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IMPROVING THE ATHLETIC PERFORMANCE OF  
HIGHLY SKILLED COLLEGE VOLLEYBALL PLAYERS THROUGH THE  
USE OF A VIDEOTAPE TREATMENT PACKAGE

A Thesis

Presented to

the Faculty of the Graduate School  
University of the Pacific

In Partial Fulfillment  
of the Requirements for the Degree  
Master of Arts

by

Steven K. Lowe

June, 1981

## Abstract

A multiple baseline across behaviors design was used to test the effectiveness of a treatment package involving the use of a videotape recorder to improve the performance of college women volleyball players. The subjects were four highly skilled athletes, as evidenced by their participation in the University of the Pacific volleyball program, ranked second nationally during the 1980-81 season. The treatment package consisted of the following: (a) zooming in with a video camera on particular aspects of the players' performances; (b) attempts to change only one aspect of the performance of a skill rather than the entire skill; (c) cueing and corrective feedback provided by the coach during the players' viewing of the resulting videotapes; (d) the players immediately correcting their errors in performance after viewing the videotapes and (e) multiple viewings by the players of videotapes of their correct performances of the volleyball skills. The results indicated that all of the subjects benefited from the videotape treatment package. Two of the players showed improvement in the two volleyball skills for which the treatment was given. The other two players showed improvement in one of the two volleyball skills for which the treatment was given. For three of the four players their improved practice performances with the videotape treatment also resulted in improved performances during scrimmages for at least one of the two target behaviors.

This thesis, written and submitted by

Steven Keating Lowe

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is approved for recommendation to the Committee  
on Graduate Studies, University of the Pacific.

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Dated June 12, 1981

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Athletics is a new and promising area of study for applied behavior analysts. Behavioral practitioners are beginning to apply their techniques for developing, changing, and maintaining behaviors to a variety of areas in sports. For example, Rushall and Siedentop (1972), Dickinson (1976), and Suinn (1980) have written books on ways various behavioral techniques can be used to improve athletic performance.

Feedback as a way to improve athletic performance is one behavioral technique that is presently being studied. According to Bilodeau and Bilodeau (1961, p. 250), "studies of feedback or knowledge of results...show it to be the strongest, most important variable controlling performance and learning." Rothstein (1979, p. 220) adds, "If I were to choose the single most powerful tool that teachers and coaches have available to them, it would be information feedback. The teacher and coach must assume primary responsibility for structuring the performance environment, so that feedback is available. In addition, they must decide what type of feedback to provide and how to assist performers in its use."

Feedback has been shown to be a necessary component in learning a variety of skills or tasks. Thorndike (1927) in an early study on feedback, had two groups of subjects attempt to draw pencil lines of 3, 4, 5, or 6 inches over a period of several days. Both groups drew the lines while blindfolded, depriving them of visual feedback. One group was given verbal knowledge of results by the experimenter saying "right" or "wrong" after each line was drawn; a line was considered "right" if it finished within a quarter-inch target area. The group with the verbal feedback improved considerably while the group with no

knowledge of results did not improve.

Trowbridge and Cason (1932) repeated Thorndike's (1927) line drawing experiment; they hypothesized that more detailed knowledge of results would further improve performance. All groups receiving feedback showed evidence of learning, but the group with the most detailed information feedback performed better on the task. These results suggest that more detailed feedback will result in improved athletic performance.

After these early studies determined that feedback is a necessary component in learning motor skills, experimenters continued to research how feedback can best be given. Bilodeau and Bilodeau (1958) found that performance changes are a function of the absolute rather than the relative frequency of feedback. Annett (1959) found that in some cases, delays of information feedback did not hinder performance. Tosti (Note 1) suggested that feedback should not be given immediately after a response, rather when it is immediately useful; that is when the subjects have an opportunity to correct or improve their responses.

A new source of feedback, the videotape recorder, provides very detailed information and is now being used and tested in athletic environments. Traditionally athletes have been given only verbal feedback on what they are doing correctly and incorrectly. With videotape replays, the athletes do not have to act solely on the basis of the coaches' verbal cues; rather, they can see errors and act on the combination of visual and instructional (verbal-oral) feedback. The videotape provides accurate and detailed information in that it records athletes' performances exactly. The verbal feedback traditionally given by coaches could at times be inaccurate because spoken language

may not perfectly convey to the player what the coach intends. The videotape recorder also allows athletes to repeatedly view their performances so that they can acquire all the necessary information. Further, the information can be kept as a permanent record on videotapes. Finally, the videotape recorder can be used to provide information feedback immediately and/or when the athletes have an opportunity to practice their performance.

Recently, several studies have been done to test the effect of the use of the videotape recorder to improve athletic performance. Most studies have used the following basic design, with some variations: One group of subjects receives traditional instruction techniques to acquire or improve a skill, while another group of subjects receives videotape training in addition to the traditional instruction. The two groups are then compared on their performance of the skill to assess if the videotape training significantly improves the subjects' acquisition or improvement of the skill.

For example, Penman (1969) tested the effectiveness of teaching beginning tumbling with and without the use of a videotape recorder. Thirty subjects were randomly assigned to either the control or experimental groups. Both groups were taught using the same curriculum, but the experimental group also viewed their performance on the videotape recorder. The study lasted for 12 weeks involving 24 sessions of approximately 35 minutes each. At the end of the 24 training sessions the subjects in both groups were evaluated on a posttest of gymnastic stunts they had been taught. The two groups did not significantly differ in judges' ratings of their abilities to perform the stunts. One hypothesis posed by the experimenter on why the two groups did not differ



in their performance of the stunts was that the subjects in the experimental group did not have as much actual practice time on the stunts because of their time spent viewing the television monitor.

Burkhard, Patterson and Rapue (1967) did a similar study on the effect of the videotape recorder on learning the motor skills of karate. Thirteen male students in the beginning level of karate were divided into experimental and control groups. The karate class met for two 1-1/2 hour sessions a week for a nine week period. The experimental group received the following treatment once a week: A videotape film of each pair of trainees was presented to the entire group before that day's class period. The film was shown first in slow motion, with an average of one repeat showing for each pair of subjects. During the film individual errors were pointed out and corrective feedback was given by the instructor. The control group received an equal amount of verbal instruction, but with no videotape feedback. To measure the effectiveness of the videotape instruction judges were asked to rate on a point scale the series of karate maneuvers each individual made. Judges rated performance relative to adequate green belt performance. The results indicated that the performance of the experimental group (videotape feedback) after a five week period scored 20 points higher (100 point scale) than the control group (no videotape feedback).

Bunker, Shearer and Hall (1976) obtained positive acquisition of a swimming skill. There were two groups of subjects (N=36), ages 4.5 to 6.4 years in the first group and ages 6.5 to 8.5 years in the second group. Each of these age groups were separated into two groups, one of which received traditional instruction in the learning of the "flutter kick" and the other, which, in addition, received videotape feedback on

their performance of the "flutter kick." Each group met for one hour once a week for four weeks. Approximately 15 minutes of each instruction session dealt with the correct execution of the "flutter kick." All subjects had an opportunity to practice the skills. During this time period the group receiving videotape instruction was filmed and then they immediately viewed their performances. The instructor praised the children on their performances and discussed their performances with them. Only the older aged groups of children provided evidence of improvement in "flutter kicking" because of the videotaped feedback.

Watkins (1963) also found videotaped feedback to be more effective than traditional verbal feedback on correcting the batting faults of college baseball players. The baseball players were divided into two groups, one of which received traditional instruction and the other which received videotape feedback in addition to the traditional instruction. The group which received the videotape feedback was shown a videotape of their hitting once a week for a five week period, during which their coach or another instructor pointed out their batting faults and ways in which these faults could be corrected. This feedback was given on five batting strokes for each individual and it lasted for approximately three minutes for each individual. The videotaped feedback group made an average of approximately three less batting faults than the control group between the beginning of the first week and the end of the fifth week.

The results of the three previous studies, Burkhard, et al. (1967), Bunker, et al. (1976) and Watkins (1963), were statistically significant in favor of the group which received videotape feedback, but the results were not of clinical or applied significance. For treatment programs

utilizing the videotape recorder to be of use to athletic coaches, the results must show more than just statistical significance. Coaches are interested in results that show obvious improvement in the performances of their athletes in return for the money, time, and effort invested in the treatment programs.

Studies similar to the ones described above comparing traditional instruction to traditional instruction plus videotape feedback were reviewed in the index, Completed Research in Health, Physical Education, and Recreation Including International Sources, from 1969 to 1978. Of 27 studies, only six found a significant difference between the two groups in the improvement or learning of a sport skill. The effect of the videotape recorder as a training device was tested in all of the following sports: badminton (Bradley, 1976); bowling (e.g. Carmichael, 1970; Elliot, 1975; Prata, 1976); fencing (e.g. Conroy, 1970; White, 1974); football (e.g. Lindblad, 1977; Lundquist, 1969); golf (Smith, 1969); gymnastics (e.g. Beebe, 1975; Grechus, 1973; Olson, 1970; Sullivan, 1974); Highjumping (Pohl, 1972); softball (Hoffecker, 1972); swimming (e.g. Fisher, 1978; Green, 1971; Morgan, 1971; Taylor, 1972); tennis (Graves, 1974); volleyball (e.g. Chakas, 1977; Reid, 1971); and wrestling (Cox, 1970).

One reason most studies do not show that the group with the videotape instruction performs much better than the group which receives traditional instruction may be that the subjects do not have enough learning trials with the videotape recorder. For example, Conroy (1969) used the videotape feedback for 96 subjects during only two class periods in an attempt to improve fencing skills. The subjects in the Grechus (1972) study received only one viewing of their gymnastic stunt each day

during seven practice days in an attempt to improve their gymnastic skill.

Second, most of the studies reviewed did not attempt to improve one particular aspect of a sport skill, rather they attempted to achieve an overall improvement of the skill. For example, Bradley (1975) attempted to improve the badminton skills of subjects receiving videotape instruction and Penman (1969) attempted to improve the tumbling skills of subjects receiving videotape feedback. Bradley (1975) and Penman (1969) might have been more successful if they had focused on one aspect of badminton and tumbling respectively.

Third, in many of the studies reviewed here the subjects did not have an opportunity to practice what they had learned from the videotape session immediately after the session was completed (Watkins, 1963). Oftentimes this occurred because the videotape feedback was given at the end of the day's practice session (Bunker, et al., 1976).

Finally, none of the studies reviewed mentioned using a zoom lens during the videotape session, which would have allowed closer inspection of the sport skills involved. Furthermore, none of the studies mentioned using different camera angles during the filming of the sport skills. Varying the camera angles during filming may have provided more information to the athletes for improving their sport skills.

Rothstein (1979) makes some suggestion for the effective use of the videotape recorder. Her suggestions include the following:

1. Provide cues to relevant information.
2. Focus on particular aspects of performance.
3. Practice immediately after viewing.
4. Provide repetitive viewing opportunities.

5. Incorporate several viewing angles of the same performance.
6. Ensure the view is consistent with the goals of the videotaping.

To expound on the above suggestions Rothstein (1979) states:

Cues to viewing the videotape replay or to using available feedback are important, particularly for beginners and novice performers, but they are also helpful for more advanced performers, especially when they are using specialized types of feedback. (p. 222)

For example, a coach should cue, or point out, exactly what the athletes should observe when viewing the videotapes. A volleyball coach may cue the players in this way, "I want you to watch the follow-through of your arm during your serve and to watch the positioning of your feet when you are passing the ball." These verbal cues will ensure the athletes' observation of the skills intended by the coach.

The second suggestion Rothstein (1979) makes is as follows:

Feedback techniques which focus on particular aspects of the performance, using a zoom lens in conjunction with videotape or using specific verbal cues, should be particularly helpful for highly skilled individuals.

(p. 222)

The videotape recorder does not have to be used just to record scrimmages and games. The coach may want to videotape certain aspects of the players performance, such as passing a volleyball. In this case, the players would be videotaped only when they are passing the ball. The zoom lens can be used to frame in on a certain aspect of passing, such as the position of the feet during a pass. The fine details of a player's body movements can be observed with the use of a zoom lens.

The third suggestion Rothstein (1979) makes is as follows:

Practice following the administration of feedback, after decisions are made regarding what should be modified and how it is crucial...In addition this practice should occur as soon as possible after feedback administration. (p. 222)

Coaches should provide an opportunity for the athlete to practice or correct errors in performance shortly after viewing the performance. For example, volleyball coaches may videotape players spiking the ball and then have the players view their performances. During the viewing of the videotape the coaches may point out errors in the players' performance of the skill. After the players have received this corrective feedback, they should practice the correct performance of the skill. If the players were not given the opportunity to immediately try to improve their performance, they may forget the corrective feedback that was given.

