45 - EFFECTIVENESS OF PLYOMETRICS AND POWER TRAINING METHODS ON VERTICAL JUMP PERFORMANCE IN CHILDREN'S VOLLEYBALL

PRISCILA RANGEL SAMPAIO
Centro Universitário Vila Velha - UVV
Vila Velha, ES, Brasil
priscilarangel_ef@hotmail.com

1 INTRODUCTION

In volleyball there are well-defined skills, such as leaps, being this skill vastly importance in a good performance of the athlete, since in a game they can be quantified through serves, attacks, blocks, sets, and even defense.

Therefore, the jumps are directly related to athletic performance and a good physical preparation is the key to good performance in a game of volleyball, so that the player can withstand the high intensity, long lasting and still respond with effective technical actions (MARQUES JUNIOR, 2004). In game situations is common in children or adolescent athletes to commit technical errors. But what is taken into account are those errors committed by imperfect technique or lack of coordination, often, not by lack of muscle strength that stands in various technical moves. Thus, "before that vision, the strength may be an important capability to increase the output of players [...], particularly when referring to the explosive outbreak of strength in children" (Marques, BADILLO, 2005, p. 95). And the explosive strength is a determining factor for the efficiency of the vertical jump.

Thus, before the literature reviewed the purpose of this study is to determine which method of explosive strength training is more effective, plyometric or power training, to optimize the performance of vertical jump in adolescent volleyball players.

2 METHODOLOGY

This research is of a quantitative nature, since it is held by tests applied before, during and after the training offered. Systematizing the results through numerical measurements, without making value judgments, leaving the data and logic lead to real and true results (Gil, 1996). It refers to the experimental nature, since it possesses relations of cause and effect of explosive strength in vertical jump performance, handling two methods of explosive strength training aiming to identify the most effective. Thomas and Nelson (2002, p. 304) say that the experimental research "attempts to establish relations of cause and effect, namely, an independent variable is manipulated to judge its effect on a dependent variable [...]".

SAMPLE

Until the beginning of the training program, all subjects (volleyball players) selected for this work did not do any physical preparation, and most had never done strength training.

The sample consisted of individuals belonging to different volleyball teams, of children and youth categories, with age between 14 and 17 and with weight, height and body mass index (BMI) presented in Table 1. Athletes practice the modality three times a week for over a year, a total of 20 athletes of both genders. Moreover, they are healthy, which were incorporated into this work with the consent of the parents. They were divided into two groups with equal numbers for the implementation of training: 10 athletes plyometrics (P) and 10 athletes power training (PT).

Table 1- Physical characteristics of the voluntaries

Group	Pliometria	Power Training
Age (years)	15,0 ± 1,2	15,0 ± 0,8
Body Mass (kg)	60,0 ± 14,9	66,0 ± 11,1
Height (cm)	172,5 ± 0,1	169,0 ± 0,1
Body Mass Index (kg/m^2)	20,0 ± 4,2	22,4 ± 3,2

Data furnished with the mean ± standard deviation

EVALUATION OF EXPLOSIVE STRENGTH

The manipulation of data was evaluated by testing Vertical Jump (VJ, MARINS; Giannichi, 2003, p.118) to indirectly measure the explosive power of lower limbs and vertical jump height of the athletes involved in the research.

For this, we started a warm-up with the athletes from 10 to 15 minutes long, to perform the VJ. After warming up, they stood up, sideways to the graduated surface and with the arm extended vertically, marked with the fingers, the highest point they could reach. To facilitate reading, their fingers were with chalk dust. The test consists of jumping as high as possible, while allowing athletes the flexing of the legs and swing of the arms to execute the jump. There were three attempts to jump, being availed the one of best reach.

The tests will be performed before, during and after the weeks of training, for a more effective evaluation.

DATA ANALYSIS

The analysis of comparisons of data obtained in the pre and post VJ test, the two experimental groups were performed using Student-T test and analysis of variance (ANOVA). In addition to re-test, carried out between strength training and explosive strength training itself, to have a better understanding of the evolution of the results. Since all the statistical hypotheses to be tested with alpha = 5%. The data were presented as mean + / - standard deviation.

EXPERIMENTAL PROTOCOL

The training lasted 16 weeks, for it was necessary to perform strength training to precede the main program, which would be plyometrics and power training, promoting neural adaptation and developing muscle resistance. The strength training was developed in the weight room for 8 weeks with three sessions per week, totaling 24 sessions.

