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THE EFFECT OF FEEDBACK AND INDIVIDUAL-GROUP CONTINGENCIES ON THE TEAM BEHAVIORS OF AN INTERCOLLEGIATE BASEBALL TEAM

Paese, Paul Carmine

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THE EFFECT OF FEEDBACK AND INDIVIDUAL-GROUP CONTINGENCIES ON THE TEAM BEHAVIORS OF AN INTERCOLLEGIATE BASEBALL TEAM

DISSertation

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By
Paul C. Paese, B.S., M.A.

* * * * *

The Ohio State University
1980

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To Margot and Tony
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CHAPTER I

INTRODUCTION

Sport has always been an important part of society. Even though it has been so important, scholarly work in sport has been limited until recent times. The sciences have been very prominent in their contribution to research in sport settings. Many studies have been generated that have looked at the effect of exercise on the organs, systems and muscles of the body. Other topics of interest have been body fatigue, conditioning and strength development, through the sub-field of exercise physiology. This had been the major emphasis in sport research until the last decade or so when coaches and physical educators expressed a desire to learn more about the principles of motor learning, growth and development, interpersonal relationships, and personalities of individuals engaged in sport. This was the beginning of sport psychology.

The sub-field of sport psychology is still in its infancy as demonstrated in the fact that the International Society of Sport Psychology was not established until 1965. Much of sport psychology's early interest dealt with personality factors that led to success in sport, aggression in sport,
social status, etc. Physical educators and coaches have always suggested that sport participation was beneficial in helping to change behavior, but have neglected to verify their claims with research. It has only been within the last decade that the sub-field of sport psychology has been interested in the psychological aspect of improving performance. One of the ways that sport psychology has affected sport is through the discipline of psychology, which has shown continuous development over the years. One approach in psychology that has and will answer many more of the questions physical educators and coaches have had on how to improve athletic performance and how to motivate these individuals is through the area of operant conditioning.

Theories and principles of operant psychology have Largely been derived from the work of B.F. Skinner. Skinner's Science and Human Behavior (1953) extended his system to social behavior, religion, psychotherapy and education. This led to a change in procedures for changing behaviors in schools, hospitals, etc. It wasn't until after Skinner published his book The Technology of Teaching (1968) which applied the use of behavioral analysis to education, that operant psychology obtained practical application to human learning and motivation. Early use of applied behavior analysis in educational settings was in the special classroom. In the early 1970's educators began applying the principles of Skinner into the "normal classroom." O'Leary
and O'Leary published *Classroom Management* (1972) which gave the readers research evidence and techniques in applying applied behavioral analysis procedures into the "normal classroom." Since it has been successful in classroom settings it has much to offer physical education and sport, although behavioral analysis and its research has been neglected in the literature and by its practitioners (McKenzie and Rushall, 1973). The major impetus for the use of applied behavioral analysis in physical education and sport came from the work of Rushall and Siedentop, *The Development and Control of Behavior in Sport and Physical Education* (1972).

The implication of applied behavior analysis is very satisfying to the user, as it produces successes in observable and measurable terms. It is becoming increasingly popular in many areas of human endeavor. There is no reason for sport and physical education to neglect this trend.

The text gave practitioners systematic techniques and strategies for developing and maintaining behavior in play education and sport. Thus within the last six to seven years there has been an increase in the use of applied behavioral analysis in physical education and sport. Still today many areas in physical education and sport are untapped as far as the use of applied behavioral analysis in its research and the use of its research by its practitioners. This is one of the major reasons I have decided to use applied behavioral analysis as my research paradigm.
Significance of Study

As an educator I am always concerned with improving student performance. As a coach I am interested in improving athletic performance. Many of the earlier studies in sports with the goal of improving athletic performance have used changing the coach's behavior as the independent variable. Recently, studies have been done to show that as an athlete matures he/she will be less dependent on the coach as a change agent and that the athlete is more capable of choosing his/her own course of action. McKenzie (1972) felt that athletes who control each others behaviors are more successful in attainment of certain goals as compared to the reinforcement coming from the coach. Most of the studies done in athletic settings have been done with the goal of increasing individual skill performance in practice situations, not game situations.

Feedback has been effective in many settings: 1) classrooms (Broden, Hall and Mitt, 1971; Moore and Schaut, 1975; Kepler, 1977, etc.); 2) treatment of phobias (Leitenberg, Agras, and Thompson, 1968); 3) increasing job performance (Catano, 1976); and 4) increasing visual motor skills of slow learners (Parker, Cook, Rosenfeld and Todd, 1973). Feedback has also been effective in improving performance in elementary classes over other independent variables such as a reward of candy (Donahue and Ratliff, 1976). Feedback given to teachers regarding their
teaching effectiveness has shown positive results (Geller, 1975; Overall and Marsh, 1975).

Studies dealing with types of feedback have been numerous. Some examples are that verbal feedback is more effective than visual feedback (Park, 1973), and Lowery (1964) concluded that immediate feedback is much more effective in producing desired results than delayed feedback.

Contingency systems have been proven effective in education, mainly in token systems (reinforcers given contingent upon the earning of tokens) and individual reinforcement contingency systems. Many studies in classroom settings (regular and special) have had positive results in the use of token systems and individual reinforcement contingency systems (McKenzie, et al., 1968; Osborne, 1969; Ervin and Fox, 1976; Birnbrauner, et al., 1965; etc.). There are many other studies done in educational settings giving credence to the usefulness of individual reinforcement in token and contingency systems. Individual contingency systems outnumber studies done in group contingency systems as demonstrated in a perusal of the literature in such journals as The Journal of Applied Behavior Analysis, Journal of the Experimental Analysis of Behavior, etc.

Athletics is a medium that is notorious for the use of statistics. Baseball is a team game that uses individual
and team statistics as much as or more than any other sport (offensively - batting average, runs batted in, home runs, stolen bases, etc.; defensively - errors per game, pitching earned run average, fielding average, etc.). There are many intangible behaviors that if grouped together would be very useful statistics for improving team performance.

The importance and effectiveness of feedback, token systems, and contingency systems have proven to be effective. Most of the studies done using feedback in physical education/sport settings have been on individual skills in practice or class (gym) situations (Watkins, 1963; Mitchell, 1969; McKenzie, 1974; etc.). Individual token systems and individual contingency systems have been effective in physical education/sport (Heward, 1977, Rushall and Pettinger, 1969, etc.); and they far outnumber the studies done using a group approach. Group contingency reinforcement systems have been neglected in physical education and especially in athletics. Also, as mentioned earlier, there is a movement away from the coach being the main supplier of feedback to his/her athletes and a need in baseball to change the so called intangibles of the game (cutoffs, moving runners up, getting the first batter retired in an inning, etc.) into new grouped behavior statistics to help a team improve its performance in game situations. Thus, in light of prior research, I feel there is a need to do a study that will try to increase team behaviors in
athletics where the coach is the main supplier of feedback to his/her athletes (public record) and the use of an individual-group reinforcement contingency system as independent variables. Studies using team over individual behaviors as dependent variables in physical education/sport is something we have neglected along with group contingency systems. In the fields of physical education and athletics, we must continue to follow the road paved in research by the other areas of education.

Statement of the Problem

The question under investigation in this study was:

Does written and verbal feedback to team members about their game performance and the use of an individual-group oriented reinforcement contingency system making use of team/group/individual reinforcement increase certain team behaviors in game situations?

Other sub-questions under investigation were:

1. Did the interventions used not only improve the behaviors under investigation, but did this improvement lead to greater team success?

2. What intervention was more effective in improving the behaviors under investigation and led to greater team success?

Delimitations

This study was delimited to the team behaviors of a college baseball team during game situations only and includes all members of the team as subjects.
The dependent variables were behaviors only emitted by a baseball team during game situations as recorded by the official scorer and special coding system developed by the investigator.

The independent variables for the study were intervened on the team/group in two phases. The first phase is written and verbal feedback given to the team/group after each game, and a second phase which is individual-group reinforcement in which a reinforcer is given to the individual/group every third, fourth, or fifth game, contingent upon improvement of the specified behavior(s).

Limitations
1. The study was limited to team behaviors and those behaviors' subsequent improvement based on team/group/individual feedback and contingencies.
2. This study was limited to a given number of games in a college baseball season and can be further limited by weather conditions (rainouts) which could further limit the number of data points and number of data points for each behavior in each intervention.
3. The study was limited in that injuries to team members can affect team performance and its improvement.
4. The study was limited in that the different opposing teams all have different skill levels and this effect upon our team behaviors being intervened on cannot be controlled.
5. This study was limited to a given number of times a behavior is emitted during a game (high or low) which will have an effect upon the compiling of relevant averages. Hopefully by the combining of many different behaviors to form one, this problem will be minimized.

6. The study was limited to reinforcers that can be used for team members of NCAA regulations.

7. The study was limited in that this investigator has no control over how good and bad teams fall on the schedule, whether they are spread out or fall at the beginning or end of the season.

8. The study was limited to the fact that coders were also subjects, thus having greater insight to the study's focus, especially at its beginning.

Definitions

Advance - move toward the next base. To reach a base nearer home plate.

Advance a runner - by bunting, hitting behind the runner, etc., so the base runner can advance to the next base.

Balk - an illegal action of the pitcher which permits base runners to advance one base.

Base hit (hit) - a fair batted ball which permits the batter to reach first base without the aid of an error by the defense and not at the expense of a runner being retired at the next base.

Baseline - the level at which behavior is occurring before attempts are made to change it.
Base on balls or walk - four pitches ruled outside the
strike zone by an umpire which allows the batter to go
to first base.

Behavior - observable and measurable responses of an
organism to internal and external stimuli.

Behavior modification - refers to the use of the principles of operant psychology to change behavior.

Contingencies - the relationship between a given response and its environmental consequences; contingencies may have the effect of strengthening, maintaining, weakening, or eliminating a behavior.

Cutoff - a point in front of a base where a throw from the
outfield is intercepted by an infielder.

Dependent variable - a measured variable in an
experimental design.

Direct observation - a method of obtaining behavioral data
which records the behavior as it occurs. Event and time
sampling are both methods of direct observation (Sulzer-
Mayer).

Earned run - a run which scores as the result of hits,
sacrifices, stolen bases, put outs, bases on balls, hit
batsman, balks or wild pitches before fielding chances
have been offered to retire the side. An unearned run
is a run that scores because of an error.

Error - a misplay by the defensive team which aids the
team batting by allowing a batter to reach base.

Event recording - making a tally of discrete events in
order to obtain a frequency of events as they occur.

External validity - the extent to which the results may be
generalized.

Extrinsic reinforcers - use of reinforcers that are not
natural to the classroom, e.g. kites, candy, prizes, etc.

Feedback - information an individual/group receives about
the adequacy or appropriateness of a response as a con-
sequence of that response.

Hit by pitch - batter struck by pitched ball when in
batters box thus enabling him to reach base.
**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; the extent to which the changes are due to what the experimenter said they were due to.

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

**Intrinsic reinforcers** - use of reinforcers that are natural to the classroom, e.g. extra recess, stars, free time, etc.

**Multiple baseline** - two or more graphs showing levels of the same behavior, different behaviors, subjects and settings - a single subject experimental design that involves: 1) obtaining base rates of several dependent behaviors; 2) applying the independent variable to one of the dependent behaviors until it is substantially changed while the other dependent behaviors changed little if any; 3) applying the independent variable to a second dependent variable as in number 2 above. This procedure is continued until it is demonstrated that each behavior systematically changes when the independent variable is applied to it. (Sulzer-Mayer)

**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.

**Operant behavior** - measurable and observable actions that are developed and maintained by the environmental consequences associated with them.

**Out** - batter or runner retired, not safe.

**Public record** - the posting of team averages on the team board, a public form of feedback.
Reinforcement - a procedure that has occurred when the contingent use of a stimulus results in an increase or maintenance of a dependent behavior.

Reinforcer - a stimulus the contingent use of which results in the increase/decrease or maintenance of the dependent behavior.

Reliability - percent of agreement of observer on what they have observed on the same subject(s) during the same session.

Runs batted in (RBI) - a run which scores because of a safe hit or sacrifice hit, an infield put-out (not on a double play), a base on balls, or getting hit by a pitched ball. The batter is also credited with a RBI if with less than 2 outs, an error is made on a play which a runner from third would have scored and does.

Sacrifice bunt - a ball placed by the batter to advance a base runner.

Sacrifice fly - a fly ball which enables a baserunner to score after the ball is caught.

Squeeze - the batter bunts the ball with less than 2 outs and a runner on third. The runner on third starts for the plate as the pitch is being delivered.

Steal (stolen base) - the advance of a baserunner to the next base unaided by a hit, put out, error, balk, base on ball or hits batsman.

Strikeout - three strikes; three pitches ruled in the strike zone by the umpire or a combination of called strikes and swings by the batter.

Tag up - position of a base runner for an attempted advance on fly balls with less than 2 outs.

Token reinforcers - an object that can be exchanged at a later time for another reinforcing item or activity. The extent to which tokens are reinforcing or take on the properties of a generalized reinforcer is dependent on the individual's experience and on what back-up items are available.

Validity - the closeness an instrument comes to measuring what it was intended to measure.
Wild pitch - a pitch that is in the dirt or one the catcher cannot handle or block and gets by the catcher which allows a runner to advance.

Summary

This chapter presented a brief summary of research in physical education and sport with a major emphasis on feedback and contingency systems. The statement of the problem, and the significance of the study was also presented as were the delimitations, limitations and definitions that are important for understanding the study.
CHAPTER II

REVIEW OF LITERATURE

Areas to be investigated in this review of literature are: 1) the different types of feedback and the effect feedback has on performance in both classroom and physical education/sport settings; 2) token economy systems and their effect on performance in different environmental settings (hospitals, classroom, athletic teams, etc.); and 3) different types of contingency systems and their effect on performance in classroom and physical education/sport settings.

Feedback has been shown to be effective in creating behavior change (Skinner, 1953; Gayne, 1965; Hops and Cobb, 1973; McMillan, 1977; Locke, 1968; Drabman, 1975; Annett, 1967; Breyer and Allen, 1972; McNamara, 1971, etc.). Not only has feedback had positive results in "special" and "normal" classrooms, but in changing teacher behavior (Tierney, 1975; Kepler, 1977) whether it be from peers in an intern or microteaching setting (Kong, 1977). Parents have also been trained to use feedback and to effectively change their own child's behavior (Herbert and Baer, 1972). Rushall and Siedentop (1972) summarize some
thoughts on feedback and its reinforcing potential.

"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 synonymous . . . 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

Token systems have been used in a variety of educational and special settings:


6. In the home (O'Leary, O'Leary and Becker, 1967).


It is important to notice that in most of the studies done in the many different settings using token economy systems, the use of individuals over group is far more abundant.

The use of contingency systems has gained popularity in its use over the last five to ten years. Many of the
early studies used individual contingency systems, although group systems have gained in popularity. The reason for the increased use of group contingency systems is because of economic reasons and the practicality of reinforcing a whole group rather than each individual (Herman and Tramontana, 1977). Both individual and group contingency systems have been proven effective in educational settings for the purpose of changing behavior and/or increasing performance (McAllister et al., 1969; Quesenbery, 1971; Robertshaw and Hiebert, 1973; Chacwick and Day, 1971; etc.).

The purpose of this chapter is to explore the use of feedback token economy systems and contingency systems as independent variables and to look into their effectiveness in changing behavior and increasing performance in mainly educational settings.

Types of Feedback

This section will deal with different types of feedback for effecting behavior change (visual, verbal, auditory, kinetic, positive feedback, negative feedback, public and self recording).

Battig (1954) looked at the effect of different feedback cues on a lever positioning skill. Six groups of ten were used in the study. The six groups all had to perform a particular motor skill. The results illustrated that
visual cues were the most effective, and that the elimination of visual cues impaired skill acquisition.

Malina (1969) did a study that involved high school males in overarm throwing tasks. Five groups were used (a control group, a special information feedback only group, an accuracy information feedback group, a speed information feedback group, and no information feedback group). Results showed that groups receiving feedback had better results than the control group (no practice) and the no information feedback group. Also, the withholding of accuracy affected performance more than the withholding of information of speed.

Park (1973) studied the effect of verbal feedback, videotape feedback, and a combination of both in the performance of retarded teenagers. The dependent variable was ratings of performance skill for ninety minutes of envelope sealing. The results were that the verbal feedback group performed significantly higher than the other two groups.

Another study (Whitehead, 1974) using the learning of a gross motor skill as a dependent variable tested the use of conventional feedback (verbal) and videotape feedback to improve the learning of a motor skill. Differences in performance between both feedback treatment groups showed no significant difference between groups in skill performance.
Darst (1975) concluded that student teachers in physical education improved teaching effectiveness with feedback (audio or written), than with no feedback at all.

McClintock and Van Avermaet (1975) did a study that used type of recording of scores as independent variables instead of verbal, visual or auditory feedback. Three groups were used in the study: 1) subject recorded his/her own scores on the blackboard; 2) subject recorded his/her own scores on their own score sheet; and 3) no recording of scores. Self recording of scores improved group performance over no recording at all. Blackboard recording (public record) produced significantly higher scores as time went on over recording of scores on personal sheet. Van Houten and Van Houten (1977) used a special education class to see if performance was affected by posting team and individual scores. The researchers concluded that the group who had individual scores posted, had higher performances than the group who only had team scores posted.