The fourth suggestion Rothstein (1979) makes is as follows:

The videotape replay should be used at least five times with multiple replays each time for benefits to accrue. (It has been suggested that the replay system at the Montreal Olympics may have operated to the advantage of those performers whose performances were constantly replayed). (p. 222)

Much of the learning that occurs in practice sessions is due to repetition. For example, a volleyball coach will repeatedly practice offensive formations until they become automatic. Repetition is also necessary for learning to occur during the viewing of performances on the videotape recorder. In the first few viewings of the videotapes,

the athletes might for example, attend to their personal appearance on the screen rather than their performance of the skills involved. Also, some details that are missed during the first viewing of the videotapes may be observed in later viewing. For these reasons, multiple viewings of the videotapes are highly recommended.

Rothstein's (1979) fifth suggestion is the following:

The focus of the videotape replay or other feedback should be shifted to afford attention to other aspects or views of the same performance. (In the World Series this point was reinforced through the replays from many different vantage points; each view afforded different information). (p. 222)

The coaches should make sure their players are videotaped performing the same skill from different angles. For example, volleyball coaches may want to videotape their players serving the ball from a view from the front, back, and side. Different information can be obtained from viewing the videotapes of the serve taken from different angles. The follow-through may be observed better from a view from the front, while the positioning of the feet may best be observed from the side.

The sixth suggestion Rothstein (1979) makes is as follows:

The view provided via videotape, or the other types of feedback, should be consistent with the skill to be learned or improved. (p. 222)

The coaches should make sure before videotaping that the information they want to give their athletes will be provided by the view chosen for videotaping. For example, if the coaches are interested in the relationship between when the spikers begin their approach and when the ball is set, they must ensure both the setter and the spiker can be

observed in the picture taken during videotaping.

The purpose of this study was to incorporate many of Rothstein's (1979) suggestions into a treatment package for improving the performance of highly skilled college athletes. A head coach first identified flaws or errors in performance in several volleyball players' skills. These players were then videotaped performing these skills and the camera zoomed in on particular aspects of their performance where the flaws would most likely be evident. The players then immediately observed their performances on a videotape replay with the coach both cueing the players on what to observe and providing corrective feedback on ways to improve their performances. The players were then asked to immediately practice and improve their performance. Once the players had performed the skills correctly, they were shown repetitive viewings of their correct performance of the skills. This treatment package was evaluated by using a multiple baseline across behaviors design.

### Method

#### Subjects

Four women volleyball players at the University of the Pacific served as subjects in the study. The players were highly skilled volleyball players, as evidenced by their participation in the University of the Pacific volleyball program, ranked second nationally during the 1980-1981 season. Two of the subjects were starters on the 1980-81 team, Player Two (spiking and defense) and Player Three (spiking and serve reception). In addition, one of the players was named by the Association for Intercollegiate Athletics for Women (AIAW) as a Division I first team All-American (Player Four [defense and blocking]). The other two players were high ranking reserves who played in all of the team's



1980-81 volleyball matches. The four players were selected randomly from the population of the entire University of the Pacific volleyball team, excluding seniors. The seniors did not participate in the study because the study was conducted in the Spring of 1981, after the seniors had completed their last season of intercollegiate volleyball.

During the Spring semester the coaches normally have individual practice sessions with the players to work on various volleyball skills. The study was conducted during these individual practice sessions and therefore, the study should have been viewed by the players as part of their normal practice procedures. The players were not told they were participating in a scientific study and therefore, they were not told the purpose or experimental hypothesis of the study. This was done in an attempt to protect against any demand effects that might have occurred which would have been a threat to the internal validity of the study.

The first two players were told they were helping the coaches in trying out a new practice procedure that would eventually be used with all the team members. Because the players may have performed differently by seeing themselves in a test situation where their performance was being evaluated, the next two players were told this procedure was one in which all team members were going to begin participating.

Possibly because of the experimenter's direct involvement in the procedures during the practice sessions, some of the players suspected that the procedures used were being tested as part of a thesis or class requirement. These players suspicions became apparent when several of the players asked the experimenter if his participation in the study was for a thesis or class requirement. The experimenter admitted the project was for a thesis requirement but he did not provide any further

information on the experiment.

### Equipment

The videotape recorder used in the study was an AKAI UPS 7300 model with a color camera, a type JVC 6X66. The videotape recorder was set in the two hour playing time mode. The camera lens was a zoom (12.5-75mm) with a 1:1.9 ratio. The videotape used was of the model type JVC T120 VHS 1/2 inch tape. The camera was hand held by the experimenter using the angle of viewing the coach recommended for best observation of the volleyball skills involved in the study.

### Selection of Target Behaviors

The experimenter asked the head volleyball coach to identify and describe two flaws or errors in performance for each of the four players (see Appendix A for complete description). The coach was told to pick two flaws that were approximately equal in the amount of practice time spent on them in the normal team practice sessions during the time frame of the study and in their difficulty to correct. These flaws or errors in performance served as target behaviors in the study.

Since coaches cannot possibly attend to all flaws in performance made by each athlete in each practice session, they must establish priorities. The prioritization of target behaviors and the sequencing within a multiple baseline design is therefore both of methodological and practical importance.

One of the flaws was of high priority, a flaw which the coach wanted corrected as soon as possible. This flaw was the first target behavior to receive the experimental treatment in the multiple baseline across behaviors design. For all players the second flaw the coach

identified occurred in a different volleyball skill than the high priority flaw. The second flaw was referred to as a low priority flaw, one that the coach felt did not have to be corrected immediately. The volleyball skill with the low priority flaw served as the second target behavior in the multiple baseline across behaviors design.

### Videotape Observations

The experimenter asked the coach to define the most advantageous angle for videotaping each particular skill, and the experimenter then used this same angle of viewing throughout all observation sessions (see Appendix B). Next, the players were videotaped individually performing the skills with the low and high priority flaws. The experimenter used a zoom lens to frame the area where the flaw could best be observed. For example, in filming a player's arm position while blocking, the zoom lens was used to frame only the player's upper body to allow for closer observation of the player's arm position.

The outcomes of the players' performances of the skills were not followed by the camera. For example, the flight of the ball after a pass was not followed, in order to allow filming of the players' follow-through.

The outcomes of the players' performances were recorded by independent observers who rated numerically each performance of the skills. The rating system used was a modified version of the Coleman-Neville Statistical System of Evaluation. This statistical system was used by the University of the Pacific during all of its volleyball matches. The observers had prior experience with the rating system, having used it during the team's regular season matches.

The rating of the outcome of each skill was based on the following

rating system:

- 4 - the play scores
- 3 - very good execution but you do not score from it (often the requirement is that you receive a "free ball" from the play)
- 2 - average execution
- 1 - poor execution but you do not lose the point from it (often the requirement is that you donate a "free ball" to your opponents on the play)
- 0 - a complete misplay costing the point or side out (Coleman, Neville & Gorton, 1971, p. 72).

In the study only the performance of one individual was observed. The entire play with the other team members was not carried out. Therefore, the observers had to rate the skill as if the play had developed with the other players performing the skills correctly. For example, when rating a player's forearm pass the rater must assume the setter and spiker would have performed their skills correctly after the pass had been executed (see Appendix c for further description of the modified version of the Coleman-Neville Statistical System of Evaluation rating system used in the study).

### Procedures

The following procedure was the same for each of the four players but it was carried out individually with each player (see Table 1). The experimental procedure was divided into two parts. (The coach read the proposal for the study, and the experimenter discussed it with him so that he knew his role in the study).

Part one. After the coach selected the target behaviors for the

study, the low and high priority flaws, the player met with the coach and experimenter for an individual practice session where she was videotaped performing these skills. In addition to the coach and experimenter, the two assistant coaches, manager, and an additional player were present at the practice sessions. These individuals performed such functions as participating in drills, observing, and recording for the study. The experimenter first asked the player to perform both the low and high priority skills 10 times; each performance of both skills was videotaped. For each player a coin was flipped to determine which skill was performed first for baseline videotaping.

The player then viewed the videotape of her performance on the high priority skill. She did not view the videotape of the low priority skill. If the player asked to see the videotape of her performance on the low priority skill she was told there was only time to view the videotape of one skill during that session. In addition, she was told the other skill would be viewed during a later practice session.

During the viewing of the videotape, the player viewed each of the 10 performances of the skill at regular speed. The coach pointed out in each performance of the skill whether or not the high priority flaw was occurring. For example, "See, you did not follow-through with your arm here," (pointing to the skill on the monitor). If the high priority flaw did not occur in some performances, the coach would remark, "Good, you did not make the error during that performance."

After viewing all the performances at regular speed the player viewed all 10 performances again in slow motion with the coach again pointing out the presence or absence of the flaw. After the viewing of the videotape, the coach provided verbal feedback and/or modeled the

TABLE 1  
Procedures

Part One High Priority Skill

Day 1.

1. Videotaping of both the low and high priority skills (ten times each).
2. Viewing the videotape of the high priority skill, first at regular speed, then in slow motion.
3. Videotaping of high priority skills (ten times).
4. Viewing the videotape of high priority skill, first all performances at regular speed, then the first five performances in slow motion.
5. Videotaping of both the low and high priority skills ten times each.
6. Viewing the videotape of the high priority skill, first all performances at regular speed, then the first five performances in slow motion.

Part Two High Priority Skill

Day 2.

1. Videotaping of high priority skills (ten times).
2. Viewing the videotape of high priority skill, first all performances at regular speed, then the first five performances in slow motion. Coach provides a quantitative rating for each performance.
3. Steps 1 and 2 are repeated twice more for a total of three times.

Day 3.

Viewing of three or more correct performances of the skill, first at regular speed, then in slow motion, then stop-action and finally again at regular speed.

Day 4.

Same procedure as Day 3.

Day 5.

Player videotaped during team scrimmage. (Entire procedure repeated during second week on low priority skill).

correct performance of the skill. The coach then asked the player to perform the skill again and to try to correct the error in performance but not to worry about the outcome of the play.

This procedure of being videotaped and then immediately viewing the videotape was repeated for a total of three sessions. In the second session, the athlete performed only the high priority skill (ten times) and then immediately viewed her performance. In the third session, the player performed both the low and high priority skills (ten times each) but only viewed her performance on the high priority skill. In the second and third sessions the player did not view all her performances in slow motion as she did in the first session, but only her first five performances. Part one of the treatment session concluded with the final viewing of the videotape of the high priority skill.

Part two. The following day the player participated in another individual practice session. During this session the player performed only the high priority skill. The skill was videotaped in the same manner as in Part One of the treatment. The player performed the high priority skill ten times and then viewed each of ten performances, once at regular speed and once in slow motion. The coach rated each performance of the skill on a 7 point Likert scale for the degree of presence or absence of the flaw (see Dependent Measures section) and the coach provided the player with verbal feedback on these ratings. The coach also provided corrective feedback as was done in Part One of the study. This procedure of being videotaped and then immediately viewing the videotape while the coach provides a quantitative rating was repeated for a total of three sessions. In the second and third sessions the player viewed all of her performances once at regular



speed and the first five performances in slow motion.

The player was told to try and get as many consecutive performances with a rating of 1 or 2 (perfect execution) as she could because during the next two days she would be viewing just the skills she had performed correctly. The player had to meet a criterion of three consecutive performances with a rating of 1 or 2 to use for viewing during the next two days. All the players were able to achieve at least three consecutive successful performances in the minimum of three sessions (30 performances). The minimum number of consecutive successful performances was three by Player Two in spiking the one set and the maximum number of consecutive successful performances was seven by Player One in serve reception.

These consecutive successful performances of the skill were then selected and shown to the player for 10 minutes each during the next two days. The experimenter showed these performances of the skill first at regular speed, then in slow motion, then stop-action, and finally again at regular speed. After the player viewed her successful performances of the high priority skill on two consecutive days, she was videotaped performing the skill ten times, either prior to or following the team scrimmage, and then during the scrimmage. The experimenter did not videotape the entire team during the scrimmage, but rather zoomed in on the players involved in the study so that their performances of the skills with the low and high priority flaws could be analyzed. Again, the coach suggested the angle for best viewing (see Appendix B).

Parts One and Two of the procedure were repeated on the low priority skill during the week following the treatment on the high

priority skill. Observations on the high priority skill continued to be taken with the use of the videotape recorder as was done previously on the low priority skill, but no additional treatment was given to the high priority skill.

