

THE EFFECTS OF VIDEO FEEDBACK AND SELF-MONITORING
ON IMPROVEMENT OF SKILLS FOR VOLLEYBALL PLAYERS

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CERTIFICATION OF APPROVAL

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TABLE OF CONTENTS

	PAGE
List of Figures	v
Abstract	vi
Introduction	1
Method	13
Participants and setting.....	13
Measurement	14
Intervention and research design.....	16
Treatment fidelity.....	17
Interobserver agreement.....	17
Social validity.....	18
Results	20
Discussion	29
References	39
Appendices	
A. Consent form	44
B. Task analysis of swing blocking	46
C. Task analysis of highball hitting	48
D. Task analysis of jump topspin serve	49
E. Sample task analysis form for a player	51
F. Treatment fidelity checklist.....	53
G. Self-monitoring training instruction.....	54
H. Social validity questionnaire for player.....	55

LIST OF FIGURES

FIGURE	PAGE
1. Percentage of steps executed correctly across target behaviors for Ashley	21
2. Percentage of steps executed correctly across target behaviors for Tina	22
3. Percentage of steps executed correctly across target behaviors for Chelsea.....	23
4. Percentage of steps executed correctly across target behaviors for Gina.....	24
5. Percentage of steps executed correctly across target behaviors for Jackie	25

ABSTRACT

This research focused on behavioral coaching methods for improvement of accurate skill performance in sports. Five female volleyball players from a university team participated in the study. Multiple baseline across behaviors design was used to evaluate the effectiveness of video feedback alone and video feedback with self-monitoring. The results are unclear and suggest that these methods may not be effective when separated from other behavioral methods.

Keywords: behavioral coaching, video feedback, self-monitoring, task analysis

INTRODUCTION

The principles of learning that lie at the core of applied behavior analysis can be used to evaluate and predict the outcomes of the performance of competitive athletes. The research that involves behavioral interventions in sports has been conducted for over 30 years. According to the summaries of the previous published research (Austin & Carr, 2000; Luiselli, Woods & Reed, 2011), some evidence have been reported for the effectiveness of using behavioral methods in coaching. These techniques can be used successfully to improve correct skill execution and enhance the satisfaction of athletes and others in their sporting environment (Austin & Carr, 2000). Although the interest in behavioral sport psychology has grown, the number of published studies on behavioral sport psychology is still low, which results in a lack of appreciation and attention given to those techniques. In their review of sport performance research, Luiselli, Woods and Reed (2011) suggest that further investigations are needed to compare the specific outcomes of different behavioral procedures, as well as greater emphasis on social validity by measuring the acceptability and satisfaction with the interventions.

The coaching strategies used for athletes vary with every team and with the people who program the practices and drills. Although the behavioral techniques which concentrate on eliminating mistakes by aversive stimulus control (e.g. adding a negative stimulus to the person's environment) can influence the target behavior, they can have various side effects (Dickinson, 1976). Different types of

reinforcement work differently for different people, thus it is important to choose the best one for an individual. Social consequences, such as verbal (praise), nonverbal signs (smile, applause), physical contact (pat on a back), rewards and social attention, may have a great influence on behavior (Williams, 2001). They are parts of the natural contingencies that are present in the sporting environment, and they can reliably change the performance of individual athletes. The effectiveness of a majority of behavioral coaching methods rely on that class of reinforcement. The procedures based on the principles of learning which have a great potential to provide positive outcomes for the execution of sporting skills are descriptive feedback and/or differential reinforcement (Martin & Koop, 1983; Mellalieu, Hanton, & O'Brien, 2006), video feedback (Rikli & Smith, 1980; Erbaugh, 1985; Hazen, Johnstone, Martin & Srikaneswaran, 1990; Reed & Fleming, 2010), goal setting (Brobst & Ward, 2002) and/or public posting (Ward & Carnes, 2002; Smith & Ward, 2006), video modeling (Winfrey & Weeks, 1993; Boyer, Miltenberger, Batsche & Fogel., 2009), and self-monitoring (Hume, Martin, Gonzalez, Cracklen & Genthon, 1985). Unfortunately there are not many researchers who evaluate these techniques alone. Most of the interventions are behavioral packages that contain more than one method (Hume et al., 1985; Ward & Carnes, 2002; Smith & Ward, 2006). Thus, the effectiveness of particular components cannot be determined.

Video in coaching. Due to the development of technology, using videotape in coaching has become more popular because it can provide a more precise presentation of the accurate sport performance of experts, as well as it is an

additional means of feedback for the execution of motor skills (Rikli & Smith, 1980). Videos of an athlete can serve as a form of augmented feedback because it includes information about consequences of the performance.

According to Mayer, Sulzer-Azaroff and Wallace (2012), feedback supplies information on performance. It can function as discriminative stimuli, increasing or decreasing the probability of target behavior, which depends on a history of reinforcement. The function of the feedback that is used as a component of intervention should be specified in order to improve performance. Thus, feedback can signal that either reinforcement or punishment is available. Repetitive presentation of feedback which is paired with reinforcement may become a conditioned reinforcement itself and lead to the necessary changes in target behavior. With time, the feedback may be gradually removed if contingency managers assume that some stimuli in the natural environment will acquire reinforcing value and maintain the behavior.

Dickinson (1977) emphasized the requirement of feedback whenever a novel behavior is learned, for the reinforcement to influence it. An organism must observe its own behavior and perceive how the body is stimulated to learn which movement is reinforced. There are two forms of feedback that an athlete may receive as a consequence of executing a skill. The first is proprioceptive which is based of sensory stimulation (e.g. muscles, joints), the second is exteroceptive and works by observing the movement, for example in the mirror. If being paired with reinforcement, both types of feedback alone may function as a conditioned reinforcers. Thus, Dickinson (1977) concludes that “the success involved in

producing accurate responses which we can see may be reinforcing, just as the success associated with the “feel” of an appropriate response may be reinforcing”(p.76).Hodges, Chua, and Franks (2003) state that, if skills have complex spatiotemporal demands, it would be reasonable to assume that video feedback would enhance the understanding of task requirements. According to some researchers (Rikli & Smith, 1990), it is a popular way method in coaching to watch the videotapes of performance, although it lacks of strong evidence, because specific conditions for most effective application of video, are not yet supported by a sufficient amount of research.

Hazen and others (1990) conducted two experiments on the effectiveness of a video feedback package for improving skills of competitive swimmers. In the first experiment the intervention consisted of symbolic modeling, verbal instructions, video feedback, and verbal feedback. The results suggest that those procedures caused an increase of correct performance of the skills. In the second experiment an individual video feedback package (experimental condition) was compared with a group video procedure (control condition) which involved viewing recorded performance of training practice by all swimmers together with a coach. The percent of correct performance per session of a particular component of freestyle swimming was measured. As predicted, the control condition had little effect or no effect on the increase in correct responses for the athletes, while the individual feedback resulted in immediate improvement (Hazen et al.,1990).

Video feedback used with the addition of watching models performance was also evaluated in a group study with tennis players (Rikli & Smith,1980). The

researchers compared video intervention and their various temporal conditions: video watched in the early, in the middle, or both early and middle stages of the instructional cycle. The control group which did not receive the treatment had significantly poorer performance scores than the three experimental groups. The findings were not clear and did not support video feedback as a coaching method that is always effective. However, according to the authors it can be a valuable supplement to the more traditional verbal feedback.

Boyer et al.(2009)conducted a study where they evaluated the effects of video modeling of experts using video feedback with four female gymnasts on three skills - backward giant circle to handstand, a kip cast and a clear hip circle. Each skill was judged based on a 28-item checklist, and the data were analyzed using a multiple baseline across participants design. The percentage of correct items for each trial was recorded. During the intervention phase, after the participants performed the skill, she watched the video of her performance accompanied by the video of an expert gymnast performing the same skill. The participants tried to repeat the skill after viewing the video. The authors concluded that this method allowed for faster improvement in gymnasts skills in comparison to regular coaching. The higher level of skills execution was maintained after withdrawal of the intervention. This was measured weekly in follow-up sessions.

One of the most recent that reported positive outcomes of video feedback in a sport setting, focused on evaluation of three behavioral coaching methods for improving the offensive line pass-blocking skill of high school football players (Stokes, Luiselli, Reed & Fleming., 2010). The procedures used were: descriptive

feedback, descriptive feedback with video feedback and teaching with acoustical guidance (TAG). The dependent variable was the percentage of steps executed correctly during a practice pass-blocking skill. Each step was evaluated “correct” or “incorrect” by the coach and marked in a table. The steps were listed in a 10-step task analysis, prepared prior to the experiment. During the descriptive feedback phase the task analysis form was reviewed with the player. Praise and nonverbal approval were given for a correct performance and explanation of appropriate execution was given for an incorrect performance. In the descriptive feedback with video feedback condition the performance of the skill was recorded and the video was evaluated by both the coach and the player. Verbal feedback was given as in the previous phase. During the TAG condition, one to three steps of the task analysis that were performed most incorrectly were chosen as a focus of the intervention. If the participant performed the step correctly a bullhorn was sounded by the coach. In the descriptive feedback plus video feedback condition all participants achieved the acceptable performance criterion of 70–90% of correct pass-blocking (the accuracy increased even more with TAG condition). Descriptive feedback alone was not effective in improving the skill performance.