Nelson (1974) taught reading acquisition to kindergarten children. The use of positive feedback following correct responses and negative feedback following incorrect responses was used as independent variables. Results demonstrated that negative feedback for incorrect responses was slightly more effective than the use of positive feedback following correct responses for the improvement of
reading skills. Witte and Huntermark (1975) concluded similar findings. They concluded that the quality of performance increased after subjects were criticized, than when praise followed performance.

McMillan (1977) did a study to see how feedback would affect student attitude and performance. The four groups used in the study were: 1) teacher praise in high effort assignments; 2) no praise in high effort assignments; 3) teacher praise in low effort assignments; and 4) no praise in low effort assignments. Results indicated that feedback had a greater effect on students than no feedback at all. Students who received praise in high effort assignments formed more significant attitudes and had higher achievement rates than students who received no praise.

From the studies reviewed it is hard to draw too many conclusions. It seems to point to the fact that feedback produces greater results in a variety of situations over no feedback. Some studies alude to the preciseness of feedback as the most important variable to increasing performance (Shapiro, 1977), although this is inconclusive. Research is inconclusive on what type of feedback (verbal, visual or auditory) is most effective. Public recording of scores (group or individual) is more effective in increasing performance than self recording on personal score sheets. The effectiveness of positive and negative feedback to increase performance is inconclusive at this time.
The Effect of Delayed and Immediate Feedback

How quickly should feedback be given following a task or response? That is the major question to be examined in this section.

Lowery (1964) did a study involving the throwing of magnetized pellets at a target. He sought to determine whether delaying feedback to subjects would hurt performance. Two groups were formed. One got immediate feedback after each trial, and the other group got feedback after every other trial. Results were that delayed feedback resulted in slower skill acquisition, but better retention.

Lewis and Strain (1970) did a study looking at immediate and delayed feedback (teacher response) to students after performance of a task. Three groups were used: 1) a no feedback group; 2) an immediate feedback group; and 3) a delayed feedback group. Results demonstrated that feedback increased student performance over the no feedback group, although no significant difference existed between the immediate feedback group and the delayed feedback group in performance, as long as delayed feedback was not given after the next response.

Many educators have written about the importance of immediate feedback (knowledge of results) (Popham and Baker, 1970). The major conclusion of this brief review is that whether feedback is given immediately after a
response or delayed, performance will not be affected as long as the next response does not take place first (Magill, 1977; Bilodeau and Dilodeau, 1958; etc.).

**Effect of Feedback on Performance**

This section will delve into the literature looking at the effect feedback has in different settings and with different subjects. Not only will feedback effect be looked into in general educational settings, but outside of education, on student performance, on teacher performance/behaviors and in physical education/sport.

Pioneer studies in feedback (Arps, 1920; Elwell and Grindley, 1938) concluded that improvement of performance continued as long as feedback was provided and that once feedback was withdrawn, improvement declined.

Donohue and Ratliff (1976) investigated the effects of: 1) loss of candy; 2) contingent reward of candy; and 3) feedback. Results indicated that the performance of the group given feedback was significantly higher than the group rewarded with or deprived of candy.

Berger (1967) used a group of male college students who were tested for maximum grip strength. As one group received feedback concerning their performance, the other group did not. After a specified time interval the groups reversed roles. The results showed that each group did
significantly better during the feedback stage, than when in the non-feedback stage.

A study that used feedback to cut back on student absenteeism was done by Fiordaliso, Lindeman, Filipczak, and Friedman (1970). Four groups were used in the study: 1) parents were called when students were absent; 2) no calls to parents; 3) positive phone calls and letters of praise/or good student attendance; and 4) no letters or phone calls of praise. Both groups receiving feedback had significantly higher attendance, although no significant differences between feedback groups.

Effect of Feedback Outside of Education

The presentation of feedback to employees in business settings improved work related performance. Catano (1976) decreased errors made by employees when filling out data forms by publically posting the finished forms. Koch (1976) gave daily feedback to work teams regarding performance. Performance of teams getting feedback was much higher than the group receiving no feedback at all.

Feedback given to individuals in trying to decrease slouching and stuttering rates showed positive results with the use of vibro-tactile stimulations for slouching and auditory feedback to decrease stuttering (O'Brian and Arzin, 1970; Arzin, Jones and Flye, 1968).
Feedback can also be a very positive weapon in these energy short times. Seaver and Patterson (1976) sought to try and save fuel oil consumption by consumers. Three groups were set up: 1) one group received no feedback on oil consumption; 2) one group received feedback on fuel consumption; and 3) one group received feedback plus commendation on fuel consumption. Both experimental groups had significantly lower fuel consumption than the no feedback group, although the feedback commendation group had slightly lower fuel consumption than the normal feedback group.

Feedback – Affecting Student Performance

Numerous studies have been done demonstrating the effect of feedback on student performance (Kirby and Shields, 1972; Drabman and Lehey, 1974; Levy, 1974; and Hasazi and Hasazi, 1972).

Van Hauten, Hill and Parsons (1975) improved writing performances of children in classroom situations. Baseline writing rates were determined for each subject followed by the implementation of feedback on compositional rates, which increased performance. Further improvement occurred as a result of public posting of scores while continuing verbal feedback. An interesting study by Worland (1976) sought to increase spelling accuracy and increase task behavior. The study made use of three groups: 1) no
feedback given; 2) positive feedback and nickels given; and 3) negative feedback (for time off task). Results showed that positive feedback improved spelling, but not on task behavior. Negative feedback increased off task behavior, but spelling accuracy decreased.

Ward and Baker (1968) used verbal feedback following appropriate behavior to cut down on student deviant behavior. During baseline conditions deviant behavior was seventy-four percent, but during the experimental stage in which feedback was used, deviant behavior was reduced to thirty-seven percent. A similar study using a reversal design and feedback as the independent variable to decrease deviant behavior obtained similar results. Using twenty second intervals, 1.39 deviant behaviors took place each interval in a forty minute class during baseline conditions. The use of feedback reduced deviant behavior to 0.49 per interval. The researchers Patterson and Brodsky (1966) removed feedback during a second baseline which increased deviant behavior to 1.77 per interval, but when feedback was reinstated deviant behavior dropped to 0.37 per interval. Ayllon and Kelly (1972) showed that pupils who received constant feedback had significantly higher performance on standardized tests than students who received no feedback.
The Effect of Feedback on Teacher Performance/Behavior

Extensive research has been done in education on the use of feedback to improve teacher effectiveness whether it be in a field experience for interns or with in-service teachers. Also, feedback coming from different sources (supervisors, peers, students, etc.) has also been proven effective (Widell, 1969; Pinkston, et al., 1973; Friedman, 1973; Cooper, Thompson and Baer, 1970).

Through the use of videotape, Saudergas (1973) applied criterion rates of praise to increase and decrease teacher behaviors. Hall (1971) used teachers as experimenters and observers to increase or decrease their own teacher behaviors.

Many studies have used microteaching as a form of feedback to improve teaching interns' teaching behaviors (Brashear, 1970; Davis and Smoot, 1969; etc.). Pearlberg (1968) found that microteaching techniques and the use of a portable video recorder can improve teaching behaviors of an intern teacher in vocational programs. Mocadlo (1973) found microteaching to be an effective strategy for changing inquiry strategies of science and math teachers. Other studies demonstrate the effectiveness of modeling combined with verbal and pictorial feedback in helping teachers acquire complex behaviors (Roush, 1969; Koran, 1970, Orme and Oliver, 1966; Rutherford, 1971).
Feedback to teachers has come in a variety of other methods from different sources. Jones (1969) used systematic feedback to get teachers to interact more with their students. Holmbert, Thomson and Baer (1972) used immediate feedback, graphic feedback, and observer feedback to get higher rates of reinforcement from teachers. Thomas (1971) used a videotape for teachers to analyze their own behavior. The self observation of a videotape by teachers of specific categories of behavior was successful in changing their own behaviors. Silverman and Kimmel (1972) studied the effect of immediate feedback by way of a wireless hearing aid on student teachers. Teachers were given immediate feedback while teaching. Results indicated that teachers who received immediate feedback increased their verbal behaviors over those teachers who did not receive immediate feedback.

Student feedback was also responsible for changes in teacher behavior (Gaye, et al., 1969). Centra (1975) found that college teachers will modify their teaching behavior after necessary student feedback. Tukman and Oliver (1968) found that feedback from students led to improved teaching behavior as measured by change in student ratings. Some still feel that the use of student feedback to change teacher behavior is questionable (Krumhotz, 1971). Kepler (1977) did a study using descriptive feedback from students regarding their behavior within the classroom environment.
Teachers reacted favorably to this form of feedback and it was successful in changing teaching behavior. Hofer (1973) used two groups of teachers, one who received feedback from student ratings and the other group did not. Teachers who received feedback improved their teacher behaviors in much greater quantity than teachers who received no feedback.

The studies reviewed in this section show the importance of feedback for improving performance in a variety of settings, on a variety of subjects not only in education, but in noneducational settings.

Feedback in a Physical Education Field Experience Setting

Feedback, as demonstrated earlier in this review, has been very useful in the field of education. One of the most important endeavors in the use of feedback in physical education has come from The Ohio State University under the direction of Dr. Daryl Siedentop. In a series of studies, feedback has been used in a variety of ways, from a variety of sources, in affecting the teaching skills of student teachers in physical education (e.g., Rife, 1973; Hughley, 1973; Darst, 1974; Hamilton, 1974; Boehm, 1974; Dodds, 1975; Dessecker, 1975; Hutslar, 1976; McKenzie, 1976; Cramer, 1977; and Currens, 1977). The dependent variable used was a "package intervention" which included in varying forms: written instructions, verbal and graphic
feedback, positive reinforcement, cueing, and modeling. Single subject design and a multiple baseline across behaviors, subjects, or settings were used to show causal relationships between the "package intervention" and changes in the student teachers' behavior.

Rife (1973) examined changes in student teacher behavior and its effect upon pupil behavior. The experimenter modeled a particular teacher behavior, while student teachers observed. The student teachers then attempted to demonstrate the same teacher behavior in his/her own class. Feedback consisted on instructions, cueing, reinforcement, and graphic feedback. Results showed that modeling, combined with feedback, were effective in decreasing teacher behavior rates of negative feedback for skill attempts and negative reactions to off task behavior. Increased rates of positive feedback for skill attempts and on task behavior also increased. Hughley (1973) used direct information feedback as an independent variable to affect teaching behavior of physical education student teachers. The use of a multiple baseline demonstrated that student teacher behaviors were modified through the use of the package intervention (verbal and graphic feedback, cueing, reinforcement, etc.).

Darst (1974), Hamilton (1974), and Boehm (1974) used a competency based package intervention on student teacher behavior. Targets were given to student teachers in five
modules: planning, interpersonal relations, management, instructional feedback, and pupil assessment. The use of targets by the experimenter acted as a source of feedback to the student teachers and was responsible for increasing such behaviors as feedback statements, use of names, and behavioral interactions. Currens (1977) supported the finding of Darst, Hamilton, and Boehm by demonstrating significant changes in student teacher behavior through the use of a competency based "package intervention."

Dodds (1975) and McKenzie (1976) used peers to provide feedback to fellow student teachers to try and change teaching behaviors through the use of a "package intervention." Dodds used competency based models (6) as dependent variables, e.g. behavioral recording techniques, instructional processes, management, interpersonal relations, instructional feedback, and individual pupil assistance. Results demonstrated that peer feedback was effective in changing student teachers' behaviors. McKenzie (1976) used a peer assessment model similar to Dodds' to develop specific teaching skills. The competency model consisted of gym rules, positive reinforcement, extinction, modeling, token economy procedures, behavioral games, behavioral contracting, time out, and response costs.

Hutslar (1976) and Crammer (1977) used cooperating teachers to apply the "package intervention" in an attempt to change student teacher behavior. Thus cooperating
teachers had to be trained extensively in the use of applied behavioral analysis. Hutslar (1976) used elementary level cooperating teachers in his study. Target teaching skills were rates of skill feedback, behavior interactions, average time per managerial episode, and use of class time. In twenty-three of twenty-four cases, cooperating teachers' feedback (package intervention) was successful in changing student teacher behavior. Crammer (1977) replicated Hutslar's (1976) study, but used secondary level cooperating teachers. Crammer reported significant results as to the change of student teachers' behavior through the use of a "package intervention" by a cooperating teacher.

Dessecker (1976) used a self assessment model for supervision via tape recorded lessons on the verbal interactions of physical education student teachers. Student teachers recorded their own lessons, then coded the tape themselves and returned it to the experimenter for coding. Results of the data indicated that significant changes were made in all categories: skill and behavioral feedback statements, use of student first names, managerial time per class, etc.), and that self-monitoring, with supervisory feedback, can create behavioral change.

A study that supplements other studies done using the Ohio State University model (package intervention) with student teachers was by McMillan (1978). The major
difference was that McMillan used student interns in a secondary field experience instead of student teachers. Twenty-one Ohio State University majors doing their field experience in secondary physical education were used as subjects in the study. Each intern had teaching behaviors such as instructional time, activity time, management time, levels of appropriate behavior, skill feedback statements, behavior interactions, etc., intervened on through the use of a peer feedback system which acted as an independent variable after baseline conditions. Peers were trained in observation techniques (duration recording, event recording, and time sampling), and the use of videotape. Two peers were assigned to each intern to observe their teaching. Results indicated that for sixty-nine percent of the seventy-one behaviors intervened on, positive changes in those teaching behaviors occurred. Also, that students (peers) could be trained and be successful in changing the teaching behaviors of their fellow physical education interns.

In conclusion, the use of feedback from a variety of sources (experimenter, supervisor, peers, cooperating teacher, self) and in a variety of ways (package intervention) can be effective in changing the target teaching behaviors of student teachers and field experience students.
Feedback in Physical Education/Sport

As mentioned before, applied behavior analysis has been used sparingly in sport and physical education. ABA design and the use of feedback has been very instrumental in the area of increasing teacher performance behaviors (Ohio State University model - Siedentop) but not as much in the athletic or physical education class situation.

The use of an attendance board in which swimmers self recorded and publically displayed certain inappropriate behaviors was done by McKenzie (1972). The use of public recording and self recording reduced absenteeism by forty-five percent, tardiness by sixty-three percent and early departures were completely suppressed. McKenzie and Rushall (1974) took the use of self recording one step further than McKenzie (1972) did to increase productivity of swimmers during swimming practice. The experimenter's rationale was that self-recording of athletic performance may provide enough feedback to reinforce desirable practice behaviors. Swimmers were to keep track of how many laps they did during swimming practice. The use of self-recording on a public board increased the average laps per minute by approximately twenty-seven percent.

Some studies have made use of videotape recording as a source of feedback to increase student/athlete performance. Watkins (1963) used videotape replay to correct baseball batting faults. Thompson (1969) and DeBacy (1970)
improved student golf skills through the use of videotape recording. Burkhard, et al. (1967) used videotape to help students learn basic karate skills. Beverly (1973) and James (1971) both found that videotape feedback was superior in the improving of skill performance over verbal feedback in trampoline skills (James) and archery (Beverly). Beverly also concluded that it made no difference if videotape feedback was given after each class or every other class for improving skill performance in archery.

Lloyd (1969) did a study to see if audio and visual feedback would improve certain tennis skills over no feedback at all. Four groups were used. The first three groups were given audio and visual feedback by looking at their performance and receiving audio criticism of their performance. Each of the first three groups were given the package feedback but at different stages of the study (fifth, eighth, and eleventh weeks). Results indicated that giving feedback only once at selected stages of the learning period did increase performance. Zebas (1975) used feedback and monetary rewards to increase the broad jump ability of high school girls in physical education class. One group received videotape feedback, a second group received money as a reward for improvement, and a third group was the control group. Results were that
neither feedback nor rewards increased performance over the no feedback group.

Mertler (1974), through the use of direct information feedback, sought to modify certain coaching behaviors of a girls' basketball coach to see if these changes affected team behaviors, as well as targeted player behavior. Results indicated that direct information feedback was effective in modifying the coaching behavior in such things as positive feedback, positive feedback to on task behavior, cutting down managerial episodes during practice, etc. The change in coaching behavior's greatest effect on players was an increase in active participation of players during practice. Mertler also concluded, "Why is it, as teachers or coaches, we find it difficult to praise students for doing what is expected of them?" (p. 88).

One of the most recent studies done using feedback in athletic settings was by Crossman (1979). Crossman sought to give feedback to athletes on their practice behavior through the use of an athletic observation system in regard to their utilization of practice time and their subsequent practice behaviors. The experimenter's belief was that athletes given feedback from someone other than their coach will still improve athletic performance, which is moving away from coach-centered to athlete-centered environments. Thus an athlete will become less dependent
on the coach as a behavioral change agent and more capable of choosing a course of action for his/herself and for fellow athletes. Crossman used three collegiate wrestlers, female volleyball players, and gymnasts as subjects, again trying to increase the productivity of their practice behaviors. The results were that practice behaviors did change slightly in the desired direction in two of the three subject settings. The three volleyball players went down in productive practice behavior during interventions probably because of a change in coaches during intervention, demonstrating the effect coaches have on their players.