#### Dependent Measures

After the experimental treatment, two University of the Pacific assistant volleyball coaches served as observers and viewed the videotapes of the players' performances of the targeted volleyball skills. The assistant coaches participated in the individual practice sessions and may have had some idea of the purpose of the study, but they were not directly told of the purpose or experimental hypothesis of the study. The observers were told by the experimenter that the study could not be explained to them because of the possibility of biasing the results of the study. They were told the study would be explained to them after its completion. The observers were not told which videotapes were taken before treatment and which after treatment. This step helped control for any expectancies the observers might have had about the outcome of the study.

The observers were trained to observe and record the dependent measures prior to their viewing sessions (see Appendix D for a further description). Each performance of the volleyball skills videotaped during the baseline and treatment sessions was rated independently by the observers on a 7 point Likert scale for the degree of presence or absence of either the high or low priority flaws. The observers were given operational definitions of the flaws. They were also provided with the Likert scale appropriately anchored for the rating of each

volleyball skill (see Appendix E for further description). The Likert scales were of the following general type:

1	2	3	4	5	6	7
correctly		little		much of		flaw
performed		flaw		the flaw		completely
skill		evident		evident		evident

The performances rated by the observers were from the following practice sessions: (a) The videotapes taken on both skills before any treatment was implemented; (b) two additional videotape sessions in Part One of the treatment on the high priority skill and one additional videotape session on the low priority skill; (c) the videotapes taken on the high priority skill in Part Two of the treatment; (d) the videotape taken on the high priority skill after Part Two of the treatment and just prior to or following the team scrimmage; (e) the videotapes taken on both skills in the scrimmage after Part Two of the treatment on the high priority skill; (f) two videotape sessions in Part One of the treatment on the low priority skill and one videotape session on the high priority skill taken after Part One of the treatment session; (g) the videotapes taken on the low priority skill in Part Two of the treatment; (h) the videotape taken on the low priority skill after Part Two of the treatment, just prior to or following the team scrimmage; and (i) the videotape taken on both skills in the scrimmage after Part Two of the treatment on the low priority skill.

During the videotaping of each performance of the skill an observer rated the outcome of the skill using a modified version of the Coleman-Neville Statistical System of Evaluation (see Videotape Observations section). These outcome data were also used as dependent measures in the study.

### Interobserver Agreement

Using procedures suggested by Cohen (1968) Weighted Kappa for agreements was computed to estimate the interobserver agreement for the degree of presence or absence of the flaws and the observers' ratings of the outcomes of the skills. The formula for Weighted Kappa for agreements is the following:

$\sum W_{ij} P_{ij} - \sum W_{ij} P_{cij} / W_{max} - \sum W_{ij} P_{cij}$ , where  $W_{ij} P_{ij}$  is the weight for all  $ij$  times percentage observed in cell  $ij$ ;  $W_{ij} P_{cij}$  is the weight in cell  $ij$  times the percentage expected by chance; and  $W_{max}$  is the maximum weight assigned. Gelfand and Hartman (1975, p. 219) suggest that a Kappa of .6 or greater provides adequate interobserver agreement. Weighted Kappa for agreements has not been used frequently in the literature and therefore parameters for acceptable interobserver agreement have not been established. For the purpose of this paper a Weighted Kappa rounded to .5 is considered acceptable interobserver agreement. Interobserver agreements were taken in 45% of the sessions in which outcome ratings were made and 95% of the sessions in which performance ratings were made. The sessions in which agreement data were taken was determined by the availability of the observers. The agreement data are presented in the results section of the paper.

### Design

The design for the study is a single subject multiple baseline across behaviors design. The low priority skill served as an untreated baseline which can be compared to the high priority skill which received the experimental treatment. After the conclusion of the treatment on the high priority skill, the low priority skill received the treatment. Both skills were observed throughout the study whether they had received

the experimental treatment yet or not through the use of the videotape recorder.

## Results

### Reliability

The Weighted Kappa for agreements on the performance ratings were adequate (equal to or greater than .5) for all players on all skills except the high and low priority skills for Player One (see Table 2). The interobserver agreement on the outcome ratings was adequate for all subjects on all skills (see Table 3).

### Player One (serve reception and blocking)

Player One's high priority flaw was present in serve reception and her low priority flaw was present in blocking (see Appendix A for further description). In analyzing the performance ratings for Player One it must be noted that the interobserver agreement data did not meet the required Weighted Kappa  $\geq .5$  (see Table 2).

Performance ratings in practice sessions. A session in both the performance ratings and the outcome ratings was approximately 10 performances for each subject (see Figure 1). Player One's performance ratings indicate an improvement in serve reception immediately after treatment was implemented. All sessions, but one, in the treatment phase had superior performance ratings than the baseline rating in serve reception, although there is some trend toward a return to baseline levels (see Figure 1).

The results of the treatment for correcting the player's blocking performance were not as favorable. Figure 1 illustrates that the player's blocking did not improve after treatment was implemented. In fact, Figure 1 indicates the player's blocking may have even deteriorated.

TABLE 2

Interobserver Reliability  
Weighted Kappa for Agreements  
for the Performance Ratings

Players & Skills	# Sessions Inter- observer Agreements Taken/Total # Sessions	# Joint Sessions	Weighted Kappa for Agreements
One			
Serve reception	9/11	90	.36
Blocking	9/11	84	.00
Two			
Spiking	11/11	99	.56
Defense	11/11	80	.50
Three			
Spiking	11/11	98	.47
Serve reception	11/11	104	.65
Four			
Defense	11/11	95	.71
Blocking	11/11	91	.50

TABLE 3

Interobserver Reliability  
Weighted Kappa for Agreements  
for the Outcome Ratings

Players & Skills	# Sessions Inter- observer Agreements Taken/Total # Sessions	# Joint Observations	Weighted Kappa for Agreements
One			
Serve reception	3/7	29	.64
blocking	4/7	30	.68
Two			
Spiking	3/7	26	.53
Defense	4/7	35	.77
Three			
Spiking	2/7	20	.57
Serve reception	3/7	30	.85
Four			
Defense	3/7	29	.76
Blocking	3/7	36	.95

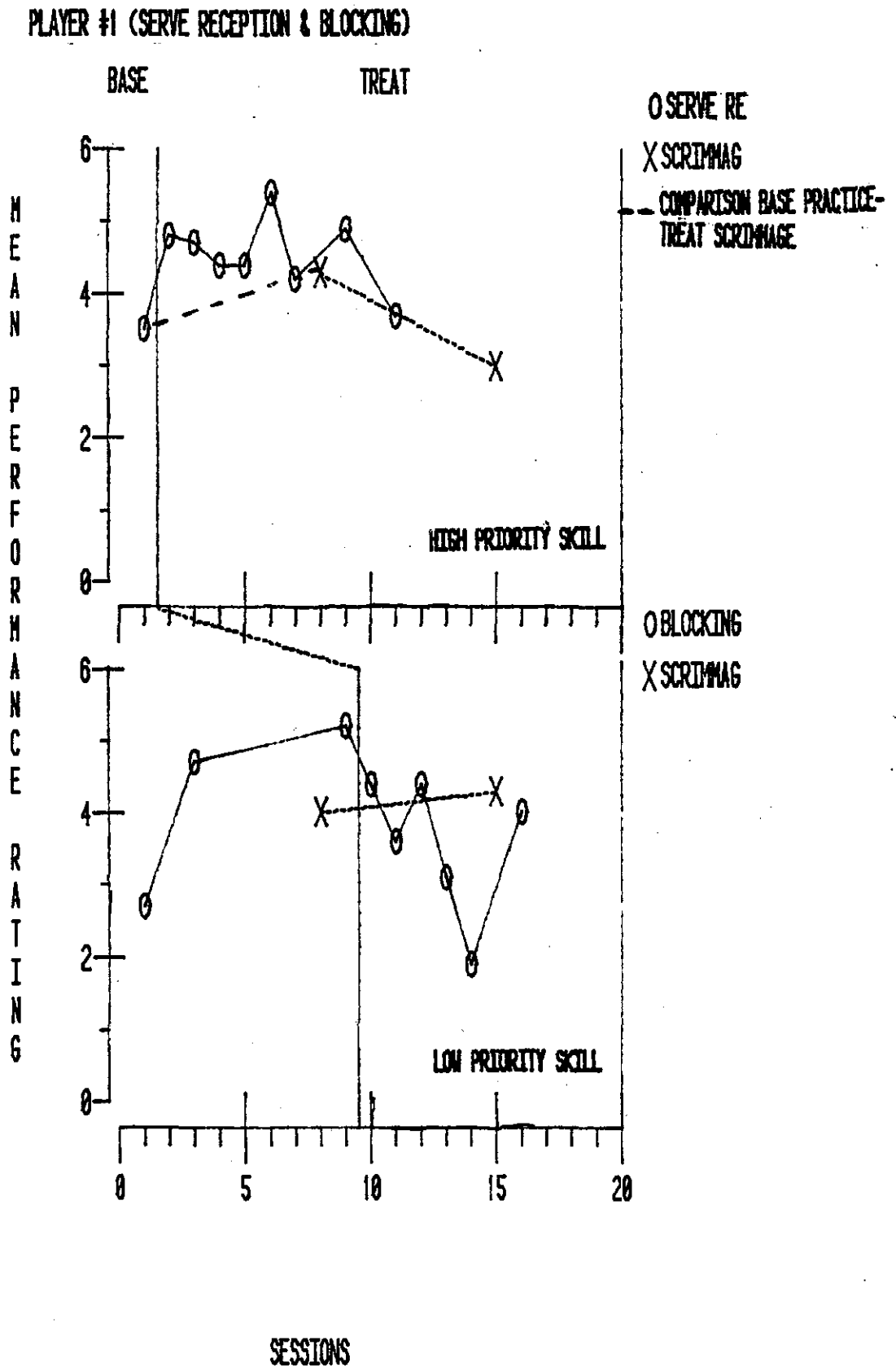


Figure 1: Performance ratings on the low and high priority flaws for Player One. BASE=baseline; TREAT=treatment; SCRIMMAG=scrimmages; SERVE RE=serve reception



Performance ratings in scrimmage sessions. The data for the scrimmage sessions are analyzed differently for the high priority skills as compared to the low priority skills. The players did not perform the high priority skills in a scrimmage session during the baseline phase. The players performed the high priority skills in two scrimmage sessions during the treatment phase. Therefore, in analyzing the data for the high priority skills, the two scrimmages during the treatment phase are compared to the baseline practice sessions (see Figure 1). The players performed the low priority skills in a scrimmage session during both the baseline phase and the treatment phase. Therefore, the baseline scrimmage session is compared to the treatment scrimmage session for the low priority skill. The data is analyzed in this way for all subjects in both the performance ratings and the outcome ratings.

The data show that the positive effects of the treatment on serve reception failed to generalize to the scrimmage situation. The mean performance rating in the first scrimmage was 4.2 and the mean rating in the second scrimmage was 3.0. The player's blocking performance improved slightly in the scrimmage after treatment was implemented with a mean rating of 4.3 as compared to the baseline scrimmage rating of 4.0.

