to completing the coding sheet every observation session, coders were required to fill out The Descriptors Sheet (see Appendix D). This sheet allows the observer to note any unusual circumstances which may have occurred while data were being recorded and thereby aids the researcher in uncovering explanations for trends in the data.

Feedback was given to the athlete three ways to aid comprehension. The intervention consisted of: 1) feedback presented in percentages; e.g., fifteen percent of the athlete’s practice time was spent in specific practice, 2) feedback was given in the form of fractions; e.g., you spent one third of your practice time in inactivity, and 3) examples of productive and non-productive behaviors which they emitted during the practice session.

To simplify the feedback given to each athlete concerning how he/she utilized his/her practice time, behaviors were grouped according to their level of productivity. Group 1 behaviors consisted of those
behaviors thought by the researcher to be highly productive and which when emitted by the athlete during practice have a high probability of improving subsequent performance. Productive behaviors in Group 1 included: specific practice, related practice, and demonstrating. Group 2 consisted of behaviors which have no or perhaps a detrimental effect on improving subsequent athletic performance. These non-productive behaviors included: unrelated activity, inappropriate activity, unrelated interaction, exclusion, injury, and inactivity. A third group of behaviors classified as "Interaction" totalled the percentage of time during practice the athlete was communicating with others (coaches and athletes) concerning matters related to the sport.

All other behaviors not included in the above three groups were categorized as concurrent. These behaviors usually have a moderate to low effect on changing behavior. The effects of the intervention (if any) on the concurrent behaviors will be discussed in Chapter V of this text.

Feedback given to the athlete was given in both the written and verbal mode of communication. Coders were requested to verbally discuss the findings from each observation session (regarding percent occurrence of behaviors in each group discussed above) and provide feedback on The Athlete Feedback Sheet (see Appendix E) which the athlete can take home and reexamine. Information supplied on The Athlete Feedback Sheet includes percentages, fractions, and examples of productive
and non-productive behaviors the athlete emitted during the observed practice session.

The intervention phase continued in each setting until a definite trend in the behavior of each subject was evident.

The original number of subjects in each of the three sports chosen for the study was four. During data collection, one subject from each sport environment was omitted from the study. One volleyball player discontinued school, one wrestler caught a facial disease which disabled him from practicing, and one gymnast sprained her ankle.

Subject mortality is a common occurrence in research and in this particular circumstance did not pose a serious threat to the internal or external validity of the study.

Data were collected for both wrestlers and volleyball players in the intervention phase until the end of the school year. This reduced the number of data collection sessions, which were possible for both sports, as indicated in Figures 1 and 2 on pages seventy-three and seventy-four of this text. Ideally, data should have been collected for the same duration of time as the gymnasts to enhance the internal validity of the study.

The Observation Code

The Ohio State Athlete Observation Code (OSAOC) is divided into three major categories: 1) activity focus, 2) behavior, and 3) interaction. The activity focus category describes what activity the groups the athlete is a member of is involved in at a particular time in the practice session; e.g., the athletes are involved in a controlled scrimmage. The
behavior category allows an observer to code the athlete's primary behavior during a practice time interval; e.g., responding. The interaction category indicates the number of people involved in an interaction. Taken together the three descriptors combine to give a picture of the general and specific behaviors occurring in the environment at a particular time.

Interval recording is used for the CSAOC. Interval recording involves coding the principle behavior which occurs during a five-second observation period. Each interval is composed of an observation period followed by a five-second recording period. There are one hundred intervals on each recording sheet.

During the recording period, the observer records his/her observations in each of the three major categories for the instrument he/she is using. A pre-recorded audio-tape with instructions regarding when to observe and when to record is used to cue the observer. For example, "observe interval one (five-second pause), record interval one (five-second pause), observe interval two (five-second pause), record interval two (five-second pause)" etc. Use of such a tape increases reliability between observers by insuring that they are observing the same events as they record.

All behaviors in the CSAOC are coded on the basis of their duration (the longest occurring behavior in an interval is recorded as subjectively judged by the observer).

While coding, observers should station themselves so verbalizations made by the participants in practice are audible. If an observer must come close to the practice area to hear what the participants are saying,
and thereby becomes a distractor to the athletes, at least two sessions for subject adaptation should be allowed before actual data collection begins.

Listed below are the activity focus descriptors which were observed in the natural setting during this study:

1. **General Practice**  
Athletes are practicing various skills on their own or with other athletes; e.g., a gymnast working on the uneven bars, two wrestlers wrestling, volleyball players working with others or by themselves on some aspect of the game.

2. **Controlled Scrimmage**  
Athletes are divided into two teams for the purpose of practicing strategy and game plays that will occur in competition. Controlled scrimmage does not replicate a game situation; e.g., volleyball players are practicing a formation with no opposition on the other side of the net, wrestling with a partner with the clock set for a specific time period.

3. **Game Scrimmage**  
Athletes participate in a scrimmage which replicates an actual game situation.

4. **Conditioning Activity**  
Athletes participate in activity with the express purpose of improving respiratory and cardiovascular endurance or improving muscle tone and flexibility; e.g., running, skipping, doing push-ups, stretching, doing calisthenics.

5. **Skill Drill**  
Athletes practice a drill with the specific purpose of improving a skill or a variety of skills; e.g., blocking drill in volleyball.

6. **Instruction**  
The coach is instructing his/her athletes concerning a topic directly related to the subject matter; e.g., "Before vaulting you must plant both feet firmly on the floor" or "we could have improved our blocking last game."

7. **Management**  
Coaches and athletes are involved in an activity that is not directly related to the subject matter; e.g., taking roll call, calling players together, getting equipment ready, taking a team picture.

8. **Rest**  
Athletes are not involved in any form of body movement.
Listed below are the athlete behaviors which were observed in the natural setting during this study:

1. **Specific Practice**
   The athletes are practicing a skill which **he/she has been instructed to do by the coach**; e.g., practicing aerial cartwheels, wrestling with a partner.

2. **Related Practice**
   The athletes are performing a physical activity which is directly related to the subject matter; e.g., doing cartwheels on the mat, setting a volleyball in the air.

3. **Unrelated Activity**
   The athlete is performing a physical activity which is unrelated to the subject matter; e.g., doing handstands in wrestling practice, doing lay-up shots in volleyball practice.

4. **Inactivity**
   The athlete is waiting for his/her turn to perform or is waiting in line to use equipment.

5. **Inappropriate Activity**
   The athlete behaves in such a way as to interfere with the functioning of another athlete; e.g., taking someone's volleyball they had been practicing with.

6. **Responding**
   The athlete is answering questions from the coach or other athletes which are directly related to the subject matter.

7. **Questioning**
   The athlete is questioning his/her coach or peers concerning a topic directly related to the subject matter.

8. **Interaction Athlete or Coach**
   **Positive**
   The athlete interacts verbally with other athletes by offering positive comments about matters directly related to the activity; e.g., "You did that hip circle very well" or "I like the way you spotted me."

   **Negative**
   The athlete interacts verbally with another athlete by giving negative, sarcastic comments about matters directly related to the activity; e.g., "Your vault was the worst I've ever see" or "I don't think you know what you're talking about."
8. continued

Neutral
Comments made by the athlete to another athlete or coach which are neither positive nor negative but which relate directly to the activity; e.g., "These warm-ups will be great during competition."

9. Unrelated Interaction
The athlete converses with other individuals about subjects which are not related to the activity; e.g., talking about a date the previous night, asking mother what time it is.

10. Instruction
The athlete tells another athlete to do something directly related to the subject matter; e.g., "go get enough hand grips", "keep pace with me", or "don't bend your knees when you get in that position."

