

SMALL-SIDED GAMES VS. INSTRUCTIONAL TRAINING FOR IMPROVING SKILL ACCURACY IN YOUNG FEMALE VOLLEYBALL PLAYERS

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Original scientific paper

Abstract

The aim of our research is to determine the effects of small-sided games training on accuracy in young female volleyball players. Forty-two youth female volleyball players participated in this study. Players were tested for overhead and forearm passing, setting, serving and serving under pressure. Small-sided games and instructional training were performed at the beginning of the season and added to the volleyball practice sessions three times a week for a total duration of 12 weeks. Small-sided games training induced significant ($p < 0.05$) improvements in overhand passing and forearm passing accuracy. The instructional training showed no significant improvements in passing accuracy. Training induced significant ($p < 0.05$) changes between pre training and post training in the experimental group for serving and serving under fatigue. Control group induced improvements in serving accuracy only. To conclude, small-sided games appear to be an effective way of improving accuracy in young female volleyball players. The results of this study indicate that this method was more effective than the traditional instructional program.

Key words: game-based, traditional, technique, effects.

Introduction

Volleyball is a team sport where players have to pass a ball over a net to fulfil their objectives (Palao & Valades, 2009). The average work to rest ratio is 1:2.4 (7 seconds of work to 16 seconds of rest) (Vescovi, 2002). Volleyball is a complex discipline with high technical, tactical, and athletic demands on the players (Kugler, Krüger-Franke, Reininger, Trouillier, & Rosemeyer, 1996). In addition to well-developed physiological capacities which are important for team sports, volleyball players are also required to have well-developed technical skill and precision. Moreover, athletes are often required to demonstrate these qualities under high levels of pressure and fatigue (Gabbett & Georgieff, 2007). Coaches of young volleyball players at early phases of development often use skill tests to assess their athletes' skill level in the basic fundamentals of the game, such as serving, passing, or spiking (attacking). In addition, coaches use these tests to obtain information that will be helpful in predicting the players' future success (Lidor, Arnon, Hershko, Maayan, & Falk, 2007). In recent years, an approach called game-based training has been developed in order to combine the skill and conditioning elements in a coordinated approach. Young players often find it hard to support the traditional fitness training, because of a lack of enjoyment and experience with this type of exercise (Wall & Côté, 2007). Gabbett (2008) showed that skill-based conditioning games that simulate the physiological demands of competition in junior elite volleyball players offer a specific training stimulus. Gabbett, Georgieff, Anderson, & Cotton (2006) have concluded that skill-based volleyball training improves spiking, setting, passing accuracy, spiking, and passing technique. They also stated that skill-based training programs

should be supplemented with an appropriate amount of energy system training to enhance the physiological and anthropometric characteristics of talented junior volleyball players. Recently, Krističević, Madić & Krakan (2016) found similar effects of game based training with instructional training in improving skill accuracy in junior volleyball players. Skill and decision-making abilities are crucial in order to become a successful player. However, the remaining challenge regarding the long-term athlete development is the amount of time devoted to various skills. Therefore, more research is needed in order to confirm this theory, especially in younger volleyball players. The aim of our research is to determine the effects of small-sided games training on precision in young female volleyball players.

Methods

Participants

Forty-two youth female volleyball players participated in this study. Descriptive characteristics are presented in Table 1. Inclusion criteria were regular participation in practice sessions and competitions, and the absence of injury in the past 6 months. Prior to the start of the study, subjects undertook several tests to determine their baseline technical skill levels. Players were then randomly allocated into a small-sided games (SSG) group ($n = 22$) or instructional group (ITG) ($n = 20$). All subjects received a clear explanation of the study, including the risks and benefits of participation, and written parental or guardian consent was obtained before players were permitted to participate.

The protocol of the study was approved by the Ethical Committee of the Faculty of sport and

physical education, University of Novi Sad, and according to the revised Declaration of Helsinki.

Table 1 Descriptive characteristics for the small-sided game (SSG) group and the instructional training group (ITG).

| SSG | ITG |
|--------------------------------|----------------------------|
| N = 22 | N = 20 |
| Age: 11.26±1.12 years | Age: 11.12±1.08 years |
| Height: 161.12±7.42cm | Height: 162.22±6.26 cm |
| Body mass: 45.89±11.29 kg | Body mass: 46.44±9.67 kg |
| Training experience: 2.2 ± 1.1 | Training experience: 2.1 ± |

Measurements

Besides the results, basic anthropometric parameters (body height and body weight) were registered in the study protocol. The initial testing took place after the preseason conditioning period while the final testing was performed after 12 weeks of intervention with the small-sided games training method and instructional training. Both teams had comparable training loads and followed similar periodization throughout the season.