**Token Reinforcement**

Token economy systems are complex forms of a contingency system. "Generally a token system involves a student receiving a token such as a check mark, ticket, poker chip, etc., at various intervals for appropriate academic, social or skill performance. Later these tokens can be exchanged for a variety of other reinforcers such as edibles, free time, special privileges, etc." (McKenzie, 1976; p. 22-23). The basic elements of token economy systems are: 1) systematic observation; 2) specific behaviors designated desirable or undesirable; 3) backup reinforcers; and 4) tokens, the medium of exchange and exchange rules (Krasner and Krasner, 1973). These token systems can be used on
individuals or groups. The secondary reinforcers, which are extrinsic or intrinsic, are contingent upon the earning of tokens. The tokens are contingent upon the appropriate or desired response of the behavior.

There have been many reviews done on token economy systems, but the most complete is by Kazdin and Bootzin (1972). The review discusses token systems and their use in many different settings on subjects: 1) psychiatric inpatients (Ayllon and Azrin, 1965; Atthowe and Krasner, 1968; Henderson and Scoles, 1970, etc.); 2) mentally retarded (Girardeau and Spradlin, 1964, Hunt, Fitzhugh and Fitzhugh, 1968, etc.); 3) delinquents (Burchard and Tyler, 1965, Tyler, 1967; Cohen, 1968; etc.); and 4) autistic children (Metz, 1965; Hingtgen, Sanders and DeMyer, 1965; etc.). Some examples of these types of studies are as follows. Holt and Hobbs (1973) used an ABAB design to test token systems on delinquent boys in trying to increase on task behavior, social interaction, and assignment completion. For example, token phases during on task behavior was ninety-one percent, but when tokens were removed, on task behavior was seventy-nine percent. Results were consistent on other behaviors as well. O'Leary and Becker (1967) used a token system to decrease deviant behavior with emotionally disturbed teens. Deviant behavior was defined as pushing, shoving, gum chewing, fighting, tardiness, etc. Prizes were used as
secondary reinforcers. Deviant behavior during baseline ranged from sixty-six percent to ninety-one percent compared to intervention of token systems which ranged from three percent to thirty-two percent.

There are many more studies done using this system (McLaughlin and Malaby, 1972; Miller, 1962; Karrarker, 1977; etc.), but to summarize them all in this review would be far too extensive.

Token Systems on Classroom Behavior in Classroom Settings

One of the earliest token programs was done by Bornbrauer and Lawler (1964). Retarded children were given tokens for such behaviors as hanging coats, sitting at the desk attentively, and working on task. Tokens were exchanged for extrinsic reinforcers, candy and trinkets. Results were that the token system was effective in changing thirty-seven of forty-one behaviors to appropriate levels. O'Leary and Becker (1967) gave points to students for paying attention, remaining seated, and facing forward. Points were exchanged for extrinsic prizes. Deviant behavior during baseline was seventy-six percent, but during intervention deviant behavior went down to ten percent.

Bushell, Wrobel and Michaelis (1968) increased student performance in writing, reciting, and participation by earning tokens and exchanging them for intrinsic reinforcers (movies, short field trips, etc.). Hewitt, Taylor, and
Artuso (1969) did a study comparing a token system to normal teaching methods to increase student attentiveness and increased performance, as well as increased attentive behavior. Fox and Ervin (1976) increased students' correct reading responses by using a token system. Tokens were exchanged for use of the coke machine, going to ballgames, etc. Osborne (1969) used free time as an intrinsic secondary reinforcer to increase in-seat behavior of students. Osborne refers to the effectiveness of intrinsic reinforcers in the normal classroom with no extra cost to the teacher and/or school. McKenzie, Clark, Wolf, Kothera, and Borson (1968) used weekly grades as tokens to increase academic performance of students. The interesting part of this study was that the earning of weekly grades (tokens) could be turned in for money, which was used as secondary reinforcers, although the money was given to the student by his/her parents. Thus an "A" would be worth so much money, a "B" worth so much, etc., thus demonstrating that parents can be involved in helping a teacher increase the performance of his/her child.

As reported, of all the studies reviewed thus far in this section, there are more studies using individual token systems over group token systems. Two studies showing the use of group token systems are as follows. Clark and Fisher (1971) used a group token system to cut down on the
amount of wasted food at lunch time in an elementary school. Through the use of a group token system, wasted food went down from forty pounds per day during baseline to eighteen point six pounds per day during intervention. Barish, Saunders, and Wolf (1969) divided students (class) into two groups; both groups received points for talking out, for getting out of seat, etc. The group with the fewest amount of points could trade in for extra free time, special activities, etc. Deviant behaviors were reduced considerably for both groups from baseline conditions in which points were not available.

Token systems have even been used to change teacher behavior. Chadwick and Day (1971) found that teacher and classroom aids increased approval statements and decreased disapproval statements when tokens were used.

Token Systems in Physical Education/Sport

Token systems are "a largely untapped resource for improving behavior in physical education and sport environments" (McKenzie, 1976; p. 48).

Hutchinson and Siedentop (1972) tested the effectiveness of token economy systems in physical education classes for the multiple handicapped. The token system was found to be effective in modifying and maintaining appropriate behaviors (attending to the teacher, participation) in special physical education class through the dispensing
of tokens for appropriate target behaviors. Huber (1973) used a token economy system to increase appropriate behavior and motor task performance in special physical education classes. The token system was effective in reducing disruptive behavior, but only slightly successful in increasing motor skill performance of the students.

Brock, Brock, and Wills (1972) looked into the effect of awarding points as the result of practice attempts for two 15 year old male pole vaulters. Points earned could be exchanged for edibles or an excused absence from practice. Both pole vaulters improved their performance during treatment sessions.

One of the more important studies done in an athletic setting using a token economy system was by Jones (1978) the head women's basketball coach at Purdue University. The purpose of the study was to affect a measurable change in certain behaviors of girls attending a summer basketball camp. Seven female subjects were chosen, ages thirteen to seventeen, with varying degrees of ability. The subjects participated into 3 types of game situations: 1) a modified game with "Olympic rings" (points awarded for specific game behaviors); 2) a modified game without "Olympic rings"; and 3) regular scored games. A court observer used a bullhorn to award points for rebounds, good passes, screen/picks, moving without the ball, getting the ball to the center of the court after an outlet pass,
and steals. Individuals were given "Olympic rings" for performance of these behaviors. One ring was given to each team member for every 20 points scored by the team. Individuals could trade in tokens for secondary reinforcers, e.g. 2 rings M&M's, 16 rings Coke and a candy bar, 32 rings ice cream, etc. Results were as follows: during modified token games, a mean average points scored per game of 89.5, during modified game with no tokens, a team average of 37.6 points per game; and during the regular scored games a 46.5 scoring team average. The study indicates that token economy systems used in athletic settings can be effective in increasing team performance by awarding tokens and secondary reinforcers to individuals.

Physical Education/Sports use of token economy systems has been effective, but its use has been limited. The use of intrinsic reinforcers is a natural in the physical education setting. Token systems have been proven effective with small groups in special situations. There is a need to do more research with larger classes in physical education/sport to see if not only behavior can be improved, but also skill performance as well.

Contingency Systems

The use of contingency systems has been very popular and effective over the last ten years in education. Many studies today in classroom settings are using group
contingencies to change student/class behavior. The literature is abundant with these types of studies (Long and Williams, 1973; Robertshaw and Hiebert, 1973; Sloggett, 1971; Kazdim and Forsbery, 1974; etc.).

**Group Contingency Systems and Their Effectiveness**

Two studies that exemplify the effect of group contingency systems in the classroom are by Schmidt and Ulrich (1969), and Barrish, Saunders, and Wolf (1969). Schmidt and Ulrich (1969) used a reversal design and group contingencies to cut down on classroom noise. A two minute extension to the gym period was contingent upon unbroken silence for ten minutes during a quiet period. Class noise average during baseline conditions was fifty decibels. During the first phase of intervention, class noise went down to forty decibels. The reinstatement of baseline conditions raised noise average to forty-five decibels. The reinstatement of intervention lowered class noise again for thirty-five decibels. Barrish, Saunders, and Wolf (1969) wanted to reduce out-of-seat behavior and talking out responses by a class. The class was broken into two groups. Each time a child talked or got out of his/her seat, a mark was put on the board which meant a loss of privileges by all members of the group (privileges were extra recess, time to work on special projects, first to line up for lunch, etc.). For example, in math class
during baseline, talking out responses occurred with ninety-six percent of the students and eighty-two percent of the students for out-of-seat behavior. During game intervention, talking out was only nineteen percent and nine percent for out-of-seat behavior. With removal of game conditions, behavior rates increased. During rein-statement of game conditions, behaviors decreased, thus demonstrating causality.

Classroom group oriented contingencies have had many reviews, but one of the most complete was by Litow and Pumroy (1975). In the review there were three major advantages pointed out in using group contingencies over individual contingencies: 1) lower cost of applying group contingencies over individual contingencies (Wasik, 1970); 2) group contingencies were easier to manage - "easier to dispense one reinforcer to the class than to dispense one to each class member" (Herman and Tramontana, 1971; p. 118); and 3) the peer group can be utilized in controlling and enhancing classroom behavior (Litow and Pumroy, 1975; p. 341).

Litow and Pumroy classified group-oriented contingency systems into three different categories: independent, dependent, and interdependent. A dependent group oriented contingency system "is established when the same response contingencies are simultaneously in effect for all group members" (p. 342). An example is that if all students are
to remain seated in their chairs in order to receive ten minutes of free time at the end of a forty minute session and one student gets out of his chair, the whole class loses the privilege. An example of this type of study are Coleman (1970), Kubany, Weiss, and Sloggett (1971), etc.

An **independent group oriented** contingency system "is established when the same response contingencies are simultaneously in effect for all group members but are applied to performances on an individual basis" (p. 342). If a class was to do an assignment in twenty minutes time, those students who didn't finish would not get a prize. Examples of this type of study are Dialman (1973), Kuypers, Becker, and O'Leary (1968), Meichenbaum, Bowers, and Ross (1968), etc.

An **interdependent group oriented** contingency system "is established when the same response contingencies were simultaneously in effect for all group members but are applied to a level of performance" (p. 343). An example is that free time activities to a class are contingent upon the whole class reaching an average of seventy-five percent accuracy in hitting the specified targets in archery. Examples of this study are Walker and Hops (1973), Wilson (1971) and Jacobs (1970), etc.

The Litow and Pumroy (1975) review also discussed the effects of the three different group systems in affecting
the performance of the entire class. Fourteen studies were done comparing the three different types of group systems. Seven studies reported no difference, six reported interdependent group systems to be the most effective, and one reported independent group systems to be the most effective in changing behavior or increasing performance (p. 344). Litow and Pumroy concluded:

"If further studies can empirically demonstrate that interdependent group-oriented contingency systems are as effective as individual contingencies and independent group-oriented contingency systems, the applied behavior scientist will have an array of techniques that are practical, effective, and cognizant of peer-group pressures in the classroom setting. More widespread use of interdependent group-oriented contingency systems will be seen as advances in behavioral technology devices for monitoring classroom behavior and for regulating this system of group-oriented contingencies in the classroom."

O'Leary and Drabman (1971) urged caution in initiating group oriented contingencies because of:

"The possibility that a particular child cannot perform the requisite behavior, the resulting possibility of undue pressure on a particular individual, and the possibility that one or two children may find it reinforcing to subvert the program or beat the system." p. 390

Contingency Systems in Physical Education/Sport

Many of the activities in physical education/sport involve team or group competition and thus are very conducive to interdependent group contingency systems.
Of course, individual contingency systems have been popular as well. Still there is a lack of research in physical education/sport using contingency systems.

Some of the studies using individual contingency systems are very relevant to this review and are as follows. Heward (1978) used a professional touring baseball team to test individual contingencies on the offensive production of the team. An ABAB design was used and a new baseball statistic efficiency average was used as a dependent variable. The efficiency average was calculated by the total number of hits, runs scored, runs batted in, walks, sacrifices, and hit by pitch during times at bat, divided by the total number of times a player goes to the plate. Baseline was taken on efficiency average the first twenty-eight games in which no reinforcement was given. The next fourteen games reinforcement was available, followed by a second baseline for fourteen games. Intervention was again available the last fourteen games of the season. Reinforcement was available to individuals after every seven games during intervention. Reinforcement was extra meal money, five dollars to the player with the highest efficiency average for the period, three dollars to the second highest individual average, and two dollars for the third highest average. The results were that six of nine players had higher EA's during intervention than during baseline. Team
E.A. increased from .601 during first baseline to .831 during first intervention. Total team E.A. during the twenty-eight games of intervention was .782 and .730 for the forty-two games of baseline conditions.

Other individual contingency systems to improve performance were by Birdsong and McCune (1977), who used people charting and contingent free time to improve performance in 110 and 220 yard preseason training intervals run by female university basketball players. Olson and Heward (1972) found that contingent "free" bowling increased bowling practice rates in introductory and intermediate college bowling classes. Brown and Copeland (1971) utilized the playing of basketball with the school principal for fifteen minutes during the lunch hour as a reinforcer contingent upon the appropriate behavior of a third grade student.

Siedentop and Dawson (1978) used an independent contingency system to increase team skill performance and team attitude. The contingencies were that a large "Eagle Effort Board" would be posted in the school hallway. Point accumulations were posted daily and a "star" was placed next to the name of each player who had a daily high point total. All players who accumulated 1,000 points were awarded an "Eagle Effort" award at the end of the season. Results showed that layup shooting improved from sixty-eight percent during baseline to
eighty percent during intervention. Jump shooting went from thirty-one percent in baseline to fifty-one percent during intervention, and free throws from fifty-nine percent to sixty-seven percent during intervention. Encouraging comments by peers occurred on an average of thirteen times per practice during baseline to sixty-five times during intervention.

McKenzie (1972) used an interdependent group oriented contingency system called "disqualification" to increase inappropriate behaviors during swimming practice. Club members were divided into three teams. Disqualifications could occur to team members for: 1) unnecessary stopping; 2) not pushing off; 3) not swimming in; 4) changing stroke; or 5) not following rules of the game. A "d" was placed next to team members' places on the unit board. The team with the fewest "d's" received social praise and small humorous rewards from coaches. Behaviors that had interfered with swim practice were dramatically reduced.

Siedentop, et al. (1973) used independent group contingencies to reduce time spent in management by junior high school students in physical education. The entire class could accumulate "free time" which could be used once a week, if all student were: 1) in assigned places by starting time; 2) attentive to the teacher within five seconds of being cued; and 3) able to complete
organizational changes within twenty seconds after the signal. Total savings of time accounted to as much as twelve minutes per class. Young (1973) set up an interdependent group contingency system so that one or both teams could earn additional gym time. Points were earned if team members were behaving appropriately at a given signal from a cassette at different intervals. Groups did not earn a point when the tape sounded and they weren't acting appropriately. Results indicated that although behavior improved, skill acquisition did not.

Summary of the Literature

The purpose of this chapter was to outline research that has been done on the topic of feedback, token economy systems, and contingency systems.

Feedback has demonstrated to be effective in producing behavioral change and increased performance, over no feedback in various educational settings: special classrooms, institutional settings, athletic fields, etc.

Research is inconclusive as to the type of feedback that is the most productive, although there is growing support for a combination of visual and verbal feedback. Public recording of individual and group scores, work output, etc., as a type of feedback has proven to be quite effective in different settings, education, athletics, business, etc.
The question on whether feedback should be given immediately after a response has been dealt with in great quantity through research. The research seems to conclude that it makes no difference when feedback is given as long as it takes place prior to the next response.

Feedback has also demonstrated to be effective in improving student performance in many different settings in education. Improvements in teacher skills has been attributed to feedback, whether it was from supervisors, peers, self, etc.

Physical education/sport has demonstrated the usefulness of feedback especially in the changing of student teacher behavior. The use of a "package" intervention as a form of feedback changed student teacher behavior in a variety of situations from a variety of sources (supervisor, cooperating teacher, peers, self). Behavior change, improvement, and skill performance in physical education/sport settings as a result of feedback have also been demonstrated.

Token economy systems as indicated in this review have been effective in many different settings, with many different subjects: psychiatric wards, hospitals, delinquent teens, handicapped children, as well as "normal" classroom settings in education. Physical education and sports have used token systems to increase skill
performance and to change behavior, although the latter (behavior change) has been much more successful through the use of token systems.

Contingency systems have been proven effective in varied educational settings. Individual contingency systems have been used more than group systems, although the latter is gaining popularity in its use and effectiveness because of economic and managerial reasons. Of the three different types of group contingency systems, inter-dependent systems have been given more support in the literature over dependent and independent contingency systems. Physical education and sports have made use of contingency systems to increase team, individual, and class performance, as well as to modify and/or maintain appropriate behaviors in physical education class.