Outcome ratings in practice sessions. Player One's outcome ratings improved in both serve receiving and in blocking after treatment was implemented (see Figure 2). In three out of four of the sessions in the treatment phase the player had a superior mean outcome rating as compared to the baseline outcome rating. In the final practice session in treatment the player achieved a mean outcome rating of 2.6, compared to the mean baseline outcome rating of 1.9. Both of the player's outcome

PLAYER #1 (SERVE RECEPTION & BLOCKING)

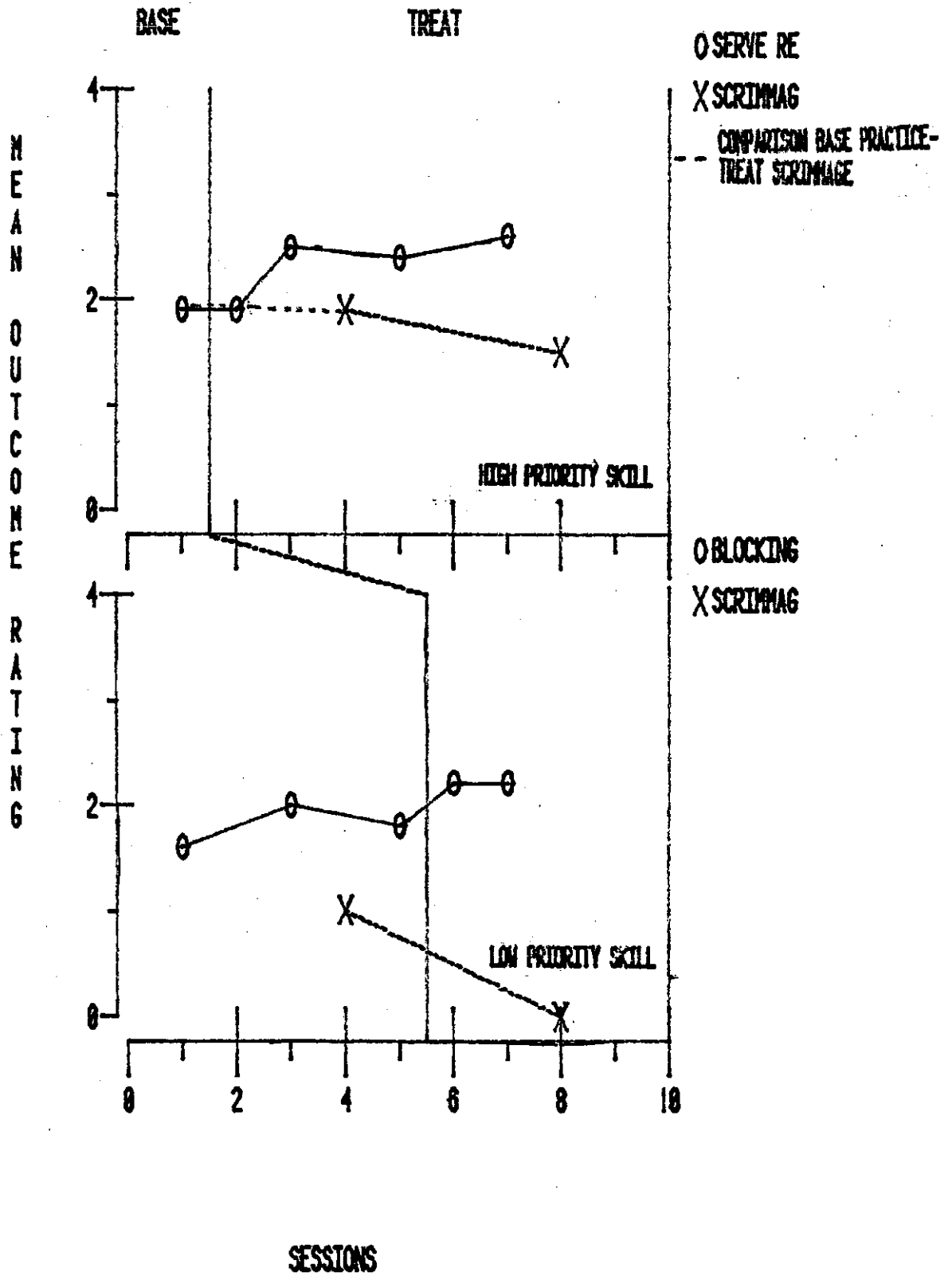


Figure 2: Outcome ratings on the high and low priority flaws for Player One. BASE=baseline; TREAT=treatment; SCRIMMAG=scrimmages; SERVE RE=serve reception.

ratings for blocking in the treatment phase were superior to any of the mean outcome ratings in the baseline phase.

Outcome ratings in scrimmage sessions. The positive effects of the treatment did not generalize to the scrimmage situations for either serve receiving or blocking (see Figure 2). When analyzing the data the fact that the player had only three blocking attempts in the first scrimmage and only five serve receptions in the second scrimmage must be taken into account (see Table 4). Therefore, the player may not have had enough opportunities to exhibit her abilities in these scrimmages.

Self report. Player One (serve reception and blocking) gave a positive report on the effects of the treatment. The subject stated, "These practices have really been good for me. I've been passing (serve reception) much better lately."

#### Player Two (spiking and defense)

Player Two's high priority flaw was present in spiking and her low priority flaw was present in playing individual defense (see Appendix A for further description).

Performance ratings in practice sessions. Evidence of improved spiking performance is illustrated by the performance ratings (see Figure 3). The flaw in performance was less evident in all sessions during the treatment phase as compared to the rating of the flaw given in the baseline session. The low priority flaw, individual defense, did not show much evidence of improvement in either the baseline or treatment phases but during two sessions in the treatment phase the player did evidence less of the flaw than any of the sessions in the baseline phase.

TABLE 4

Frequency of Performances  
in the Scrimmage Sessions

Players & Skills	# Performances First Scrimmage	# Performances Second Scrimmage
One		
Serve reception	10	7
Blocking	3	10
Two		
Spiking	5	4
Defense	3	1
Three		
Spiking	9	5
Serve reception	10	6
Four		
Defense	5	2
Blocking	10	9

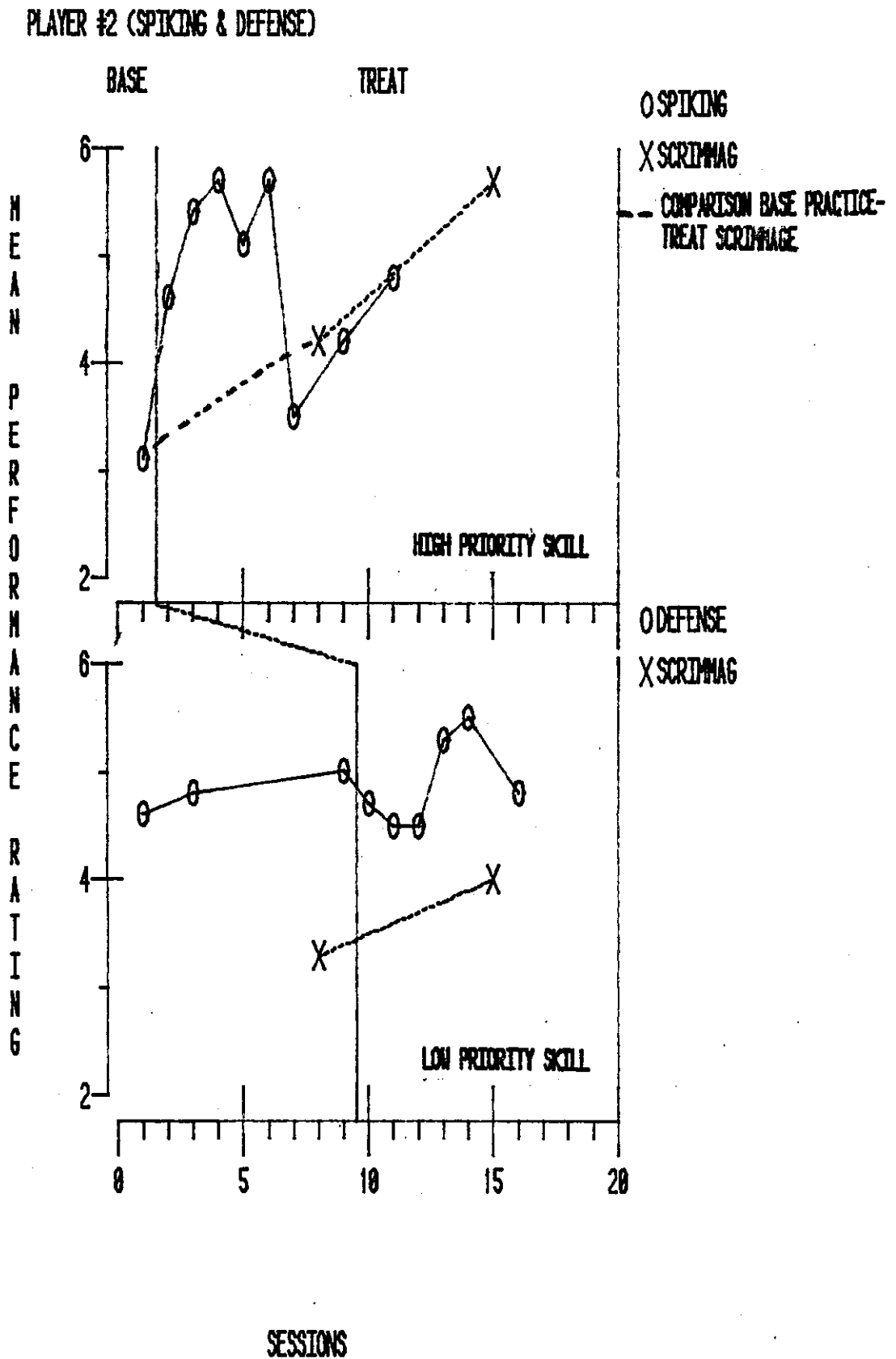


Figure 3: Performance ratings on the low and high priority flaws for Player Two. BASE=baseline; TREAT=treatment; SCRIMMAG=scrimmages;

Performance ratings in scrimmage sessions. The positive effects of the treatment on improving the player's spiking of the one set appeared to generalize to the scrimmage situation (see Figure 3). The player's mean performance rating in the first scrimmage was 4.2, which was better than the baseline practice session rating of 3.1. The player's rating in the second scrimmage was even better, with a mean rating of 5.7 which was as good as any of the ratings obtained in the treatment practice sessions.

The player's performance ratings on playing individual defense showed a positive effect of the treatment in a scrimmage situation. The mean baseline scrimmage performance rating was 3.3 for playing individual defense as compared to the mean treatment scrimmage rating of 4.0. Again in analyzing the data it must be noted that the player had only three opportunities in contacting the ball while playing defense in the first scrimmage and only one opportunity in the second scrimmage. If the player had more opportunities while playing defense, a more accurate assessment of her skills could have been obtained.

Outcome ratings in practice sessions. The player had a very high mean baseline outcome rating of 3.4 (4 point scale) on her spiking the one set. The player maintained this superior spiking performances during the treatment sessions (see Figure 4).

The player's individual defense outcomes gradually deteriorated during the baseline phase and then showed immediate improvement after treatment was implemented. All of the player's outcome ratings after treatment was implemented, were superior to those she had obtained during the baseline phase.

PLAYER #2 (SPIKING & DEFENSE)

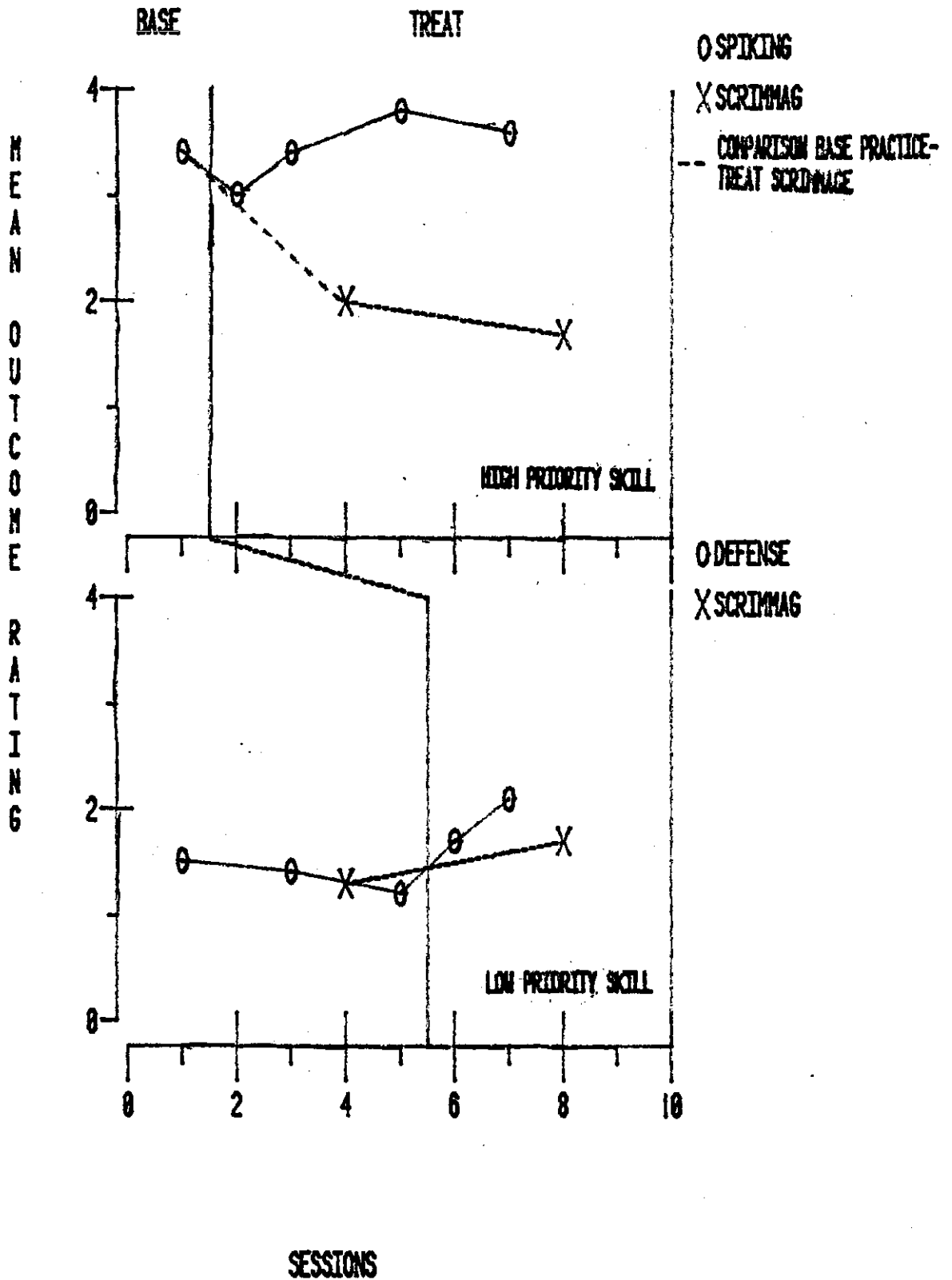


Figure 4: Outcome ratings on the high and low priority flaws for Player Two. BASE=baseline; TREAT=treatment; SCRIMMAG=scrimmages.

