



ORIGINAL SCIENTIFIC ARTICLE

THE EFFECT OF TRAINING BASED ON PART AND WHOLE COMBINATIONS ON SMASH TECHNIQUES IMPROVEMENT IN VOLLEYBALL SPORTS FOR 11-12 YEAR OLD ATHLETES

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Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

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Abstract

Objective. This study aims to examine the effectiveness of the part and whole combination-based smash training model on smash techniques in volleyball athletes aged 11-12 years.

Materials and method. This study used an experimental field testing method, with a pretest-posttest control group design approach. The participants were 52 male volleyball athletes aged 11-12 years and had an average weight and height of ± 36.02 kg and ± 144.63 cm. The instrument used to measure the smash technique was a volleyball skill test.

Results. The results of the descriptive analysis showed differences in the mean and standard deviation of the conventional group and the experimental group. The average value of the conventional group is 75.562 with a standard deviation of 8.7956, while the average value of the experimental group is 87.492 with a standard deviation of 1.9343. Hypothesis testing conducted using Mann-Whitney analysis found that the value of Asymp sig (2-tailed) was $0.000 < 0.05$, which indicates that the hypothesis is accepted.

Conclusions. Knowing the descriptive results and hypothesis testing, it is concluded that the experimental group experienced a significant improvement and was better than the conventional group. Based on the category of posttest average result assessment, the experimental group was included in the very good category. In other words, the experimental group was very competent. On this basis, this research can be used as a reference in training smash techniques for volleyball athletes at the beginner age.

Keywords: training effect, smash technique, volleyball, part and whole combination, 11-12 years old.

Introduction

Volleyball is a team sport. It takes good mental, physical, tactical and technical aspects to improve performance in volleyball (Côté, Baker & Abernethy, 2003; Gonçalves et al., 2021). All of these aspects require training and hard work supported by a systematic, tiered, sustainable and long-term program.

Most practitioners and sports experts state that it takes long-term training for 10 years in a programmed manner to create outstanding athletes in the international arena, both to improve the team and individual abilities (Chevrier et al., 2016; Sulistiyono et al., 2021). In line with other literature, becoming an Olympic champion and winning various events requires

approximately 100.00 hours of practice (Güllich, 2014; Baker & Young, 2014). Strengthened by Bompa and Buzzichelli (2019), improving the quality of training requires adequate infrastructure, knowledge of qualified coaches, supporting knowledge other than coaching knowledge, and good quality of competition so that the athletes involved can explore techniques and have high motivation. The synergy of various sectors thus plays a very important role in advancing sports achievements, especially early childhood development which must be optimized.

Balyi, Way and Higgs (2013) stated that the long-term athlete development theory is a process that is carried out systematically according to the athlete's chronological age. The development of basic techniques and skills needs to be optimized from an early age so that when athletes reach the senior stage, they are no longer talking about technical development, but rather maximizing existing techniques and performance and competing experiences to reach peak performance.

Müller (2009) explained that at the age of 10-12 years, volleyball athletes enter the basic development phase. The purpose of training at this stage is the general development of motivation to play volleyball, where the exercises applied are fun and develop perfect form and mastery of basic techniques. The six basic elements in volleyball include serving, reception, setting, block, defense, and attack (Koch & Tilp, 2009). Athletes who master good basic techniques will carry out the defense and attack effectively and efficiently. In this case, the role of the coach is very influential to create young athletes who have adequate basic techniques.

Coaches are required to be like heroes as they must have flexible roles, such as being able to act as parents, older siblings, facilitators, motivators and always updating knowledge to be later shared with the athletes. Thus, the knowledge and skills of athletes will be more developed in terms of cognitive and technical. Tirtawirya, Tomoliyus and Sudarko (2020) explained that being a champion is not easy where all aspects must be programmed and monitored properly so that the athlete's mental, physical and technical progress can be monitored.

Based on the explanation above, it is clear that the role of the trainer is needed to provide a good program, model, and basic technique. The importance of the coach's role is because the first key to increasing peak performance is the perfect technique formed at an early age that can be taught by the coach. However, there are still problems that need to be studied in depth in the application of technical training.

The basic problem for athletes aged 11-12 years, especially in volleyball is the development of basic smash techniques. In line with the opinion of Harrison et al. (1999), it is stated that teaching or training activities are complicated and complex things. Therefore, when using an approach that is not appropriate to the needs, it will be more difficult to develop skills in volleyball athletes, especially at an early age. It is often found that there is an inaccurate perspective that a good exercise is an exercise that emphasizes the quantity or amount of movement, not the quality of the movement. This kind of assumption makes the target of training less clear, whether it is aimed at physical or technical training.