11. Attending
The athlete listens or pays attention to what the coach or other athletes are doing or saying. Attention is directed toward some activity directly related to the subject matter.

12. Injury
The athlete is injured or hurt while in the athletic environment which results in inactivity.

13. Exclusion
The athlete leaves the practice area prematurely; e.g., getting a drink of water, answering the phone, etc.

14. Warming Up/Cooling Down
The athlete is either preparing his/her body for the practice ahead by performing various calisthenics and warm-up exercises or is reducing physical activity because practice will soon be terminated.

15. Maintenance
The athlete is arranging the environment for practice; e.g., setting up equipment, running for volleyballs, adjusting the height of the uneven bars.

16. Resting
The athlete is not involved in any physical activity due to fatigue; e.g., sitting on the floor after having wrestled for three minutes.
17. Demonstrating
The athlete is performing a skill while other athletes or the coach is watching with the purpose of showing how the skill should be done or pointing out something specific about the skill.

Research Design and Analysis of Data

Research Design

Three replications of a multiple baseline design across settings were implemented for this study. In the multiple baseline design across settings "data are collected for a target, behavior for one or more subjects across different circumstances or situations" (Kazdin, 1973, p. 521).

Multiple baseline designs first appeared in the literature in 1968 (Baer, Wolf, and Risley, 1968) and have since gained popularity in behavioral research:

In the multiple-baseline technique, a number of responses are identified and measured over time to provide baselines against which changes can be evaluated. With these baselines established, the experimenter then applies an experimental variable to one of the behaviors, produces a change in it, and perhaps notes little or no change in other baselines. (Baer, Wolf, Risley, 1968, p. 94)

The experimenter then applies the same treatment to the second behavior (setting) while the third behavior (setting) continues in the baseline condition. Subsequently, the third and final setting receives the intervention which continues until a consistent trend in behavior is noted.
A multiple baseline design may be implemented in three ways: across behaviors, across subjects, or across settings. For this study a multiple baseline design across settings was chosen.

Casuality (any changes which occurred were due to the intervention and not to extraneous variables) is demonstrated when behavior change occurs after the implementation of the intervention while the rates of the untreated behaviors remain at baseline levels.

Analysis of Data

As data were being collected percentage scores for the occurrence of each behavior during each observation session were tabulated. This was accomplished by counting the number of intervals in which a specific behavior was recorded in one observation session. The total frequency for each behavior was divided by the total number of intervals for each session for each subject. A percentage of occurrence was recorded on the Data Summary Sheet (see Appendix J). Percentage scores for each subject for productive and non-productive behavior groups were graphed separately.

After the data collection was completed according to the multiple baseline design, the data were evaluated with the purpose of arriving at some conclusions regarding the effects of the feedback intervention upon the subject's practice behaviors. Data were evaluated according to their practical significance for the athlete. Graphs and appropriate tables were used to show any behavior changes which may have occurred.
Reactivity

Reactivity is the interference of the observer upon the behavior being observed. Athletes who know they are being observed may act differently in practice when compared to their normal practice behaviors. Numerous precautions were taken to assure that reactivity did not influence the results in any way. First, coders were instructed to code as inconspicuously as possible. Several "trial runs" of data collection were allotted to let the athletes adapt to the presence of the coders before actual data collection began.

Reliability

When using any observational system it is important to assess whether the observations that were recorded were really representative of what actually occurred. Inter-observer reliability is one way of establishing agreement that what was coded actually did occur. Inter-observer reliability is defined as the degree to which two independent observers agree on the occurrence or the non-occurrence of operationally defined behaviors.

Three types of reliability will be assessed for the OSACC. The first measure derives an overall percentage of reliability for each session. The second reliability calculation focuses on the percent agreement of the descriptors in the activity focus and behavior categories. The following formula is used to calculate the above two reliability scores:

\[
\text{Percent} = \frac{\text{number of agreements}}{\text{number of agreements} + \text{number of disagreements}} \times 100
\]
A third calculation, the occurrence and non-occurrence reliability scores give an accurate estimate of reliability for behaviors which occur in high and low frequency. If the reliability percentages are high for the occurrence and non-occurrence calculation then the probability that the data are indeed reliable are increased dramatically.

Occurrence scores are calculated by counting the number of intervals the observers agree upon the presence of a designated behavior.

The following formula is used to calculate the occurrence reliability score:

\[
\text{Occurrence reliability} = \frac{\text{number of intervals on which both observers agreed to occurrence}}{\text{number of intervals on which at least one observer scored occurrence}}
\]

This number is then converted into a percentage. Likewise, the non-occurrence reliability figure estimates the percentage of time the observers agree upon the absence of a specific behavior.

The following formula is used to calculate the non-occurrence reliability score:

\[
\text{Non-occurrence reliability} = \frac{\text{number of intervals on which both observers agreed to non-occurrence}}{\text{number of intervals on which at least one observer scored non-occurrence}}
\]

Occurrence and non-occurrence reliability figures are rigid estimates of the accuracy of the data, particularly for behaviors occurring in high and low frequency.
Validity

An important consideration when using an instrument in experimental research is the validity of the instrument. Before using the Ohio State Athlete Observation Code it was important to insure that the instrument was indeed valid. Validity refers to the extent to which the instrument measures what it was intended to measure. Kerlinger (p. 457) used the question "Are we measuring what we think we are measuring?" to best explain this experimental concept.

Validity may be assessed one of three ways: 1) content validity, 2) criterion-related validity, and 3) construct validity. For the purpose of this study, content validity was used. Content validity involves asking colleagues to evaluate the content of the test to evaluate whether the test is measuring what it was designed to measure. Therefore, prior to its utilization, the OSACC was given to three of the researcher's colleagues with the express purpose of answering the above question.

This method of assessing validity is basically judgmental. Each component of the instrument was studied for its relevance and representativeness to the totality of the instrument.
CHAPTER IV

ANALYSIS AND DISCUSSION OF THE DATA

This chapter represents the findings of the study or the effects the intervention had upon the practice behaviors of the subjects. The first section of the chapter will deal with reliability and the latter section will cover the findings of the study.

Reliability

To assure that the results obtained were truly indicative of what occurred in each environment, several inter-observer reliability checks were performed throughout the data collection period of this study. Each observer participated in at least two or more reliability checks.

When two observers record the presence of the same behavior, then agreement is achieved. Disagreement occurs when two observers record a different behavior in an interval on the OSACC. This method is referred to as interval-by-interval reliability and is used in the majority of studies using interval recording.

Three factors influence the degree to which the data are reliable. First, the number of behaviors in the observation instrument influence reliability. The larger the number of behaviors, the greater the possibility the observers will differ in the behavior they code in each interval. A second factor which influences reliability scores is
observer training. Before actual data collection, each observer was required to code with the researcher and achieve an overall reliability of eighty-five percent or above. A final factor influencing reliability is the degree of frequency of the behavior being recorded. The larger the frequency, the more likely the reliability percentage will be high.

Reliability scores were tabulated in a variety of ways to assure accuracy by the observers while coding with the OSACC.

An overall reliability percentage for the session was first calculated. Refer to Chapter III for specifics regarding the tabulation of this figure. Percent reliability for each of the descriptors in the activity focus and behavior category was then tabulated using the same formula. Refer to Tables 1 and 2 for the above-mentioned reliability scores.

Table 3 summarizes reliability scores for each behavior including the mean percent and the lowest and highest percent obtained for each behavior.

Information contained in Tables 4 and 5 includes the reliability percentages for the occurrence and non-occurrence of five randomly selected behaviors from four reliability checks.