Task analysis of the skill. When teachers and coaches are teaching new behaviors they rarely try to put the target response under good stimulus control. Nevertheless, due to the natural contingencies, the skills are learned. However it is important to understand that accidental responses and chance reinforcement are usually inefficient when teaching new behavior and can result in many problematic behaviors or incorrect links of more complex chains (Rushall & Siedentop, 1972).

Rushall and Siedentop (1972) recommend that “the task of teacher and coach is to improve upon the effects of natural contingencies so that the skill develops more quickly, and skills that might not otherwise develop do become part of the players repertoire”(p.133).

One of the first steps in programing a behavior analytic intervention is clarifying the problem by creating a clear definition of the target behavior. Teaching a novel behavior or changing particular links of a complex behavior may be a source of unidentified difficulties and it may require a precise task analysis of a skill.

The level of specificity of task analysis, which may be also seen in the number of its steps, changes with the purpose for which it is used. Breaking down athletic skill may be viewed from two different perspectives. From the molar point of view, complex target volleyball skills in behavioral research would consist of responses such as anticipatory movement, approach movement and the skill itself (e.g. hit, spike, or serve in volleyball). This whole chain would be considered correct and reinforced, if all of those steps were executed as described in the task analysis. A molecular perspective would break down the skill itself, the last link described above, into even more detailed movements of separate parts of the body (Rushall & Siedentop, 1972).

Although the accuracy in execution of a sport skill is important for the outcome of athletes’ performance, it is often competing with the speed of performing. Depending on the history of reinforcement, an athlete may perform slowly and more accurately or at a higher rate but with more errors. The

contingencies that are put on those two aspects of skill execution change the behavior of an athlete (Dickinson, 1977). In sports, many of the skills are reinforced for the speed of acquisition when taught during primary training sessions. This is an example of shaping novel behavior (Rushall & Siedentop, 1972). Thus, at the beginning, the reinforcement tends to be delivered even if the behavior only resembles the execution of the skill or the response serves the same function as the target “ideal” response (e.g. scores a point, successful block). It may result in an inaccurate topography of a skill, which becomes more important with the level of a competitiveness. The more advanced an athlete is, the higher is the level of their performance. Therefore, knowledge of steps that need to be taken to reach a desired criteria enhances coaching procedures. Observing progress in correct skill execution is reinforcing, because it leads to competitive success (Rushall & Siedentop, 1972). Definitions of target behaviors that included a task analysis have been used by researchers to improve verbal instructions of appropriate execution of various sport skills, e.g.: tennis serves (Rikli & Smith, 1980), swimming strokes (Koop & Martin, 1983), practice program by freestyle figure skaters (Hume et al., 1985), backward giant circle, kip cast, and clear hip circle (Boyer et al., 2009); offensive line pass-blocking skill in football (Stokes et al., 2010)

Self-monitoring in coaching. Austin and Carr (2000) suggest using sport specific behavioral checklists, which would usually include the task analysis of skills viewed from the molar perspective. They help the athlete to specify what they want to work on and set easily identified goals for improvement. The

checklist involves “performance aspects of practices and competitions that an athlete can easily check off or identify in order to provide a quick, convenient and yet reasonably thorough assessment of those areas in which the athlete would like some help” (Austin & Carr, 2000, p.413). Although this procedure can be used informally by different people in a sport setting, it can be also analyzed from behavioral point of view.

Self-management is a behavioral procedure that is used primarily in organizational behavioral management but it can also have positive outcomes for people in other settings (Austin & Carr, 2000). One part of self-management is where a person records their own performance (self-recording). To allow appropriate monitoring of an individual’s behavior, a precise operational definition of target behavior is needed. The more specific the description, the more accurate is an individual’s knowledge of performance. This makes progress easier to observe and improvement can reinforce correct responses in the future. If an athlete knows enough about the sport and the execution of the skills they are practicing, their behavior may be rule-governed. If advanced enough, they may use self-instruction, which would enhance the development or improvement of the performance. Thus, according to Dickinson (1977), “the derivation of rules from experience of the contingencies of reinforcement and punishment in the sport may form the basis for improvement in skill on a subsequent occasion” (p.89). The effectiveness of self-instruction differs depending on the generalization of the rules to different skills. In addition it may vary between athletes and their history of reinforcement of rule-identification

behavior. Notwithstanding, providing a person with a precise description of correct behavior and teaching them to self-monitor their performance, may lead to a rule-governed execution of the target skill. In behavioral sport psychology there are no published studies on the effectiveness of self-monitoring or self-recording as an intervention alone.

For example, Hume and others (1985) created a self-monitoring checklist for freestyle figure skaters to improve and maintain desirable practice behaviors. The intervention involved instruction about the requirements throughout a practice session. Self-monitoring of the performed skills was accomplished by completing a chart that was prepared for each skater and placed by the board at the arena during practice sessions. Each chart contained data from baseline and previous trainings. The coach's feedback was based on the charts. The dependent variables were the frequency of jumps and spins attempted, number of times the skaters practiced their programs and duration of off-task behaviors. The authors concluded that the intervention improved specific practice behaviors and decreased off-task behavior of three figure skaters.

Self-monitoring and video feedback combined. Behavioral programs that use video feedback in combination with aspects of self-management, such as self-recording or self-evaluation have been reported as an effective method for the positive change of target behavior in different applied settings. For example, individualized video feedback was used as an intervention for skill acquisition enhancement in a study on a group-based parent training program (Phaneuf & McIntyre, 2007). The researchers video recorded performance with the addition of

a review sheet of taught skills to provide mothers with feedback on their improvement in targeted maternal behavior. During feedback sessions, the participants were asked to evaluate their own behavior when watching the video and if an inappropriate behavior was observed, they were asked to identify any possible correct responses.

Kern, Wacker, Macb, Kromrey, Dunlap and Falk (1995) conducted two experiments that focused on a self-evaluation package that included video feedback to increase the amount of appropriate and decrease the frequency of inappropriate peer interactions of students with emotional and behavioral disorders. Three experimental conditions were evaluated – rewards, rewards plus discussion and self-evaluation based on video recorded performance. The results showed that only self-evaluation based on video recorded performance was effective for the improvement in peer interactions, as opposed to rewards and rewards plus discussion conditions. In their second experiment, the authors wanted to check if the intervention would be similarly effective in a group context. The intervention consisted of three conditions: self-evaluation plus rewards, rewards only, and self-evaluation only conditions. Self-evaluation based on video recorded performance plus rewards improved the behavior significantly. Self-evaluation only (without rewards) was effective on a similar level.

Given the current advances in technology, a combination of video recorded performance and a self-monitoring procedure based on videos seems to have great potential for the improvement of specific sport skills. The purpose of the current study is to compare the outcomes of video feedback alone to the effectiveness of a

behavioral coaching intervention that adds self-monitoring to video feedback, on appropriate skill execution by volleyball players. A social validity assessment will determine if the athletes and coaches value the outcomes and procedures.

METHOD

Participants and setting

The participants were five female students from a University in California who play on the University volleyball team. The age of participants ranged from 19 to 21 years old and all played volleyball for at least five years. The player positions were: two middle hitters, one outside hitter, one play setter, and one defensive specialist. They were selected to participate in this study by their coach because they would benefit from additional coaching on the three skills targeted in the study. Selection criteria excluded players who attend practices inconsistently. The players selected for the study were asked about their willingness to participate and given a consent form to sign prior to the study (see *Appendix A*). Other than being told that they were receiving additional coaching in serving, blocking and hitting, the participants were not informed about the purpose of the study. Participants' names were changed to assure their anonymity.

The study was conducted during volleyball off-season months (March, April, and May). Data were collected at individual and team practices. Overall, the players practice 12 hours a week. Individual practices are held throughout the semester. On those days the coaching staff meets with a maximum of four players and focuses on particular skills. The team practices are held four to five days per week, and last for two hours. The first hour is devoted to instruction and drills and the second hour is used for skill training. During every practice session approximately 25 to 45 minutes are spent on practicing the skills chosen for the study.

Measurement

Three skills were selected as dependent variables in this study. First, the percentage of correctly executed steps of swing blocking as described in an 13-step task analysis was measured (see *Appendix B*). At the end of a practice session the participant was asked to perform a swing blocking of a high ball set. The player positioned herself in the middle of the field next to the net. On the other side of the net, there was a setter in the middle and a hitter on the right side of the field. The hitter spiked the ball that was passed to her by the setter. The participant was asked to use that opportunity to perform the swing block.

Second, the percentage of correctly executed steps of highball hitting as described in a 12-step task analysis was measured (see *Appendix C*). At the end of a practice session the participant was asked to spike a high ball. The player positioned herself around the center of the left side line of the court and the setter stood in the center of the center line on the same side of the court. The setter passed the ball parallel to the net, giving the player opportunity to perform a highball spike.

Third, the percentage of correctly executed steps of a jump topspin serve as described in a 14-step task analysis was recorded (see *Appendix D*). At the end of a practice session the player positioned herself in the service area and was asked to perform a jump topspin serve standing.

The task analyses were first created based on a handbook, *Volleyball Coaching Manual* (Roque & Hansen, 2001). Then, the players' coaching staff was asked to validate and correct the steps defining the skills.