Feedback, token economy systems, and contingency systems have all been shown to be effective in physical education and sports, although more research is needed. We in physical education and sport need to replicate more of the studies and findings in education to see if they are applicable to us. Feedback has been effective in producing behavioral change with student teachers in physical education, but its effect on skill performance in physical education/sport has been slight. Also, what type of feedback is more successful in producing desired results in physical education and more research in physical
education/sport is needed to give more support to public recording of behavioral and performance skills.

The use of contingency systems in physical education and sport has been successful, but ever so slight in use. We can no longer speculate and have inclinations about what will work in our professions. We must develop a sound research base that can be used by our practitioners.
CHAPTER III

METHODS AND PROCEDURES

The purpose of this study was to analyse the effects of feedback individual-group (interdependent, independent) contingencies on specific team behaviors of an intercollegiate baseball team.

In the process of doing this study, many problems arose, some not anticipated. I did not expect to have as many rainouts (10) as we had. This not only caused problems for the players, but the coders as well. Extra training sessions took place during the extended layoffs of three to four days, especially early in the season. I did not expect the learning of the coding system to be difficult, but it was harder than anticipated. Changes in pitching roles and a personal problem for one coder led to the changing of coders during a game, and I did more coding myself than expected. Also because of the shortened schedule, interventions on some of the behaviors took place in violation of the design's original format in order to use both interventions on all five behaviors.
This chapter is included to give the reader an understanding of the methods, procedures, and processes used to implement such a study.

**Subjects and Settings**

The subjects used were twenty-six male athletes from the Capital University Baseball Team. The subjects were broken down by position: eleven pitchers, two catchers, six outfielders, and seven infielders, all ranging in age from eighteen to twenty-one. The subjects were observed in game conditions only, at all home games and away games. The home games were played at Creek Front Stadium (Columbus Campus) which is approximately one mile from the main campus in Bexley, Ohio. Most of the away games were with Ohio Conference Southern Division teams (Marietta College, Otterbein College, Wittenberg University, Muskingum College, Denison University, and Ohio Wesleyan University), although other away games were played at various other sites (see Appendix C).

**Characteristics of Subjects**

**Pitchers**

Eleven pitchers made up Capital's pitching staff. One of the pitchers was also an outfielder-designated hitter, although his main job was on the pitching staff. The staff was in a four to five man starting rotation depending on the number of games per week and the number
of doubleheaders. The rest of the staff took on roles such as spot starting, long relief, and short relief. It is interesting to note that there were no senior pitchers, two junior pitchers, and the rest were freshmen and sophomores. The main nucleus of the pitching staff was back from the 1979 season that was third in the Ohio Conference and sixth in the nation in earned run average (ERA) for Division III schools.

**Infielders**

The infield was made up of nine ballplayers. Of the nine infielders, six only played one position (two catchers, two first basemen, one shortstop, and one third baseman). The other three worked at two positions, one player primarily worked at third base but also worked some at second, a second player primarily worked at second base but also worked at shortstop, and a third player primarily worked at second base but also did some catching. The infield was made up of no seniors, two juniors, and the rest were freshmen and sophomores. Only the starting catcher from the 1979 season was gone. Team fielding last year was fourth best in the Ohio Conference.

**Outfield**

Six players made up Capital's outfield. All outfielders primarily worked at one position, but also did some work at a second position. The outfield was made
up of one senior, no juniors, and the rest were freshmen and sophomores.

TABLE 1
CHARACTERISTICS OF SUBJECTS (PITCHERS)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Age</th>
<th>Year in School</th>
<th>Letters Earned</th>
<th>Throws/Bats</th>
</tr>
</thead>
<tbody>
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<td>Soph</td>
<td>1</td>
<td>L/L</td>
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<td>L/L</td>
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<td>Jr</td>
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<td>R/R</td>
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TABLE 2
CHARACTERISTICS OF SUBJECTS (INFIELDERS)

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TABLE 3
CHARACTERISTICS OF SUBJECTS (OUTFIELDERS)

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<td>R/R</td>
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<tr>
<td>6</td>
<td>18</td>
<td>Fr</td>
<td>0</td>
<td>R/R</td>
</tr>
</tbody>
</table>

Sport Environment

The sport environment was a men's intercollegiate baseball team during a seven week season. The squad consisted of twenty-six players, five coaches, a statistician, and a trainer. Four weeks of swimming and weight training, plus six weeks of pre-season workouts took place prior to opening day. A forty-two game schedule consisted of twenty-one home games and twenty-one away games. The schedule also included thirteen doubleheaders and sixteen single dates, weather permitting. Rainouts did lead to extra doubleheaders and cancellations of games. Doubleheaders consisted to two seven inning games, whereas single games consisted on nine innings.

This baseball team was very young, when looking at age. There were eleven freshmen, ten sophomores, four juniors, and only one senior, although five of nine starters were
back, including four of the six top pitchers. The 1979 Capital University Baseball Team was 20-14, third in the conference. The team was again picked to finish within the top four in 1980, although they were to take on their toughest schedule ever. Besides a thirty-three game schedule with Division III schools, the schedule also included six games with Division II teams and three games with Division I teams.

Target Behaviors

The target behaviors used in this study were determined from last year's statistics and this year's pre-season practice. The behaviors chosen and/or combined were team behaviors in which the most improvement was needed, and if improved, would hopefully lead to greater team success. The behaviors chosen were from the offensive and defensive aspects of the game of baseball. Pitching was another area looked at and as most baseball experts agree, pitching is about eight percent of the game. The order the behaviors were intervened on were determined after a baseline was taken. The five behaviors to be intervened on were: 1) defensive efficiency average; 2) pitching efficiency average; 3) modified efficiency average; 4) offensive advancement efficiency average; and 5) offensive strikeout efficiency average.
Definitions of Target Behaviors (Dependent Variables)

1. **Defensive Efficiency Average (DEA)** - This behavior encompasses team fielding and defensive success in many different situations (sacrifice, squeeze, stolen base, cutoff, sacrifice fly, tag up, passed ball, first and third, and run down situations) and using those situations to see if the defense mentally and physically executed the proper play. The defensive average was figured out by dividing the number of successful opportunities by the number of total opportunities. In the mental execution section on this behavior, a throw to an incorrect base by an infielder or outfielder and an incorrect defensive setup is considered a lost opportunity. A throw to a correct base by an infielder or outfielder is considered a successful opportunity. In the physical execution section, an out, a correct cutoff play, etc., when the runner(s) is being denied advancement are all considered successful opportunities. No out (e.g. sacrifice situation), runner(s) advancement, error, or incorrect cutoff are all considered lost opportunities.

An example in coming up with the defensive efficiency average for one game is as follows: The defense handled fifteen of seventeen normal fielding plays. In a sacrifice situation a throw to a wrong base occurred (0-1), there were two errors (0-2), five
correct cutoffs (5-5), two incorrect cutoffs (0-2), in
four situations (tag up, squeeze, etc.) runners advanced
(0-4), and in three situations runner(s) were denied
advancement (stolen base, sacrifice bunt, etc.) (3-3).
Total 23 successful opportunities and 11 lost oppor-
tunities. 23/34 = .676 DEA

2. Pitching Efficiency Average (PEA) - The pitching
average was figured out statistically by dividing the
number of total opportunities into the number of
successful opportunities. The situations involved
in this average were 0-2 pitches, pitches in bunt situ-
ations, squeeze situations, double play situations,
fielding plays for the pitcher, normal situations in
which a wild pitch or balk took place, pickoffs, and
special situations (covering first and backing up
bases, walks, strikeouts, runners in scoring position,
earned runs, unearned runs, whether or not the first
batter was retired in an inning, number of hits, and
number of outs).

In the mental execution section, a throw to a
correct base was counted as a successful opportunity.
Not backing up a base, not covering first, and throw-
ing to a wrong base were lost opportunities. A lost
opportunity in the physical execution section was a
bad pitch in the various situations, not getting an
out in certain situations, an error, a wild pitch,
and a balk. Other lost opportunities occur with walks, earned runs, and runners that scored when in scoring position. A successful opportunity in the physical execution section occurs when good pitches were made in certain situations and outs a pitcher was responsible for in a fielding play and when the first batter in an inning was retired. Strikeouts and unearned runs were counted as successful opportunities.

An example of a pitching efficiency average for a nine inning game is as follows: five walks (0-5), eight strikeouts (8-8), ten runners in scoring position in which three scored (7-10), five runs scored in which four were earned (1-5), ten 0-2 pitches in which eight were good pitches (8-10), six attempted bunts in which four were good pitches (4-6), four times in nine innings the first batter was retired (4-9), eight double play situations in which two were good pitches (2-8), pitcher made (2-3) fielding plays, one wild pitch (0-1), threw to one incorrect base (0-1), covered first base twice (2-2), and gave up five hits (0-5) in nine innings (27-27), thus sixty-five successful opportunities and thirty-five lost opportunities. 65/100 = .650 PEA

3. **Offensive Strikeout Efficiency Average (OSEA)** - This statistic was computed by dividing the number of at bats into the number of times the team did not strikeout
during those at bats in a single game, e.g. forty at bats and five strikeouts during the game. $\frac{35}{40} = .875$ OSEA

4. **Offensive Advancement Efficiency Average (OAEA)** - This average includes the number of times the offense was successful in moving runners up in sacrifice bunt and squeeze situations, hitting behind a runner, stolen bases, sacrifice flies, tag ups, divided by the number of opportunities attempted, e.g. sacrifice (3-5), hitting behind runner (1-3), stolen bases (4-5), and sacrifice flies (1-2). $\frac{9}{15} = .600$ OAEA

5. **Modified Efficiency Average (MEA)** - This was calculated by dividing the total number of times the team and/or player went to bat into the total number of hits, runs batted in, walks, hit by pitch, and runs in a game e.g. in one game a team has 40 at bats with 10 hits, 6 RBI's, 3 walks, 1 hit by pitch, and 5 runs. $\frac{25}{40} = .625$ MEA

**Independent Variables**

Two independent variables were used as interventions, feedback and individual-group contingencies. Feedback was in the form of public recording of team and individual averages which were posted on the team board. Feedback also consisted of talking to (verbal feedback) individuals and the whole team at once concerning the averages of the behaviors by the experimenter, who is also an assistant coach.
The second independent variable which was used as the second intervention along with feedback (public record and verbal feedback) was individual and group contingencies. Some behaviors had individual contingencies and others had group contingencies tied to them, but the mixing of group and individual contingencies on a behavior was never done. Once a group contingency was used on a behavior, it was used in some form for the rest of the study.

Research Design

A multiple baseline across five behaviors was used in this study. A multiple baseline can be used in one of three ways when doing a study: across behaviors, settings, or subjects. Multiple baseline design has gained in popularity since its inception into educational based studies (Baer, Wolf and Risley, 1968).

When using a multiple baseline design across behaviors at least two different, but somewhat similar, behaviors are needed. In this study five different behaviors were measured at the same time during baseline, before any intervention took place. Following baseline, the intervention strategy was implemented on only the first behavior in the design. During intervention of the first behavior, baseline conditions and measurement continued on the other four behaviors. After behavior change was generated on the first behavior, the same intervention
was applied to the second behavior, while the other three behaviors remained in baseline. Following a change in the second behavior, the intervention was applied to the third behavior and so on until all five behaviors had been intervened on by the first intervention.

Causality is demonstrated when behavior change has occurred on the first behavior and the intervention creates change on a second behavior following intervention on it. The greater number of behaviors and baselines (3 to 4) used, the greater confidence that a functional relationship has been established (Cooper, 1974).

A multiple baseline is advantageous in its use because it eliminates some of the undesirable aspects of a reversal design. When change occurs in some behaviors the experimenter may not want to revert that behavior back to its undesirable condition as in a reversal design, thus the major advantage of a multiple baseline. Also, the use of a multiple baseline repeatedly analyzes the treatment (independent variable(s)) rather than the behaviors (dependent variables) as a reversal design does.

The most important aspect of a multiple baseline design to watch out for is the "induction effect." Induction occurs when an intervention is applied to one behavior but also affects another behavior or behaviors still in baseline.
This study not only made use of a multiple baseline across five behaviors, but two interventions as well, which were repeatedly analyzed through this design. The main difference in using two interventions in a multiple baseline across behaviors is that, for example, the experimenter might be intervening on the first and second behaviors with the second intervention while the third and fourth behavior are being intervened on by the first intervention, and while the fifth behavior is still in baseline. The process would continue until all five behaviors have been intervened on by two interventions. (See Figure 1 for Graphic Prototype of the Data.)

Coder Selection and Training

Coders for this study were selected on the basis of interest and availability. All five coders selected were undergraduate students in a variety of program areas at Capital University. All coders were also members of the Capital University Baseball Team and were all pitchers. The five pitchers were either starting pitchers or long relievers. The reason baseball players were selected to code was for two reasons: 1) their knowledge of the game which reduces training; and 2) their availability to code. Because of long trips for away games and overnight trips, it was not feasible to get other coders who were not baseball players. The reason pitchers, starting and long relievers, were chosen is because their participation was
Figure 1. Graphic prototype of the data
set up in advance via a pitching rotation. Everyday players, short relievers, or utility players can't be used because of the uncertainty of when or if they will play in a given game. The use of starting pitchers and long relievers as coders did minimize this problem.

Since the coders were all college baseball players, extensive training did not have to take place. The most important part of the training sessions was to familiarize the coders with the coding instrument and to make sure the coders were given precise definitions of the different categories so they could interpret occurrence and non-occurrence of behaviors the same way. Two two-hour training sessions took place a week before the first game and the start of data collection. The second training session was a mock game consisting of three innings on tape done by the experimenter to give the coders a chance to practice coding and to go over difficult behaviors in which observer drift could occur. Two scrimmage games four days before opening day gave coders a chance to practice. Each coder coded three innings of each observation sheet during the scrimmage. Reliability of the mock training session ranged from .88 to .98 on the three observation code sheets (defense, offense, pitching). Calculation of reliability for each of the five coders was obtained by comparing the data of each against a standard (the experimenter and developer of the coding system).
Baseline

Each of the five team behaviors was to be observed using the observational coding system until a stable baseline or a trend opposite of the behavior's desired direction occurred. This phase of the study lasted five games. Intervention was not planned on being implemented until stability in the baseline occurred, which was a consistent average of the team behavior over this period or when the team behavior was going in the opposite direction desired by the experimenter.

All subjects, two weeks prior to the season, were told that they would be involved in this study and that the main purpose was to increase team performance in the offensive and defensive phases of baseball. They were also told that the improvement of these team behaviors would lead to greater team success. Each subject was given a consent form (see Appendix B) which they signed giving me permission to use them as subjects in the study and that they were given an explanation as to the purpose of the study. Parents of the subjects were also informed of the study and its purpose in a meet-the-team-night one week prior to opening day and data collection.

Interventions

As mentioned earlier, there were two interventions used in this study, feedback and individual-group contingencies.
Feedback took place in the form of public recording and verbal feedback to team and individual players. Public recording was the individual and team statistics in the various behaviors posted on the team board. Prior to each game these averages—statistics were posted and individual and team meetings concerning these averages were discussed. The defensive average showed only team efficiency, but the rest of the behaviors (pitching, strikeouts, advancement average, and modified efficiency average) were posted in team and individual efficiencies. The order the behaviors were intervened on was determined after baseline conditions. As public recording took place, individual and team goals were discussed and set. A discussion on where improvement was needed within the certain behavior to improve individual and team averages was also discussed. This phase of the study continued until all five behaviors were intervened on.

The second intervention was individual-group contingencies. It must be noted that this contingency intervention was added to feedback because the public recording-verbal feedback continued throughout the study. The main purpose of this intervention was to see if the combination of contingencies and feedback improved the performance of behavior more than just feedback alone. The defensive efficiency average had a group contingency (interdependent) tied to it. For every four games under this
intervention, a criteria was tied to accomplishing the
defensive goal. An example would be if our defensive
average had been in the area of .600, I would set a goal
that in the next four games we get over .700 at least
once and never go under .600. A group reward of a candy
bar would be contingent upon the team reaching that goal.
The pitching efficiency average also had a group contin­
gency tied to it. A four game goal was tied to the
pitching average. For example, in the next four games the
pitching efficiency average goal was to average .750, which
was fifty points higher than the last four games. If that
goal was reached, an extra dollar for meal money was
given to each pitcher for our next road trip. An indi­
vidual contingency was tied to the modified efficiency
average. An example would be, the player over the next
four games with the highest efficiency average (minimum
of ten at bats) got a McDonald's gift certificate. The
offensive advancement efficiency average was tied to
a group contingency. An example is that over the next
four games the advancement average must be .700, which was
a fifty point higher average than present. A group re­
w ard of extra batting practice was contingent upon
reaching that goal. The last behavior, the offensive
strikeout efficiency average, had an individual contin­
gency tied to it. An example is the individual(s) with
the highest strikeout efficiency and the individual with
intervention, a criteria was tied to accomplishing the defensive goal. An example would be if our defensive average has been in the area of .600, I would set a goal that in the next four games we get over .700 at least once and never go under .600. A group reward of a candy bar would be contingent upon the team reaching that goal. The pitching efficiency average also had a group contingency tied to it. A four game goal was tied to the pitching average. For example, in the next four games the pitching efficiency average goal is to average .750, which is fifty points higher than the last four games. If that goal is reached, an extra dollar for meal money will be given to each pitcher for our next road trip. An individual contingency was tied to the modified efficiency average. An example would be the player over the next four games with the highest efficiency average (minimum of ten at bats) will get a McDonald's gift certificate. The offensive advancement efficiency average was tied to a group contingency. An example is that over the next four games the advancement average must be .700, which is a fifty point higher average than present. A group reward of extra batting practice will be contingent upon reaching that goal. The last behavior, the offensive strikeout efficiency average, had an individual contingency tied to it. An example is the individual(s) with the highest strikeout efficiency and the individual with
the most improvement over the next three games got a McDonald's gift certificate.