At the time of the study, subjects had 3 volleyball practice sessions, with no additional strength and conditioning. All study procedures took place at a school athletic facility. All participants took part in one introductory week during which time proper form and technique on each fitness test were reviewed and practiced. During this session, assistants demonstrated proper testing procedures and participants practiced each test. Participants were asked not to perform any vigorous physical activity the day before or the day of any study procedure.

Moreover, all participants were instructed to have a good night's sleep (≥ 8 hours) before each testing day, to avoid drinking, or eating at least 2–3 hours before testing. Also, the participants were motivated to give their maximum effort during performance measurements. The same researchers tested the same participants, and the performance tests were performed in the same order with identical equipment, positioning, and technique. Before each testing, the participants performed a standard 20-minute warm-up. Standard warm up protocol consisted of 10 min of warm up running and 10 min of dynamic stretching and 5 x 30m of running exercises.

Procedure

Overhead and forearm passing

The passing ability of the players was evaluated by determining their ability to return a pass to a target positioned at the net, 2 m from the right-hand sideline. The target dimensions were 1.6 m long and 2.3 m wide. A coach, positioned in the service position, approximately 1 m above the ground and 10 m from the receiving player, threw an overhead pass to the receiving player. Players were required to pass the ball to another player standing with arms extended above their head, in the target area. Players were awarded 2, 1 and 0 points if a pass did not reach either of the target areas. The

aggregate from 6 trials was recorded as the player's accuracy score. More detailed explanation of the test could be found in Gabbett, Georgieff, Anderson, & Cotton (2006).

Setting

The setting ability of players was evaluated by determining their ability to set to a target positioned next to the net at net height, 5.5 m from the setting player. This location was chosen because it represents the approximate position at which a receiving player would stand when preparing to spike the ball during a match. A coach, positioned approximately 5 m from the setting player, threw an overhead pass to the setting player. Players were required to set the ball to a target that was 80 cm in diameter. Players who successfully set the ball through the target were awarded 3 points. Balls that hit the outside edge of the target but did not go through the target were awarded 2 points. Players who set the ball within 2.3 m of the net (and therefore 1.5 m of the target) were awarded 1 point. Balls that did not reach the target areas were awarded no points. The aggregate from 6 trials was recorded as a player's accuracy score (Gabbett, Georgieff, Anderson, & Cotton, 2006).

Serving

Service accuracy in a rested condition.

Players were asked to hit 10 consecutive serves to designated areas in the opposite court. Players could choose their preferred position behind the service line. Serves were performed individually, and each serve was supplied to the server by another player. Players were allowed 8 seconds to hit each serve. The points for each serve were allotted according to the designated areas.

Service accuracy immediately after physical exertion.

Players were allowed 5 sets of 2 consecutive serves (for a total of 10 serve) in which to hit to the designated areas on the opposite court. Each 2-serve set was performed following an effort designed to elevate the heart rate (HR). The physical exertion consisted of a block at the net, followed by a dig at the 3-m line, both performed twice, and again a block at the net. The players performed a block, dig, block, dig, and block. The HR of the players was measured (using Polar Electro Oy, Vantaa, Finland) immediately after completion of the physical exertion.

Players could choose their preferred position behind the service line, but it had to be identical to the position at which they hit the serves at the rested condition. Serves were performed individually, and the ball for each serve was supplied to the player by another player. Players were allowed 8 seconds to hit each serve (16 seconds for each set). The points for each serve were allotted according to the designated areas. More detailed explanation for both tests could be found in Lidor, Arnon, Hershko, Maayan, & Falk (2007).

Training program

One cycle of 12 weeks was analyzed at the beginning of the season (2015/16). SSG and instructional training interventions were performed at the beginning of the season and added to the volleyball practice sessions three times a week for a total duration of 12 weeks. SSG and IT were always performed in the middle of a session, after a standardized warm-up, and matched for exercise duration. In the first part of sessions players were involved in low-intensity technical drills, and after that, SSG and IT were used. Two weeks before the training program players performed the general conditioning in order to level the conditioning of players after the break during off season. The goals of the small-sided games program were to increase the intensity of sport-specific training, and attention was given to volleyball skills and play.