The measurement was taken three to five times a week at the volleyball court on the University campus. Data were recorded using a tablet (iPad 4) by an observer who positioned themselves in a previously specified point on the volleyball court. One execution of each skill was recorded during each practice session. The order in which their performance was recorded depended either on a randomly assigned number from 1 to 5 or on the order in which they were withdrawn by the coach from their regular practice drills. For swing blocking, the videos were taken from the end line of the court in front of the player. For highball hitting and jump topspin serve, the videos were taken on the right side of the player, approximately 10 feet from the side line of the volleyball court. Consecutive steps of the three behaviors were listed on separate forms, which were described above (see also *Appendix B*, *Appendix C*, *Appendix D*). Observers measured the performance of the skills from videos using task analysis forms, and a video analysis and sports coaching application for iPhone and iPad, called Coach's Eye. Each step of a skill was recorded as correct or incorrect. Then the number of correctly executed steps was tallied, divided by the number of all steps in the task analysis of that skill and multiplied by 100, to obtain a percentage.

Prior to the start of the study, the observers completed a training session in which they watched videos of the skills targeted in the study previously evaluated by the coach. The videos were stopped after each step and the description of a topography of the skill was presented. Then they recorded data for three sample videos that were evaluated by the coach and her assistant prior to this training. The

training lasted until the observers reached 90% agreement with the coach's evaluation.

Intervention and research design

To evaluate the effects of the intervention for each participant, a multiple baseline design across behaviors (i.e., swing blocking, highball hitting, jump topspin serve) was used. The order of the skills was counterbalanced across the participants.

Baseline. At the end of practice session or during team drills the participants were asked to move to the side court. Depending on the type of practice, the players were all performing the target skills one-by-one and were withdrawn from the practice individually or in pairs. Each player was then asked to perform the target skills. The order of the execution of the skills was semi-random and depended on the convenience related to the position of the participants and other players.

Video feedback. Immediately after execution of a target skill, each participant came to the tablet and watched the video in slow motion. Then she waited for the other players that were observed in the study to perform and watch their skills. No additional feedback was provided based on the videos.

Video feedback plus self-monitoring. In addition to the previous condition, while watching the video execution of skill, the participants rated their performance on a task analysis form. An adjusted task analysis form was handed to them before they started watching the video. The player's task analysis form was based on the basic task analysis (see *Appendix B, Appendix C, Appendix D*),

however some changes were made for it to resemble the instructions given by the coach. This form included a graph summarizing their performance from the previous days of the self-monitoring phase (presented as percentage of correctly executed steps of the particular skill they were assessing), a table containing the verbal prompts, and detailed descriptions for the steps (see *Appendix E*). The participant was instructed to evaluate each step by writing plus or minus for correct or incorrect execution of the steps, respectively, followed by a count of correct responses. Then she waited to perform the next skill or went back to practice drills. No additional feedback was provided based on the videos and evaluation forms.

Before the implementation of this condition, participants received brief training on how to self-monitor their performance. The instruction given at the beginning of each meeting is presented in *Appendix F*. During this training they were asked to evaluate their performance from the first baseline session. The criteria was 70% of agreement with the coach's evaluation. The players were also asked whether they have any further questions about the adjusted task analysis forms and possible answers were given.

Treatment fidelity

Appropriate implementation of the intervention was assessed for 23% of the sessions by filling in a checklist (see *Appendix F*) by an independent observer who was familiar with the research description. A treatment fidelity measure was calculated by dividing the number of correctly followed steps by the total number

of steps specified in the checklist (7 items) and multiplied by 100%. The mean treatment fidelity measure was 95.24%.

Interobserver agreement

Interobserver agreement was assessed by an independent observer for 35% of practice sessions of all participants for each of the three skills. Percentage of agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. An agreement was scored if both of the observers recorded a step of the task analysis of a particular skill identically (as correct or incorrect). Mean agreement was 77.77% (range, 50%-100%). The mean percentages of interobserver agreement differed between participants, ranging from 73% to 86%, due to systematic disagreements on the performance of particular steps for some participants caused by instances of inaccurate recording. Mean interobserver agreement percentages across baseline, video feedback alone phase, and video feedback plus self-monitoring were as follows: 88%, 76% and 74% for Ashley; 81%, 67% and 70% for Chelsea; 81%, 66% and 76% for Gina; 81%, 69% and 77% for Jackie; and 83%, 86% and 90% for Tina.

Social validity

Following the last practice session during which data were collected, the players, were asked to fill out a questionnaire to evaluate general satisfaction, usefulness, convenience and acceptability of the two phases of intervention (see *Appendix H*). The questionnaire included 15 items. To evaluate particular features of the interventions, a 5-point Likert scale was used for 12 statements ranging

from 1, “strongly disagree” to 5, “strongly agree”. The three remaining items are open-ended questions.

RESULTS

The results of the study are inconsistent and did not prove the effectiveness of video feedback or self-monitoring based on video-recorded performance as coaching methods for volleyball players. Generally, higher increases in appropriate execution were observed in self-monitoring condition. Figures 1 to 5 show the percentage of steps of each of the three targeted skills performed correctly by each participant.

For Ashley (see *Figure 1*), mean correct serving was 28%, 38% and 41% for the baseline, video feedback and self-monitoring phases respectively. Mean correct swing blocking was 44%, 51% and 63% for the baseline, video feedback and self-monitoring phases respectively. Mean correct hitting was 25%, 35% and 50% for the baseline, video feedback and self-monitoring phases respectively. Her performance improved constantly with each phase of the intervention by no more than 3 – 15%.

For Tina (see *Figure 2*), mean correct hitting was 47% and 51% for baseline and video feedback phases respectively. The correct performance increased by 22% with the implementation of self-monitoring phase ($M = 73\%$). Mean correct swing blocking was 64%, 55% and 76% for the baseline, video feedback and self-monitoring phases respectively. The mean correct performance decreased in the video feedback phase by 9% and improved in self-monitoring phase in comparison to previous conditions (12% for baseline and 21% for video feedback). Mean correct serving was 49% for the baseline and decreased to 44%

in video feedback phases. For the swing blocking , the percentage correct increased by 20% in the self-monitoring condition ($M = 64\%$).

For Chelsea (see *Figure 3*), mean correct hitting was 43%, 57% and 65% for the baseline, video feedback and self-monitoring phases respectively. Mean correct swing blocking was 56% for both baseline and video feedback. Her performance improved after the introduction of self-monitoring method by 20% ($M = 76\%$). Mean correct serving was 53% for the baseline and video feedback phases. Similarly as for the swing blocking the percentage correct increased in self-monitoring condition by 10% ($M = 63\%$).

For Gina (see *Figure 4*), mean percentage swing blocking was 49% and 57% for the baseline and video feedback phases respectively. The self-monitoring condition resulted in improvement of 21% ($M = 78\%$). Mean correct hitting was 45% in baseline. While the video feedback phase resulted in lower percentage of correct hitting ($M = 44\%$), the performance improved in self-monitoring phase by 26% ($M = 70\%$). Mean correct serving was 48%, 57% and 62% for the baseline, video feedback and self-monitoring phases respectively.

For Jackie (see *Figure 5*), mean correct serving was 33% and 46% for the baseline and video feedback respectively. The percentage of correct performance for serving decreased by 10% with the introduction of self-monitoring phase ($M = 36\%$). Mean correct swing blocking was 54%, 64% and 67% for the baseline, video feedback and self-monitoring phases respectively. Mean correct hitting was 42% for the baseline and decreased to 33% after the implementation of video

feedback phase. The self-monitoring condition was not implemented for this participant due to limited amount of practice sessions.

A post hoc analysis of interobserver agreement between the main observer and each of the participants was conducted for a minimum of 75% of self-monitoring sessions for each skill. Percentage of agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. An agreement was scored if the observer and participant recorded a step of the task analysis of a particular skill identically (as correct or incorrect). Mean agreement for particular participants and skills ranged from 40% - 81%. Mean interobserver agreement percentages across swing blocking, highball hitting and jump topspin serving were as follows: 58%, 71%, 50% for Ashley; 67%, 73%, 66% for Tina; 69%, 68%, 62% for Chelsea; 81%, 74%, 71% for Gina; 40% for swing blocking and 42% for serving for Jackie.