According to a study by Pranopik (2017), the smash technique is the most difficult basic technique to apply to volleyball athletes. This is in line with previous research that one of the most difficult smash techniques to learn is the straight smash technique from starting, jumping, hitting the ball to landing (Dasar et al., 2021).

The previous study applied the basic smash technique training with the drill method. The study found that the applied technique succeeded in improving basic smash skills aged 16-18 (Marzuq, 2018). However, this drilling method is less effective when given at the age of 11-12 years considering that the drill method focuses more on physical exercise because the movement is done quickly and requires good basic techniques before applying this method.

Another study on testing the effectiveness of developing smash drills found that the drill training method was able to improve smash technique skills (Mustaqim, 2019). However, this study was focused on beginner-level volleyball players in high school so it was not suitable when applied to athletes aged 11-12 years. A scientific approach that aims to achieve effective and efficient training success is therefore very much needed (Apidogo, Burdack & Schöllhorn 2021).

Based on the description that has been explained, it was found that there were problems with the volleyball smash training method at the beginner stage at the age of 11-12 years. For this reason, the researcher provides a solution to deal with these problems by applying the exercise model that has been developed by the author, namely through a part and whole combination-based exercise model. The training model of course adheres to multilateral principles, motor skills, and the development of physical literacy that are adapted to the growth and development of young volleyball athletes. The goal of this research was to see how well a training model based on a combination of parts and wholes worked. Researchers have a hypothesis that this method can improve the mastery of smash techniques for volleyball athletes aged 11-12 years.

Materials and methods

Study participants

This research is an experimental study using field testing with a pretest-posttest control group design (Yulianto, & Yudhistira, 2021). The participants were 52 male volleyball athletes aged 11-12 years old, with a height of ± 144.63 and a weight of ± 36.02 . The first step in this study was to conduct a pretest on 52 athletes using a volleyball skill assessment (Fauzi et al., 2019). After that, the A-B-B-A patter was used to implement match ordinal pairing (MSOP). After all, stages were carried out, 26 athletes were chosen for the control group where the conventional training model was applied and 26 athletes for the experimental group applied the part and whole-based combination training model.

The development of a model certainly cannot be separated from validation. The validity of Aiken's part and whole exercise model used showed results from 0.78 to 0.80 or included in the good category. This categorization is in line with the expert opinion that a coefficient of more than 0.78 is included in the good category (Dewangga, 2020; Dewangga et al., 2021; Yudhistira et al., 2021). Researchers in this study were assisted by four trainers to carry out the treatment that had been designed for group B. Athletes were given treatment with a frequency of 3x a week for 7 weeks. The duration of one training session is 90-120 minutes with adjusted dosage and intensity.

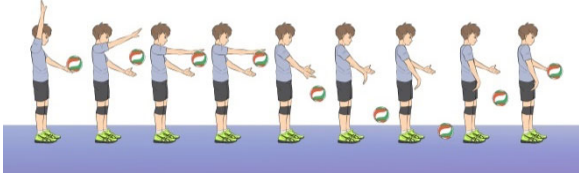
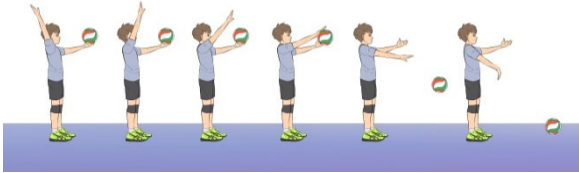
Study organization

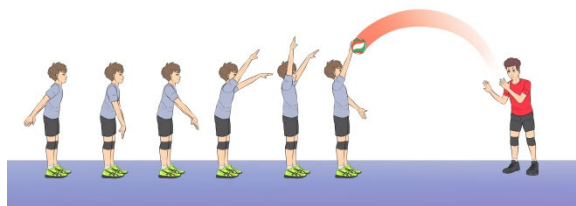
Participants must fill in the attendance list in one practice session. Attendance of participants must reach 80% within 7 weeks of training. The instrument used is a volleyball sports skill assessment from Fauzi et al. (2019). In this case, the aspects that are assessed are an introduction, warm-up, preparatory motion, imposing motion, final motion, and closing with the following assessment categories:

Table 1. Rating Categories

Final Score Criteria	Category	Category Meaning
≥ 86	Excellent	Very Competent
$76 \geq 85,9$	Good	Competent
$66 \geq 75,9$	Poor	Incompetent
$\leq 65,9$	Very Poor	Very Incompetent

Table 2. Part and Whole Based Exercise Programs and Models

No	Material	Dose
1	Introduction Pray Material Delivery Giving Motivation	5 minutes
2	Warming up Jogging Static flexibility Dynamic flexibility Warming up with the ball	15 minutes
3	 <p>Procedures</p> <ol style="list-style-type: none"> Core Exercises 1: Hitting the volleyball as high as the stomach straight down/floor The batting arm is ready straight above the head Drop the hands on the ball in a relaxed manner Keep your elbows straight when hitting the ball Wrist flex Hit the ball right in front of the body and right on the palms Catch the ball bounce back off the floor Repeat the series of movements from the beginning until the touch of the ball on the palm can be felt properly with the appropriate form of technique. Note: feel and adjust wrist flick (slow, medium, fast) 	10 reps 5 sets
	 <p>Procedures</p> <ol style="list-style-type: none"> Core exercise 2: Hitting a volleyball as high as the head forward The batting arm is ready straight above the head Drop the hands on the ball in a relaxed manner Keep your elbows straight when hitting the ball Wrist flex Hit the ball right in front of the face and right on the palm Aim for the ball 3-4 meters forward Do it in pairs. If you practice independently, then do it in front of a wall so that the exercise would be effective and efficient Repeat the series of movements from the beginning until the touch of the ball on the palm can be felt properly with the appropriate form of technique Note: feel and adjust wrist flick (slow, medium, fast) 	10 reps 4 sets

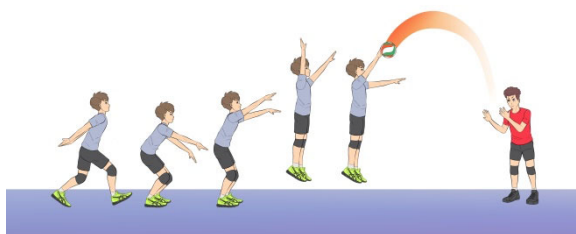


Procedures

10 reps

3 sets

- a. Core exercise 3: hitting a bouncing ball from someone else
 - b. The ball is tossed by another person (coach or partner with the athlete)
 - c. Both hands are ready straight down the side of the body
 - d. Swing both arms at the same time keeping your elbows straight
 - e. With one swing, the bat is immediately brought up, with the arms straight above the head ready to hit the ball at the highest point of reach
 - f. Keep the other hand relaxed
 - g. Hit the ball with feeling followed by a few steps forward as a follow-up movement of the foot
 - h. Note: The ball stroke must always be at the highest point of the arm reach
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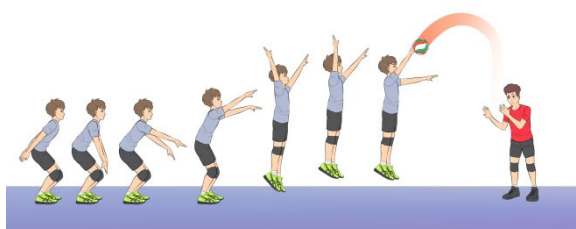


Procedures

10 reps

3 sets

- a. Core exercise 4: hitting the back ball of someone else with one final smash
 - b. The ball is tossed by someone else
 - c. Both hands are ready straight down the side of the body
 - d. Swing both arms with your elbows still straight at the same time doing one long stride as the final step of the smash
 - e. One swing jump and the bat is immediately brought up, with the arms straight above the head ready to hit the ball at the highest point of reach
 - f. The other hand, body, and legs relaxed
 - g. Hit the ball at the highest point of reach
 - h. Land with both feet at the same time
 - i. Bend the knees slightly during landing to reduce the landing force
 - j. Note: Do it in pairs or with a drill from the trainer so that the exercise would be effective and efficient
-



Procedures

10 reps

3 sets

- a. Core exercise 5: Hitting the back ball from someone else by jumping on the spot
- b. The ball is tossed by someone else