The plyometric training and power training lasted 8 weeks with two sessions, totaling 16 sessions.

The plyometrics was developed as follows: the first four weeks, the group performed 160 jumps per week, as is, 80

jumps daily on a bench of 45 cm. In the final four weeks, the same group performed 100 jumps per day, totaling 200 jumps per week, in a bench of 58 cm. Totaling 360 jumps for 8 weeks.

The power training was developed through four exercises: jumps followed by hurdles, barbell, movements of attack and throwing medicine-ball with abdominal. In the first four weeks, the group performed 20 repetitions of each exercise, a total of 160 repetitions per week, in other words, 80 repetitions daily adding all the exercises. In the final four weeks, the same group performed 25 repetitions of each exercise, a total of 200 repetitions per week, or 100 repetitions daily by adding all the exercises. Totaling 360 repetitions in the selected exercises for 6 weeks.

3 RESULTS AND DISCUSSION

Before the present study we observed that after eight weeks of plyometric training and power training isolated, with volleyball players, aged 14 to 17 years, was not presented significant results, as to the improving of the vertical jump. As well as Rodrigues et al. (2008) analyzed three groups with different training for the assessment of explosive strength and vertical jump in volleyball players. One group performed resistance training, plyometrics and other from another power / plyometrics combined, which results in power / plyometrics as a most effective method of strength training and explosive strength training and plyometrics insulated with final data without significant differences. McBride et al. (2002) found no significant differences in relation to strength training and plyometric when it comes to improving the vertical jump in athletes analyzed. Messner et al. (1999) found no significant difference in the manifestation of explosive force in the vertical jump after 8 weeks of plyometric training players in first division women's volleyball.

Studies such as these make us think of hypotheses that could change the meanings of the results, as plyometrics and power training are reported as effective in the development of explosive force on the vertical jump (ARRUDA; HESPANHOL, 2008; BARABANTI, 1997; WEINECK, 2003; ZAKHAROV; GOMES, 1992; PLATONOV; BULATOVA, 2003; DANTAS, 2003). A chance to change the significance of the data on the development of explosive strength, are the tests applied as a means of evaluating the vertical jump, causing possibilities of different results. As occurred in the work of Garcia et al (2004) who organized the work of eight weeks with a team of 13 female volleyball players aged 14 to 19 years (16.3 +1.1), performing jumps hurdles (280 jumps), jumping hurdles, but laterally (120 jumps) and plyometrics on bench 45 cm (240 jumps), twice a week. Being evaluated according to the explosive force of two performance tests with heels: the SyA test (jump and reach) and the SLSI test (HORIZONTAL LEAP). What made the training program only significant SyA test.

An other hypothesis is the heights of banks, steps and plinths for the development of plyometric training, which vary according to the literature investigated. Araújo Netto and Fernandes Filho (2008) checked the power variation at different heights of falls by 20 male volleyball players aged 16.8 ± 1 years, estimating the ideal height for the plyometric training with the 20, 40 and 60 cm. Completing the minimum and maximum height to get good results is between 40 and 60 cm. Since the heights of 20 and 40 had no significant results.

A relevant observation is the chronological age of the subjects of research volunteers, who are mostly children and adolescents. According to Cabral, and Mansoldo Perrout (2008, p.1) the arrangements sports are still divided by age group, and many of the children vary physical development of the physiologic and yet are subjected to the same training load [...]". We can say that the majority are children and adolescents often compromise their physical performance, because their maturity stage, differ from each other. Children cannot be programmed to play physiological roles, potentiating specialized training, “they are in a phase of growth and development, which arises many physical changes, psychological and psychosocial" (WEINECK apud CABRAL, MANSOLDO, PERROUT 2008, p.2).

The main determinant of muscle strength is the size of the muscle, then it is evident that as children get older, they become stronger Before adolescence, pre-puberty, this process is similar for boys and girls. However, at puberty, the process becomes quite different. The boys are influenced by the high levels of circulating testosterone, besides the stimulation of androgenic steroids, causing an increase in muscle growth rate in boys, while minor changes are found in the girls. Studies cited by Rowland (2008), discuss these gender differences in puberty, the saying that strength development in boys starts earlier and ends later in relation to the strength of the girls, which can stabilize with increasing age.