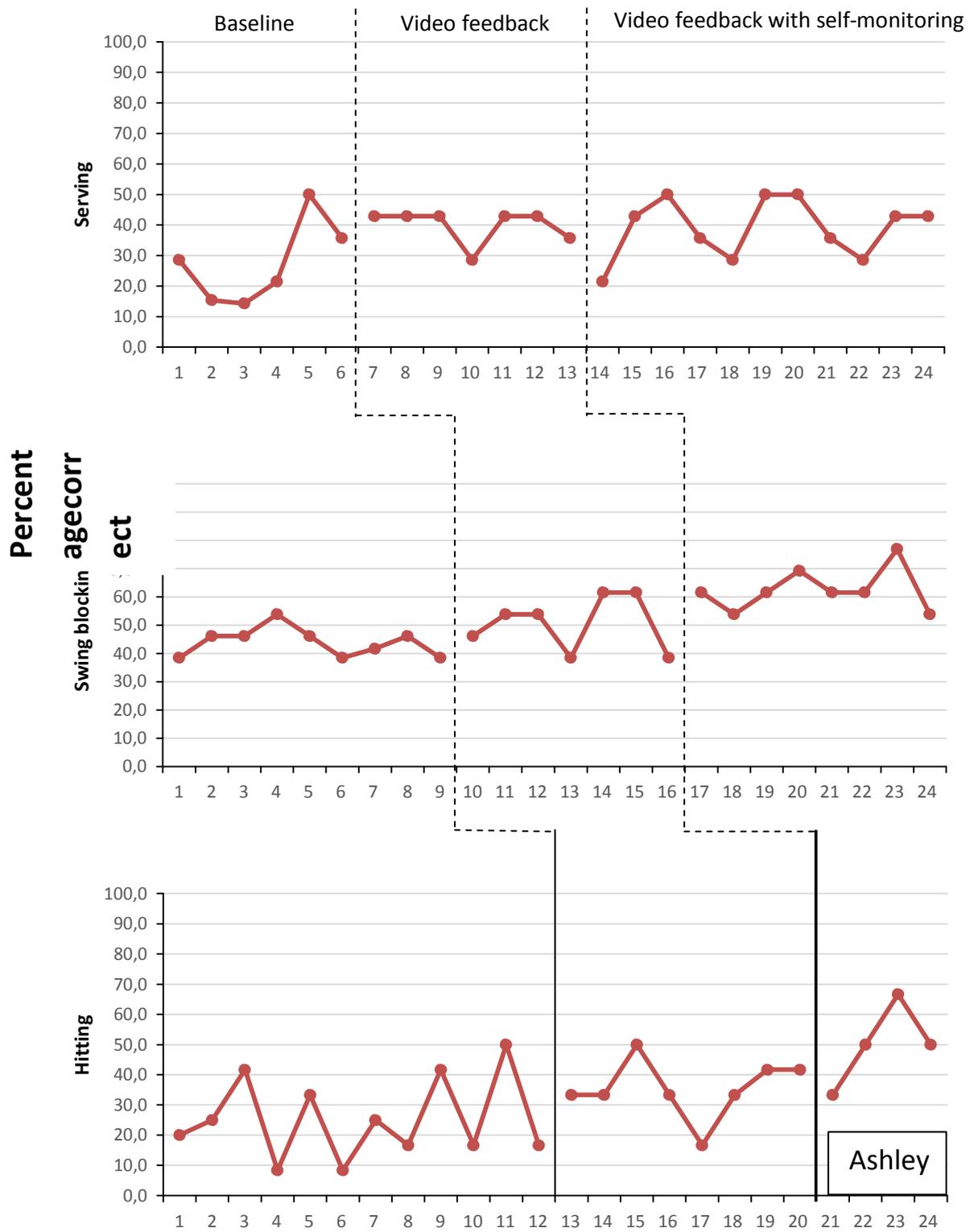


Figure 1. Percentage of steps executed correctly across target behaviors for Ashley.

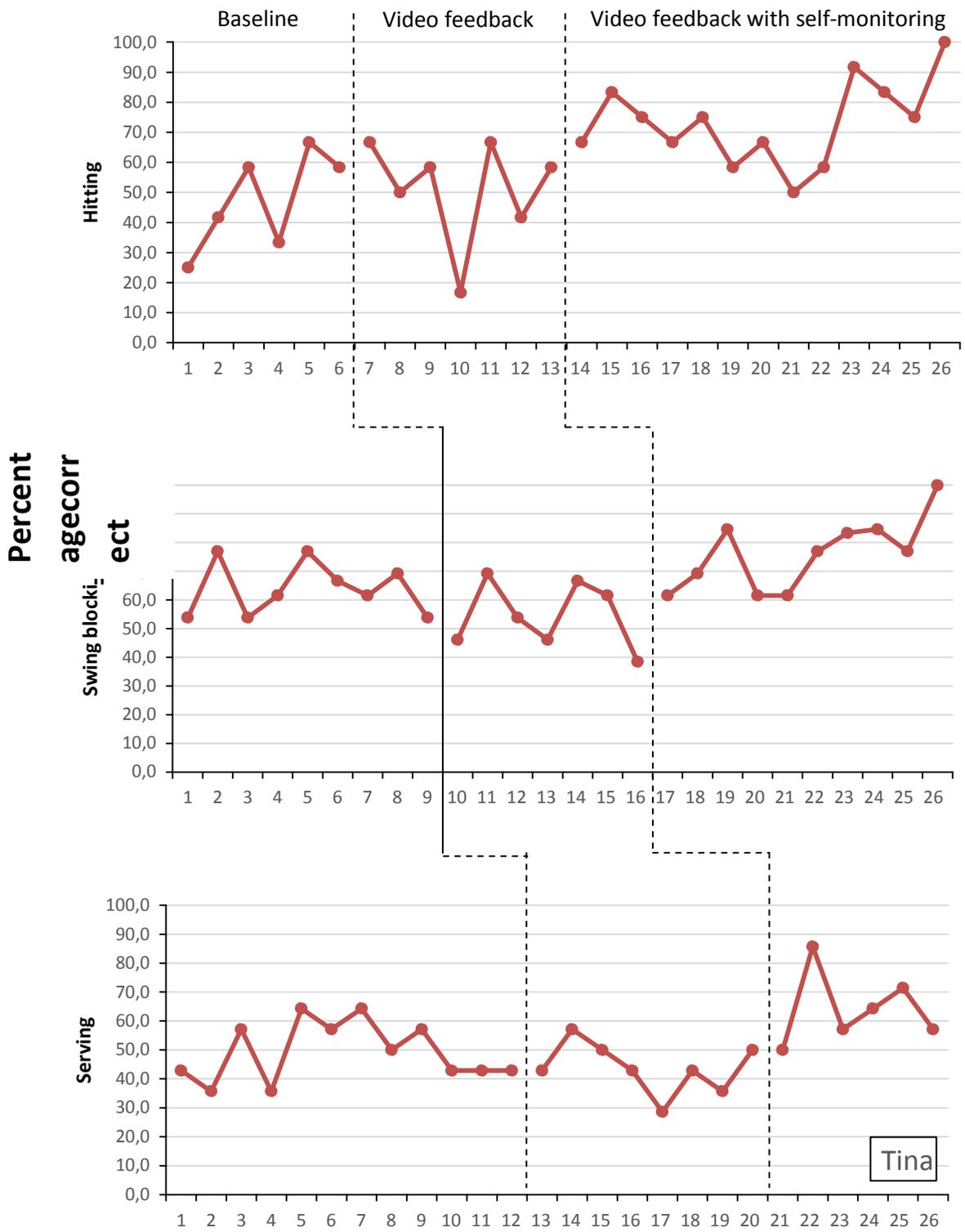


Figure 2. Percentage of steps executed correctly across target behaviors for Tina.