Outcome ratings in scrimmage sessions. The player's outcome performance was not as good in the scrimmage sessions as it was in the practice sessions for spiking the one set. The positive effects of the treatment appeared to generalize to the scrimmage situation in playing individual defense as evidenced by the outcome ratings. The mean outcome rating of 1.7 in the scrimmage following treatment was better than the mean baseline scrimmage rating of 1.3, and the treatment scrimmage rating was also better than any of the ratings in the baseline practice sessions (see Figure 4).

Self report. Player Two (spiking and defense) gave an unsolicited positive report on the effects of the treatment. The player stated, "These procedures have really been helping me, especially in hitting the one set."

Player Three (spiking and serve reception)

Player Three's high priority flaw was present in spiking and her low priority flaw was present in serve reception (see Appendix A for further description).

Performance ratings in practice sessions. The performance ratings illustrate the player's improved performance in both spiking and serve reception (see Figure 5). The player's flaw in spiking immediately improved after treatment was implemented and continued at a level superior to baseline level throughout the remainder of the treatment phase.

The player's flaw in passing remained stable during the baseline phase and then immediately improved after treatment was implemented. The player's performance ratings maintained at this level throughout the remainder of the treatment phase.



PLAYER #3 (SPIKING & SERVE RECEPTION)

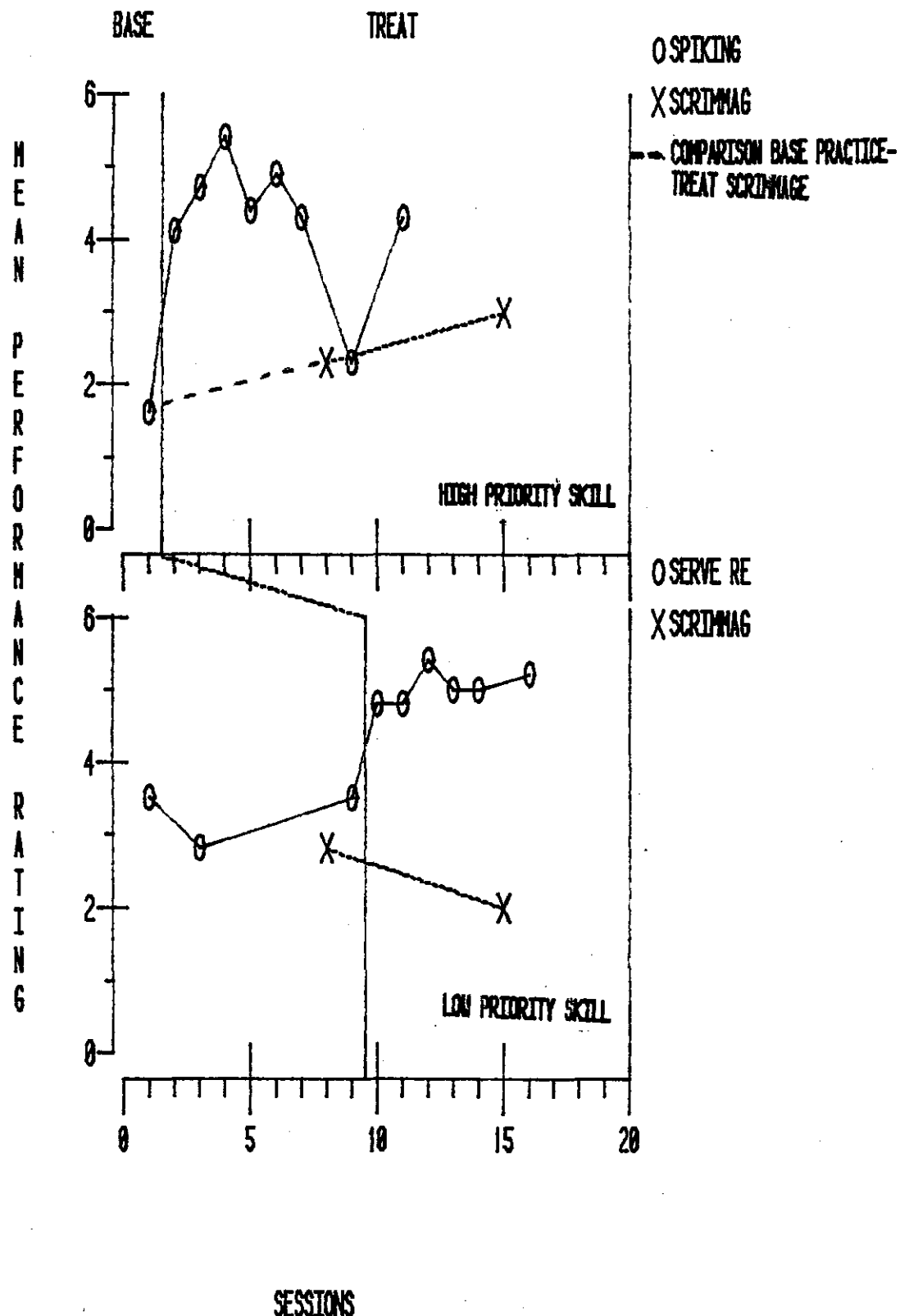


Figure 5: Performance ratings on the low and high priority flaws for Player Three. BASE=baseline; TREAT=treatment; SCRIMMAG=scrimmages; SERVE RE=serve reception.

Performance ratings in scrimmage sessions. The player's spiking performance was better in both scrimmage sessions (Session 8, 2.3 and Session 15, 3.0) as compared to the mean baseline practice rating of 1.6. However, the two scrimmage ratings on spiking in the treatment phase were not as good as the majority of the practice session ratings in the treatment phase (see Figure 5).

The positive effects of the treatment observed in the practice sessions on serve reception did not generalize to the scrimmage situation. The player had a mean serve reception performance rating of 2.8 in the baseline scrimmage session and a mean performance rating of 2.0 in the treatment scrimmage session.

Outcome ratings in practice sessions. The outcome rating showed evidence of the player's improved performance in spiking after the treatment was implemented (see Figure 6). A steady improvement in the outcome is illustrated from the mean baseline rating of 1.8 to the mean rating in the final treatment session of 2.8. The outcome of the player's serve receiving did not show improvement in either the baseline or treatment phases.

Outcome ratings in scrimmage sessions. Figure 6 also illustrates that the player's improved spiking outcomes were also evident in the scrimmage sessions. Therefore, there appeared to be a generalization of the effects of the treatment from the practice sessions to the scrimmage sessions. There did not appear to be much change in serve receiving from the mean baseline scrimmage outcome rating of 1.7 to the mean treatment scrimmage rating of 1.5.

Self report. Player Three (spiking and serve reception) gave an unsolicited positive report on the effects of the treatment. She stated,

PLAYER #3 (SPIKING & SERVE RECEPTION)

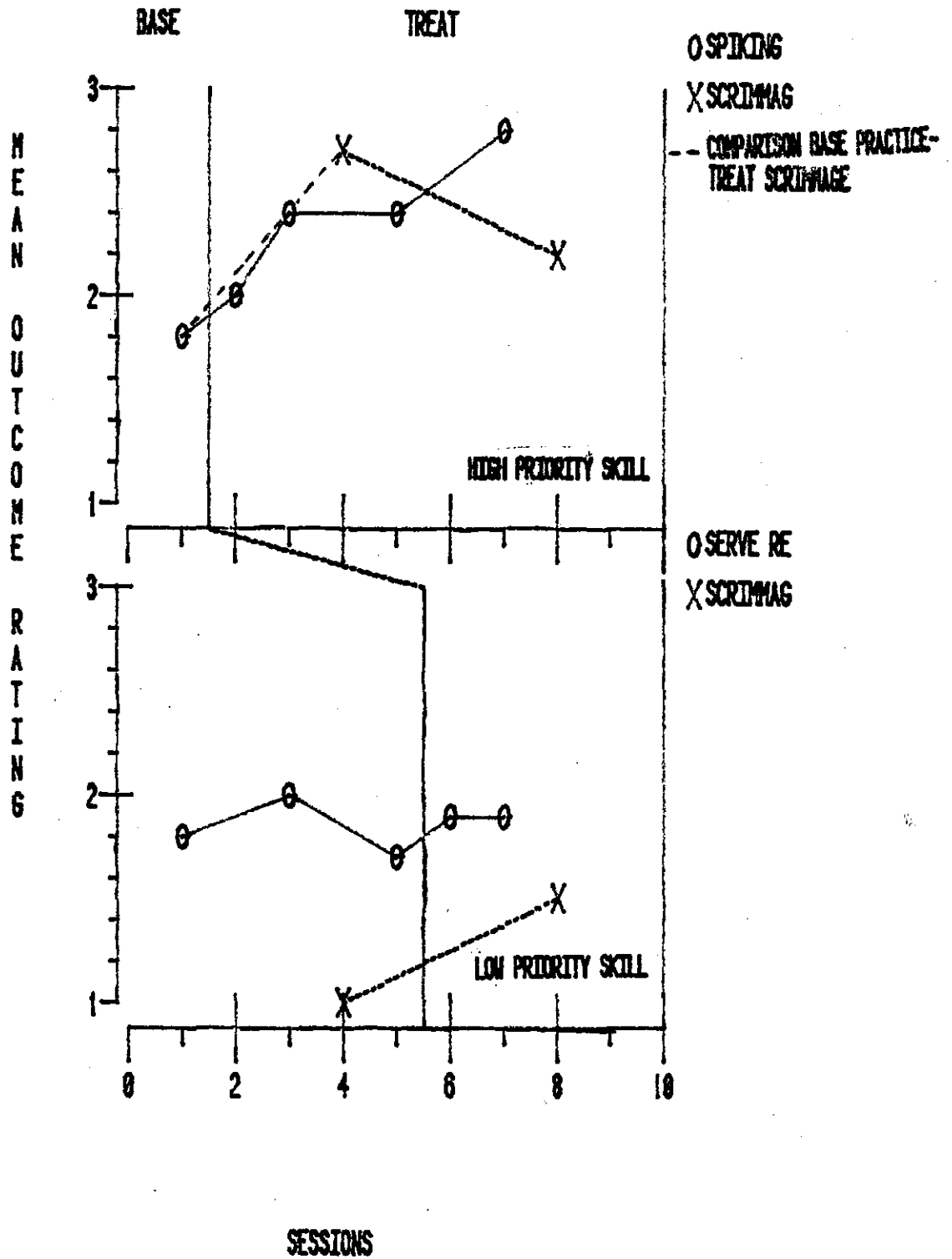


Figure 6: Outcome ratings on the high and low priority flaws for Player Three. BASE=baseline; TREAT=treatment; SCRIMMAG=scrimmages; SERVE RE=serve reception.

"I feel like I have been hitting the ball a lot harder since we have been working on my follow-through."

Player Four (defense and blocking)

Player Four's high priority flaw was present in playing individual defense and her low priority flaw was present in blocking (see Appendix A for further description).