The intervention schedule was always in three to five game increments. Of course, the goals did change, the rewards did change, even the type of group contingency did change (interdependent, independent), but once a type of contingency, individual or group, was applied to a behavior, it did stay individual or group for the rest of this intervention phase.

The Observation Code

The Baseball Observation Code (BOC) was divided into three sections: 1) defensive; 2) offensive; and 3) pitching. There are two offensive sheets, two pitching sheets, and one defensive sheet. One of the offensive sheets and one of the pitching sheets has many different categories (see Appendix D) but one recording method, event recording. Event recording is a cumulative tally or frequency count of discrete behaviors as they occur. The major defensive, pitching, and offensive sheets are set up similar with the same categories, but different behaviors. A type of interval recording was used to record behaviors on these sheets. Each sheet has a: 1) situation category; 2) mental execution category; 3) physical execution category; 4) a total section to add up plus and minus for each behavior; 5) outcome section to verbally write down what happened in baseball language; and 6) a player or pitcher
section to write down the subjects involved in the play. This observation code is used to record behavior during game play, not practices.

An example of a two inning game is as follows (see pages 76-80).

**Defense in first inning** - The first batter flied to center and was retired. The second batter singled to right with the right fielder making the play and hitting the cutoff man. The third batter singled to center with the center-fielder making the play and hitting the cutoff man. The fourth batter flied to left for the second out leaving runners still at first and second. The fifth batter walked loading the bases and the sixth batter struck out, but neither are recorded on the defensive sheet.

**Defense in second inning** - The second inning opened with a single to right with the rightfielder making the play and hitting the cutoff man. With the second batter up, a stolen base of second was successful. The second batter successfully sacrificed the runner to third. With one out, the third batter hit a sacrifice fly to center scoring the runner from third. The fourth batter grounded to short ending the inning. For this two inning example, defensive efficiency was 8 plus and 2 minus (8/10)= .800 DEA.

**Pitching in first inning** - The first batter in the inning flied to center. The second batter singled and the third batter singled to center in a double play situation with
one out. The fourth batter took an 0-2 pitch high and tight for a ball, then flied to shallow left in another double play situation. The fifth batter walked with two outs to load the bases and the sixth batter struck out to end the inning.

**Pitching in second inning** - The second inning opened with a single and a stolen base. The second batter successfully sacrificed the runner to third. With one out, the third batter hit a sacrifice fly to score the runner from third. The fourth batter grounded out. Pitching efficiency is calculated as follows: first batter in inning (1-2), double play situations (1-2), bunt situations (1-1), 0-2 pitches (1-1), walks (0-1), strikeouts (1-1), runners scoring from scoring position one of three (2-3), one earned run (0-1), hits (0-3), and two innings pitched six outs (6-6). There were twenty opportunities with thirteen successful opportunities. \( \frac{13}{21} = .619 \) PEA

**Offense in first inning** - Glassco led off by grounding to second. Hutchison singled and stole second. The third batter, Brentlinger, singled scoring Hutchison from second. The fourth batter, Shaw, struck out and the fifth batter, Stucky, walked. Brentlinger was picked off second with two outs.

**Offense in second inning** - In the second inning Noble led off with a double and was sacrificed to third by Mills. The next batter, Vazquez, hit a sacrifice fly scoring Noble.
Markley ended the inning by popping out to first. The modified efficiency average (MEA) is figured out by dividing the number of at bats into the number of hits, runs batted in, walks, hit by pitch, and runs scored. Thus with nine at bats and three hits, two runs batted in, one walk, and two runs, the modified efficiency average is $\frac{8}{9} = .889$ MEA. The offensive advancement efficiency average (OAEA) is calculated by dividing the number of opportunities into the number of successful opportunities. Thus with one stolen base (1-1), one sacrifice bunt (1-1), one sacrifice fly (1-1), and one baserunning mistake (0-1), the offensive advancement efficiency average is $\frac{3}{4} = .750$ OAEA. The offensive strikeout efficiency average (OSEA) is calculated by dividing the number of at bats by the number of times strikeouts did not occur. Thus the offensive strikeout efficiency average for this two inning game was $\frac{8}{9} = .889$ OSEA.
Markley ended the inning by popping out to first. The modified efficiency average (MEA) is figured out by dividing the number of at bats into the number of hits, runs batted in, walks, hit by pitch, and runs scored. Thus with nine at bats and three hits, two runs batted in, one walk, and two runs, the modified efficiency average is $\frac{8}{9} = .889$ MEA. The offensive advancement efficiency average (OAEA) is calculated by dividing the number of opportunities into the number of successful opportunities. Thus with one stolen base (1-1), one sacrifice bunt (1-1), one sacrifice fly (1-1), and one baserunning mistake (0-1), the offensive advancement efficiency average is $\frac{3}{4} = .750$ OAEA. The offensive strikeout efficiency average (OSEA) is calculated by dividing the number of at bats by the number of times strikeouts did not occur. Thus the offensive strikeout efficiency average for this two inning game was $\frac{8}{9} = .889$ OSEA.
SAMPLE OF CODING DEFENSIVE SHEET

Capital vs. UCLA Date 5-1-80 Single game x
Observer Jones Field condition good 1st game of DH __
Page 1 2nd game of DH __

DEFE NSE

<table>
<thead>
<tr>
<th>Player(s)</th>
<th>Inning</th>
<th>Situation</th>
<th>Mental Execution</th>
<th>Physical Execution</th>
<th>Total</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
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<td>FP</td>
<td>O+</td>
<td>+1/</td>
<td>F-3</td>
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<td>+1/ single to right</td>
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<td>C</td>
<td>CC+</td>
<td>+1/ single to center</td>
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<td>+1/</td>
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<td>C</td>
<td>CC+</td>
<td>+1/ single to right</td>
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<td>Noble Glassco</td>
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<td>RA-</td>
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Situations
- Special situation (SS)
- Fielding play (FP)
- Squeeze (SQ)
- Sacrifice (SAC)
- Stolen base (SB)
- Cutoff (C)
- Sacrifice fly (SF)
- Tag up (TU)
- Passed ball (PB)

Mental Execution
- Threw to correct base (CB+)
- Threw to incorrect base (IB-)
- Incorrect defensive setup (1O-)

Physical Execution
- Out (O+)
- No out (NO-)
- Denied advancement (DA+)
- Runner(s) advance (RA-)
- Error (E-)
- Correct cutoff (CC+)
## SAMPLE OF CODING PITCHING SHEET #1

Capital vs. UCLA  
Date 5-1-80  
Observer Smith

### PITCHING

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<thead>
<tr>
<th>Pitcher</th>
<th>Inning</th>
<th>Situation</th>
<th>Mental Execution</th>
<th>Physical Execution</th>
<th>Total</th>
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<td>-1/</td>
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### Situations
- 0-2 pitch (2P)
- Bunt (B)
- Squeeze (SQ)
- Double play (DP)
- First batter/inn (FB)
- Fielding play (FP)
- Normal (N)
- Special situation (SS)
- Pickoff (PD)

### Mental Execution
- Threw to correct base (CB+)
- Threw to incorrect base (IB-)
- Not backing base (NBB-)
- Not covering first (NCl-)

### Physical Execution
- Good pitch (GP+)
- Bad pitch (BP-)
- Out (O+)
- No out (NO-)
- Error (E-)
- Wild pitch (WP-)
- Balk (BK-)
- Covered first (Cl+)
## Sample of Coding Pitching Sheet #2

### Capital vs. UCLA Date 5-1-80 Observer Smith

#### Pitching

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<th>Runners scored</th>
<th>Earned runs</th>
<th>Unearned runs</th>
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| TOTALS  | 1     | 1   | 3                           | 1              | 1            | 0             | 0            | 3/6       |
### Sample of Coding Offensive Sheet #1

**Capital vs. UCLA**

**Date** 5-1-80

**Observer** Jones

<table>
<thead>
<tr>
<th>Player</th>
<th>Inning</th>
<th>Situation</th>
<th>Mental Execution</th>
<th>Physical Execution</th>
<th>Total</th>
<th>Outcome</th>
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<td>Vazquez</td>
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<td></td>
<td>sacrifice fly, run scores</td>
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</table>

**Situations**
- Squeeze (SQ)
- Sacrifice (SAC)
- Stolen Base (SB)
- Hit behind runner (HBR)
- Tag up (TU)
- Sacrifice Fly (SF)
- Baserunning (B)

**Mental Execution**
- Missed sign (MS-)
- Received sign (RS+)
- Baserunning mistake (BM-)

**Physical Execution**
- Runner(s) advance (RA+)
- No advance (NA-)
## SAMPLE OF CODING OFFENSIVE SHEET #2

**Capital vs. UCLA**  
**Date:** 5-1-80  
**Observer:** Jones

### OFFENSE

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Definitions

Defense

Below are the behaviors coded on the defensive efficiency sheet.

Situation

1. **Special Situation (SS)** - any rundown or first and third situation
2. **Fielding Play (FP)** - a ground ball, pop up, fly ball, or line drive
3. **Squeeze (SQ)** - an offensive tactic in which the batter attempts to score a baserunner from third with a bunt
4. **Sacrifice Bunt (SAC)** - a bunt placed by the batter to advance baserunner(s)
5. **Stolen Base (SB)** - the advance of a baserunner(s) to the next base unaided by a hit, put-out, error, balk, base on balls, or hit batsman
6. **Sacrifice Fly (SF)** - a fly ball which enables a baserunner to score after the ball is caught
7. **Tag-up (TU)** - an advance by a baserunner on first, second, or first and second on a fly ball with less than two outs
8. **Cutoff (C)** - a point in front or behind a base where a throw from the outfield may be intercepted to prevent runners from advancing
9. **Passed Ball (PB)** - pitched ball that gets by the catcher allowing the runner(s) to move up

Mental Execution

1. **Threw to correct base (CB+)** - a player gets a plus on the following: 1) an infielder who throws to the correct base when called on a sacrifice, squeeze, fielder's choice, or special situation; or 2) an outfielder gets a plus when he throws to the correct cutoff or base following a basehit and a runner(s) in scoring position
2. **Threw to incorrect base (CB-)** - a player gets a minus on the following: 1) an infielder who throws to an incorrect base when called on a sacrifice, squeeze, fielder's choice, or special situation; or 2) an outfielder gets a minus if he throws to a wrong base or cutoff following any outfield play

3. **Incorrect defensive setup (ID-)** - an incorrect defensive alignment on a bunt, rundown, first and third situation, stolen base, or any special play called

**Physical Execution**

1. **Out (O+)** - when a batter or runner is retired on a fielding play or special situation only

2. **No out (NO-)** - when neither the batter nor runner is retired in a special situation, squeeze, sacrifice, or fielder's choice situation

3. **Denied advancement (DA+)** - when a runner(s) does not move to the next base in a special situation, squeeze, sacrifice, stolen base, and an attempt fails to advance on a sacrifice fly, tag up, or any other situation

4. **Runner(s) advance (RA-)** - when a runner(s) moves to the next base in a special situation, fielder's choice, squeeze, sacrifice, stolen base, passed ball, missed or incorrect cutoff, and successful sacrifice fly and tag up situations

5. **Error (E-)** - a ball misplayed in any situation

6. **Correct cutoff (CC+)** - when an outfielder hits the correct cutoff man

7. **Incorrect cutoff (IC-)** - when an outfielder hits the wrong cutoff man or throws to the wrong base in any situation
Offense

Below are the behaviors coded on offensive efficiency sheet #1.

Situation

1. Squeeze (SQ) - an offensive tactic in which the batter attempts to score a baserunner from third on a bunt

2. Sacrifice (SAC) - an attempt by the batter to move a runner up a base by bunting down either first or third baseline depending if there are runners on first, second, or first and second

3. Stolen base (SB) - baserunner(s) advance to the next base unaided by a hit, base on balls, error, balk, or hit batsman

4. Hit behind runner (HBR) - when the batter attempts to move a runner to the next base(s) by hitting behind a runner or on hit and run play, or a run and hit play

5. Tag-up (TU) - position of a baserunner for an attempted advance on fly balls with less than two outs

6. Sacrifice Fly (SF) - a fly ball which enables a baserunner to score from third after the ball is caught

7. Baserunning (B) - runner(s) involvement in running the bases in an attempt to advance and/or score

Mental Execution

1. Missed sign (MS-) - when a runner or batter misses any offensive sign (squeeze, bunt, stolen base, etc.)

2. Received sign (RS+) - the only time a runner or batter receives a plus is when he acknowledges the sign on a squeeze play

3. Baserunning Mistake (BM-) - runner(s) fail to run bases correctly, e.g. gets off too far on sacrifice fly attempt, is picked off base, etc.
Physical Execution

1. Runner(s) advance (RA+) - when the runner is successfully advanced in all situations

2. No advance (NA-) - when the runner(s) is not successfully advanced in all situations

Below are the behaviors coded on offensive efficiency sheet #2.

Event recording used on all seven behaviors.

1. **At Bat (AB)** - counting every time a player goes to bat; a walk, error, sacrifice fly also count as a time at bat

2. **Hit (H)** - a single, double, triple, or homerun

3. **Run Batted In (RBI)** - the batter credited for getting the run in, unaided by an error or double play

4. **Base on Balls (BB)** - batter walks, goes to first base when he receives four balls when batting

5. **Hit by Pitch (HBP)** - batter is hit on the body by a pitched ball when batting; he is given first base

6. **Run (R)** - a run scored by an individual player when running the bases

7. **Strikeout (K)** - batter retired after swinging or taking three strikes

Pitching

Below are the behaviors coded on pitching efficiency sheet #1.

Situation

1. **0-2 Pitch (2P)** - count of no balls and two strikes on the batter

2. **Bunt (B)** - type of pitch thrown to the batter in a bunt situation
3. **Squeeze (SQ)** - type of pitch thrown to the batter on a squeeze play

4. **Double play (DP)** - situation with a man on first or second with less than two outs; the pitcher is looking to make a certain pitch that leads to a particular result

5. **First Batter/Inning (FB)** - the first batter faced by the pitcher in an inning

6. **Fielding Play (FP)** - a ball played by the pitcher; ground ball, line drive, or pop up

7. **Normal (N)** - refers to any situation in which a balk or wild pitch occurs

8. **Pick Off (PO)** - an attempt by the pitcher to catch a runner off base

9. **Special Situation (SS)** - a play that involves the pitcher to cover first base or the backing up of a base

**Mental Execution**

1. **Threw to Correct Base (CB+)** - a pitcher gets a plus if he throws to the correct base called for in a fielder's choice play, but, or squeeze situation

2. **Threw to Incorrect Base (IB-)** - a pitcher throws to the wrong base when called for in a fielder's choice play, bunt, or squeeze situation

3. **Not Backing Up Base (NBB-)** - pitcher fails to or backs up the wrong base

4. **Not Covering First (NCl)** - pitcher fails to cover first base on a ground ball to first or in rundown

**Physical Execution**

1. **Good Pitch (GP+)**
   - 0-2 pitch - pitch high and tight, low and away
   - Squeeze - pitch thrown high and tight, at ribs or way outside
   - Bunt - fastball strike
   - Double play - strikeout, pop up, shallow fly, ground ball
2. **Bad Pitch (BP-)**
   - 0-2 pitch - ball thrown over plate
   - Squeeze - strike or curve over the plate
   - Bunt - curve ball or ball way inside or outside
   - Double play - ball hit for basehit, deep fly, line drive

3. **Out (O+)** - batter or runner retired in special situation (covering first), pick off, fielding play involving pitcher and first batter in an inning

4. **No Out (NO-)** - when the pitcher does not get the first batter out in an inning, fielder's choice play in which no out occurs, and not covering first which allows runner to get to first

5. **Error (E-)** - miscue by the pitcher that allows a batter to reach base, runner to advance, etc.

6. **Wild Pitch (WP-)** - a pitched ball which the catcher is unable to block and permits a runner(s) to advance

7. **Balk (BK-)** - an illegal action of the pitcher which permits the baserunner(s) to advance

8. **Covered First (C1+)** - pitcher covers first on ball hit on the ground to first

Below are the behaviors coded on pitching efficiency sheet #2.

**Event recording used on all eight behaviors.**

1. **Walk** - four pitches ruled outside the strike zone by an umpire which allows the batter to go to first base

2. **Strikeout** - three strikes; three pitches ruled in the strike zone by the umpire or a combination of called strikes and swings by the batter

3. **Runners in Scoring Position** - baserunner on second or third base is in scoring position

4. **Earned Run** - a run which scores as the result of hits, sacrifices, stolen bases, put outs, base on balls, hit batsman, balks, or wild pitches

5. **Unearned Run** - run that scores because of an error

6. **Hit by Pitch** - batter struck by a pitched ball, thus allowed to take first base
7. **Hits** - number of hits a pitcher gives up in a pitching outing

8. **Outs** - number of outs a pitcher gets in a pitching outing

The following are used on the defense coding sheet and the first offense and pitching sheets.