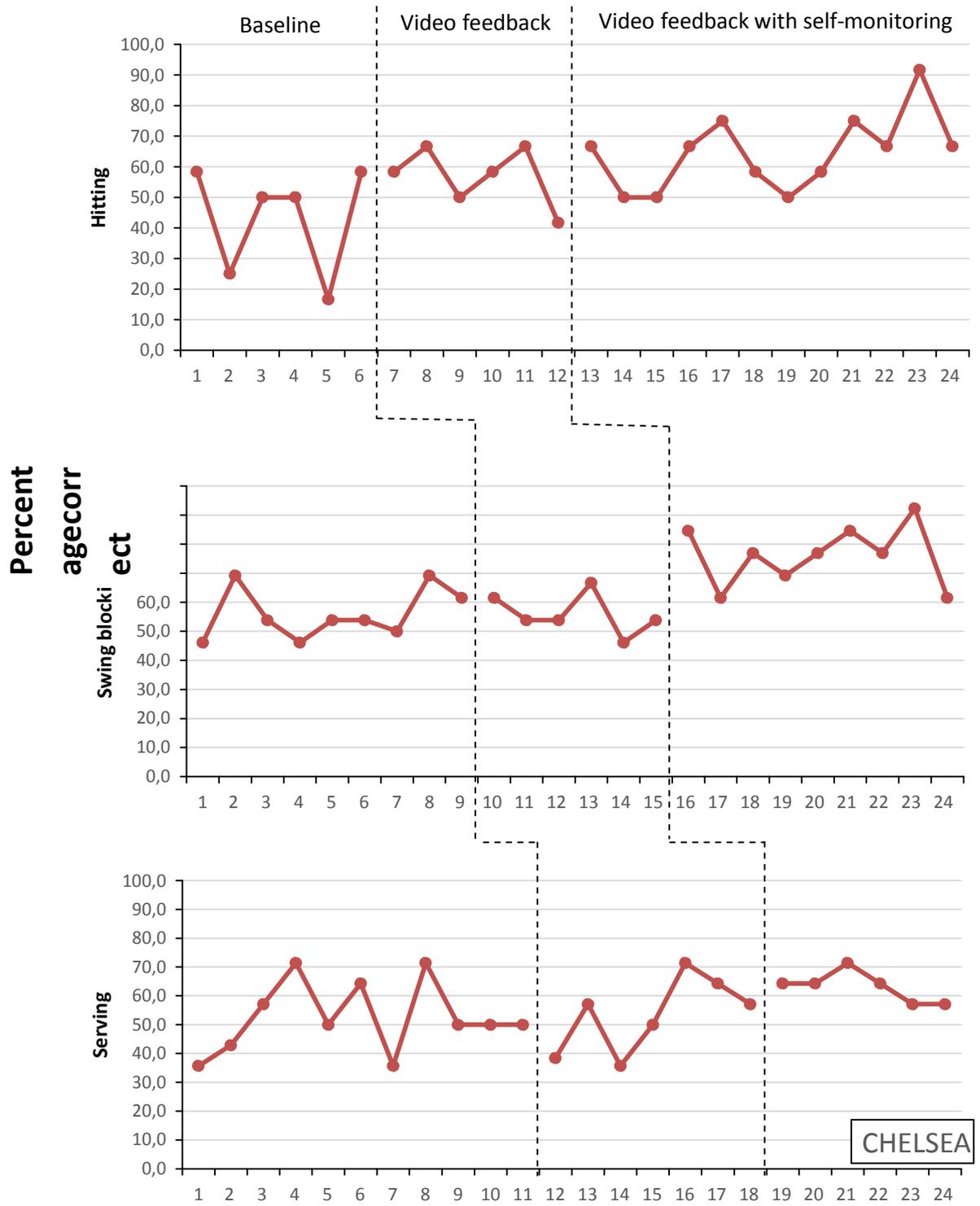


Figure 3. Percentage of steps executed correctly across target behaviors for Chelsea.

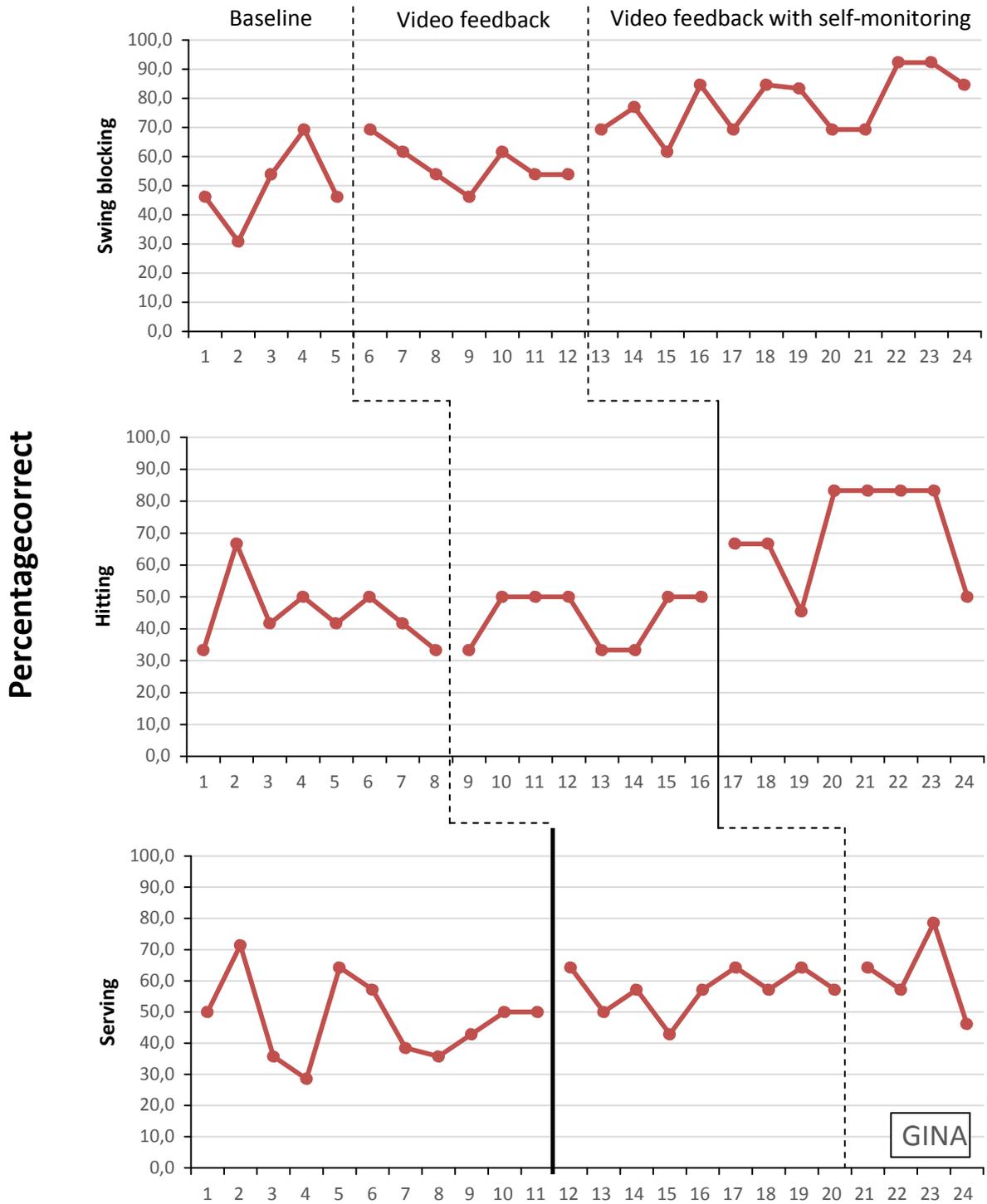


Figure 4. Percentage of steps executed correctly across target behaviors for Gina.

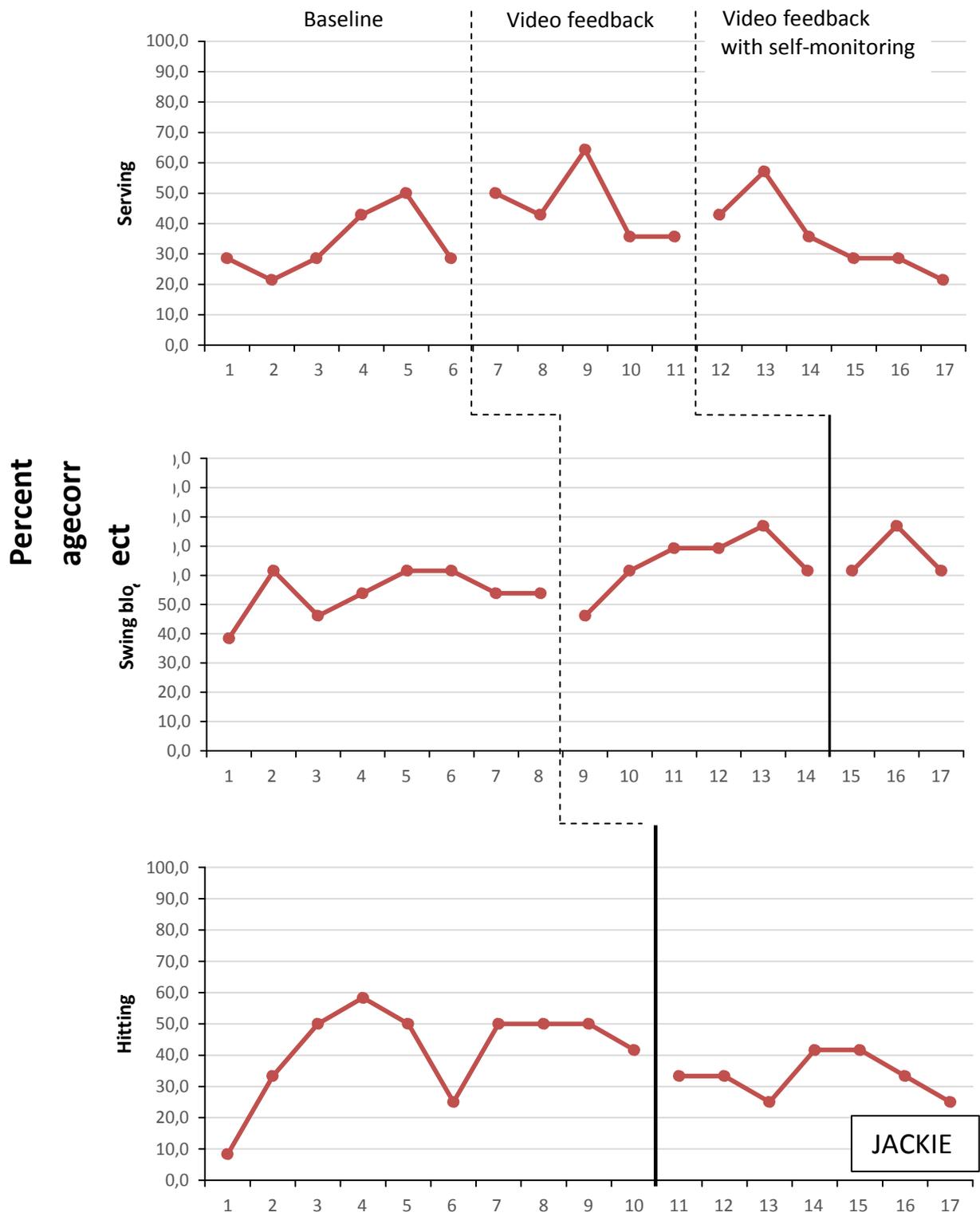


Figure 5. Percentage of steps executed correctly across target behaviors for Jackie

The social validity questionnaire results are presented in Table 1. According to the last open question four participants generally preferred video feedback alone to video feedback with self-monitoring phase. Only one participant evaluated self-monitoring as a more valuable coaching method. The results suggest that they found self-monitoring less convenient and more distracting (item 4., $M = 3$; $SD = 0.71$; item 5., $M = 3.8$; $SD = 0.84$ respectively) than video feedback alone ($M = 4.4$; $SD = 0.55$; item 5., $M = 3$; $SD = 1$ respectively). They would be also less likely to accept self-monitoring as a coaching method in their future practice (item 6., $M = 2.8$; $SD = 0.84$) in comparison to video feedback ($M = 2.8$; $SD = 0.84$). Still, they appreciated its usefulness in improving skill execution (item 2., $M = 4$; $SD = 1.22$).