Reliability calculations would suggest that the results were indicative of what occurred in each environment.

Overall percentages for each of the fourteen reliability checks were all over the eighty-five percent criterion. Reliability percentages for each of the seventeen behaviors were generally quite acceptable. One behavior, warming-up/cooling down, scored a fifty percent mean.
Table 1
Percentage Scores for Reliability Checks - Overall and by Behaviors

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<th>IA</th>
<th>R</th>
<th>Q</th>
<th>LS</th>
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<th>I</th>
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<td></td>
<td>100</td>
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Table 2

Percent Reliability Scores For the Activity Focus Category

<table>
<thead>
<tr>
<th>Activity Focus Categories</th>
<th>General Practice</th>
<th>Management Drill</th>
<th>Skill Instruction</th>
<th>Controlled Rest Scrimmage</th>
<th>Mean per Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>7</td>
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</tr>
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<tr>
<td>14</td>
<td>98</td>
<td></td>
<td>50</td>
<td></td>
<td>74</td>
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</tbody>
</table>

Mean for each Behavior:

- General Practice: 95.8
- Management Drill: 76.6
- Skill Instruction: 99.6
- Controlled Rest Scrimmage: 64.4
- Overall: 79.1
- Mean: 98.1
- All Categories: 86.2
### Table 3
Summary of Reliability Percentages by Behaviors

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Mean for all Sessions</th>
<th>Lowest Percent</th>
<th>Highest Percent</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific Practice</td>
<td>92.9</td>
<td>83.3</td>
<td>100</td>
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<tr>
<td>Related Practice</td>
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<td>62.5</td>
<td>100</td>
<td>37.5</td>
</tr>
<tr>
<td>Unrelated Activity</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Inactivity</td>
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<td>75</td>
<td>100</td>
<td>25</td>
</tr>
<tr>
<td>Inappropriate Activity</td>
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<td>50</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>Responding</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Questioning</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Instruction</td>
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<td>0</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Unrelated Interaction</td>
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<td>Interaction</td>
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<td>100</td>
<td>50</td>
</tr>
<tr>
<td>Attending</td>
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<td>100</td>
<td>50</td>
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<td>Injury</td>
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<tr>
<td>Exclusion</td>
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<td>100</td>
<td>50</td>
</tr>
<tr>
<td>Warming-up/ Cooling down</td>
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<td>50</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>Maintenance</td>
<td>83.3</td>
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<td>50</td>
</tr>
<tr>
<td>Testing</td>
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<td>83.3</td>
<td>26.2</td>
</tr>
<tr>
<td>Demonstrating</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

*indicates a frequency occurrence of zero.
Table 4

Percent Occurrence Reliability Scores for Five Behaviors

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Session Number</th>
<th></th>
<th></th>
<th></th>
<th>Mean</th>
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<tbody>
<tr>
<td>Specific Practice</td>
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<td>4</td>
<td>Mean</td>
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<tr>
<td></td>
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<td>97.7</td>
<td>92.3</td>
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<td>93.1</td>
</tr>
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<td>66.6</td>
<td>86</td>
<td>77.7</td>
</tr>
<tr>
<td>Inactivity</td>
<td>96.4</td>
<td>93.8</td>
<td>88</td>
<td>80</td>
<td>89.5</td>
</tr>
<tr>
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<td>50</td>
<td>50</td>
<td>62.5</td>
<td>65.6</td>
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<td>Maintenance</td>
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<td>89.4</td>
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<td>77.7</td>
<td>86.2</td>
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Table 5

Percent Non-Occurrence Reliability Scores for Five Behaviors

<table>
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<th>Session Number</th>
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<th></th>
<th>Mean</th>
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</thead>
<tbody>
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<td>3</td>
<td>4</td>
<td>Mean</td>
</tr>
<tr>
<td></td>
<td>98</td>
<td>98</td>
<td>97</td>
<td>95.5</td>
<td>97.1</td>
</tr>
<tr>
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<td>98.9</td>
<td>90.3</td>
<td>96.5</td>
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<tr>
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<td>96.8</td>
<td>99.4</td>
<td>95.8</td>
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<tr>
<td>Interaction</td>
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<td>95.4</td>
<td>97.9</td>
<td>96.7</td>
<td>96.9</td>
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<tr>
<td>Maintenance</td>
<td>97.8</td>
<td>97.5</td>
<td>100</td>
<td>98.9</td>
<td>98.5</td>
</tr>
</tbody>
</table>
The reason for this low figure will be discussed later in this chapter. Reliability values for the activity focus category indicated that the recordings made in this category of the OSACC were reliable.

The final reliability tabulations made were the occurrence, non-occurrence percentages. Reliability scores for this stringent estimation of reliability ranged from eighty-one to ninety-five percent for five randomly selected behaviors. Values obtained from both reliability tabulations indicate that the data presented in this chapter are reliable and indicative of what occurred during observation sessions in each environment (Table 6).

Table 6

<table>
<thead>
<tr>
<th>Specific Practice</th>
<th>Related Practice</th>
<th>Inactivity</th>
<th>Interaction</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Percent</td>
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<tr>
<td>95.1</td>
<td>87.1</td>
<td>92.6</td>
<td>81.2</td>
<td>92.3</td>
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</table>
Discussion of Reliability Scores

The majority of behavior scores were quite acceptable with the exception of two reliability percentages of zero. These figures were a result of one observer recording the presence of the behavior one time and the other observer not recording its presence at all. Likewise, the two reliability percentages of fifty found in the interaction and attending behaviors were a result of a low frequency occurrence of the behavior (one observer recorded the occurrence of the behavior twice and the other recorded its presence once).

The second table presenting reliability scores summarizes values tabulated for the activity focus category. The higher percentages were due to the decreased number of descriptors in this category (eight) and the high degree to which definitions can be differentiated and correctly coded. Reliability scores in the tenth and eleventh sessions were undesirably low because in the tenth and eleventh sessions one observer coded "General Practice" at the beginning of the session and failed to continue coding in the Activity Focus category for the remainder of the session. These unacceptably low figures were a result of forgetting to code rather than observer drift.

Values summarized in Table 3 indicate that the reliability figures for each behavior were quite acceptable. Again, the mean reliability percentage of fifty for the warming-up/cooling-down behavior was a direct result of a low frequency occurrence for that behavior.
Data found in Tables 4 and 5 suggest that the data obtained were indeed indicative of what occurred in each environment. The higher reliability percentages for the non-occurrence scores are a result of the high probability that one of the other sixteen behaviors was recorded in each interval.

Analysis and Discussion of Data

Analysis of Data

An analysis of the data revealed that two environments showed behavior change in the desired direction after intervention (see Figures 1 and 2). Both wrestlers and gymnasts showed significant increases in their occurrence of productive practice behaviors following intervention. Likewise, both groups significantly reduced their frequency of non-productive practice behaviors following intervention. See Tables 7 and 8 for a summary of productive and non-productive behavior occurrence before and following intervention.

The results for the wrestlers and gymnasts did not, however, concur with those found for the volleyball players. The practice behaviors of the volleyball players did not change following intervention. The mean amount of practice time spent emitting productive behaviors decreased slightly following intervention (see Figure 3). Likewise, the mean percentage for non-productive behaviors increased, again only slightly, following intervention. Subject 3, however, consistently decreased the non-productive behavior score each trial following intervention (see Figure 3).
Figure 1. Mean Percentages and Ranges for Productive Athlete Behaviors in Three Environments
Figure 2. Mean Percentages and Ranges for Non-Productive Athlete Behaviors in Three Environments
Figure 3. Percentage of Productive and Non-Productive Behaviors of Individual Volleyball Players
The intervention had no effect on the frequency of the interaction behavior for either the volleyball players or wrestlers following intervention, the gymnasts increased their interaction percentage but this increase was only 3.8 percent.