**Total**

Plus+ and minus- total for each situation

e.g. +1/-1

**Outcome**

Verbal disruption of situation written in baseball language.

1 - Pitcher
2 - Catcher
3 - First base
4 - Second base
5 - Third base
6 - Shortstop
7 - Left fielder
8 - Center fielder
9 - Right fielder

**Data Collection**

As mentioned earlier, five pitchers were used to code for the entire schedule of games on the defensive, offensive, and pitching aspects of a college baseball team. The Baseball Observation Code was used to record behaviors.

A coding schedule had to be established weekly to fit the pitching rotation and sometimes revised within the week because of rainouts and makeup games which would alter the pitching rotation. It was impossible to have one coder code all the behaviors, so two coders per game
were used. When reliability checks were taken, sometimes an extra coder(s) was used (see Reliability section).

Table 4 shows an example of a weekly coding schedule.

### Table 4

#### WEEKLY CODING SCHEDULE

<table>
<thead>
<tr>
<th>Week of March 24</th>
<th>Coders</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Reactivity

Reactivity is the effect the observers have on the subject (subject reactivity). If this occurs, behaviors being observed and the recording of the behaviors can be affected.

To prevent subject reactivity, the five coders were instructed not to talk over the behaviors, what they were doing, etc., with the other players before, during or after a game. The coders were similar to the subjects being observed since they are all ballplayers from the same team. Coding during a game should not affect the team because they are used to having a scorekeeper and other members of the team keep charts on their play, not only during their college playing but high school as well.
No videotape, audiotape, etc., was used to code behaviors. Thus the coders were as unobtrusive as possible. In a meeting before the season started, the subjects were given a rationale by the experimenter as to the purpose of the study and a brief explanation of what would be done (Johnson and Bolstad, 1974).

The most important aspect in guarding against observer reactivity is to make sure the experimenter does not influence the observers. This can be done by telling the observers specific results, as data is being collected and what you expect or hope the data will show. In this study the observers were part of the team and were subjects as well, so they saw what the data was resulting in, but not in the specifics. All of the above was minimized since the observers were given no feedback concerning the specific implications of the data and were not informed of the expectations concerning the data.

Reliability

Reliability is defined as the degree to which two independent observers agree on the occurrence or the non-occurrence of the operationally defined behaviors. When doing any observation it is so important to assess if what was recorded by the observers was really representative of what occurred. In order to assess interobserver reliability between observers used to code, one reliability
check on each phase of the coding instrument (defense, pitching, offense) did take place. These reliability checks did occur during baseline and interventions. Reliability checks were both announced in advance, and unannounced. Of course, unannounced reliability checks are a more stringent form of reliability assessment (Kazdin, 1977). All observers had reliability checks taken on each part of the observation code (pitching, offense, and defense). The use of an official scorer and scorebook did give a permanent product measure of reliability for some behaviors, but not all (second pitching sheet and offensive sheet). Interobserver agreement was on total behaviors for each observation sheet (offense, defense, and pitching). Reliability for each observation sheet was taken on the three categories (situations, physical execution, and mental execution). The basic measure for reliability assessment and interobserver agreement was by the interval by interval method.

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

In order to ensure higher reliability throughout the study, it is so important to precisely define the behaviors during training. Also, in order to ensure reliability, the experimenter should continue to have periodic training sessions with all coders during data collection. To stop all training once data collection started could lead to
observer drift. This is where the observers start to apply their own definitions to a behavior over a period of time which deviates from the original definition. Thus the observers have "drifted" from the original interpretation on the occurrence or nonoccurrence of a behavior. Periodic retraining would help to solve this problem and eliminate another problem of high reliability or low accuracy. Thus three additional training sessions took place after data collection began. Also, since reliability checks with a standard could not be done in added training sessions, it was done during various games between the extra training sessions. Reliability checks with a standard were only done on defense and pitching since the standard (experimenter) was a base coach when offensive coding took place. Thus, the continual training and coding against a standard hopefully minimized drift and added to the reliability and accuracy of the data.

Analysis of Data

During data collection, an efficiency average was computed for all five behaviors and the total efficiency average of a behavior was recorded to show the game by game results.

After data collection, the data were evaluated with the intent of concluding the effect of feedback and individual-group contingencies on the team behaviors of a
baseball team when compared to baseline conditions. Also analyzed was a comparison of the two interventions (feedback and feedback plus individual-group contingencies) on the five behavior's improvements and other aspects of the game of baseball, e.g. differences when playing at home vs. away. A final analysis was on the correlation of the five behavior's improvements and team success. The use of graphs and tables was used to show if changes in team behaviors occurred or did not occur following interventions. Validity of the observational instrument refers to whether the instrument measures what it was intended to measure. The help of a researcher who has much experience in developing observation instruments helped in the development of this observation instrument, adding to the validity of this instrument.

Summary of the Chapter

This chapter summarizes the methods and procedures used in doing this study which encompasses the changing of certain behaviors of an athletic team.

In review, the subjects were all members (26) of the Capital University Baseball Team. The team was made up of eleven pitchers, nine infielders, and six outfielders, with only five upper classmen of the twenty-six players. The research design used in this study was a multiple baseline across five team behaviors, making use of a
baseline and two interventions, the independent variable was feedback and individual-group contingencies. Feedback was mainly in the form of public record, which is the posting of individual and team averages on the team board. Verbal feedback to the individual players and team also took place. The second intervention added to feedback was individual-group contingencies. Some behaviors had group contingent rewards tied to them. Once a behavior had a particular intervention applied to it (individual or group), it would stay in that category for the rest of the intervention. The dependent variables were the team behaviors of the baseball team, defensive efficiency, pitching efficiency, modified efficiency average, offensive advancement efficiency average, and offensive strikeout efficiency average.

The coders were five pitchers from the Capital University Baseball Team. Training took place prior to and during data collection. A baseline was taken on each behavior for the first five games before the first intervention was applied. The Baseball Observation Code was used to record behaviors. Data was collected for all thirty-two games of the baseball season. A schedule for data collection for the five coders was written up weekly and even revised weekly depending on rainouts, makeup games, etc.
Subject and observer reactivity was minimized by giving the subjects a rationale for the study and having the coders be as unobtrusive as possible. The observers were not told about the implications of the data or the expectations of the experimenter. Since the coders are also subjects, implications of the data were acquired only through feedback by the coach and through public record. Interobserver reliability was taken at least once during each phase of the study on all coding sheets and coders. Total reliability for each coding sheet (offensive, defensive, pitching) was taken, which included the different categories (situation, mental execution, and physical execution). Data was analyzed to show the effect of the two interventions on the team behaviors over baseline and to see what intervention feedback, or a combination of feedback-contingencies was more effective. Besides looking into the interventions' effects on other aspects of the game, a correlation of team improvement and team success was also done.
CHAPTER IV

ANALYSIS AND DISCUSSION OF THE DATA

This chapter details the findings of the study and the effect the interventions had on the dependent variables, which were the selected team behaviors of an intercollegiate baseball team. The first section in this chapter deals with reliability of the data and the second section covers the findings of the study.

Reliability

When doing a study that involves data collection, coders, observation codes, etc., it is so important to make sure that what was observed actually occurred so conclusions generated are not only representative of the data collected, but reliable as well. Each observer participated in two reliability checks during each of the three phases of the study.

The method used to calculate reliability was the interval-by-interval method. If two observers record the same behavior in the same interval, agreement is achieved. When two observers record different behaviors in an
interval on the Baseball Observation Code (BOC), it represents disagreement.

One of the most important factors in assuring reliability of the data is through observer training. Before actual data collection, training and reliability checks were taken. Each of the five coders was required to achieve an overall reliability of eighty-five percent or above, before the first day of data collection. Periodic retraining during data collection added extra insurance to the reliability of the data (see Chapter 3 for detailed explanation).

Table 5 summarizes the reliability percentages for each of the three major coding sheets (defense, offense, and pitching) during the three phases of the study. A mean was also calculated for the combined reliability of the three major coding sheets.

Table 6 summarizes reliability scores for each of the main coding sheets by giving mean percentage and the highest-lowest reliability obtained from the five coders during the six reliability checks.

The figures in Table 7 include reliability percentages of five selected behaviors from the three different coding sheets. The reliability percentages represent the occurrence of behavior from the six reliability checks taken with each coder.
TABLE 5

SUMMARY OF RELIABILITY PERCENTAGES FOR THE THREE MAJOR CODING SHEETS

<table>
<thead>
<tr>
<th>Check Number</th>
<th>Defense</th>
<th>Offense</th>
<th>Pitching</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>88</td>
<td>90</td>
<td>85</td>
</tr>
<tr>
<td>2</td>
<td>89</td>
<td>95</td>
<td>83</td>
</tr>
<tr>
<td>3</td>
<td>93</td>
<td>98</td>
<td>93</td>
</tr>
<tr>
<td>4</td>
<td>92</td>
<td>97</td>
<td>94</td>
</tr>
<tr>
<td>5</td>
<td>95</td>
<td>100</td>
<td>96</td>
</tr>
<tr>
<td>6</td>
<td>98</td>
<td>100</td>
<td>95</td>
</tr>
</tbody>
</table>

Mean for each Coding Sheet: 92.5, 96.6, 91.0

Total Reliability = 93.4
### TABLE 6
SUMMARY OF RELIABILITY PERCENTAGES

<table>
<thead>
<tr>
<th>Code Sheet</th>
<th>Mean for all Sessions</th>
<th>Lowest Percent</th>
<th>Highest Percent</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defense</td>
<td>92.5</td>
<td>83</td>
<td>100</td>
<td>17</td>
</tr>
<tr>
<td>Offense</td>
<td>96.6</td>
<td>87</td>
<td>100</td>
<td>13</td>
</tr>
<tr>
<td>Pitching</td>
<td>91.0</td>
<td>70</td>
<td>100</td>
<td>30</td>
</tr>
</tbody>
</table>
TABLE 7
PERCENT OCCURRENCE RELIABILITY SCORES FOR FIVE BEHAVIORS

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Session Number</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fielding Play</td>
<td></td>
<td>93</td>
<td>90</td>
<td>95</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>96.3</td>
</tr>
<tr>
<td>Cutoffs</td>
<td></td>
<td>85</td>
<td>95</td>
<td>96</td>
<td>95</td>
<td>93</td>
<td>97</td>
<td>93.5</td>
</tr>
<tr>
<td>0-2 Pitch</td>
<td></td>
<td>90</td>
<td>98</td>
<td>97</td>
<td>100</td>
<td>100</td>
<td>98</td>
<td>97.2</td>
</tr>
<tr>
<td>Double Play</td>
<td></td>
<td>90</td>
<td>84</td>
<td>94</td>
<td>98</td>
<td>100</td>
<td>99</td>
<td>94.1</td>
</tr>
<tr>
<td>Stolen Base</td>
<td></td>
<td>100</td>
<td>100</td>
<td>98</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>99.7</td>
</tr>
</tbody>
</table>

Total mean for five selected behaviors = 96.2
Overall reliability for the six reliability checks for the three main coding sheets exceeded ninety-three percent. Total reliability for each major coding sheet ranged from ninety-one percent to ninety-six point six percent. Only on one reliability check, the second check on pitching, did total reliability for the five coders go under eighty-five percent. The lowest percent obtained during the six reliability checks for each of the five coders never went under seventy percent and seldom went under eighty percent. Numerous times coders had one-hundred percent agreement on the various coding sheets when reliability was checked.

Reliability percentages on the occurrence of behavior from five randomly selected behaviors ranged from ninety-three point five percent (cutoffs) to ninety-nine point seven percent (stolen bases). Ninety-three percent of the reliability checks were over ninety percent in agreement, and over eighty-three percent of the reliability checks on these five behaviors was over ninety-five percent. The mean percent of reliability for these five behaviors on occurrence of behavior was ninety-six point two percent.

Discussion of Reliability Scores

Reliability percentages for this study were at the level desired by this experimenter, although the learning of the coding system was harder than expected. As
demonstrated in Table 5, as the coders became more familiar with the instrument, higher agreement occurred. The coding sheet on pitching had the lowest reliability (ninety-one percent) because more coder interpretation takes place on the occurrence of behavior than on the defensive or offensive coding sheets. Periodic re-training during data collection helped to prevent observer drift, helped coders who were having problems with the instrument, answered coders questions on the occurrence of behavior by defining definitions more precisely and helped to keep reliabilities fairly high, thus assuring the data was representative of what actually occurred.

Some of the lowest reliabilities occurred on the pitching sheets because, as mentioned earlier, more interpretation had to take place on these coding sheets. For example, sometimes it is hard to see the location of a pitch or the type of pitch thrown. Also one coder had a personal problem thus affecting his reliability and the total reliability for each coding sheet, but especially the pitching sheet. It was not a problem of drift, but forgetting to code certain behaviors during certain situations.

The figures in Table 7 were very acceptable in that all reliabilities for the five selected behaviors were over eighty-five percent during the six reliability checks for
each of the five coders. The total mean percent of the behaviors during reliability sessions was ninety-six point two percent.

The figures shown in the tables in this chapter indicate reliability of the data, which builds a case for interval validity for the instrument as well as for the data. It should be noted the interobserver agreement between coders was done two times to assess reliability for the major offensive sheet and once for the defensive and pitching sheets. The added dimension in assuring reliability of the data was the use of taking reliability checks with a standard. This was done once for each of the five coders in the defense and pitching sheets during selected phases of the study. Most of these reliability checks were unannounced. One other added dimension is that the use of a permanent product measure (official scorer-scorebook) was used to randomly check coders, not only on the major coding sheets, but to check the event recording done on the second pitching and offensive sheets.

Analysis and Discussion of Data

Analysis of Data

An analysis of the data demonstrate that all five team behaviors showed behavior change in the desired direction following the implementation of both interventions when
looking at the mean efficiencies in each phase (see Figure 2). Figures 3-7 illustrate the five tiers of the multiple baseline individually and demonstrate graphically the data during each phase of the study. Table 8 gives a mean efficiency average for each team behavior in all three phases of the study.

The first intervention which was feedback (public record) increased the five team behaviors a mean percentage of over one-hundred points in comparison to baseline average. Offensive strikeout efficiency which was the last behavior to be intervened on showed only slight improvement but its efficiency was high to begin with. The second intervention, individual-group contingencies, raised all five team behaviors, but only a mean percentage of fifty points higher from the first phase of intervention. Following the second intervention, team efficiencies were raised to their highest level of the season in all five team behaviors.

Figures 2-7 also contain a line of best fit (Baer and Parsonson, 1978) for each dependent variable in each phase of the study. The line of best fit illustrates the trends of the data during each phase of the study for each dependent variable. The most important point to be made is that the data does demonstrate that the mean average of each dependent variable did change in the desired direction, but because of the excessive amount of variability and that the
Figure 2. Mean percentage and efficiency averages for five team behaviors in baseball.
Figure 3. Team efficiency averages for defense.
Figure 4. Team efficiency averages for pitching
Figure 5. Team efficiency averages for batting.
Figure 6. Team efficiency average for offensive advancement
Figure 7. Team efficiency averages for offensive strikeouts.
TABLE 8
MEAN PERCENTAGES OF TEAM EFFICIENCIES DURING ALL PHASES OF THE STUDY

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Baseline</th>
<th>Intervention 1</th>
<th>Intervention 2</th>
<th>Mean of Combined Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEA</td>
<td>.657</td>
<td>.783</td>
<td>.807</td>
<td>.795</td>
</tr>
<tr>
<td>PEA</td>
<td>.538</td>
<td>.652</td>
<td>.680</td>
<td>.666</td>
</tr>
<tr>
<td>MEA</td>
<td>.587</td>
<td>.621</td>
<td>.714</td>
<td>.668</td>
</tr>
<tr>
<td>OAEA</td>
<td>.494</td>
<td>.709</td>
<td>.792</td>
<td>.751</td>
</tr>
<tr>
<td>OSEA</td>
<td>.850</td>
<td>.864</td>
<td>.873</td>
<td>.869</td>
</tr>
<tr>
<td>Mean</td>
<td>.625</td>
<td>.726</td>
<td>.773</td>
<td>.750</td>
</tr>
</tbody>
</table>
trends of the data are not all going in the desired direction during each phase of the study for all team behaviors, the data does not warrant the conclusion that the changes were due to the interventions applied.

Table 9 illustrates that as efficiencies increased for each team behavior, higher won-loss percentages occurred during the second phase of intervention. A summary of the thirty-two game season with scores for each game and team efficiencies for each of the five team behaviors can be seen in Table 10.

Discussion

As mentioned earlier in the study, there were many variables that can affect team performance (weather and field conditions, injuries, caliber of the opposing team and players, etc.). Poor weather conditions, injuries, and the caliber of opposing teams was spread out over the total thirty-two game schedule. In spite of the above fact and because the mean efficiencies for each dependent variable did increase in the desired direction, a functional relationship still cannot be concluded.