ITEM	VIDEO FEEDBACK	VIDEO FEEDBACK PLUS
	ALONE	SELF-MONITORING
1. I liked 'this' method.	$M = 4$; $SD = 1$	$M = 3.8$; $SD = 1.30$
2. It helped me to improve my skill execution.	$M = 3.8$; $SD = 0.84$	$M = 4$; $SD = 1.22$
3. I am satisfied with the outcomes of 'this' method.	$M = 3.6$; $SD = 0.89$	$M = 3.4$; $SD = 1.34$
4. I think it is a convenient coaching method.	$M = 4.4$; $SD = 0.55$	$M = 3$; $SD = 0.71$
5. It distracted me from performing consecutive drills.	$M = 3$; $SD = 1$	$M = 3.8$; $SD = 0.84$
6. I would like my coach to use this method in the future.	$M = 3.8$; $SD = 0.84$	$M = 2.8$; $SD = 0.84$

Table 1. Social Validity questionnaire results.

DISCUSSION

The effectiveness of video feedback and self-monitoring as coaching methods for improvement of performance of the volleyball skills is not clear. The implementation of video feedback alone slightly improved the performance only in serving and swing blocking for Ashley and in hitting for Chelsea. Self-monitoring based on video feedback had more positive outcomes, although not for each of the skills and participants.

The current research should be treated as an attempt to conduct a component analysis of previous interventions in the field of behavioral coaching (Stokes et al., 2010; Boyer et al., 2009). As recommended in those previous studies, one of the goals of this study was the independent evaluation of video feedback on the improvement of sport performance. It is important to note that video feedback in the current study did not result in any form of social reinforcement, neither from the coach nor from the other players. Although all of the players preferred this method according to the social validity questionnaire, this intervention improved their mean performance by maximum of 13% percent which is equal to or less than 1.83 of steps on task analyses. Little gains in correct execution of the target skills indicates that exteroceptive feedback by watching a video of one's own performance may not be as powerful as other forms of feedback. Nevertheless, the appreciation of this method of coaching is significant and its effectiveness should be further evaluated with the addition of other forms of reinforcement.

The implementation of video feedback with self-monitoring coaching method increased the percentage of steps executed correctly of all three skills for Tina and Chelsea. For two participants, Ashley and Gina, this method was effective for swing blocking and hitting, although it did not result in a clear improvement for serving.

The results for Jackie are very unclear. The video feedback method resulted in a slight increase in correct performance for swing blocking and serving and decrease for hitting. She participated in a small amount of sessions, due to academic difficulties and an arm injury. Thus, the video feedback with self-monitoring method was only introduced for swing blocking and serving. Surprisingly this coaching method resulted in lower percentage correct for serving for Jackie.

The outcomes of the post hoc analysis suggest that lack of improvement in the self-monitoring condition may be a result of inaccurate self-monitoring. The post hoc analysis revealed that there may be a relation between the rate of improvement and the accuracy of self-monitoring. The levels and trend of improvement on accurate skill execution suggests that the self-monitoring intervention was most effective was Tina and Gina, and their accuracy of self-monitoring was consequently higher than the accuracy of other participants. Jackie who did not benefit from the implementation of self-monitoring condition was inaccurate when self-monitoring her performance (range, 23% to 50%). Additionally, when comparing the effectiveness of self-monitoring on particular skills of a player, the more visible was the improvement, the higher were the

percentages of agreement for that skill. This results suggests that the effectiveness of self-monitoring method depends on the accuracy of the self-monitoring itself. Future research should evaluate the effectiveness of this method by controlling for the level of accuracy of self-monitoring.

From a behavioral point of view, the current study evaluated coaching techniques that are based on stimulus control. The intervention used did not involve any direct manipulation of consequences of target behaviors. It focused on the observation of antecedents of participants' performance. Although watching a video of one's own performance immediately after the execution of a skill is a form of consequence, the researcher did not control for the value of this consequence. It was assumed that the presence of a camera and the fact that a person is in the research condition that included video feedback, would influence the behavior in question. Furthermore, for the self-monitoring phase, it was the influence of an upcoming self-evaluation that was being examined. Thus, this research focused on the stimulus control of altered features of practice environment.

However, it is important to emphasize that the reliability of stimulus change as an intervention depends on multiple factors that are already in effect. The operant behavior is not in a one-to-one relation to the antecedent stimulus. Discriminative stimuli only change the probability of consequent behavior and their strength is dependent on the history of reinforcement of each individual associated with those antecedent stimuli. According to Mayer, Sulzer-Azaroff and

Wallace (2012) when behavioral interventions based on stimulus change fail several factors should be considered.

First, some individuals could lack the target behavior, which may be the case of the current study. The volleyball players have not learned the target skills yet, thus improvement on the body movements was unlikely. The results of the current study may suggest that video feedback without an additional practice step may not be as effective. Previous researchers (Stokes et al., 2010; Boyer et al., 2009) that found video feedback based on task analysis of the skill to be an effective coaching method required the participant to practice the target skills after watching the video. This offered more immediate learning opportunities which might have enhanced the performance.

Second, stimulus control may have been weak, thus strengthening it through differential reinforcement would be recommended. When implementing intervention based on stimulus control, for optimal results differential reinforcement needs to be incorporated into behavior change. The lack of reinforcement signifies lack of contingencies. As explained before the consequences were not manipulated in this research. Nevertheless, it was assumed that differential outcomes on the skills performance, watched on videos or evaluated on the self-monitoring forms, would function as differential reinforcement for the players. Although the current intervention focused only on the antecedent control, it is worth considering modifying the intervention in terms of possible consequences for the target behavior. The self-monitoring condition required the participants to evaluate their own performance by checking the task

analyses boxes with pluses or minuses, which can be treated as a consequence of behavior. Self-monitoring could have been more effective than video feedback alone, because of the differential reinforcement provided by the total count of correctly performed steps.

Previous research usually paired feedback with differential reinforcement delivered by the coach (e.g. Stokes and others, 2012). Although the results of those studies suggest that the behavioral packages used were effective, they do not allow to draw any conclusions about the effectiveness of particular components included in the intervention, such as self-evaluative form of feedback or repetitive practice following feedback, which were controlled in the current study. The focus was placed on the particular components used in previous behavioral coaching interventions, thus to provide evaluation of the video feedback alone, it could not have been followed by differential reinforcement.

Goal-setting is often used in addition to differential feedback to enhance the changes in target behavior (Mayer, Sulzer-Azaroff & Wallace; 2012). A preset criteria indicates the level of performance required for reinforcement. In the current research the goals were not specified and it was assumed that the goal of each participant was to improve their performance gradually and strive for excellence. The ambiguous outcomes of this study may result from diverse individual goals of each of the participants. No criteria were specified and the participants were not given any rationale for engaging in appropriate behavior. Additionally, during the self-monitoring training, which was a prerequisite for implementing the video feedback with self-monitoring method, the participants

were assured that “the ideal performance is not always possible” (see Appendix G). This could counteract the effectiveness of the intervention, because it attenuated the importance of personal goals of the performance.

The third thing to consider when stimulus control fails is the history of punishment. If responding in the presence of a video recorder was punished in some way in the past, the antecedent stimulus may have adverse effects. Feedback itself is a behavioral consequence which follows behavior. However it acquires power to change behavior only if it is paired with punishment or reinforcement. If feedback is delivered immediately and clearly after the behavior happens, it may acquire instructional properties, allowing an individual to determine which responses will lead to reinforcement and which to punishment. This could have happened to the participants who improved their performance with the current intervention.

Fourth, interfering stimuli that could not be controlled may have impeded the effectiveness of the intervention or participants’ improvement. The more the researchers control for extraneous variables, the more focus can be put on the stimulus control. However, this is more difficult in applied research, since many factors could jeopardize the reliability of the study. Some of those interfering variables are considered below.

Although some steps in the task analyses of serving and hitting were the same, the intervention implemented for one of the skills did not influence the performance in the other skill. The reason for that may be that performance on hitting involves other players, while serving is an independent skill, so the

contingencies on both behaviors are different. The execution of hitting improved throughout the study for four and serving only for two participants, which may suggest that the participation of the other players leads to some form of social reinforcement, which changed the related behavior of the participants.

Nevertheless, each of the skills represents an independent repertoire for the player contingent on different sources of reinforcement, suggesting that coaches should focus on each skill separately and the research should address a wide range of sporting skills.