- c. Both hands are ready straight down the side of the body with the knees in a bent position
- d. Swing your arms at the same time straighten your knees with your elbows straight
- e. With one swing, the bat is immediately brought up, with the arms straight above the head and ready to hit the ball at the highest point of reach
- f. The other hand relaxed
- g. Hit the ball with feeling at the highest point of reach
- h. Land with both feet at the same time
- i. Bend the knees slightly during landing to reduce the landing force
- j. Note: Do it in pairs or with a drill from the trainer to be effective and efficient in practice

4	Cooling Down Jogging Static flexibility	8 minutes
5	Closing Evaluation Motivation Closing pray	5 minutes

Statistical analysis

SPSS 23 was used to analyze the data. The first step in the data processing was to present descriptive data, such as mean and standard deviation. The Mann-Whitney nonparametric test was used for this case's comparative analysis. The purpose of this test was to compare the control group and the experimental group by applying a part and whole-based training model to improve the smash technique of volleyball athletes aged 11-12 years.

Results

Table 3 above presents the results of the control group descriptive analysis where this group has an average pretest value of 73.262 with a standard deviation value of 3.4408, while the posttest average value gets 75.562 with a standard deviation value of 8.7956. In the part and whole group, the mean values of pretest and posttest are 73.485 and 87.492 with standard deviation values of 2.9568 and 1.9343, respectively.

Table 3. Descriptive Analysis Results of Pre-test and Post-test

Group	Variable	Pre-test		Pos-test	
		Mean	SD	Mean	SD
Control Group	Introduction				
	Warming Up				
	Preparatory Move	73.262	3.4408	75.562	8.7956
	Hit motion				
	Final Move				
	Closing				
Part and Whole Group	Introduction				
	Warming Up				
	Preparatory Move				
	Hit motion				
	Final Move	73.485	2.9568	87.492	1.9343
	Closing				

tively. It can be concluded that based on the posttest average between the control group and the part and whole group, the part and whole group is better than the control group.

Table 4. Hypothesis testing of the control group and the part and whole group

Group	Mean	Asymp sig (2-tailed)
Post-test-Control Group	75.562	0.000
Post-test- Part and Whole Group	87.492	

The results of hypothesis testing using Mann-Whitney analysis are presented in Table 4. The hypothesis is rejected if the Asymp sig (2-tailed) value > 0.05 and vice versa, while the hypothesis is accepted if the Asymp sig (2-tailed) value is < 0.05. The value of Asymp sig (2-tailed) 0.000 < 0.05 is the value obtained in this study which indicates that the hypothesis is accepted. Thus, it can be concluded that there is a significant difference between the control group and the part and whole training model group in improving smash technique in athletes aged 11-12.

Discussion

The part and whole method is a method of learning that aims to teach skills in stages. The learning stage begins with simple and easy movements and progresses to the overall movement (Setiawan & Purnomo, 2020). Another viewpoint stated that the part and whole method is commonly used in educational sports in elementary and junior high schools to teach motor skills ranging from simple to complex (Tuasikal, 2021).

Decaprio (2013) stated that in learning motion, educators must set an example by dividing skills into several parts from simpler ones and leading to broader movements. Reinforced by van Merriënboer & Liesbeth Kester (2008), in learning one must look at the complexity and characteristics of an interrelated skill such as the specification and level of difficulty as well as the duration used to teach the skill.

Previous research revealed that the part and whole training method in achievement sports is a method that provides training from the more general to the specific

(Mariyanto et al, 2020). Sports achievement is an effort to develop and maximize aspects that support the progress of athlete achievement. This is similar to teen volleyball, which necessitates a modern training approach with a few training variations to encourage athletes to develop motor skills. However, expectations and reality are frequently out of sync since some still technical exercises have not applied the principles of practice such as the principle of progressive and the principle of variation. Furthermore, athletes' understanding of a coach's explanation of the basic smash technique is sometimes lacking, making it difficult for them to process the information provided.

Because of the complexity of the smash technique's motion, practicing smash techniques at the age of 11-12 has a high level of difficulty. The cognitive level of children at this age influences their understanding of the material taught by the trainer, necessitating careful method selection. Part training can be a good way to practice smashing techniques. The practice process is modified as it progresses from easy to more difficult stages.

Literature review states that technique in volleyball has a fundamental role related to the actual match. Techniques in volleyball that must be mastered are the technique of starting position, passing, serving, blocking, and attacking. The importance of improving basic techniques to become better is therefore very important so that performance at higher stages can be optimized (Abdiravupovich, 2021). Martens (2012) added that to learn difficult skills, especially complex skills, these skills need to be broken down into smaller and simpler parts or segments. It aims to make it easier for students to apply the material provided.