Performance ratings in practice sessions. In seven out of the eight practice sessions in the treatment phase the player's mean performance rating for playing individual defense reflected better performance than in baseline. In the other treatment session the mean rating was the same as the baseline rating. The final mean treatment rating in a practice session was 5.8 compared to the mean baseline practice session rating of 4.7. Therefore, the flaw in playing individual defense was not as prevalent after the treatment was completed as it had been during the initial baseline practice session (see Figure 7).

In three out of the five practice sessions in the treatment phase on blocking, the player performed better than she did in any of the baseline practice sessions. Therefore, in these treatment sessions the flaw in blocking was not as prevalent as in the baseline practice session. The mean performance rating in the final practice session in the treatment phase was 4.7 compared to a mean rating of 4.1 in the initial baseline session and the lowest mean baseline rating of 2.9.

Performance ratings in scrimmage sessions. The player's individual defense performance was superior in the two scrimmage sessions (Session 7, 5.8 and Session 15, 5.0) as compared to the mean baseline practice rating of 4.7. Therefore, the positive effects of the treatment on playing individual defense appeared to generalize to the scrimmage

PLAYER #4 (DEFENSE & BLOCKING)

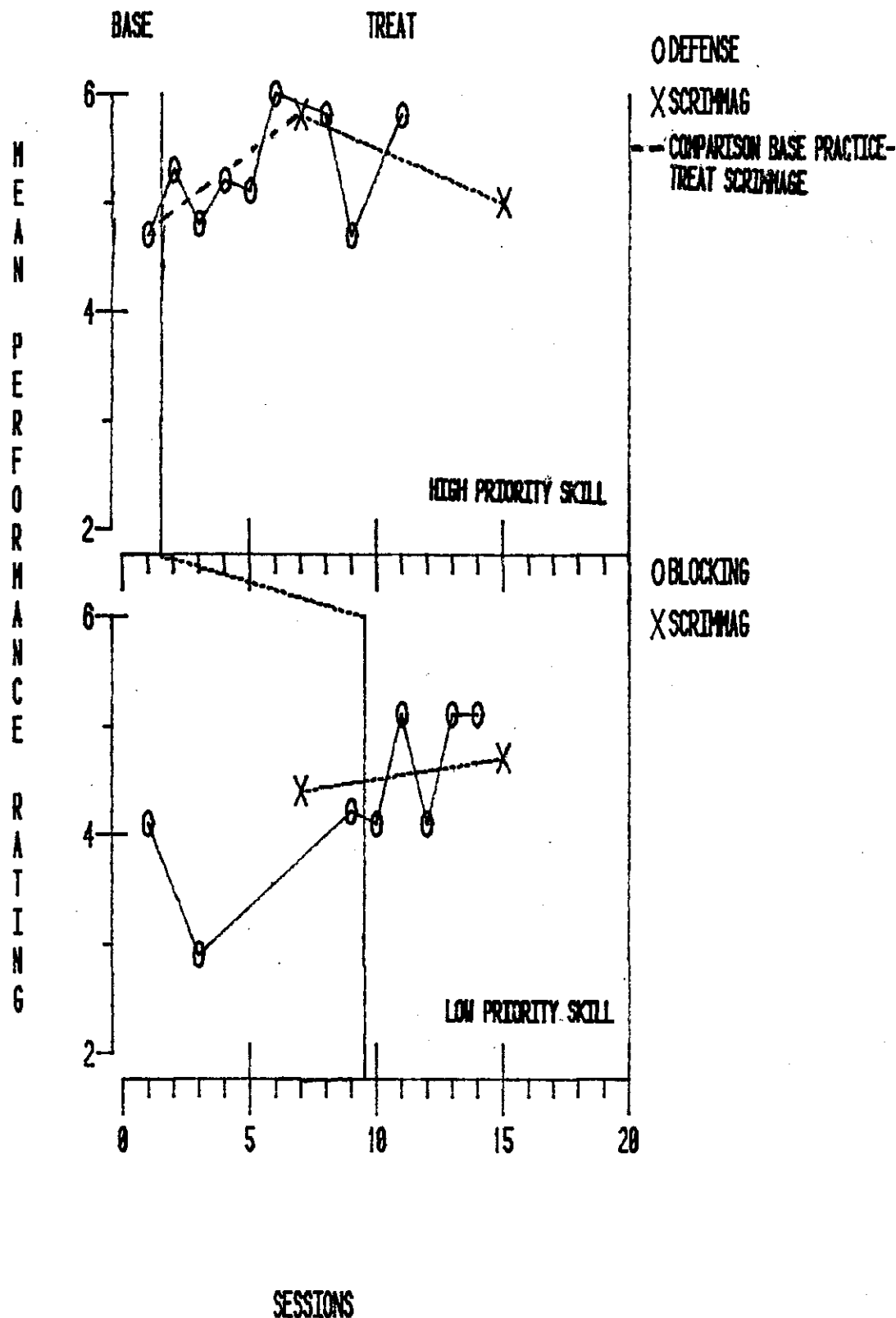


Figure 7: Performance ratings on the high and low priority flaws for Player Four. BASE=baseline; TREAT=treatment; SCRIMMAG=scrimmages.

sessions. The performance ratings of the player's blocking performance in the scrimmage situation indicated a slight decrease in the degree of the presence of the flaw from a mean baseline rating of 4.4 to a mean treatment rating of 4.7 (see Figure 7).

Outcome ratings in practice sessions. Player Four's outcome ratings indicate an improvement in playing individual defense. Three out of the four practice sessions had a better mean outcome rating than the baseline practice session rating of .6. The best mean outcome rating was 1.5, which was achieved in the final practice session. The outcome ratings in practice showed no improvement during the baseline or the treatment phase in the player's blocking performance (see Figure 8).

Outcome ratings in scrimmage sessions. The outcome ratings for playing individual defense in both scrimmage sessions (Session 4, .9 and Session 8, 1.0) were better than the baseline practice session rating of .6. Therefore, the positive effects of the treatment in improving the player's individual defense appeared to generalize to the scrimmage situation. The player's outcome ratings in blocking improved from a baseline scrimmage rating of 1.2 to the mean scrimmage rating of 2.0 achieved after the completion of the treatment (see Figure 8).

### Discussion

The results indicate that all of the players benefited from the videotape treatment package. Two of the players (Player Three [spiking and serve reception] and Player Four [defense and blocking]) had superior performance ratings in both the low and high priority skills after treatment was implemented. The other two players had superior performance ratings in one of the two target behaviors after treatment was implemented. The outcome ratings also suggested a positive effect of the treatment on the players' performance of the volleyball skills.

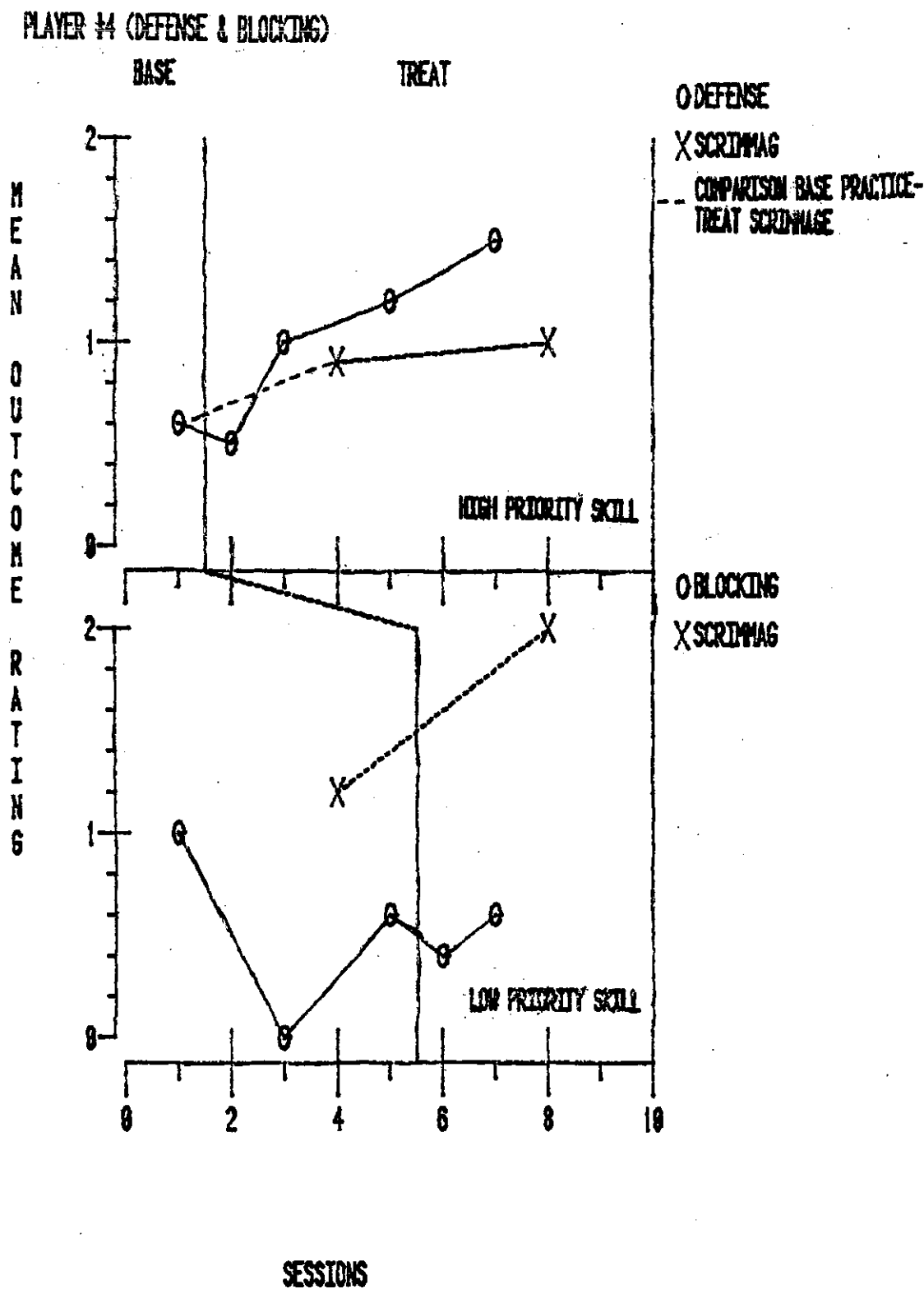


Figure 8: Outcome ratings on the high and low priority flaws for Player Four. BASE=baseline; TREAT=treatment; SCRIMMAG=scrimmages.

Player One's (serve reception and blocking) outcome ratings in the treatment phase were superior to the ratings she had received in the baseline phase for both the low and high priority skills. The other three players had superior outcome ratings after treatment was implemented in one of the two target behaviors.

The results indicated that some of the players' improved performances generalized from the practice situation into the scrimmage situation. For example, Player Four's improved individual defense and blocking in practice generalized to the scrimmage sessions as evidenced by the player's performance ratings. The performance ratings of Players Two and Three also indicated improved spiking performances in the scrimmage sessions in the treatment phase as compared to the baseline practice sessions. Overall, one can conclude that the videotape treatment package was successful in helping women college volleyball players correct errors in their performances of various volleyball skills.

Small differences in performance are extremely important in athletic competition. Games can be won or lost, depending upon the outcome of just a few plays of the many that occur in various games. For example, at the 1981 United States Volleyball Association Open Championships in Arlington, Texas, the University of the Pacific lost their last game in the winners bracket by the score of 15-13 to Utah State. Thus, the difference between the two teams came down to the minimum differential of two points. Dr. Taras Liskevych, the University of the Pacific head volleyball coach states, "that the difference between the top teams in the country is just a matter of a few points " (Note 2). Therefore, small improvement in performances in these highly skilled athletes could mean the difference of winning or losing a national championship.

Dr. Liskevych states that the performance ratings can be analyzed



in the following way:

If the players consistently perform skills with a performance rating of six or seven they would create points for the team. If the players perform skills with a performance rating of four, their performance would be neutral, neither helping or hurting the team. Finally, if the players perform skills with a performance rating of one or two they would be losing points for their team.

All the players in the study showed improvement in at least one of the skills in going from a baseline performance rating of four or below, thus being neutral or hurting the team, to performance ratings of above four, thus helping the team. The players moved from performing a skill at a level considered neutral or a liability, to a level which they were considered performing positively for the team (creating points for the team). Dr. Liskevych reports on Player Two, "since the study began she has gone from being a below average middle hitter to an above average middle hitter."

Dr. Liskevych states that the reason the videotape treatment package was useful to him as a coaching device was because,

The videotapes gave me evidence or proof of my verbalizations.