The most significant limitation of this research is the limited number of sessions during which data could be collected. The data collection had to be finished because of the end of the practice season. Two players received the video feedback with self-monitoring intervention only for four sessions with their third skill (hitting for Ashley and serving for Gina). More behavioral coaching sessions could have enhanced the rate of improvement, because it would allow for the development of verbal behavior as prompts for the accurate execution of each of the skills. An anecdotal observation revealed the emergence of verbal behavior after the start of self-monitoring phase. Just before the execution of the skills, some of the players emphasized the necessity to focus on the steps by saying “I’m trying to focus on my steps”, “I’m performing the skill at a slower pace because I think about my steps.” In the social validity questionnaire one participant reported that she did not like the self-monitoring part of the intervention because it “made her overthink” her performance. Unfortunately, the limited amount of sessions

prevented reliable observation of any improvements and their maintenance over time.

Additionally, because the players had to leave their regular practice drills in order to participate in the research sessions, time spent for the intervention had to be minimized. Thus, the participants were allowed to watch their performance only once when they evaluated their performance in the video feedback plus self-monitoring phase. According to the players' comments in the social validity questionnaire, e.g. "It was too hard to correctly assess yourself after only viewing the video one time", this made accurate evaluation impossible, which probably jeopardized the effectiveness of the intervention.

Another limitation was the tool used for videoing participants' performance. Current developments in technology lead to new and more sophisticated methods of coaching. The application that was used in data collection was a useful tool that helped to observe and evaluate skill execution of athletes. Unfortunately some of the body movements, which are significant for appropriate skill execution, involve fine motor skills or are very short in time, which are difficult to observe on the videos. Often the images of the player were blurred and accurate evaluation of correct performance was difficult, which may be seen in the low percentage of interobserver agreement measures.

Although none of the participants reached the mean percentage of correct steps of 80%, which was the typical criterion in previous research (Stokes et al., 2010), the improvement made by some participants may be enough to produce optimal performance on the skills during practice and games. This could be

evaluated by observing the quality of execution of the skills by collecting data on the ball placement in the field and by observing participants' performance in competitive games. Unfortunately, the former would require additional people taking in vivo data on the place where the ball landed or another recording device, set at a larger distance for wider perspective on the volleyball court. The latter would require conducting generalization probes in the game environment phase which could not be part of the current study due to the lack of appropriate resources.

According to the social validity questionnaire, the participants found the video-feedback with self-monitoring inconvenient due to the amount of time needed to evaluate the performance. In the current study the participants were required to devote some of the time from their regular practice, which resulted in more negative attitudes toward the methods used. The evaluation of this method could be different if all of the team members would receive similar coaching or if the coach was involved in the research as an intervention manager.

The current study did not result in any significant conclusions for the field of behavioral coaching in sports. Although the average percentage of correct performance of some volleyball players increased with the implementation of the coaching methods, the results do not provide clear cut observations of improvement. Further research should involve more data collection that would allow for a systematic observation for extended amount of time, including maintenance and generalization measures. Another recommendation is to make sure that the research does not interrupt the regular practice. If it was a part of

regular practice for everyone, all participants could focus more on their performance, allowing the intervention to work as powerfully as possible.

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APPENDICES

APPENDIX A
CONSENT FORM

1. This research study will examine factors that are related to effective methods of coaching. If you agree to participate, you will be asked to follow the instructions given to you during individual and team practices, as additional methods of coaching.
2. You are free to discontinue your participation at any time without penalty.
3. Participation in this research study does not guarantee any benefits to you. However, possible benefits include the fact that you may learn something about how research studies are conducted and you may learn something about this this area of research, e.g. differences among diverse approaches of coaching.
4. You will be given additional information about the study after your participation is complete.
5. If you agree to participate in the study, you will receive additional coaching during your regular practices in spring semester.
6. All data from this study will be kept from inappropriate disclosure and will be accessible only to the researchers and their faculty advisor and the volleyball coaching staff. The researcher will observe and collect data on your individual performance in order to evaluate the effectiveness of particular coaching methods.
7. The present research is designed to reduce the possibility of any negative experiences as a result of participation. Risks to participants are kept to a minimum. However, if your participation in this study causes you any concerns, anxiety, or distress, please contact the Student Counseling Center at (209) 667-3381 to make an appointment to discuss your concerns.
8. This research study is being conducted by Sylwia Zielinska. The faculty supervisor is Dr. Bruce Hesse, Professor, Department of Psychology and Child Development, CaliforniaStateUniversity, Stanislaus. If you have questions or concerns about your participation in this study, you may contact the researcher at (209) 202-5430 or by e-mail: sylwia.zielinskaa@gmail.com.
9. If you would like to obtain information about the outcome of the study, please do not hesitate to contact the researcher (Sylwia Zielinska: sylwia.zielinskaa@gmail.com) .
10. If you have any questions about your rights as a research participant, you may contact the Campus Compliance Officer of California State University Stanislaus at IRBadmin@csustan.edu.

11. You will be provided with a blank, unsigned copy of this consent form at the beginning of the study.
12. By signing below, you attest that you are 18 years old or older.
13. By signing below, you are indicating that you have freely consented to participate in this research study.

PARTICIPANT'S SIGNATURE: _____

DATE: _____

APPENDIX B

TASK ANALYSIS OF SWING BLOCKING

PLAYER	DATE	
STEP	Detailed description	CORRECT/ INCORRECT (+/-)
1. Coiled	<ul style="list-style-type: none"> ✓ Start with knees and arms bent. <ul style="list-style-type: none"> ○ Legs bent at half squat ○ Hands are in front of the body, where they can be seen in her peripheral vision, at the chest level – in between the waist and the shoulder line 	
2. Eye sequence	<ul style="list-style-type: none"> ✓ Stay coiled and do not move body. ✓ The head is moved from the setter towards the hitter and does not follow the ball. 	
3. First step left	<ul style="list-style-type: none"> ✓ Left foot step heel then toe. ✓ The step is big enough, so that leg is stretched out <ul style="list-style-type: none"> ○ The knee does not extend past the heel, when the heel first touches the floor 	
4. Arms swing	<ul style="list-style-type: none"> ✓ Arms goes down. <ul style="list-style-type: none"> ○ Arms are not raised higher than their original position. 	
5. Position in front of the hitter	<ul style="list-style-type: none"> ✓ The right foot is directed towards the pole of the net after the right step <ul style="list-style-type: none"> ○ The foot is not turned towards the net until the jump is attempted. 	
6. Jump up with both feet	<ul style="list-style-type: none"> ✓ The feet are hips/shoulder wide. ✓ Both feet rise above the floor in the same moment. ✓ The feet are pressed forward when up in the air. 	
7. Timing of the jump	<ul style="list-style-type: none"> ✓ Occurs slightly after the hitter's jump. 	
8. Jump up while using arms.	<ul style="list-style-type: none"> ✓ The chest is directed towards the pole when both feet rise above the floor and arms swing up. 	
9. Arms	<ul style="list-style-type: none"> ✓ Arms are extended and straight <ul style="list-style-type: none"> ○ Arms can be extended with the body line or slightly skewed towards the left. 	
10. Hands press	<ul style="list-style-type: none"> ✓ Hands reach over the net. ✓ The heels of the hands pressed over the net to the ball. 	
11. Fingers spread	<ul style="list-style-type: none"> ✓ Fingers spread and rigid. 	
12. Seal	<ul style="list-style-type: none"> ✓ The arms do not touch the net. 	

13. Land	<ul style="list-style-type: none">✓ Land in the same space as the jump was made<ul style="list-style-type: none">○ No more than 1 feet distance between the jumping and landing place for both feet	
SUMMARY		

APPENDIX C

TASK ANALYSIS OF HIGHBALL HITTING

PLAYER		DATE	
STEP	Detailed description		CORRECT/ INCORRECT (+/-)
1. Timing step	<ul style="list-style-type: none"> ✓ Start with right foot slightly forward. ✓ Arms are straight and hanging at the side of the body. 		
2. Directional step	<ul style="list-style-type: none"> ✓ As the ball leaves setters hand, step with left foot is taken. ✓ This step is bigger than the first one. ✓ Hands are not raised above the elbows, when raised up 		
3. Acceleration step	<ul style="list-style-type: none"> ✓ Finish with right-left step. <ul style="list-style-type: none"> ○ The right step is bigger than the previous step. ○ The length of the last step is similar to the length of the directional (second step) ✓ Feet are moved approximately 1 feet before the place where the ball is falling. 		
4. Lower the hips	<ul style="list-style-type: none"> ✓ Bend moving leg's knee to lower the hips with the last two steps. 		
5. Jumpup	<ul style="list-style-type: none"> ✓ Both feet are raise above the floor at the same time. ✓ Feet are hips-/shoulder - width apart 		
6. Arms swing	<ul style="list-style-type: none"> ✓ Arms swing back straight with palms up. <ul style="list-style-type: none"> ○ The arms are not wide. ✓ Bring arms back up as jumps in air. 		
7. Nonhitting arm up	<ul style="list-style-type: none"> ✓ Non hitting arm pulls up straight and is directed towards the ball. 		
8. Hittingarm - elbow	<ul style="list-style-type: none"> ✓ Hitting arm elbow is: <ul style="list-style-type: none"> ○ high, ○ up above the ear ○ back behind the shoulder. 		
9. Handback	<ul style="list-style-type: none"> ✓ The hitting hand is behind the head and then swings forward to the ball. 		
10. Elbowleads	<ul style="list-style-type: none"> ✓ Hitting arm elbow leads the hitting hand to the swing. 		
11. Transition of the nonhitting arm	<ul style="list-style-type: none"> ✓ Non hitting arm come back down to side of body when the hitting arm contacts the ball. 		
12. Landing	<ul style="list-style-type: none"> ✓ Land within 1-2 feet distance from where the jump was taken. 		
SUMMARY			