In addition, players were introduced to small-sided games rules. None of the players were performing any additional resistance or aerobic training outside of the 3 training sessions. The duration of training sessions was recorded, with sessions typically lasting 80-100 min. For this purpose, small-sided games exercise were selected based on previous experience and pilot studies in which mean exercise intensity is suggested by previous authors (Gabbett, 2008). The type of SSG used was 2v2 (7m x 3m) and 3v3 (12m x 6m) on smaller court. This configuration was chosen because of the greater intensity experienced in this type of drill compared to SSG involving more players. Another reason for using smaller court is because more players can exercise simultaneously (up to 12 players performing 3v3 drills at the same time). Drills were played like a competition. Although the duration of each individual rally in this drills was not controlled by the coach, total duration of the drill can be recorded to assist in inter and intra-session planning. Instructional training sessions were designed to develop volleyball technique and accuracy.

All skills were taught by using blocked practice so that all trials for each skill were completed before moving onto the next skill (Gabbett, 2008). A typical instructional training session consisted of players performing individual skills against a wall or to a partner in a non-competitive environment, multiple repetitions, and practice of technique in a closed-skill environment.

Statistical analysis

Statistical analysis included descriptive analyses (means and standard deviations for the sample as a whole, and separately for the SSG and ITG) for the pre- and post-training status. Normality and homoscedasticity assumptions for all data before and after intervention were checked respectively with Shapiro-Wilk and Levene's tests. Training effects were analyzed using a two-way analysis of variance (ANOVA) (2 x 2) with repeated measures. Factors included training groups (SSG and ITG) and time (pre- and post-training). A criterion α level of $P < 0.05$ was used to determine statistical significance.

Results

The Shapiro-Wilk test has shown that all data was normally distributed. The changes in overhead and forearm passing, setting, serving and serving under fatigue accuracy are shown in Table 2. There were no significant differences ($P > 0.05$) between the groups for passing, setting, serving, and serving under fatigue accuracy before training. The changes in passing accuracy are shown in Table 2. Small-sided games training induced significant ($p < 0.05$) improvements in overhand passing and forearm passing accuracy. Instructional training showed no significant improvements in passing accuracy. Training induced significant ($p < 0.05$) changes between pre training and post training in the experimental group for serving and serving under fatigue. Control group induced improvements in serving accuracy only (Table 2).

Table 2 Volleyball accuracy at pre- and post-training. Data are mean \pm SD.

| | SSG (n=22) | | ITG (n=20) | |
|-----------------------|----------------------------|--------------------------|----------------------------|--------------------------|
| | Initial (Mean \pm SD) | Final (Mean \pm SD) | Initial (Mean \pm SD) | Final (Mean \pm SD) |
| Overhead pass | 5.24 \pm 1.56 | 6.72 \pm 1.79*† | 6.36 \pm 2.29 | 6.59 \pm 1.92 |
| Forearm Pass | 4.26 \pm 1.79 | 5.49 \pm 1.31*† | 5.36 \pm 1.76 | 6.08 \pm 1.52 |
| Setting | 7.46 \pm 2.29 | 8.28 \pm 3.05 | 8.33 \pm 2.20 | 9.85 \pm 2.54* |
| Serving | 25.26 \pm 4.63 | 30.24 \pm 4.35*† | 26.65 \pm 4.78 | 29.85 \pm 5.15* |
| Serving under fatigue | 26.45 \pm 5.28 | 29.67 \pm 5.07*† | 25.12 \pm 7.23 | 28.14 \pm 6.78 |

* Significant difference $p < 0.05$ between initial and final testing; † Significantly greater improvement than in ITG ($p < 0.05$).

Discussion and conclusion

The present study investigated the effect of a small-sided games training program on precision in female youth volleyball players. Our results show that small-sided games training showed better results than instructional group at increasing most performance parameters in young female volleyball players.