The concurrent behavior percentages for both wrestlers and gymnasts decreased significantly following intervention. A change in behavior for the concurrent behavior group did not occur for the volleyball players following intervention.

Discussion

The absence of positive behavior change following intervention for the volleyball players may have been due to a number of factors. The volleyball team performed its practice in a coach-centered environment. Athletes were consistently instructed to perform certain drills which involved large amounts of time performing maintenance behaviors (chasing volleyballs) and inactive behaviors (waiting in line for a turn). Many of these drills involved only two players working at one time, while the other players retrieved volleyballs or waited in line for their turn to perform.

Another factor which may have had some effect on the results was the time of data collection. Data for this study were collected after the volleyball team had completed its regular season schedule. Motivation to practice and to improve skills was low. Neither the coach nor the players seemed particularly anxious to improve old skills or learn new ones. Had the data been collected during the regular
### Table 7

Percent Scores and Means for Productive Behavior of Subjects During Baseline and Intervention

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Volleyball Players</th>
<th>Wrestlers</th>
<th>Gymnasts</th>
</tr>
</thead>
<tbody>
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<td><strong>Baseline</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1</td>
<td>52.0</td>
<td>40.5</td>
<td>25.2</td>
</tr>
<tr>
<td>2</td>
<td>44.9</td>
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<tr>
<td>3</td>
<td>47.8</td>
<td>40.7</td>
<td>37.9</td>
</tr>
<tr>
<td><strong>MEAN</strong></td>
<td>48.2</td>
<td>37.3</td>
<td>29.6</td>
</tr>
<tr>
<td><strong>Intervention</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>52.5</td>
<td>59.4</td>
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<td>3</td>
<td>43.6</td>
<td>71.3</td>
<td>58.2</td>
</tr>
<tr>
<td><strong>MEAN</strong></td>
<td>42.9</td>
<td>69.0</td>
<td>48.2</td>
</tr>
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<td>Subjects</td>
<td>Volleyball Players</td>
<td>Wrestlers</td>
<td>Gymnasts</td>
</tr>
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<td>----------</td>
<td>------------------</td>
<td>-----------</td>
<td>----------</td>
</tr>
<tr>
<td>1</td>
<td>23.8</td>
<td>21.0</td>
<td>48.7</td>
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<td><strong>Baseline</strong></td>
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<td><strong>37.0</strong></td>
<td><strong>44.8</strong></td>
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<td>2</td>
<td>26.9</td>
<td>20.0</td>
<td>33.7</td>
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<td>3</td>
<td>31.0</td>
<td>10.8</td>
<td>38.9</td>
</tr>
<tr>
<td><strong>Intervention</strong></td>
<td><strong>37.2</strong></td>
<td><strong>8.0</strong></td>
<td><strong>19.2</strong></td>
</tr>
<tr>
<td>2</td>
<td>31.0</td>
<td>6.0</td>
<td>14.2</td>
</tr>
<tr>
<td>Mean</td>
<td>33.0</td>
<td>8.2</td>
<td>24.1</td>
</tr>
</tbody>
</table>
inter-collegiate season, perhaps the intervention would have changed the behavior of the athletes in the desired direction.

One final factor which may have effected the outcome of the study for the volleyball players was the change in coaches at the time the intervention was implemented. The new coach was a player on The Ohio State Men's Varsity Volleyball Team. Practices were somewhat unstructured and on two occasions a replacement coach led practice. Although all of the subjects observed in volleyball were practicing for a national tournament, practices were not particularly high pressure situations.

In the wrestling environment, wrestlers often scrimmaged for varying periods of time which inevitably were followed by either rest or instruction. After the intervention was introduced, subjects increased their productive behavior percentages by scrimmaging with other wrestlers, practicing specific skills, and generally emitting fewer non-productive behaviors such as inactivity and exclusion (see Figure 4).

Refer to the final data point in the intervention phase for wrestlers 1 and 2 (Figure 4). These percentages are considerably lower than other productive behavior percentages tabulated following intervention. The wrestlers during this final practice session of the year scrimmaged hard for the first twenty-five minutes of practice, then met with the coach in the practice area to discuss future plans for the team. This team meeting lasted the remainder of the practice and, therefore, significantly reduced the time each wrestler had to
Figure 1. Percentage of Productive and Non-Productive Behaviors of Individual Wrestlers
emit specific and related practice behaviors. The above occurrence serves as an explanation for the unexpected trend in data found for wrestlers 1 and 2 during the final observation session.

Subjects in the gymnastics environment responded favorably to the intervention. Following intervention all subjects increased their frequency of specific and related behaviors and decreased their frequency of non-productive behaviors. The researcher was concerned that the subjects would not fully comprehend the intervention, but this was not found to be the case. All subjects in gymnastics reacted with interest to the feedback given to them. Following feedback the researcher and the coders noticed the subjects trying to spend inactive moments practicing skills while in line.

A large percentage of each subject's non-productive behavior emission occurred at vaulting. The gymnasium was structured to accommodate four stations: floor exercise, vaulting, balance beam, and uneven bars, with approximately eight athletes at each station. Each station, except vaulting, had several pieces of appariit and floor space enough for each athlete to practice. At the vaulting station, only one box-horse existed. Therefore, athletes at this station spent a high percentage of their time emitting inactive and maintenance behaviors due to inavailability of coaches for spotting and apparati. The subjects observed in volleyball also spent a great majority of their practice time waiting in line for a turn. The practice time wasted in both the volleyball and gymnastics environments due to athletes waiting in line for a turn to perform could have been alleviated by increasing the number of practice stations and pieces
Figure 5. Percentages of Productive and Non-Productive Behaviors of Individual Gymnasts
of apparati. If, for example, two or three set and spike drills involving five volleyball players at each drill formation were occurring at one time, less time would be spent waiting in line and more time could be devoted to specific and related practice. Likewise, if two box-horses were utilized with one coach at each box-horse, then athletes would spend a greater amount of time in physical activity and less time waiting in line.

Table 8 summarizes scores for the interaction behavior group discussed in Chapter III. The interaction behavior refers to the frequency the subject verbally communicated with either the coach or fellow athletes regarding matters directly related to their sport.

The intervention had no apparent effect on the frequency of the interaction behavior recorded for either the volleyball players or the wrestlers. An increase in the percent occurrence of the interaction behavior from 2.2 percent to 6 percent was found for the gymnasts. This small increase (3.8 percent) in only one of three settings forces the researcher to conclude that the intervention had no apparent effect on influencing the frequency of the interaction behavior in this study.

In addition to discussing changes in productive and non-productive behaviors following intervention, changes in concurrent behaviors were also monitored. Concurrent behaviors refer to those behaviors which have a moderate to low effect on positively changing subsequent athletic performance. Behaviors categorized as concurrent were as follows: responding, questioning instruction, attending, warming-up/
cooling down, maintenance, and resting. Concurrent behaviors with the highest frequency occurrence the majority of sessions were attending, maintenance, and resting, respectively. All other concurrent behaviors were recorded infrequently.

Interestingly, a pattern emerged concerning the frequency occurrence of the concurrent behavior group following intervention.

A change in behavior for the concurrent behavior group did not occur for the volleyball players following intervention (refer to Table 9). This finding is in keeping with the results found for both the productive and non-productive behavior groups for this sport. The failure of the intervention to change the behavior of the subjects in a positive direction may have been due to factors previously outlined in this chapter.