The use of a line of best fit for each team behavior during each phase of the study warrants the above conclusion. When looking at Figures 2-7, if all trends of the data were like Figure 3 in which there is a descending trend in baseline and ascending trends in the two
<table>
<thead>
<tr>
<th>Behavior</th>
<th>Baseline Won-Loss</th>
<th>First Intervention Won-Loss</th>
<th>Second Intervention Won-Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEA</td>
<td>2-3, .475</td>
<td>5-4, .556</td>
<td>10-8, .556</td>
</tr>
<tr>
<td>PEA</td>
<td>4-5, .444</td>
<td>5-5, .500</td>
<td>8-5, .615</td>
</tr>
<tr>
<td>MEA</td>
<td>6-6, .500</td>
<td>5-4, .556</td>
<td>6-5, .545</td>
</tr>
<tr>
<td>OAEA</td>
<td>7-7, .500</td>
<td>6-4, .600</td>
<td>5-3, .625</td>
</tr>
<tr>
<td>OSEA</td>
<td>9-9, .500</td>
<td>5-4, .556</td>
<td>3-2, .600</td>
</tr>
<tr>
<td>Game</td>
<td>Score</td>
<td>DEA</td>
<td>PEA</td>
</tr>
<tr>
<td>------</td>
<td>----------------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>1</td>
<td>Capital 3/Rio Grande 7</td>
<td>0.700</td>
<td>0.606</td>
</tr>
<tr>
<td>2</td>
<td>Capital 5/Muskingum 5</td>
<td>0.714</td>
<td>0.729</td>
</tr>
<tr>
<td>3</td>
<td>Bellarmine 6/Capital 1</td>
<td>0.567</td>
<td>0.719</td>
</tr>
<tr>
<td>4</td>
<td>Bellarmine 6/Capital 1</td>
<td>0.615</td>
<td>0.610</td>
</tr>
<tr>
<td>5</td>
<td>Bellarmine 3/Capital 5</td>
<td>0.388</td>
<td>0.506</td>
</tr>
<tr>
<td>6</td>
<td>Louisville 11/Capital 5</td>
<td>0.865</td>
<td>0.411</td>
</tr>
<tr>
<td>7</td>
<td>Louisville 15/Capital 1</td>
<td>0.350</td>
<td>0.212</td>
</tr>
<tr>
<td>8</td>
<td>Capital 7/Ohio Wesleyan 3</td>
<td>0.729</td>
<td>0.515</td>
</tr>
<tr>
<td>9</td>
<td>Capital 9/Ohio Wesleyan 3</td>
<td>0.821</td>
<td>0.527</td>
</tr>
<tr>
<td>10</td>
<td>Capital 3/Wilmington 2</td>
<td>0.714</td>
<td>0.793</td>
</tr>
<tr>
<td>11</td>
<td>Capital 6/Wilmington 5</td>
<td>0.390</td>
<td>0.673</td>
</tr>
<tr>
<td>12</td>
<td>Capital 5/Huntington 9</td>
<td>0.742</td>
<td>0.500</td>
</tr>
<tr>
<td>13</td>
<td>Capital 7/Ottawa 1</td>
<td>0.954</td>
<td>0.321</td>
</tr>
<tr>
<td>14</td>
<td>Capital 1/Dayton 1</td>
<td>0.743</td>
<td>0.489</td>
</tr>
<tr>
<td>15</td>
<td>Capital 6/Marietta 2</td>
<td>0.340</td>
<td>0.673</td>
</tr>
<tr>
<td>16</td>
<td>Marietta 2/Capital 1</td>
<td>0.353</td>
<td>0.707</td>
</tr>
<tr>
<td>17</td>
<td>Ohio Wesleyan 5/Ottawa 0</td>
<td>0.600</td>
<td>0.617</td>
</tr>
<tr>
<td>18</td>
<td>Capital 3/Urbana 1</td>
<td>0.753</td>
<td>0.785</td>
</tr>
<tr>
<td>19</td>
<td>Capital 12/Capital 6</td>
<td>0.622</td>
<td>0.617</td>
</tr>
<tr>
<td>20</td>
<td>Capital 5/Muskingum 4</td>
<td>0.773</td>
<td>0.550</td>
</tr>
<tr>
<td>21</td>
<td>Capital 13/Muskingum 1</td>
<td>0.395</td>
<td>0.604</td>
</tr>
<tr>
<td>22</td>
<td>Capital 7/Wilmington 2</td>
<td>0.909</td>
<td>0.780</td>
</tr>
<tr>
<td>23</td>
<td>Capital 8/Wilmington 3</td>
<td>0.793</td>
<td>0.687</td>
</tr>
<tr>
<td>24</td>
<td>Demison 11/Capital 3</td>
<td>0.333</td>
<td>0.621</td>
</tr>
<tr>
<td>25</td>
<td>Ottawana 9/Capital 0</td>
<td>0.724</td>
<td>0.639</td>
</tr>
<tr>
<td>26</td>
<td>Ottawana 9/Capital 1</td>
<td>0.806</td>
<td>0.657</td>
</tr>
<tr>
<td>27</td>
<td>Capital 3/Ohio Wesleyan 3</td>
<td>0.797</td>
<td>0.739</td>
</tr>
<tr>
<td>28</td>
<td>Capital 13/Muskingum 5</td>
<td>0.750</td>
<td>0.667</td>
</tr>
<tr>
<td>29</td>
<td>Muskingum 8/Capital 5</td>
<td>0.315</td>
<td>0.625</td>
</tr>
<tr>
<td>30</td>
<td>Wright State 16/Capital 3</td>
<td>0.368</td>
<td>0.366</td>
</tr>
<tr>
<td>31</td>
<td>Capital 1/Kenyon 0</td>
<td>0.772</td>
<td>0.824</td>
</tr>
<tr>
<td>32</td>
<td>Capital 8/Kenyon 0</td>
<td>0.905</td>
<td>0.902</td>
</tr>
</tbody>
</table>

*Doubleheader
*Home game
intervention phases, a conclusion that the independent variables used were responsible for the change in team behaviors could be concluded. Figure 4 illustrates a descending trend in intervention two, Figure 5 has ascending trends in all three phases, Figure 6 has an ascending trend in baseline and a descending trend in intervention one, and the trends in Figure 7 are minimal.

Capital's final record was seventeen wins and fifteen losses. As illustrated in Table 9, winning percentage was higher during the intervention phases of the study, especially when individual-group contingencies were added to public recording (feedback) during intervention two.

It is interesting to look at run production and runs scored on per game during each phase of the study, as illustrated in Figures 8 and 9. Runs per game increased by a mean of one run from baseline to the first intervention, but only showed a very slight increase when individual-group contingencies were applied to the offensive team behaviors. Many times in baseball a team will hit well, advance runners, not strikeout very much, but will still have trouble scoring runs because of the lack of key hits. Even though offensive efficiencies increased during the individual-group contingency phase, we did lack key hits in many situations. Runs given up per game increased by one run from baseline through the first intervention phase of public recording (feedback).
Figure 8. Runs per game and means during each phase of the study
Figure 9. Runs scored on per game and means during each phase of the study.
This is very interesting since our defensive and pitching efficiencies increased during the first intervention phase. This is because during two games during the feedback phase, the pitching gave up over twenty-five runs. During intervention two, runs given up per game went down to five runs per game which was the lowest of the season in comparison to the other two phases of the study. When combining both interventions, run production and runs against were five point eight in both cases, which was better than during the baseline phase. Lines of best fit were drawn in during each phase of the study in Figures 8 and 9. Figure 8 shows an ascending trend during each phase, and Figure 9 illustrates an ascending trend in intervention two. Again, because of the trends of the data, no conclusion of causality can be made for the interventions being responsible for increases in runs scored and decreases in runs given up per game.

When public recording took place during the first phase of intervention, players were much more interested in how the team was doing and how they were doing individually than I had expected. Many players came up to me individually and said that they would have liked more of this done with other teams they had played for. What they were referring to was the feedback sheets that were posted on the team board after each game (see Appendix E). Many times during the season, as soon as a game was over,
players wanted to know what the team efficiency was, especially on defense. The public recording phase of the study did have a positive effect in that it did increase all team efficiencies.

Individual and group contingencies, when added to public recording, increased team behaviors. The change was not as drastic as the first intervention, but the highest team efficiencies for each behavior occurred during that phase. The players were very interested in obtaining the individual and group rewards for either having the highest efficiency or reaching the team goal over a particular set of games. The group rewards were smaller in value than the individual rewards, but the players still worked hard to obtain them whether it was for fun or for individual pride. A mixture of interdependent and independent group contingencies were to create behavior change in the dependent variables. There was no real significant difference between independent and interdependent group contingencies, although the latter seemed to create more interest. This added interest with independent contingencies probably stems from the fact that the players have more initiative to work to attain a goal without having to depend on others. No significant difference resulted between individual and group contingencies. The individual contingencies again seemed to create more interest not only because the rewards were a
little greater in value, but also because it meant you were the best for that set of games. Players would ask often after each game who was in the lead for many of the individual rewards. The team was out of the conference race going into the last week of the season, but the use of the contingencies kept interest high and motivation up. Table 11 contains the contingency schedules, reward, and results. Many times a goal was set, but not reached by the team. This probably occurred because the goals were set too high or the reward was not powerful enough.

It is also interesting to look at some of the other variables and their effect upon the dependent variables. What were the efficiencies of the dependent variables when looking at such variables as games won, games lost, home games, away games, playing teams over a five-hundred winning percentage, teams under a five-hundred winning percentage, doubleheaders, single games, first games of doubleheaders, and second games of doubleheaders (see Tables 12 and 13). In all five team behaviors, team efficiency averages were higher in games won than in games lost. The average in games won was over one hundred and fifty points higher. The importance of the aforementioned fact is that what I was trying to increase did have an effect on whether we won or lost and shows the validity of the observation instrument. Also, in every team behavior efficiencies were higher when playing at
TABLE 11
INDIVIDUAL AND GROUP CONTINGENCIES USED DURING INTERVENTION II

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Dates</th>
<th># of Games</th>
<th>Contin-</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>gency</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Goal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Reward+</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Result</td>
</tr>
</tbody>
</table>

Set #1
- DEA 4/21-4/23  4  G INT .825  A  No/.794

Set #2
- DEA 4/24-4/26  3  G INT .675  A  Yes/.689

Set #3
- DEA 4/29-4/29  3  G INT .500  A  Yes/.345
- PEA 4/29-4/29  3  G INDP .700  B  Yes/individuals(4) Yes/team .700
- MEA 4/29-4/29  3  IND highest avg  C  Team .801

Set #4
- DEA 5/3-5/6  3  G INT .330  A  No/.409
- PEA 5/3-5/6  3  G INDP .715  B  Yes/individuals(2) No/team .658
- MEA 5/3-5/6  3  IND highest avg/ most improved  C  Team .531
- OEA 5/3-5/6  3  G INT .675  D  No/.525

Set #5
- OEA 5/3-5/10  5  G INT .830  E  No/.322
- PEA 5/3-5/10  5  G INDP .720  B  Yes/individuals(4) No/team .676
- MEA 5/3-5/10  5  IND highest avg/ most improved  F  Team .772
- OEA 5/3-5/10  5  G INT .675  G  Yes/.875
- OSEA 5/3-5/10  5  IND highest avg  H  Team .373

* G INT = group interdependent  G INDP = group independent  IND = individual
+ A = candy bar  B = Big Mac  C = Big Mac Meal  D = Baskin-Robbins gift certificate  E = can of pop
F = 2 Clippers tickets  G = ice cream sundae  H = small pizza
TABLE 12
THE EFFECT ON TEAM BEHAVIORS USING THE VARIABLES WON/LOSS, HOME/AWAY, AND ABOVE 500 TEAMS/UNDER 500 TEAMS

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Teams Above 500</th>
<th>Teams Below 500</th>
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<tbody>
<tr>
<td>DEA</td>
<td>.817</td>
<td>.737</td>
</tr>
<tr>
<td>PEA</td>
<td>.714</td>
<td>.543</td>
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<tr>
<td>MEA</td>
<td>.799</td>
<td>.503</td>
</tr>
<tr>
<td>OAEA</td>
<td>.684</td>
<td>.558</td>
</tr>
<tr>
<td>OSEA</td>
<td>.877</td>
<td>.815</td>
</tr>
</tbody>
</table>

Mean avg.  .778  .627  .767  .663  .631  .753

Record  17  15  10-2  7-13  1-11  16-4
TABLE 13
THE EFFECT ON TEAM BEHAVIORS USING THE VARIABLES DOUBLEHEADERS/SINGLE GAMES AND FIRST GAME OF DOUBLEHEADERS/SECOND GAME OF DOUBLEHEADERS

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Double-header</th>
<th>Single Game</th>
<th>First game of DH</th>
<th>Second Game of DH</th>
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</thead>
<tbody>
<tr>
<td>DEA</td>
<td>.778</td>
<td>.776</td>
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<td>.786</td>
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<tr>
<td>PEA</td>
<td>.631</td>
<td>.643</td>
<td>.656</td>
<td>.606</td>
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<tr>
<td>MEA</td>
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<td>.587</td>
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<td>.650</td>
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<tr>
<td>OAEA</td>
<td>.634</td>
<td>.621</td>
<td>.627</td>
<td>.640</td>
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<tr>
<td>OSEA</td>
<td>.851</td>
<td>.868</td>
<td>.848</td>
<td>.854</td>
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<tr>
<td>Mean avg.</td>
<td>.714</td>
<td>.699</td>
<td>.715</td>
<td>.707</td>
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</table>
home than on the road. Team efficiencies were lower for each dependent variable when playing teams over a five-hundred winning percentage by an average of one-hundred and twenty points. Capital was only one and eleven against teams over five-hundred. This does indicate that Capital was out of their league when playing Division I and II teams. Capital beat the teams they should have beaten, but couldn't beat the better teams they had to beat in order to win the conference. This probably occurred because the team was very young, only one senior and four juniors.

In looking at the team efficiencies when comparing doubleheaders to second games of doubleheaders, the data indicate very slight differences. The team efficiencies in doubleheaders had a slightly higher mean average than single games of doubleheaders. The difference is minimal although I would attribute this slight difference to more opportunities in doubleheaders than in a single game and a greater incentive to win the first game of a doubleheader than the second game. Also a few more second team players will play the second game of a doubleheader, especially if the first game was won.
A survey of the research indicates that feedback has been effective in producing a change in behavior and an increase in performance in a variety of educational settings. Token economy systems and contingency systems have also enjoyed much success in various settings, with a variety of subjects.

Physical education and sport have used feedback, token economy systems, and contingency systems to increase skill performance, to create behavior change and to modify and/or maintain appropriate behavior in the gymnasiums, athletic fields, teacher training centers, etc. As mentioned earlier, the major problem is that the above independent variables, although proven effective, have not been used to the extent they should be by our practitioners in the field.

A major need for baseball, in the experimenter's eyes, was an observation system that could observe game behavior and group those behaviors into new statistics which would report many of the behaviors that go unnoticed. Also the use of these new grouped behaviors
could lead to a better understanding by the players and coaches, thus leading to an increase in team performance and success.

Summary

The purpose of the study was to assess the effects of feedback (public record) and individual-group contingencies on the team behaviors of an intercollegiate baseball team.

The subjects were all twenty-six members of the Capital University Baseball Team. The team was made up of eleven pitchers, nine infielders and six outfielders at the start of the season. Only five of the twenty-six players were upper classmen.

The coders for the study were five pitchers from the Capital University Baseball Team. Training took place prior to data collection, but also took place during various times during the collection of data to prevent observer drift. All coders were required to attain eighty-five percent reliability on all three coding instruments prior to the start of data collection.

Observations took place for all thirty-two games of the baseball schedule. Ten of the games were rained out. The observation instrument used for the study was the Baseball Observation Code (BOC). The instrument was used to record behaviors in baseball emitted by the players in
game situation only. The instrument consisted of three major categories: one for pitching, one for defense, and one for offense. A type of interval recording was used on one of the offensive and pitching sheets, as well as the defensive sheet. Event recording was used for the second pitching and offensive sheets.

A multiple baseline across behaviors was used as the research design. Three phases of the study took place involving a baseline and two interventions. Five behaviors were measured in baseline before an intervention was applied. The first intervention was implemented after baseline, but only on the first behavior. After a behavior change occurred on the first behavior, the intervention was applied to the second behavior. This process continued until all five behaviors were intervened on by the first independent variable. The second intervention was not applied to the first behavior until a behavior change occurred using the first intervention. At this time the first intervention was being applied to the fourth behavior. The process continued until all five behaviors were also intervened on by the second intervention. Causality is demonstrated in a multiple baseline design when behavior change occurs after the implementation of the intervention, while the other behaviors remain at the same rate.

The dependent variables in the study were defensive efficiency average (DEA), pitching efficiency average (PEA),
modified efficiency average or batting efficiency (MEA), offensive advancement efficiency average (OAEA), and offensive strikeout efficiency average (OSEA).