Based on the opinion explained previously, the part and whole method is an ideal method for learning motion in the context of sports education. This method could, however, be adopted and applied to sports that lead to achievement. This is what drove the researchers to create a part-and-whole-based smash training model and put it to the test in the hopes of improving smash technique mastery in volleyball athletes aged 11 to 12.

Based on the results of the descriptive analysis in the control group, it was found that the mean value of the pretest was 73.262 with a standard deviation of 3.4408. Meanwhile, the average posttest value is 75,562 with a standard deviation of 8.7956. The pretest and posttest values indicated an increase in the posttest scores in the control group.

The results of the descriptive analysis in the part and whole exercise model group showed 73,485 for the mean value of the pretest with a standard deviation of 2.9568. The average value of the posttest of the part and whole exercise model, meanwhile, was 87,492 with 1.9343 as the standard deviation value. This finding indicates that the control group's posttest scores have increased. However, when the posttest scores of the control and part and whole exercise model groups were compared, it was discovered that the control group's posttest score was lower. The hypothesis was tested using Mann-Whitney analysis, which yielded an Asymp sig (2-tailed) value of 0.00 0.05, indicating that the hypothesis was accepted. In other words, the difference between the control group and the part and whole exercise model group was significant.

According to the results of descriptive analysis and hypothesis testing, the part and whole-based smash training

model developed by the researcher has been shown to improve the mastery of smash techniques in volleyball athletes aged 11-12 years. Furthermore, in the post-test of the part and whole exercise model group, the outcome assessment category was included in the very good category means that had a very competent meaning. Thus, this finding can be used as a reference in training volleyball athletes at the beginner age and as a reference in writing scientific papers related to sports coaching, particularly volleyball.

Conclusions

Knowing the research findings and discussion, it was found that the experimental group through the application of the part and whole-based smash training model showed a significant improvement and was better than the conventional group. On this basis, this research can be used as a reference to train volleyball athletes' smash techniques at the beginner age.

Acknowledgment

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Conflict of interest

All authors have declared no conflict of interest.

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ВПЛИВ ТРЕНУВАННЯ НА ОСНОВІ ЧАСТКОВИХ ТА ЦІЛІСНИХ КОМБІНАЦІЙ НА ВДОСКОНАЛЕННЯ ТЕХНІК СИЛЬНОГО АТАКУЮЧОГО УДАРУ У ВОЛЕЙБОЛІ ДЛЯ СПОРТСМЕНІВ 11-12 РОКІВ

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; Е – збір коштів

Реферат. Стаття: 6 с., 4 табл., 5 рис., 29 джерел.

Мета дослідження – дослідити ефективність моделі тренування сильного атакуючого удару на основі часткових та цілісних комбінацій у вдосконаленні технік удару у волейболі для спортсменів 11-12 років.

Матеріали і методи. У дослідженні використовувався експериментальний метод практичного випробування за планом попереднього та підсумкового тестування контрольної групи. Учасниками були 52 спортсмени-волейболісти чоловічої статі у віці 11-12 років із середньою вагою та зростом $\pm 36,02$ кг та $\pm 144,63$ см. Інструментом для оцінки техніки удару був тест на волейбольні навички.

Результати. Результати описового аналізу показали відмінності в середньому та стандартному відхиленні у звичайній та експериментальній групах. Середнє значення звичайної групи становить 75,562 із стандартним відхиленням 8,7956, тоді як середнє значення експериментальної групи – 87,492 із стандартним відхиленням 1,9343. Пере-

вірка гіпотези, проведена за допомогою критерію Манна-Уїтні, виявила, що значення *Asymp sig* (двосторонній) було $0,000 < 0,05$, що вказує на те, що гіпотезу прийнято.

Висновки. Знаючи описові результати та результати перевірки гіпотези, можна зробити висновок, що в експериментальній групі відбулися значні покращення порівняно зі звичайною групою. На основі оцінки середнього результату підсумкового тестування, експериментальну групу віднесено до дуже хорошої категорії. Іншими словами, експериментальна група стала дуже компетентною. Виходячи з цього, дане дослідження може бути використано як орієнтир у тренуванні технік сильного атакуючого удару для волейболістів-початківців.

Ключові слова: тренувальний ефект, техніка сильного атакуючого удару, волейбол, часткова та цілісна комбінація, 11-12 років.

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