Table 9

Mean Percentages for Interaction Behavior Occurrence During Baseline and Intervention

<table>
<thead>
<tr>
<th>Base-line</th>
<th>Volleyball</th>
<th>Wrestling</th>
<th>Gymnastics</th>
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<tbody>
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<td>2.2</td>
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<table>
<thead>
<tr>
<th>Inter-action</th>
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<th>Gymnastics</th>
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<td></td>
<td></td>
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<tr>
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<td>7.0</td>
</tr>
<tr>
<td>Mean</td>
<td>4.3</td>
<td>5.1</td>
<td>6.0</td>
</tr>
</tbody>
</table>
The concurrent behavior percentages for both the wrestlers and the gymnasts decreased significantly following intervention. This finding was likely a result of the increased amount of practice time subjects in both groups spent emitting productive behaviors such as specific and related practice. Replacing the amount of time subjects spend emitting behaviors which have a moderate to low effect on positively changing subsequent athletic performance with behaviors which have a high effect on positively changing behavior is certainly a desirable consequence of the feedback intervention.

Table 10

Mean Percentages for Concurrent Behavior Occurrence During Baseline and Intervention

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Volleyball</th>
<th>Wrestling</th>
<th>Gymnastics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
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<td></td>
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<tr>
<td>1</td>
<td>18.1</td>
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<td>24</td>
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<tr>
<td>2</td>
<td>16.8</td>
<td>29.3</td>
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<tr>
<td>3</td>
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</tr>
<tr>
<td>Mean</td>
<td>18.4</td>
<td>31.7</td>
<td>26.1</td>
</tr>
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</table>

<table>
<thead>
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<th>Intervention</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
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<td>12.1</td>
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<td>20.6</td>
</tr>
<tr>
<td>Mean</td>
<td>19.9</td>
<td>16.2</td>
<td>20.7</td>
</tr>
</tbody>
</table>
CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Feedback has been proven to be effective in improving the performances of a wide variety of individuals in institutional settings, classroom environments, vocational settings, and athletic arenas. A survey of completed research dealing with the application of feedback systems in sporting environments reveals that a voluminous amount of work is yet to be done.

One area of research in sport which has received attention has been the objective observation of coach and athlete behaviors using observation instruments. Data compiled over a period of time on a variety of sports using these observation systems revealed that athletes spend the majority of their practice time emitting behaviors other than those directly involved with improving athletic performance.

An observation system designed to give athletes feedback concerning how they are utilizing their practice time, may result in a reduction of non-productive practice behaviors and an increase in productive behaviors each practice.

Summary

The purpose of this study was to assess the effects of giving athletes feedback regarding their time utilization in practice, on subsequent practice behaviors.
The subjects were nine competitive athletes from three separate sports. The subjects included three male intercollegiate wrestlers from The Ohio State Varsity Team, three female volleyball players from The Ohio State University Varsity Team, and three female gymnasts who are members of the Universal Gymnasts Team of Columbus, Ohio.

The coders were nine graduate students in The School of Health, Physical Education, and Recreation of The Ohio State University. Prior to coding, observers were required to complete a training manual and coding with one other individual and obtaining an overall reliability percentage of at least eighty-five in two consecutive sessions. Coders were also required to memorize definitions for each descriptor in the observation system and practice giving feedback to substitute subjects following data collection.

Observations took place in the three environments the Spring Quarter of 1979. The observation instrument used in the study was The Ohio State Athlete Observation Code (OSACC). This instrument is divided into three categories: 1) activity focus, 2) behavior, and 3) interaction. Interval recording, which involves recording the principle behavior which occurs during a five-second interval, was used in the OSACC. Each interval is composed of a five-second observation period followed by a five-second recording period. During the recording period, three descriptors are recorded, one for each category (activity focus, behavior, and interaction). Taken together, the three descriptors combine to give a picture of the general and specific behaviors occurring in the environment at a particular time.
The research design used in this study was a multiple baseline design across settings. In a multiple baseline design observations in the baseline condition are first recorded until a stable baseline in one setting is achieved. The feedback intervention is then implemented to the setting which stabilized its baseline first. The other two settings are held in the baseline condition. After more observation sessions have taken place, the second setting to stabilize its baseline, is intervened upon. The third setting is held in the baseline condition until a consistent trend in behavior is noted for the second setting in the intervention phase. The third setting is then introduced to the feedback intervention.

Experimental control in the multiple baseline design is demonstrated when behavior change occurs after the implementation of the intervention while the rate of the untreated setting remains constant.

The intervention was feedback given to the athlete following practice regarding how subjects utilized their practice time during the observed session. Feedback was given in both verbal and written form. To simplify the feedback given to each athlete, behaviors were grouped according to their level of productivity; e.g., productive behaviors, non-productive behaviors.

Another behavior group labelled interaction represented the times the subjects verbally communicated with their coach or other athletes regarding matters concerned directly with their sport.

Concurrent behaviors were also monitored before and after interaction. Concurrent behaviors refer to behaviors which have a moderate to
low effect on positively changing athlete behavior. Feedback was given to the athlete in three ways to aid comprehension: 1) percentages; e.g., you spent thirty-eight percent of your practice time interacting with your coach and other athletes, 2) fractions; e.g., one third of your practice time was spent doing behaviors which will have no effect on your improvement in gymnastics, and 3) examples; e.g., behaviors which you did which were productive were wrestling with a partner, practicing a new hold, etc.

Validity, which refers to the extent to which the instrument measures what it was intended to measure, was assessed by asking three colleagues to evaluate the content of the test for its relevance and representativeness to the totality of the instrument.

Each coder participated in at least two reliability checks during the data collection period. Several different calculations were performed following each check to assure that the data recorded were accurate.

Reliability checks were performed throughout the data collection period. Reliability percentages assess whether the observations that were recorded were representative of what actually occurred in the environment.

Reliability scores were tabulated in three ways: 1) overall reliability for each session, 2) percent reliability for each descriptor in the activity focus and behavior categories, and 3) reliability percentages for the occurrence and non-occurrence of five randomly selected behaviors. Scores for the overall reliability of
each session were all over the criterion of eighty-five percent. Reliability scores for descriptors in both the activity focus and behavior categories were quite acceptable. The occurrence and non-occurrence reliability scores suggested that the data obtained were indicative of what occurred in each environment.

The results revealed that both wrestlers and gymnasts showed behavior change in the desired direction after intervention. Both groups significantly increased their frequency of productive practice behaviors following intervention. Likewise, both groups significantly decreased their frequency of non-productive practice behaviors following intervention.

The practice behaviors of the volleyball players did not change significantly following intervention. Productive behaviors decreased slightly following intervention and non-productive behaviors increased slightly following intervention. The results found for the volleyball players could have been due to a number of factors including the following: time of data collection, apparent lack of motivation to improve volleyball skills, and changes in coaches for the team at the time of intervention.

The results indicated that the intervention did not change the frequency of the interaction behavior for either the volleyball or the wrestlers. Percent occurrence of the interaction behaviors for the gymnasts did increase slightly (3.8 percent) following interaction but this was not deemed significant.
The concurrent behavior percentage for the wrestlers and gymnasts decreased significantly following intervention. This finding was probably due to the increased amount of practice time the subjects spent emitting behaviors which were productive. A change in behavior for the concurrent behavior group did not occur for the volleyball players following intervention. This result may have been due to factors outlined in a preceding paragraph in this chapter.

Conclusions

Within the limitations and delimitations of this study and as a result of analyzing the data, the following conclusions were drawn:

1. Inter-observer reliability scores indicated that the data obtained were representative of what actually occurred in each environment.