The interventions used were feedback (public record) and individual-group contingencies. Feedback was used mainly in the form of public record, which was the posting of team and individual efficiencies on the team board. Individual and group contingencies were used on all five dependent variables as well. Rewards were given out to the team and/or individuals, contingent upon the completion of the goal that was set. Public record continued during the contingency phase of the study.

Reliability checks on coders were performed throughout data collection. Reliability scores indicate if the data collected are truly representative of what actually occurred in the environment being observed. Each coder participated in two reliability checks during each phase of the study for a total of six. Reliabilities were obtained four times from each coder by calculating reliability between coders and twice when compared with the standard. Reliabilities were calculated on overall reliability, reliability in each category, and on the occurrence of five selected behaviors from the three major coding sheets. Overall reliability exceeded ninety-three percent and ranged from ninety-one percent to almost ninety-seven percent on the three major coding instruments. Reliabilities on the
occurrence of behavior were very high, indicating what was recorded actually did occur on the playing field.

The results indicated that all five team behaviors showed a behavior change in the desired direction when looking at the dependent variables mean efficiency average following the intervention of both independent variables. Some of the team behaviors were affected to a larger degree, but still all the means of the five behaviors did increase. The largest percent of change occurred with the use of feedback (public record) following baseline, but the highest efficiencies of the season were recorded after individual-group contingencies were applied during the second phase of intervention. Winning percentage also increased during the intervention phases, although the second intervention (individual-group contingencies) produced a slightly higher winning percentage than the feedback stage. The major point to be made is that, even though mean efficiencies did increase, the change was not due to the interventions implemented. Other variables must also be held accountable for the increases in team performance and by using a line of best fit on each behavior during each phase of the study, statements concluding a functional relationship cannot be made. The figures graphically demonstrate that not all baselines had descending trends and not all interventions
had ascending trends which are needed to conclude a functional relationship.

As stated above, other variables must also be held accountable for affecting team efficiencies, such as the opposing team and whether you are playing at home or on the road. Since the schedule had a mixture of good and bad teams, as well as playing sites, spread out on the schedule, increases in mean efficiencies for each team behavior only can be attributed to the interventions used in this study.

The main purpose of the coding instrument was to observe and record behaviors using those behaviors to form new team efficiencies. The hope was that these behaviors could be manipulated in such a way that increased team performance and success would accrue. Results indicate that in all cases behaviors were higher in games won than in games lost, giving validity to the coding instrument. The behaviors created from this coding instrument when increased did lead to greater team success. Thus the instrument had measured what it was intended to measure.

Conclusions
As a result of analyzing the data, the following conclusions were drawn.

1. Changes in the dependent variables occurred in the desired direction, but confident statements of a functional relationship cannot be made.
2. Variables such as the opposing team, site of games, injuries, weather conditions, etc., also had an effect on the dependent variables.

3. Reliability scores indicate that the data represent what actually occurred in the games played.

4. An increase in the dependent variables following interventions did lead to a higher winning percentage when compared to baseline.

5. The observation instrument was a valid instrument in acquiring data to help in the assessment of the team behaviors under investigation.

6. Feedback (public record) proved to be a successful independent variable when looking only at the greatest increase in total mean efficiency average from one phase to the next in all five team behaviors.

7. Individual-group contingencies proved to be successful when looking only at the fact that team efficiencies for each of the five team behaviors was raised to their highest mean average of the year during this particular phase of the study.

8. A combination of individual-group contingencies plus feedback seems to be the strongest intervention when looking to increase team performance and to increase team success.

9. There was no significant difference between individual and group contingencies when trying to increase team behaviors.

10. There was no significant difference between interdependent and independent group contingencies when trying to increase team behaviors.

11. Interdependent group contingencies were more successful in creating behavior change than in many of the previous studies reviewed.

12. The combined intervention led to greater run production and a decrease in runs scored on in comparison to baseline averages.

13. An increase in the normal individual and team statistics occurred during the intervention phases of the study, although the contingency phase produced greater results than feedback alone.
14. Behavioral reinforcement programs are successful, and its use in the sport environment does lead to an increase in team performance.

Recommendations

Since this observation instrument (BOC) is new and has only been used once, the most important item in need is its continued use. The more the instrument is used, the more internally valid it is likely to become. Changes in the instrument are needed such as adding more behaviors to the first offensive observation sheet in order to create more total opportunities in game situations. Also the major pitching sheet needs one major addition, the need to count a walk to a batter in a double play situation as a lost opportunity. The more the instrument is used and modified the more sophisticated and valid it will become. Also since the results are in doubt, there is a need to strengthen the independent variables.

The use of non-baseball players to code with this instrument is a good possibility. The question is, would it be as easy to train the non-baseball players to use this observation instrument and would reliabilities be as high as the baseball players who coded? Replication is of course needed in order to generalize the results concluded in this study. The need to do this study with an extensive baseball season and in a better climate, if possible, is essential. It would also be possible to use
a few different teams at the same time while doing the study. This type of study would add much more external validity to the results.

It would be very interesting to do the exact same study, but change the order of the interventions. Would different results occur and would either intervention be more or less successful in comparison to this study? If feedback and contingencies were used as the first intervention and contingencies were removed in the second intervention, would efficiencies start to decline?

When doing a study of this nature or replicating this study, it would be interesting to change the design to a multielement design. Its use could be beneficial when trying to change different behaviors quickly rather than waiting until the end of the season to try and change a behavior that needs increasing as in a multiple baseline. Multielement designs also take care of problems such as unstable baselines, induction effect, etc.

Experimentation with different contingencies is also needed whether replicating the format of this study or one similar, but in a different environment. We know that contingencies are effective but which ones are the most effective, individual or group? What type of group contingency is the most effective? This study, though producing no significant difference in either question stated above, still made its preferences known
based on subject interest. If more studies were done in physical education and sport using different types of contingencies, we might be able to conclude not only which ones are the strongest, but also which ones work best in certain situations, in certain environments, and with certain types of subjects.

The need in physical education and sport then is to do more research using different types of feedback and contingencies, because they have already been proven successful in many research endeavors. The problem is, although successful, that their use in research and in field settings is still in the infancy state within our area.
APPENDIX A

LETTER OF CONSENT
Dr. Ley and Coach Welsh:

As you know I will be doing my doctoral dissertation this spring using the Capital University baseball team. I have already received written approval to conduct my study from my doctoral committee and the Human Subjects Committee at Ohio State. I have received your verbal approval, but I feel to make it official I should also have your written approval. If any questions arise, please feel free to contact me. Thank you for your cooperation.

Yours truly,

Paul C. Paese

I hereby grant my permission for Paul C. Paese to conduct a doctoral study using the Capital University baseball team.

Athletic Director

Head Baseball Coach

College of Education
APPENDIX B

SUBJECT CONSENT FORM
CONSENT FOR PARTICIPATION IN
SOCIAL AND BEHAVIORAL RESEARCH

I consent to participating in (or my child's participation in) a study entitled The Effect of Feedback and Individual-Group Contingencies on the Team Behaviors of an Intercollegiate Baseball Team.

Paul C. Paese has explained the purpose of the study and procedures to be followed. Possible benefits of the study have been described as have alternative procedures, if such procedures are applicable and available.

I acknowledge that I have had the opportunity to obtain additional information regarding the study and that any questions I have raised have been answered to my full satisfaction. Further, I understand that I am (my child is) free to withdraw consent at any time and to discontinue participation in the study without prejudice to me (my child). The information obtained from me (my child) will remain confidential and anonymous unless I specifically agree otherwise.

Finally, I acknowledge that 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: _________________________________ Signed: _________________________________

(Participant)

(Investigator/Project Director or his/her authorized representative)

(Person Authorized to Consent for Participant - If Required)

PA-027 (2/79) -- To be used only in connection with social and behavioral research for which an OSU Human Subject Review Committee has determined that the research poses no risk to participants.
1980 CAPITAL UNIVERSITY BASEBALL SCHEDULE

Tuesday March 25 Rio Grande (2) Home 2:00
Wednesday March 26 Bluffton Away 3:30
Thursday March 27 Muskingum Home 3:30
Saturday March 29 Wittenberg (2) Home 1:00
Monday March 31 Denison Home 3:30

Tuesday April 1 Bellarmine (Louisville, KY) Away 3:00
Wednesday April 2 Bellarmine Away 1:30
Thursday April 3 Louisville, KY Away 1:00
Saturday April 5 Ohio Wesleyan** (2) Home 1:00
Monday April 7 Wilmington Away 1:00
Tuesday April 8 Wittenberg** Away 3:30
Thursday April 10 Ashland Home 3:30
Friday April 11 Ohio Dominican Away 3:30
Saturday April 12 Denison** Home 1:00
Monday April 14 Cincinnati Away 3:30
Wednesday April 16 Otterbein** Home 3:30
Friday April 18 Denison Away 3:30
Saturday April 19 Marietta** Away 1:00
Monday April 21 Ohio Dominican Home 3:30
Wednesday April 23 Urbana Home 3:30
Thursday April 24 Marietta** Home 3:30
Saturday April 26 Muskingum** Away 1:00
Monday April 28 Wilmington Away 1:00
Tuesday April 29 Denison** Away 3:30

Saturday May 3 Otterbein** (2) Away 1:00
Wednesday May 7 Ohio Wesleyan** Away 3:30
Thursday May 8 Muskingum Home 1:00
Friday May 9 Wright State Away 3:00
Saturday May 10 Kenyon (2) Home 1:00

Friday May 16 OAC Championship Playoff (2)
Saturday May 17 at Northern Site (1)

Wednesday May 21-24 NCAA Midwest Regional Championship - Division III

Friday, May 30-Sunday, June 1: NCAA Division III World Series National Championship

**OAC Southern Division Games
APPENDIX D

BASEBALL OBSERVATION CODE
(BOC)
<table>
<thead>
<tr>
<th>Situations</th>
<th>Mental Execution</th>
<th>Physical Execution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special situation</td>
<td>Threw to correct base (CB+)</td>
<td>Out (O+)</td>
</tr>
<tr>
<td>SS</td>
<td>Threw to incorrect base (IB-)</td>
<td>No out (NO-)</td>
</tr>
<tr>
<td>Fielding play (FP)</td>
<td>Incorrect defensive setup (IO-)</td>
<td>Denied advancement (DA+)</td>
</tr>
<tr>
<td>Squeeze (SQ)</td>
<td></td>
<td>Runner(s) advance (RA-)</td>
</tr>
<tr>
<td>Sacrifice (SAC)</td>
<td></td>
<td>Error (E-)</td>
</tr>
<tr>
<td>Stolen base (SB)</td>
<td></td>
<td>Correct cutoff (CC+)</td>
</tr>
<tr>
<td>Cutoff (C)</td>
<td></td>
<td></td>
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<tr>
<td>Sacrifice fly (SF)</td>
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<td>Tag up (TU)</td>
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<td></td>
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<td>Passed ball (PB)</td>
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# PITCHING

<table>
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<tr>
<th>Situations</th>
<th>Mental Execution</th>
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<tbody>
<tr>
<td>0-2 pitch (2P)</td>
<td>Threw to correct base (CB+)</td>
<td>Good pitch (GP+)</td>
</tr>
<tr>
<td>Bunt (B)</td>
<td>Threw to incorrect base (B-)</td>
<td>Bad pitch (BP-)</td>
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<td>Squeeze (SQ)</td>
<td>Not backing base (NBB-)</td>
<td>Out (O+)</td>
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<tr>
<td>Double play (DP)</td>
<td>Not covering first (NCl-)</td>
<td>No out (NO-)</td>
</tr>
<tr>
<td>First batter/inn (FB)</td>
<td></td>
<td>Error (E-)</td>
</tr>
<tr>
<td>Fielding play (FP)</td>
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<td>Wild pitch (WP-)</td>
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<tr>
<td>Normal (N)</td>
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<td>Balk (BK-)</td>
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<td>Covered first (Cl+)</td>
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<td>Pickoff (PO)</td>
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## Situation Table

- **Mental Execution**
  - Threw to correct base (CB+)
  - Threw to incorrect base (B-)
  - Not backing base (NBB-)
  - Not covering first (NCl-)

- **Physical Execution**
  - Good pitch (GP+)
  - Bad pitch (BP-)
  - Out (O+)
  - No out (NO-)
  - Error (E-)
  - Wild pitch (WP-)
  - Balk (BK-)
  - Covered first (Cl+)
<table>
<thead>
<tr>
<th>Pitcher</th>
<th>Walks</th>
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<th>Earned runs</th>
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**Situations**
- Squeeze (SQ)
- Sacrifice (SAC)
- Stolen base (SB)
- Hit behind runner (HBR)
- Tag up (TU)
- Sacrifice fly (SF)
- Baserunning (B)
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APPENDIX E

TEAM AND INDIVIDUAL FEEDBACK SHEETS
CAPITAL UNIVERSITY BASEBALL

Team DEA

Team OSEA

Team PEA

Team OAEA

MEA
<table>
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<tr>
<th>Name</th>
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| Name       | H      | R      | Bi      | St      | Sac    | Fly    | AVG  | Sl | Bi | St | Sac | Fly | AVG  | Sl | Bi | St | Sac | Fly | AVG  | Sl | Bi | St | Sac | Fly | AVG  | Sl | Bi | St | Sac | Fly | AVG  |
|------------|--------|--------|---------|---------|--------|--------|------|----|----|----|-----|-----|------|-----|----|----|----|----|----|-----|-----|----|----|----|----|----|-----|-----|----|----|----|----|----|----|-----|
| Barkley    |        |        |         |         |        |        |      |    |    |    |     |     |      |     |    |    |    |    |    |     |     |    |    |    |    |    |    |     |
| Cobwell    |        |        |         |         |        |        |      |    |    |    |     |     |      |     |    |    |    |    |    |     |     |    |    |    |    |    |    |     |
| Glassco    |        |        |         |         |        |        |      |    |    |    |     |     |      |     |    |    |    |    |    |     |     |    |    |    |    |    |    |     |
| Grant      |        |        |         |         |        |        |      |    |    |    |     |     |      |     |    |    |    |    |    |     |     |    |    |    |    |    |    |     |
| Kenny      |        |        |         |         |        |        |      |    |    |    |     |     |      |     |    |    |    |    |    |     |     |    |    |    |    |    |    |     |
| Law        |        |        |         |         |        |        |      |    |    |    |     |     |      |     |    |    |    |    |    |     |     |    |    |    |    |    |    |     |
| Mills      |        |        |         |         |        |        |      |    |    |    |     |     |      |     |    |    |    |    |    |     |     |    |    |    |    |    |    |     |
| Noble      |        |        |         |         |        |        |      |    |    |    |     |     |      |     |    |    |    |    |    |     |     |    |    |    |    |    |    |     |
| Show       |        |        |         |         |        |        |      |    |    |    |     |     |      |     |    |    |    |    |    |     |     |    |    |    |    |    |    |     |
| Stucky     |        |        |         |         |        |        |      |    |    |    |     |     |      |     |    |    |    |    |    |     |     |    |    |    |    |    |    |     |
| Trentlinger|        |        |         |         |        |        |      |    |    |    |     |     |      |     |    |    |    |    |    |     |     |    |    |    |    |    |    |     |
| Hutchinson |        |        |         |         |        |        |      |    |    |    |     |     |      |     |    |    |    |    |    |     |     |    |    |    |    |    |    |     |
| Dieser     |        |        |         |         |        |        |      |    |    |    |     |     |      |     |    |    |    |    |    |     |     |    |    |    |    |    |    |     |
| Vasquez    |        |        |         |         |        |        |      |    |    |    |     |     |      |     |    |    |    |    |    |     |     |    |    |    |    |    |    |     |
| Metuchi    |        |        |         |         |        |        |      |    |    |    |     |     |      |     |    |    |    |    |    |     |     |    |    |    |    |    |    |     |
| Moody      |        |        |         |         |        |        |      |    |    |    |     |     |      |     |    |    |    |    |    |     |     |    |    |    |    |    |    |     |
| Totals     |        |        |         |         |        |        |      |    |    |    |     |     |      |     |    |    |    |    |    |     |     |    |    |    |    |    |    |     |

Offense  G:4A: MEA: OSEA:  Date:  Capital vs.  

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# Defense

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LIST OF REFERENCES


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


Brown, R. and Copeland, R. Basketball with the school principal as a reward for decreasing disruptive behavior: A new direction for education. Behavior Analysis, University of Kansas, 1971, 137-140.


Fox, P. and Ervin, T. The efficiency of reward contingencies and peer teaching on reading skill acquisition and on task attending with elementary school children. Unpublished manuscript, Appalachian State University, 1976.

Friedman, P. Relationship of teacher reinforcement to spontaneous student verbalization within the classroom. Journal of Educational Psychology, 1973, 65, 59-64.


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


McNamara, J.R. Teacher and students as sources for behavior modification in the classroom. Behavior Therapy, 1971, 2, 205-213.


Ng Wai-Kong The effectiveness of feedback in minicourse/microteaching in improving teaching skills, University of Science, Penang, Malaysia, 1977.


Sloggett, B.B. Use of group activities and team rewards to increase classroom productivity. Teaching Exceptional Children, 1971, 3, 54-66.


Tuckman, B.W. and Oliver, W. The effectiveness of feedback to teachers as a function of source. Journal of Educational Psychology, 1968, 59, 297-301.