I could now show them what before I could only tell them. The treatment package also provided more structure to our individual practice sessions and there seemed to be more interaction between the coach and players. The treatment package made me evaluate exactly what the flaws in my players were and what I could do to correct them. Finally, the players seemed to enjoy the videotape sessions.

In addition to the coach feeling the treatment package was successful for him, three out of the four players gave an unsolicited positive

report on the effects of the videotape treatment package. (The fourth subject did not give a negative report on the videotape treatment package, she just did not comment on the treatment package to the experimenter).

The players employed in the study were highly skilled athletes as evidenced by their participation in the University of the Pacific Volleyball program, ranked second nationally during the 1980-81 season. Therefore, the positive results of the study indicate that the videotape package is a technique that has promise when used with highly skilled athletes. It is especially significant that Player Four (defense and blocking), an Association for Intercollegiate Athletics for Women (AIAW) first team All-American, was able to correct errors in performance in both the low and high priority skills.

Both of the starters that were employed in the study (Player Two [ spiking and defense ] and Player Four [ defense and blocking ] ) showed superior generalization of their improvement in performances from the practice situation to the scrimmage situation than the two non-starters. For example, the performance ratings indicate that both of the starters (Player Two and Player Four) had superior performances in the treatment scrimmage situation on the high priority skills than they did in the baseline practice situations. In addition, both of the starters showed improvement in their performances in the treatment scrimmages as compared to their performances in the baseline scrimmages on the low priority skills. Only one non-starter (Player Three) showed any improvement in the treatment scrimmage on the high priority skill and only one non-starter (Player One) showed improvement in the low priority skill in the treatment scrimmage. Therefore, it appears the starters were more capable than the non-starters in transferring their learning from the

practice situation into the scrimmage situation.

This author believes that the treatment package was successful in helping the players improve their performances because of the incorporation into the treatment package the following of Rothstein's (1979) components: (a) zooming in with a video camera on particular aspects of the player's performances; (b) attempts to change only one aspect of the player's performances of the skills rather than the entire skill; (c) cueing and corrective feedback provided by the coach during the players' viewing of resulting videotapes; (d) the players immediately correcting their errors in performance after viewing the videotapes and (e) multiple viewings by the players of videotapes of their correct performances of the volleyball skills.

Following are some problems that occurred in the study and what one could do to help solve them: First, the interobserver agreement on the performance ratings of Player One was not adequate and some of the other interobserver reliabilities were low. To improve the interobserver agreement, the observers could have observed and rated in their observer training sessions the same skills they would later observe and rate in the actual rating sessions. More specific behavioral definitions could have been used so that the observers would know exactly what behaviors constituted a rating of seven, six, five, etc., on the Likert scale.

Secondly, it was difficult to control the scrimmage situation so that each player was able to perform both the low and high priority skills an adequate number of times. Higher frequencies of the performances of the skills could be obtained by observing more scrimmage sessions.

The study was administered during the off-season for the volleyball players (Spring of 1981) but the procedures could easily be

adapted to regular season practice sessions. For example, a coach may have some players run a drill on one court and the videotape instruction may be provided on another court. Players can be rotated from the drill sessions into the videotape instruction session. The coach and players do not have to wait to view the performances until after practice, rather the viewing can be done immediately after performing the skill. In addition, immediately before the following practice, the player may spend five minutes viewing only her correct performances from the previous practice session. Use of the videotape treatment package in this manner is "time effective" for both the coaches and players since they do not have to spend time outside of normally scheduled practices, videotaping or viewing the videotapes.

The present study was carried out during a two week time period for each subject. Therefore, coaches who use the treatment package as a regular training device may obtain even better results because of the increased number of viewing opportunities by the players. The coach may also want to keep a videotape library on the players performances of the skills. Later, then, if the players begin again to make errors in performances, the coach can show the players their previous correct performances of the skills. This accomplishes two purposes, showing the players that they can perform the skills correctly and how to perform the skills correctly.

Since the videotape treatment package was successful in helping the players improve a variety of volleyball skills (spiking, blocking, serve reception, and individual defense), the treatment package does not appear to be limited to use in just one skill or type of skill. Future research could test the effectiveness of the videotape treatment package

in different sports and with different populations of athletes. Researchers may also want to observe the effect of lengthening the time of the treatment, observation and treatment of flaws specific to the scrimmage or game situations, and self-management of the treatment package by the athletes.

In summary, the present study illustrates that the videotape recorder can be an effective device for improving players' performances of sports skills if the procedures employed in this study are followed. Use of the videotape treatment package with highly skilled athletes can improve acquisition of correctly performed skills which is the primary goal of coaches in their practice sessions.

## Reference Notes

1. Tosti, D. T. Formative Feedback. Unpublished manuscript, 1979.  
(Available from Operants, Inc., 41 Marinta, San Rafael, California 94901).
2. Liskevych, Taras. Personal Communication, June 2, 1981.

## References

- Annett, J. Learning a pressure under conditions of immediate and delayed knowledge of results. Quarterly Journal of Experimental Psychology, 1959, 11, 3-15.
- Beebe, J. L. A comparison of four methods of feedback in the form of knowledge of performance on the learning of gymnastic skills. Completed Research in Health, Physical Education and Recreation Including International Sources, 1975, 17, 90. (Abstract)
- Bilodeau, E. A. & Bilodeau, I. McD. Variable frequency of knowledge of results and the learning of a simple skill. Journal of Experimental Psychology, 1958, 55, 379-383.
- Bilodeau, E. A. & Bilodeau, I. McD. Motor skills learning. Annual Review of Psychology, 1961, 12, 243-280.
- Bradley, W. F. A comparison of three instructional methods on the improvement of selected badminton skills. Completed Research in Health, Physical Education and Recreation Including International Sources, 1976, 18, 115. (Abstract).
- Bunker, L. K., Shearer, J. D., & Hall, E. G. Videotaped feedback and children's learning to flutter kick. Perceptual and Motor Skills, Octo. 1976, 43, 371-374.
- Burkhard, D. G., Patterson, J., & Rapue, R. Effect of film feedback on learning the motor skills of karate. Perceptual and Motor Skills, 1967, 25, 65-69.
- Carmichael, G. A. Videotape instant replay as a teaching technique in beginning bowling classes. Completed Research in Health, Physical Education and Recreation Including International Sources, 1970, 12, 246. (Abstract).

- Chakas, C. J. The effects of videotape feedback on learning motor skills in volleyball. Completed Research in Health, Physical Education and Recreation Including International Sources, 1977, 19, 132. (Abstract).
- Cohen, J. Weighted Kappa: Nominal scale agreement with provision for scaled disagreement or partial credit. Psychological Bulletin, 1968, 70, 213-20.
- Coleman, J. E., Neville, B., & Gorton, B. A statistical System for Volleyball and Its Use in Chicago Women's Association: International Volleyball Review, 1971, 27, 72-73.
- Conry, B. J. Effectiveness of the use of videotapes in learning fencing. Completed Research in Health, Physical Education and Recreation Including International Sources, 1970, 12, 255. (Abstract).
- Cox, K. M. An experiment in teaching complex motor skills to university freshman male students using continuous and discrete concept sequences with and without instant videotape replay. Completed Research in Health, Physical Education and Recreation Including International Sources, 1970, 12, 255. (Abstract)
- Dickinson, J. A Behavioral Analysis of Sport. New Jersey: Princeton Book Company, 1976.
- Elliot, G. E. The motivational effect of simulated videotaping on bowling performance of college students. Completed Research in Health, Physical Education and Recreation Including International Sources, 1975, 17, 100. (Abstract).
- Fisher, J. C. The effects of videotape recording on swimming performance and knowledge of stroke mechanics. Completed Research



- in Health, Physical Education and Recreation Including International Sources, 1978, 20, 216. (Abstract)
- Gelfand, D. M., & Hartmann, D. P. Child Behavior Analysis and Therapy. New York: Pergamon Press, 1975.
- Graves, J. M. The effectiveness of the instant videotape recorder in teaching the tennis serve. Completed Research in Health, Physical Education and Recreation Including International Sources, 1975, 17, 67. (Abstract)
- Grechus, M. L. The effect of videotape feedback on a selected skill in gymnastics. Completed Research in Health, Physical Education and Recreation Including International Sources, 1973, 15, 50. (Abstract)
- Green, W. B. The effectiveness of television replay as a technique in teaching beginning swimming skills. Completed Research in Health, Physical Education and Recreation Including International Sources, 1971, 13, 76. (Abstract)
- Hoffecker, T. W. Videotape feedback as a supplementary technique in the presentation of the overhand softball throwing skill. Completed Research in Health, Physical Education and Recreation Including International Sources, 1972, 14, 140. (Abstract)
- Lindblad, R. F. The effects of augmented feedback in the form of videotape replay on performance of the football punt. Completed Research in Health, Physical Education and Recreation Including International Sources, 1977, 19, 224. (Abstract)
- Lundquist, A. T. Immediate knowledge of results via videotape replay and its effect on the learning of selected football skills. Completed Research in Health, Physical Education and Recreation Including International Sources, 1969, 11, 195. (Abstract)

- Morgan, N. A. Comparison of movement cues and videotape feedback in teaching a gross motor skill to college women in a required program of physical education. Completed Research in Health, Physical Education and Recreation Including International Sources, 1972, 14, 144. (Abstract)
- Olson, L. C. Instant feedback via videotape and its effect on the learning of a selected side horse routine. Completed Research in Health, Physical Education and Recreation Including International Sources, 1970, 12, 206. (Abstract)
- Penman, K. Relative effectiveness of teaching beginning tumbling with and without an instant replay videotape recorder. Perceptual and Motor Skills, 1969, 28, 45-46.
- Pohl, P. L. Relative effectiveness of using videotape feedback in teaching the high jump. Completed Research in Health, Physical Education and Recreation Including International Sources, 1972, 14, 127. (Abstract)
- Prato, D. J. The effects of three terminal augmented feedback conditions upon the acquisition of motor skill in bowling. Completed Research in Health, Physical Education and Recreation Including International Sources, 1976, 18, 142. (Abstract)
- Reid, D. A. The effect of the use of the videotape recorder as an aid in teaching the volleyball serve. Completed Research in Health Physical Education and Recreation Including International Sources, 1971, 13, 168. (Abstract)
- Rothstein, A. L. Information feedback in coaching of highly skilled athletes. In P. Klavara & J. V. Daniel (Eds.), Coach, Athlete and the Sport Psychologist. Champaign, Ill.: Human Kinetics Publishers, 1979.

- Rushall, B. S., & Siedentop, D. The Development and Control of Behavior in Sport and Physical Education. Philadelphia: Lea & Febiger, 1972.
- Smith, B. B. The effectiveness of television videotape instant playback in learning the pitch and run shot in golf. Completed Research in Health, Physical Education and Recreation Including International Sources, 1969, 11, 163. (Abstract)
- Suinn, R. M. (Ed.). Psychology in Sports Methods and Applications. Minneapolis: Burgess, 1980.
- Sullivan, V. L. Effectiveness of using the videotape recorder in improving vaulting skills. Completed Research in Health, Physical Education and Recreation Including International Sources, 1974, 16, 160. (Abstract)
- Taylor, W. G. The effectiveness of instant videotape replay as a source of immediate visual feedback upon learning or improving performance of a gross motor skill. Completed Research in Health, Physical Education and Recreation Including International Sources, 1972, 14, 232. (Abstract)
- Thorndike, E. L. The influence of primacy. Journal of Experimental Psychology, 1927, 10, 18-29.
- Trowbridge, M. H., & Cason, W. An Experimental study of Thorndike's theory of learning. Journal of General Psychology, 1932, 7, 245-260.
- Watkins, D. L. Motion pictures as an aid to correcting baseball batting. Research Quarterly, 1963, 34, 228-233.
- White, M. L. The use of videotape replay to provide knowledge of improvement in learning the fencing lunge. Completed Research in

Health, Physical Education and Recreation Including International Sources, 1974, 16, 125. (Abstract)

## APPENDIX A

## Definition of Subject's Flaws

The following are the operational definitions for the flaws or errors in performance for each subject:

Subject #1

High priority flaw. The flaw was present in serve reception. The subject would contact the ball while receiving the serve with her arms almost parallel to the floor resulting in the passed ball going straight up rather than to the intended target. The subject should contact the ball with her forearms pointed to the target which results in a pass with a low (flat) trajectory. The ball should be contacted at waist level with her thumbs pointing to the floor, and her arms forming a 45° angle with the floor.