2. Changes in behavior were a result of the intervention and not extraneous variables.

3. Positive changes in the practice behaviors of the subjects occurred in two out of three environments.

4. The feedback intervention increased the amount of productive behaviors emitted by wrestlers and gymnasts during practice.

5. The feedback intervention did not positively effect the practice behaviors of the volleyball players.

6. The occurrence of non-productive behaviors decreased in the wrestling and gymnastics environments due to the implementation of the intervention.

7. The frequency occurrence of the interaction behavior was not changed by the feedback intervention.

8. The concurrent behavior occurrence for the wrestlers and gymnasts decreased significantly following intervention.

9. A change in behavior for the concurrent behavior group did not occur for the volleyball players following intervention.
**Recommendations**

When implementing a feedback system with the purpose of improving athlete time utilization during practice, time of data collection is of paramount importance. Data should be collected during the regular competitive season when motivation to improve performance is high. If this study is replicated with a group that are practicing off-season, a reinforcement package could be paired with the feedback intervention to facilitate positive behavior change.

This study intervened directly upon the practice behaviors of the subjects. Within the structure of an athletic practice, athletes are limited in the amount of time they can use productively due to the availability of equipment and drill formations which involve certain amounts of non-productive time usage. If improved time utilization in practice is the goal, then the practice behaviors of both athletes and coaches should be intervened upon. By providing coaches with feedback concerning how their athletes are utilizing their practice time, an increase in productive practice behaviors by athletes may result. This "intervention package" may also include an educational phase for coaches which could include such topics as efficient drill formations and how to reduce time spent on managerial tasks. The behaviors of coaches could also be observed and recorded using The Ohio State Coach Observation Code (OSCOC) (see Appendix K). Feedback could be given to coaches from the OSCOC regarding the frequency of behaviors they emitted during the observed practice. This intervention could positively influence time utilization for both athletes and coaches during practice which in turn could optimize athletic performance during competition.
This researcher recommends that future scientific endeavors regarding the implementation of feedback for improving the practice behaviors of athletes utilize an "intervention package". This "package" could include feedback to both athletes and coaches concerning practice behaviors and their frequency in addition to an educational phase for coaches providing ideas concerning how they can reduce the occurrence of non-productive behaviors by their athletes.

The findings of this study lend support to the possibility that feedback combined with other contingencies may have a dramatic effect on positively changing the practice behaviors of athletes. Possible contingencies which may be implemented include goal setting, self-recording of frequency emission of target practice behaviors by athletes, and the use of reinforcers such as medals and ribbons by coaches for desirable performance during practice.

In addition, it is recommended that replication of this study should involve more subjects in each setting (six to ten) and at least five settings in the multiple baseline design. The additional subjects and settings recommended would clarify the possible effects the intervention has on the dependent variables.

In subsequent research attempts, it may be valuable for the researcher, following intervention, to obtain each subject's opinion of the intervention through the use of an evaluation form. This procedure may lend insight to possible future uses of the observation instrument and provide information regarding its strengths and shortcomings.
An additional subcode "G" (group) could be added to The Ohio State Athlete Observation Code. This subcode would represent the times the athlete was interacting with both the coach and other athletes.

Broader systematic applications of feedback systems in sport and physical education environments will likely strengthen the already powerful potential feedback has for improving athletic performance.

Future research in the area of feedback may shift its emphasis from traditional teacher/coach controlled environments toward student/athlete controlled environments. Self-regulated feedback systems may prove effective and efficient tools for affecting positive behavior change. Less emphasis placed upon superiors such as teachers and coaches as behavior change agents may prove far more effective than traditionally-based structures.

A need exists for a more concerted effort by researchers to pursue a more in-depth investigation of the vast potential feedback has for positively changing the behaviors of athletes and coaches in numerous athletic settings.

Future scientific inquiry into methods of improving athletic performance will likely uncover innovative and practical ways feedback interventions can be implemented to achieve this end.
REFERENCES


Arps, G. F. Work with knowledge of results vs. work without knowledge of results. Psychological Monographs, 1920, 28, 125.


Bilodeau, I. McD. Accuracy of a simple positioning response with variation in the number of trials by which knowledge of results is delayed. American Journal of Psychology, 1956, 69 432-434.


Drabman, R. and Lahey, B. Feedback in classroom behavior modification: effects on the target and her classmates. *Journal of Applied Behavior Analysis, 1974, 7 (4).*


Geller, S. E. A technique to provide lecturers with continuous student feedback. Paper presented at meeting of the American Psychological Association, Chicago, August, 1975.


James, P. Video feedback in learning beginning trampoline. Perceptual and Motor Skills, 1971, 32, 669-670


Moore, J. and Schaut, J. An evaluation of the effects of conceptually appropriate feedback on teacher and student behavior Unpublished manuscript, Busknell University, 1975.


Siedentop, Daryl and Hughley, C. The Ohio State University Teacher Behavior Rating Scale. Journal of Health, Physical Education and Recreation, 1915, 46, 45.


Zajonc, R. The effects of feedback and probability on group success on individual and group performance. *Human Relations*. 1962. 15, 149-161

APPENDIXES
APPENDIX A

CODER'S TRAINING MANUAL
**Introduction**

This manual was written with the intent of teaching individuals how to use The Ohio State Athlete Observation Code. Careful examination of the contents of this booklet will allow for effective use of the instrument.

The Ohio State Athlete Observation Code (OSACC) provides an efficient means of determining the frequency and duration of specific behaviors emitted by athletes in a practice environment. Percent time spent emitting each behavior within a practice session can be easily calculated.

Inconsistency in an athlete's performance from practice to practice may also be clearly demonstrated by the OSACC. An athlete may display a predominance of high productivity behaviors one practice session and a predominance of low productivity behaviors the next session. If practice is to be effective, it is desirable for an athlete to spend a consistently high percentage of his/her practice time emitting productive behaviors.

Data from the OSACC can help aspiring athletes gain insight into what types of behaviors (and their frequency) successful athletes emit during practice. These behaviors can then be modeled by young athletes with the hope of attaining improved performances. The data generated from the OSACC may also be helpful to aspiring athletes
concerning the type and frequency of behaviors they might wish to emit during practice.

Decisions about behavior change of an athlete during practice can be made based upon the objective data gathers from the OSACC. For example, an athlete may wish to increase the amount of time spent in physical activity during a practice when data yielded from the OSACC indicates a high percentage of time is spent doing behaviors which do not involve physical activity.

The use of the OSACC need not be limited to the above purposes. With the increased use of the observation code, new and innovative uses of the instrument by practitioners and researchers will be sought. When implemented correctly, the OSACC can serve as an effective instrument for systematically and objectively recording the occurrences of behaviors emitted by athletes in practice environments.

The Observation Code

The Ohio State Athlete Observation Code is divided into three major categories: 1) activity focus, 2) behavior, and 3) interaction. The activity focus category describes what activity the group as a whole is involved in at a particular time in the practice session, and therefore serves as a general descriptor of what is happening at a given time during practice; e.g., the athletes are involved in a controlled scrimmage. The behavior category allows an observer to code the athlete's primary behavior during a practice time interval; e.g., specific practice, responding, etc. The interaction category
indicates the number of people involved in an interaction. Taken together the three descriptors combine to give a picture of the general and specific behaviors occurring in the environment at a particular time.

The OSACC classifies eight activity focus categories. Seventeen behaviors constitute the behavior category. In the interaction category, a group consists of four or more individuals and a small group includes two to four individuals. If an athlete is not involved in communication with any other person then "I" for individual should be coded.