APPENDIX D

TASK ANALYSIS OF JUMP TOPSPIN SERVE

PLAYER	DATE	
STEP	Detailed description	CORRECT/ INCORRECT (+/-)
1. Starting position (righthanders)	<ul style="list-style-type: none"> ✓ Start with feet even ✓ Weight slightly forward, bends forward ✓ Ball in right hand ✓ Elbow is parallel to the floor 	
2. Right foot step	<ul style="list-style-type: none"> ✓ Make small step with right foot while holding the ball in right hand with elbow bent 	
3. Serving toss	<ul style="list-style-type: none"> ✓ The ball rolls down right hand to your fingertips and is tossed slightly in front you. <ul style="list-style-type: none"> ○ Do not cup the ball with your hand 	
4. Left step	<ul style="list-style-type: none"> ✓ As the ball is in the air, take a slightly bigger left step towards the ball. 	
5. Arms extended	<ul style="list-style-type: none"> ✓ After toss, as the left step is taken, both arms are extended straight and palms are down. 	
6. Arms swing	<ul style="list-style-type: none"> ✓ Arms swing back with palms up. <ul style="list-style-type: none"> ○ Not too wide ○ Bring arms back up as you jump in air. 	
7. Last two steps	<ul style="list-style-type: none"> ✓ Hips are lowered, with the last right-left steps. 	
8. Jump up	<ul style="list-style-type: none"> ✓ Jump up with both feet at the same time ✓ Feet are hips-/shoulder-width apart. 	
9. Non hitting arm up	<ul style="list-style-type: none"> ✓ Non hitting arm pulls up straight and is directed towards the ball. 	
10. Hitting arm - elbow	<ul style="list-style-type: none"> ✓ Hitting arm elbow is: <ul style="list-style-type: none"> ○ high, ○ up above the ear ○ back behind the shoulder. 	
11. Hand back	<ul style="list-style-type: none"> ✓ The hitting hand is behind the head and then swings forward to the ball. 	
12. Hitting arm – elbow	<ul style="list-style-type: none"> ✓ Hitting arm elbow leads the hitting hand to the swing. 	
13. Transition of the nonhitting arm	<ul style="list-style-type: none"> ✓ Non hitting arm come back down to side of body when the hitting arm contacts the ball. 	

14. Land	✓ Land in the pitch.	
SUMMARY		

APPENDIX E

SAMPLE TASK ANALYSIS FORM FOR A PLAYER

SKILL	<i>Highballdropping</i>	DATE	5/15																
PLAYER'S INITIALS	XYZ																		
PREVIOUS DAYS – PERCENTAGE OF CORRECT STEPS																			
<table border="1"> <caption>Data for Percentage of Correct Steps</caption> <thead> <tr> <th>Date</th> <th>Percentage of Correct Steps</th> </tr> </thead> <tbody> <tr> <td>5/1</td> <td>65</td> </tr> <tr> <td>5/5</td> <td>65</td> </tr> <tr> <td>5/6</td> <td>45</td> </tr> <tr> <td>5/7</td> <td>85</td> </tr> <tr> <td>5/8</td> <td>85</td> </tr> <tr> <td>5/12</td> <td>85</td> </tr> <tr> <td>5/13</td> <td>85</td> </tr> </tbody> </table>				Date	Percentage of Correct Steps	5/1	65	5/5	65	5/6	45	5/7	85	5/8	85	5/12	85	5/13	85
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5/12	85																		
5/13	85																		
STEP	CORRECT/ INCORRECT (+/-)	Detailed description																	
1. Timing step		<ul style="list-style-type: none"> ✓ Start with right foot slightly forward. ✓ Arms are straight and hanging at the side of the body. 																	
2. Directional step		<ul style="list-style-type: none"> ✓ As the ball leaves setters hand, step with left foot is taken. ✓ This step is bigger than the first one. ✓ Hands are not raised above the elbows, when raised up 																	
3. Acceleration step		<ul style="list-style-type: none"> ✓ Finish with right-left step. <ul style="list-style-type: none"> ○ The right step is bigger than the previous step. ○ The length of the last step is similar to the length of the directional (second step) ✓ Feet are moved approximately 1 feet before the place where the ball is falling. 																	
4. Lower the hips		<ul style="list-style-type: none"> ✓ Bend moving leg's knee to lower the hips with the last two steps. 																	
5. Jumpup		<ul style="list-style-type: none"> ✓ Both feet are raise above the floor at the same time. ✓ Feet are hips-/shoulder - width apart 																	
6. Arms swing		<ul style="list-style-type: none"> ✓ Arms swing back straight with palms up. <ul style="list-style-type: none"> ○ The arms are not wide. ✓ Bring arms back up as jumps in air. 																	
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9. Handback		✓ The hitting hand is behind the head and then swings forward to the ball.
10. Elbowleads		✓ Hitting arm elbow leads the hitting hand to the swing.
11. Transition of the nonhitting arm		✓ Non hitting arm come back down to side of body when the hitting arm contacts the ball.
12. Landing		✓ Land within 1-2 feet distance from where the jump was taken.
SUMMARY		

APPENDIX F

TREATMENT FIDELITY CHECKLIST

	Intervention aspect	Implementation (+/-)
1	<p>The observer recorded the performance:</p> <ul style="list-style-type: none"> - From the end line for swing blocking - Approximately 10 ft from the right side line for hitting and serving. 	
2	<p>The observer asked the player to perform targets skill.</p>	
3	<p>If video feedback method was implemented, the participants were reminded to approach to the iPad after the first execution of the skill. If video feedback with self-monitoring method was implemented, the participants were reminded to approach to the iPad after the first execution of the skill and evaluate their performance on a checklist handed by an observer.</p>	
4	<p>The observer turned on the Coach's Eye application and iPad camera when participant approach the end line of the volleyball pitch and stops the recording after the serve.</p>	
5	<p>The observer handed in appropriate checklist to the participant and turned on the video with the skill execution.</p>	
6	<p>The observer did not provide any form of feedback to the participant.</p>	
7	<p>The observer answers only those questions which refer to the checklist itself. If the participant ask any question about the correctness of skill execution, the observer answers "I cannot provide you this information. / Please refer to the detailed description."</p>	

APPENDIX G

SELF-MONITORING TRAINING INSTRUCTION

1. During the next part of the study you will be asked to evaluate your performance of the volleyball skills that are targeted in the study.
2. The evaluation will be based on the detailed description, which was prepared specifically for this study by the researcher and your coach. Each skill was broke down into specific steps which are necessary for the appropriate skill performance. It is important to note that they describe an ideal performance which may not always be possible. The steps are described in the table provided by the researcher.
3. During training meetings with the researcher you will receive information on how to evaluate your performance.
 - Before the execution of the skills, you will be informed which skills you are going to watch and which skills you are going to evaluate.
 - After performing the skill that you are asked to evaluate, you will come to the iPad stand and you will receive a form from the researcher. The form will include summary of your performance from previous days and a table for the evaluation of the given skill.
 - You will be asked to evaluate your performance on the video. The video will be played once in slow motion.
 - Give back the form to the researcher.

APPENDIX H

SOCIAL VALIDITY QUESTIONNAIRE FOR PLAYER

This is a questionnaire which summarizes your experience of the additional coaching procedures. Please read all the statements and questions carefully and follow the instructions.

There are several statements regarding the two coaching methods that were used. The first method when you only watched yourself in slow motion just after performing a skill, was called “video only phase”. The second method when you watched yourself in slow motion just after performing the skill, simultaneously evaluating your skill execution was called “self-monitoring phase”.

Please rate how much you personally agree or disagree with these statements - how much they reflect how you feel or think personally. Use the following scale:

- (1) Strongly disagree
- (2) Disagree
- (3) Neither agree nor disagree
- (4) Agree
- (5) Strongly agree

VIDEO-ONLY METHOD		1	2	3	4	5
1.	I liked video-only method.					
2.	It helped me to improve my skill execution.					
3.	I am satisfied with the outcomes of video-only method.					
4.	I think it is a convenient coaching method.					
5.	It distracted me from performing consecutive drills.					
6.	I would like my coach to use this method in the future.					

SELF-MONITORING METHOD		1	2	3	4	5
1.	I liked self-monitoring method.					
2.	It helped me to improve my skill execution.					
3.	I am satisfied with the outcomes of self-monitoring method.					
4.	I think it is a convenient coaching method.					
5.	It distracted me from performing consecutive drills.					
6.	I would like my coach to use this method in the future.					

Please answer the following questions about the experience of those methods in general.

What are the things you liked the most about “video-only method” and “self-monitoring method”?

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What are the things you disliked about “video-only method” and “self-monitoring method”?

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Which method do you prefer and why?

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