In similar studies with young male subjects Gabbett (2008) and Gabbett, et al. (2006) have concluded that skill-based volleyball training improves spiking, setting, passing accuracy, spiking and passing technique. Our results are similar to results found in Gabbett, et al. (2006) study. It has been suggested that traditional technical training, which uses blocked practice, provides greater short-term improvements in skill than random practice, such

as this performed by the game-based conditioning games group in our study (Shea & Morgan, 1979). However, using random practice could have longer-term performance benefits (Gabbett, 2008). After 12 weeks of game based training, there were increases in two passing accuracy tests, overhead and forearm passing. Skill-based group showed significant improvement in both, the overhead and forearm passing compared to control group. Possible reasons could be found in the fact that players in skill-based training have more passing actions due to less players on the court. Moreover, smaller court in small-sided games leads to less powerful serving, forcing players to use overhead passing. It is interesting that SSG group showed better results compared to IT group having in mind that almost all instructional training sessions were designed to develop volleyball technique and accuracy. We can speculate that children benefit more from this fun and dynamic approach during SSG. In similar study, two 4-week training programs consisting of SSG or mixed training both resulted in improvements in various technical skills ranging from 17 % to 27 % (Bogdanis, Ziagos, Anastasiadis, & Maridaki, 2007).

This is consistent with Delextrat and Martinez (2014) who showed a significantly better improvement in shooting skills after SSG than HIT, while passing skills were similarly increased by both training methods. Our results show a tendency for better improvement in passing skills in the group undertaking SSG training. A possible explanation could be found in the fact that players in the SSG training always had a target during games, which is similar to the target during the passing tests. Moreover, short shuffling moves in SSG, associated with tests, which involve leg coordination in addition to passing ability could significantly

contribute to better results. Both groups showed significant improvement in serving accuracy. This is not surprising since both training programs use the same technique to improve volleyball skills. The only difference is that players in small-sided games training are involved in more stressful situations due to opponents and scoring in games. Therefore, it was expected that players in small-sided group would significantly improve Service accuracy after physical exertion. Accordingly, there were significant differences ($p > 0.05$) between pre training and post training following small-sided training in youth female volleyball players. However, in contrast to our results Gabbett, et al. (2006) found that the post training serving accuracy was not significantly different from that recorded prior to training due to wider target and greater complexity of the serving task which may lead to increased number of errors.

Most recently, Krističević, Madić & Krakan (2016) found similar effects of game based training with instructional training in improving skill accuracy in junior volleyball players. To conclude, small-sided games appear to be an effective way of improving accuracy in young female volleyball players. The results of this study indicate that this method was more effective than traditional instructional programme. From a practical viewpoint, these findings demonstrate that instructional-based training programs could be supplemented with a skill-based conditioning training or with appropriate amount of energy system training to enhance the physiological characteristics of young volleyball players and to improve volleyball accuracy. Many coaches do not use the approach described in this article to the training process because they fear that the level of skills could decrease in young volleyball players.

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IGRE NA MALOM PROSTORU NASUPROT TRADICIONALNOG NAČINA OBUKE ZA POBOLJŠANJE PRECIZNOSTI KOD MLADIH ODBOJKAŠICA

Sažetak

Cilj ovog istraživanja je utvrditi učinke obuke igara na malom prostoru na preciznost kod mladih odbojkašica. Četrdeset i dvije mlađe odbojkašice sudjelovale su u ovom istraživanju. Igračice su bile testirane na preciznost dodavanja prstima i podlakticama, preciznost dicanja, servis i servis nakon napora. Igre na malom prostoru i tradicionalno učenje tehnike su izvođeni tri puta tjedno u tijeku 12 tjedana. Igre na malom prostoru su izazvale značajni ($p < 0,05$) napredak kod preciznosti dodavanja prstima i podlakticama. Tradicionalni trening nije pokazao značajne učinke kod preciznosti dodavanja. Došlo je do značajnog ($p < 0,05$) napretka nakon treninga kod eksperimentalne grupe kod servisa i servisa nakon napora. Kontrolna grupa je napredovala samo kod preciznosti serviranja. Zaključno, igre na malom prostoru predstavljaju efikasan način poboljšanja preciznosti kod mladih odbojkašica. Rezultati ovog istraživanja ukazuju da je metoda igara na malom prostoru efikasniji od tradicionalnog načina u poboljšanju preciznosti kod mladih odbojkašica.

Ključne riječi: igre, tradicionalna, tehnika, efekti.

Received: July 3, 2017

Accepted: August 16, 2017

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