**Coding Definitions**

Before coding begins, it is essential to obtain a clear understanding of the meaning of the definitions included in the three categories. Read the definitions and commit them to memory. After having done so, think of several examples for every definition. It will also be necessary for you to memorize the code initials for each definition. You will find that while coding there will not be sufficient time to consult your key every time for the correct code initial. Consult the appendix for activity focus and behavior category definitions.

**Observation Procedures**

Interval recording is used for the OSACC. Interval recording involves coding the principle behavior which occurs during a five-second observation period. Each interval is composed of an observation
period followed by a five-second recording period. There are one hundred intervals on each recording sheet.

During the recording period, record your observations for each of the three major categories. You will be supplied with a pre-recorded audio-tape with instructions regarding when to observe and when to record. For example, "observe subject one, (five second pause) record subject one, (five second pause) observe subject two, (five second pause) record subject two" (five second pause), etc. Use of such a tape increases reliability between observers by insuring that they are observing the same events as they record.

Each coder will also be supplied with an earjack which plugs into the back of each recorder. Use of an earjack removes the possibility of the tape becoming a distractor to either the athletes or the coach.

**Equipment**

Each coder will be supplied with the following equipment: 1) several coding sheets, 2) several descriptor sheets, 3) a set of definitions for each category, 4) a clipboard and pencils, 5) a cassette tape, 6) an earjack, and 7) a coder's training manual. Cassette recorders will be located in a central location for pick-up prior to coding. Two or three sharp pencils should be on hand each coding session. In addition, a pocket calculator will be helpful in tabulating percentages following coding.

**Procedures for the Study**

Prior to actual data collection, coders should make sure they have completed the following steps:
1. Submitted their schedule for the quarter and rechecked it with the researcher for accuracy.

2. Indicated coding preferences or locations (those coders without cars should not code gymnastics practices).

3. Read, understood, and signed a coder's contract.

4. Obtained enough supplies.

5. Attended the coders' meetings.

6. Arranged for reliability checks with the researcher.

7. Read and understood the contents of the coders' training manual.

8. Memorized and understood the definitions used in the instrument.

9. Understood all the procedures involved in coding and giving feedback to the subjects.

Reliability

When using any observational system it is important to assess whether the observations that were recorded were really representative of what actually occurred. Inter-observer reliability is one way of establishing agreement that what was coded actually did occur. Inter-observer reliability is defined as the degree to which two independent observers agree on the occurrence or the non-occurrence of operationally defined behaviors.

Each coder will be required to code with another observer from time to time to assure reliability and to check for observer drift (the tendency of observers to alter previously defined definitions over a duration of time). Before actual coding begins each coder will be required to meet with the researcher to discuss any problems with the
instrument's operational definitions. Then he/she should code with the researcher under actual practice conditions. While reliability checks are occurring, a split earjack will be used to assure that both coders are recording at the same time. During training sessions the trainee will also be required to give feedback to the researcher in a role-play situation based upon the results obtained during the reliability check. An overall reliability of at least eighty-five percent will be required before coders may collect data. An overall percentage of reliability can be assessed by using the following formula:

\[
\text{Percent agreement} = \frac{\text{number of agreements}}{\text{number of agreements} + \text{number of disagreements}} \times 100
\]

Data Collection

After each coder has successfully completed the training program required before using this instrument, data collection may begin.

Every Friday before noon your coding schedule for the following week will be left at a central location. The Coder's Schedule Sheet will tell you where you are coding, what subject you will be observing, the date, and the time (see Appendix).

Arrive at the designated location approximately fifteen minutes ahead of time so equipment may be set up. Station yourself so that verbalizations made by the participants are audible. Try and station yourself as inconspicuously as possible, so your presence does not become a distractor to either the athletes or the coaches. Set up all your equipment insuring that the cassette tape is rewound back to the
beginning. Ask someone in authority (either a coach or an administrator) who your subject(s) are for the particular session. Try not to draw the athlete's attention to the fact that you will be observing him/her.

Prior to coding, fill out the information required at the top of each coding sheet; e.g., athlete's name, sport, observer. In addition to completing each coding sheet, fill out as accurately as possible the descriptor's sheet (see Appendix). You may wish to fill in the apparatus and coaches present information prior to coding. The third information section, unusual circumstances, may be completed following data collection. If you wish you may write subcodes on the coding sheet to help you remember when a particular incident occurred. Accurate completion of the descriptors sheet will aid the researcher in uncovering possible explanations for trends in data.

When practice begins, commence coding. Completion of each coding sheet takes approximately seventeen minutes. Two subjects will usually be observed during one coding session. This may effectively be done by alternately observing subjects from one interval to the next. If for example, you observe and record Subject A the first interval, observe and record Subject B the next interval, and so on. Recording can be easily accomplished by assigning rows one and three to Subject A on the coding sheet and rows two and four to Subject B. After one sheet is complete, stop the cassette and start rewinding it. During this time get another sheet out and prepare to code the second sheet. After two sheets have been accomplished, stop coding.
It will be the responsibility of the coder to tabulate the results so feedback may be given to the subject in percentages. It is important that each athlete receives his/her feedback concerning the observations that were made before the next coding session. If results can be tabulated before the athlete leaves the practice area, feedback may be given after the practice from which it was collected. This can be easily done by counting up the number of times each subject emitted each target behavior. Percent time emitting each target behavior can easily be calculated by the following formula:

\[
\text{Percent} = \frac{\text{number of intervals the behavior occurred in}}{\text{total number of intervals}} \times 100
\]

E.G. \( \frac{13}{95} \) (number of specific practice behaviors recorded) \( \times 100 \)

A blank column on the right-hand side of each coding sheet has been left for tabulating percentages.

This study employs an intervention. Therefore, before the intervention is employed, several baseline readings must be collected. When you receive your coding assignment I will indicate whether the recording will be in the baseline or intervention phase. If baseline readings are being collected on the subject do not employ the intervention (feedback). Simply collect the data from the assigned location on the assigned subject and leave the practice. Do not give feedback until instructed to do so.
After percentages for each behavior have been tabulated scores must be grouped so feedback given to the subject concerning how they utilized their practice time is somewhat simplified.

**Group 1** - Behaviors that have a high probability of improving subsequent performance.

A. specific practice  
B. related practice  
C. demonstrating

**Group 2** - Behaviors which have no effect or perhaps a detrimental effect on improving subsequent athletic performance.

A. unrelated activity  
B. inappropriate activity  
C. unrelated interaction  
D. exclusion  
E. injury  
F. inactivity

**Group 3** - Interaction - Communication with others concerning a topic related to the subject matter.

A. positive  
B. negative  
C. neutral

All other behaviors are not included when providing athletes with feedback as they usually have a moderate to low effect on changing behavior.

Totals should then be calculated so the coder has one overall percentage for each of the three groups of behaviors.

After each of the percentages has been totalled (totalling three), the coder is now ready to give feedback to the subject concerning how
they utilized their practice time while data were being collected (providing the subject is being observed in the intervention phase). Refer to the appendix for an example of an Athlete Feedback Sheet.

Feedback is given to each subject through verbal and written communication. Verbal feedback should be given three ways:

1. **Percentages** offered to the athlete for each behavior group; e.g., "My results show that you spent thirty-four percent of your practice time doing things which will help you improve your gymnastics performance in the future".

2. **Fractions** to give the athlete another means by which to understand the data; e.g., "My results show you spent approximately one third of your practice time doing things which will help you improve your gymnastics in the future".

3. Give examples, when appropriate, of behaviors the athlete did which might have positively or negatively influenced subsequent performance.