Subject #1

Low Priority flaw. The flaw was present in blocking. The subject's hands and arms were parallel with the plane of the net (not penetrating and breaking the plane). This allowed the opponents' spikes to fall between the net and the subject's body after contact with the ball during the attempted block. The subject's hands and arms should penetrate the imaginary plane at the top of the net, without contacting the net. This will cause the ball to fall on the opponent's side of the net after contacting the subject's hands or arms.

Subject #2

High priority flaw. The flaw was present in spiking the "one set". The one set is a short quick set in the middle of the court where the spiker jumps before the setter touches the ball. The subject jumped

too close to the net. This action prohibited a complete arm swing and follow-through during hand-ball contact in the spike. Jumping too close to the net caused the subject to pull her arms toward her body so that she would not hit the net during her follow-through. The subject should start her jump farther away from the net to allow for a complete arm extension in her follow-through without touching the net.

#### Subject #2

Low priority flaw. The flaw was present in playing individual defense. Individual defense is defined as receiving and successfully passing an opponent's hard driven spike. The subject's error in performance was that she contacted the ball too high on her forearms or she contacted the ball on the backside of her forearms, on a spike above her waist. The subject should contact the ball on both forearms just above the hands (towards the body midline) in the waist area. If the ball is above her waist she should pivot and move her arms to a higher plane so that the ball is still contacted in the proper place on her forearms.

#### Subject #3

High priority flaw. The flaw was present in spiking. The subject did not have a complete follow-through in her arm swing while spiking. She would stop her arm movement after contacting the ball at head or shoulder height rather than at her legs. The subject should follow-through in such a manner that her arm which contacts the ball is parallel or past her legs at the moment she touches the floor at the completion of her jump in the spike attempt.

#### Subject #3

Low priority flaw. The flaw was present in serve reception. The

subject's error in performance was that her feet would be moving when she passed the ball while receiving a serve. The subject should have both feet stationary and in contact with the floor at the moment she passes the ball while receiving a serve.

Subject #4

High priority flaw. The flaw was present in playing individual defense. The subject would contact the floor with her knees, hands or another part of her body while attempting a sprawl before the ball was contacted while receiving a spike. The subject should contact the ball before any part of her body other than her feet touches the floor in the attempted sprawl.

Subject #4

Low priority flaw. The flaw was present in blocking. In spike attempts from the outside of the court the subject coming from the middle front position to the right front position would not get her feet squared off to the net. The player's feet were parallel to the net rather than perpendicular to it. In blocking to the outside (right front position) she should have her right foot slightly in front of her left foot and they should both be perpendicular to the net.

## APPENDIX B

## Camera Angles and Distances for Filming Each Skill

Subject #1

High priority skill - serve reception. The subject was filmed from 20 feet (6.1m) with a view of the left side of the subjects body. The subject was standing in the left back position on the volleyball court. The zoom lens was set so that the entire subject's body was visible in the picture.

Subject #1

Low priority skill - Blocking. The subject was filmed from 20 (6.1m) with a view of the left side of the subject's body. The camera was hand held while filming down the length of the net. The subject was in the left front position on the volleyball court. Only the subject's upper body and arm extension over her head were framed in the picture. Zooming in on the subject's upper body allowed close observation of the amount of arm penetration in the subject's attempted blocks.

Subject #2

High priority skill - Spiking. The subject was videotaped from 30 feet (9.1m). The camera was hand held while videotaping the left side of the subject's body. The subject was in the middle front position on the volleyball court. The subject's entire body was framed in the picture and her spike approach, hit, and follow-through were filmed.

Subject #2

Low priority skill - Individual defense. The subject was videotaped



from 30 feet (9.1m). The camera was hand held while videotaping the left side of the subject's body. The subject was in the middle back position on the volleyball court. The subject's entire body was framed in the picture.

Subject #3

High priority skill - Spiking. The subject was videotaped from 20 feet (6.1m). The camera was hand held while videotaping the right side of the subject's body. Filming the right side of the subject's body allowed better viewing of the subject's follow-through in her right-handed spike. The subject was in the right front position on the volleyball court. The subject's body from the knees up was framed in the picture.

Subject #3

Low priority skill - Serve reception. The subject was filmed from 20 feet (6.1m) with a view of the left side of the subject's body. The subject was standing in the left back position on the volleyball court. The subject's entire body was framed in the picture.

Subject #4

High priority skill - Individual defense. The subject was filmed from 30 feet (9.1m) with a view from the left side of the subject's body. The subject was standing in the middle-back position on the volleyball court. The subject's entire body was framed in the picture.

Subject #4

Low priority skill - Blocking. The subject was filmed from 30 feet (9.1m) with a view of the left side of the subject's body. The camera was hand held while filming down the length of the net. The subject was in the middle-front position on the volleyball court. The subject's

entire body was framed in the picture.

Scrimmages for all subjects. These were videotaped in much the same manner as the individual performances of the skill. Occasionally other players blocked the view of the camera; when this occurred, the experimenter would move to a more advantageous position. The players rotated to all positions on the court so their distance from the camera varied. The distance range from the camera was approximately 20 feet (6.1m) to 45 feet (13.7m). The experimenter occasionally zoomed in for a closer observation of the subjects' performances when they were at a greater distance from the camera. In all but two of the scrimmages, two subjects were videotaped during the same scrimmage. The coach had the two subjects play in positions next to each other to allow the experimenter to easily shift the view of the camera from one subject to the other as they performed the various targeted volleyball skills. In the other two scrimmages only one subject's performance was videotaped during the scrimmage.

## APPENDIX C

## Outcome Rating System

The following is the modified version of the Coleman-Neville Statistical System of Evaluation used for rating the outcomes of the volleyball skills performed in the study.

Blocking

- 4 - The effect of the block resulted in an immediate point or sideout. The ball was blocked straight down on the opponents side of the net.
- 2 - The effect of the block resulted in the ball staying in play on either side of the court. The ball could have been played by a team member or an opponent.
- 0 - The effect of the block resulted in an immediate point or sideout for the opposition. The ball was blocked out of bounds, or between the blocker and the net on her side of the court, or the blocker committed a net violation.

Individual Defense (forearm passing a hard driven spike)

- 3 - A perfect dig allowing the receiving team to set all of their hitters and execute their offense.
- 2 - An average dig that allowed the receiving team to set only two of their hitters.
- 1 - An uncontrolled dig that forced the receiving team to return a "free ball" to the serving team. The serving team was unable to mount an attack. The setter was forced to forearm pass the ball rather than overhand set the ball.

- 0 - A complete misplay of the spike resulting in an opponent's point or sideout.

#### Serve Reception

- 3 - A perfect pass allowing the receiving team to set all of their hitters and execute their offense.
- 2 - An average pass that allowed the receiving team to set only two of their hitters.
- 1 - An uncontrolled pass that forced the receiving team to return a "free ball" to the serving team. The serving team was unable to mount an attack. The setter was forced to forearm pass the ball rather than overhand set the ball.
- 0 - A complete misplay of the serve resulting in an opponent's point.

#### Spiking

- 4 - The spike resulted in an immediate point or sideout. The observer must have been able to assume the ball would have gone around a block. The ball must have been hit at a sharp angle across the court near the 10 foot line or deep down the sideline.
- 2 - The spike could have been blocked. The ball was not hit sharply across the court at the 10 foot line or deep down the sideline. No point or sideout was scored or lost.
- 0 - The spiker hit the ball out of bounds or committed a violation at the net. If the ball was blocked by the opponent and resulted in an immediate point or sideout,

this also resulted in this score (Coleman, Neville & Gorton, 1971, pp. 72).

Definition

Free ball is defined as a nonspiked return of a ball by an opponent that should be easily handled and turned into an offensive play.

## APPENDIX D

## Observer Training

The experimenter, head coach and the observers (assistant coaches) met for a 1-1/2 hour observer training session. Prior to the training session the experimenter and head coach selected videotapes of three players not in the study performing various volleyball skills. The coach identified flaws in performances in these skills and wrote operational definitions of the three flaws. The coach also rated on a 7 point Likert scale (see Dependent Measures section) each performance of the skill for the degree of presence or absence of the flaw.

The observers were given a written hand-out of the operational definitions of the subjects' flaws and the head coach explained these definitions to them. The observers were then shown seven performances of the skills in slow motion. The coach explained the rating he gave for each performance of the skill. Both good and poor performances were used in these examples. The observers were then shown seven more performances of the subject performing the same skill and the observers independently rated each performance of the skill. The observers and head coaches then compared and discussed their ratings.

The observers were then given an operational definition of another player's flaw in performance. The coach explained the definition to the observers but the observers were not given any examples of the coaches' ratings of the players' performances of the skill. The observers were asked to rate nine performances independently. After the ratings were completed, the observers and the head coach compared and discussed the ratings they had given.

With a third subject, the observers were given an operational definition of the subject's flaw in performance. The coach explained the definition and in addition, the observers were shown several examples of the player performing the skill and how the coach had rated the performance. The observers then independently rated 16 performances of the volleyball skill. The coach and observers compared and discussed their ratings of the performances. This concluded the 1-1/2 hour observer training session. After the training session, the experimenter determined the interobserver agreement between each observer and the head coach using Weighted Kappa for agreements (Wka). The Weighted Kappa for agreements = .55 for the interobserver agreement between the head coach and observer one. The Weighted Kappa for agreements = .57 for the head coach and observer two. The experimenter deemed these reliability values sufficient to allow the observers to rate the experimental data without additional training sessions.

Before the observers rated any of the subject's performances used in the study, they were given a written copy of the operational definition of the subject's flaw in performance (see Appendix A) and the experimenter explained the flaws to the observers. In addition, the observers were shown 10 of the subject's performances of the skill she had done in Part Two of the treatment and the experimenter told the observers how the coach had rated the performances and why he had given the performances such a rating. This procedure was used before rating the low and high priority skills for each subject.

## APPENDIX E

Likert Scales for Rating the Degree  
of Presence or Absence of the Flaws

The following are the Likert scales used by the observers to rate the degree of presence or absence of the flaws for each subject. (See Appendix A for definitions of the subjects' flaws).

Subject #1High Priority Flaw

1	2	3	4	5	6	7
Perfect pass; angle of arms $45^{\circ}$ with the floor; arms pointing to target at contact		Angle of arms half way between $45^{\circ}$ and parallel to the floor at contact				Angle of arms parallel to the floor above contact

Subject #1Low Priority Flaw

1	2	3	4	5	6	7
Both arms pene- trating the plane of the net at contact with the ball		Both arms close to the top of the net; almost pene- trating				Both arms well in back of the net; a lot of space bet- ween the subject's body and net



Subject #2High Priority Flaw

1	2	3	4	5	6	7
Full arm ex- tension in follow-through; body is in back of the ball			Restricted follow-through; not a full arm extension result- ing in the body being underneath the ball at contact			Very restricted follow-through; body or arm hitting net or the subject commits a center line violation; take off in jump very close to net or "long jumping" forward

Subject #2Low Priority Flaw

1	2	3	4	5	6	7
Perfect dig pass; ball is contacted on forearms just above hands and the waist area			Ball is con- tacted high on the fore- arms almost at the elbow			Ball is contacted on the backside of the forearms

Subject #3High Priority Flaw

1	2	3	4	5	6	7
Follow-through		Follow-through			Follow-through	
is such that her		is such that her			is such that her	
arm is parallel		arm is at waist			arm is at or	
or past the mid-		level] at the			above head level	
dle of her leg		moment she con-			at the moment	
at the moment she		tacts the floor			she contacts	
touches the floor		at the completion			the floor at	
at the completion		of her jump			the completion	
of her jump					of her jump	

Subject #3Low Priority Flaw

1	2	3	4	5	6	7
Both feet		One foot is			Both feet are	
are stationary		stationary and			moving at the	
and are in con-		the other is			moment she	
tact with the		moving at the			contacts the	
floor at the		moment she con-			ball	
moment she		tacts the ball;				
touches the ball		similar to a				
		pivot in basket-				
		ball				

Subject #4High Priority Flaw

1	2	3	4	5	6	7
Ball played		One foot is			Both feet are	
without any		stationary and			moving at the	
part of her		the other is			moment she con-	
body other		moving at the			tacts the ball	
than her feet		moment she con-				
touching the		tacts the ball;				
floor		similar to a pivot				
		in basketball				

Subject #4Low Priority Flaw

1	2	3	4	5	6	7
Right foot		One foot is			Feet are	
is slightly		squared off			Parallel	
in front of		but the other			to the	
left foot;		is not			net	
feet squared						
off and per-						
pendicular to						
the net						