Do not use phrases such as "you only did ..." or wow!!! you spent _____ amount of your practice time .....". Try to relate the results to each subject without placing value judgments on the findings.

Written feedback should also be given to each subject after recording. Write the results on the Athlete Feedback Sheet using percentages and fractions, and give examples. The use of written feedback allows the athlete to take the results home and digest them. Use carbon paper to make two copies of the Athlete Feedback Sheet.

When giving feedback from Group 3 (interaction), differentiate positive and negative feedback if a difference in values exists.
When you have completed your assignment, staple or clip the coding sheet, descriptor sheet, any calculations, and the carbon copy of the Athlete Feedback Sheet together. Please put the above items in a prearranged location when convenient.
APPENDIX B

TABLES PRESENTING PERCENT OCCURRENCE FOR PRODUCTIVE, NON-PRODUCTIVE, CONCURRENT AND INTERACTION BEHAVIORS FOR SUBJECTS EACH SESSION
Table 11
Percentages of Productive Behaviors Occurring in Observation Sessions by Volleyball Players

<table>
<thead>
<tr>
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*absent from session.
TABLE 12

Percentages of Non-Productive Behaviors Occurring in Observation Sessions by Volleyball Players

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*absent from session
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Percentages of Productive Behavior Occurring in Observation Sessions by Wrestlers

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*absent from practice
Table 14

Percentages of Non-Productive Behaviors Occurring in Observation Sessions by Wrestlers

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Table 15
Percentages of Productive Behaviors Occurring in Observation Sessions by Gymnasts

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*absent from practice
Table 16

Percentages of Non-Productive Behaviors Occurring in Observation Sessions by Gymnasts

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*absent from practice
Table 17
Percentages for Concurrent Behavior Occurrence Each Session During Baseline and Intervention

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= intervention
* absent from practice
Table 18

Percentages for Interaction Behavior Occurrence for Each Session During Baseline and Intervention

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--- intervention

* absence from practice
APPENDIX C

OHIO STATE ATHLETE

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<th>Skill drill</th>
<th>Instruction</th>
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**Sport:** Ohio State Athlete Observation Code

**Athlete:** (8)

**Observer:** (Name)

**Intervention of Baseline:** (Signature)
APPENDIX D

DESCRIPTOR'S SHEET
Observer __________________
Date ____________________
Athlete __________________

**Descriptor's Sheet**

**Apparatus in Environment**

**Coaches Present**

List or describe any unusual circumstances which occurred while coding was taking place. Include anything you feel might be advantageous to know when data are being analyzed.
APPENDIX E

ATHLETE FEEDBACK SHEET
ATHLETE FEEDBACK SHEET

A. Time spent in practice doing things that will help you improve your performance.

EXAMPLES

B. Time spent in practice doing things which will not help you improve your performance in your sport.

EXAMPLES

C. Time spent in practice talking to other athletes or your coach.

Positive

Negative

EXAMPLES
APPENDIX F

Coder's Contract
Coder's Contract

I, ____________________________, agree to aid in the collection of data for Jane Crossman’s dissertation. I understand I will receive _____ credits under course number PE 889 or 693 (circle one). Coding assignments will be given (whenever possible) one week in advance. I will not be required to code at a time other than those I have previously stipulated.

Signed:

Coder: _________________________

Researcher: _____________________

Jane Crossman
APPENDIX G

CONSENT TO SPECIAL TREATMENT OR PROCEDURE
THE OHIO STATE UNIVERSITY

CONSENT TO SPECIAL TREATMENT OR PROCEDURE

I, hereby authorize or direct

or associates or assistants of his or her choosing, to perform the following treatment or procedure and such additional
services as they may deem reasonably necessary in its performance (describe in general terms) Give feedback
to the athlete following practice regarding how the athlete is utilizing his/her
practice time.

I hereby authorize or direct ______ (myself or name of subject)
The experimental portion of the treatment or procedure is: Giving verbal and written feedback.

This is done as part of an investigation entitled: The Effects of Systematic Behavioral Feedback on the Practice Behaviors of Athletes

1. Purpose of the procedure or treatment: Help the athlete improve his/her utilization
of his/her practice time.

2. Possible appropriate alternative methods of treatment:

3. Discomforts and risks reasonably to be expected:

4. Benefits which may be expected: Improved utilization of practice time.

5. Likely results of the experimental treatment or procedure:

I hereby acknowledge that I have had a full opportunity to ask any questions regarding the procedure described above
and that all questions have been answered by Jane Crossman
to my full satisfaction. He/She has explained the risks described above and I understand them, and he/she has also
offered to explain all possible risks or complications.

I understand that any further inquiries I may have concerning the procedure described above will be answered, and I
understand that I am free to withdraw my consent and participation in this project at any time after notifying the
project director without prejudicing my future care. No guarantee has been given to me concerning this treatment or
procedure.

I have read and fully understand the consent form. I have signed it freely and voluntarily and understand a copy is
available upon request.

Date: ___________ Time: ___________ AM

Signed: ___________ (Subject)

Witness: ___________

(Person Authorized to Consent for Subject - If Required)

Witness: ___________

I certify that I have personally completed all blanks in this form and explained them to the subject or his/her represen-
tative before requesting the subject or his/her representative to sign it.

Signed: ___________ (Signature of the project director or authorized representative)

PA-0288 (1/79)
APPENDIX H

COACH'S EVALUATION FORM
COACH'S EVALUATION FORM

Name of Coach: ____________________

Name of Athlete Being Described: ____________________

1. How long have you coached the above-mentioned athlete?

2. Please comment on the athlete's natural abilities in his/her sport.

3. Describe the athlete's practice behaviors including such areas as effort, determination, utilization of time, strengths, and weaknesses.

4. In your opinion, how does the athlete perform in competition?

5. Please included in the space provided below or on the reverse side, any information you feel would be advantageous for this researcher to know with regard to this athlete and his/her participation in athletic competition.
APPENDIX I

ATHLETE INFORMATION SHEET
ATHLETE INFORMATION SHEET

Name: _______________________

Team or Club: _______________________

1. How long have you been a competitor in your sport? List the athletic teams or clubs in your sport, you have been a member of and give the dates; e.g., high school volleyball - Columbus, Ohio 1974-77.

2. (a) How many days do you practice each week?
   
   (b) How long are your practices? (generally)

3. How often do you compete?

4. Describe the level of competition you are involved in now; e.g., city, regional, state, national, etc. (if more than one please specify).

5. (a) Please list the major competitions you have been a participant in since you began competing in your sport.
   
   (b) Indicate the outcome of each competition; e.g., your team won, you placed third, etc. (specify each event).

6. Have you been a member of any team representing your state or country? If so, please specify.
APPENDIX J

DATA SUMMARY SHEET
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APPENDIX K

OHIO STATE COACH OBSERVATION CODE
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**Activity**
- **Focus**
  - IP individual practice
  - CS controlled scrimmage
  - CG game scrimmage
  - CA conditioning activity
  - SD skill drill
  - GM general workout
  - I instruction
  - M management
  - R rest
  - TT time trials

**Behaviors**
- P Positive reinforcement
- N Positive feedback
- F Negative feedback
- U Unrelated communication
- A Unrelated activity
- I Coach interaction
- G Corrective feedback
- T Technical instruction
- Q Questioning
- A Attending
- C Officiating
- P Physical guidance
- O Organization
- S Spotting
- G Giving instructions
- C Coach model
- M Monitoring

**Interaction**
- G Group (5 or more)
- S Small group (2-4)
- I Individual
- Subcodes
  - positive +
  - negative -
  - coach C
  - athlete A
  - group G