So, given this scenario of gender differences, with regard to workforce development, there is a chance that might have influenced to the responses of the training, since the groups were formed by boys and girls teens.

Klausen et (apud ROWLAND, 2008) studied two groups of boys and girls aged 10 and 12 and 13 and 15 years. The average jump height, increased in the first group of 15 to 19 cm, with no difference between genders. But between 13 and 15 years, the average vertical jump increased from 18 to 24 cm for boys and no significant change was observed in girls during the three years. Significant, due to the enhancement of muscular strength of boys, exceeding the height of jumps, from those observed in girls.

Other important factor to be observed is the sexual maturation of children. Generosi et al (2008) evaluated the effectiveness of a program of resistance training for strength development in pubescent adolescents male, by 48 students, being 33 in the experimental group and 15 in the control group. Were made, the abdominal tests (repetitions for a minute), horizontal jump (cm), the medicine ball throw (cm), grip strength (Kgf) and last bar (maximum of repetitions). Among the results can be shown that it is possible the development of strength in individuals pubescent adolescents, without the use of specific apparatus of bodybuilding. However there was no improvement in post-test for explosive power of lower members (horizontal thrust). Cabral, Mansoldo and Perrout (2008) in their research related to sexual maturation and physical performance in swimmers from 11 to 14 years, through the tests of 50 and 100 meter free. The results showed that there is a relationship between age, sexual maturation and anthropometric measurements, which are linked directly to the physical performance. An small sample had a good physical performance without even having developed the maturity and anthropometric, having developed the same chronological age. Studies like these show the efficiency of link organic development with the physical development. Even receiving the influence of chronological age, sexual maturation may provide us with data that will escape normality, with such data can individualize training in physical quantities and qualities, in the primary stages of growth.

4 CONCLUSION

The results of this study were not significant to determine which method would be most effective plyometrics and power training to optimize the performance of vertical jump in volleyball adolescents.

However every chance brought out for the pipeline of a training program in this age group studied, should be taken into account to improve the explosive strength of lower limbs as the jump vertical.

Futures studies could address the same goals methods and procedures, of any change is necessary it would be only the target audience, using male or female teenagers isolated. In order to monitor the development of explosive strength, the vertical jump performance and influence of sexual maturation and gender.

5 REFERENCES

AFONSO, J.; GARGANTA, J. **Treino da força em crianças e jovens praticantes de jogos desportivos: um imperativo para o rendimento e para a saúde.** Efdeportes. Revista digital, Buenos Aires, n.111, ano 12, ago. 2007.

ARAÚJO NETTO, J.; FERNANDES FILHO, J. T**reinamento de diferentes alturas do salto em profundidade.** Efdeportes. Revista digital, Buenos Aires, n. 115, ano 12, jan. 2008.

DANTAS, E. H. M. **A prática da preparação física.** 5. ed. Rio de Janeiro: Shape, 2003.

ESPER, A. **Evaluación Del salto em equipos de voleibol femenino de primera división de la Argentina em competencia.** Efdeportes. Revista digital, Buenos Aires, n. 53, ano 8, out. 2002.

FLECK,S. S.; KRAEMER, W. **Fundamentos do treinamento de força muscular.** 3. ed. Porto Alegre: Artmed, 2006.

GALDI, E. H. G.; BANKOFF, A. D. P. **Eficiência de saltos verticais de atletas de voleibol, analisada no teste de 60 segundos, em quatro intervalos de tempo.** Revista Brasileira de Ciência do Esporte, v. 22, n. 2, p. 85-97, jan. 2001.

GARCIA, J. E. et al. **El efecto acumulado de um programa de entrenamiento de saltos em jugadoras de voleibol de cadetes mayores. Efdeportes.** Revista digital, Buenos Aires, n. 69, ano 10, fev. 2004.

GARCIA, J. et al. **Efecto retardado de um entrenamiento de pliometria em jugadoras de voleibol.** Efdeportes. Revista digital, Buenos Aires, n. 81, ano 10, fev. 2005.

GENEROSI, R. A. et al. **Programa de treinamento resistido sem o uso de aparelhos no desenvolvimento da força em adolescentes masculinos púberes, dentro do ambiente escolar**. Efdeportes. Revista digital, Buenos Aires, n. 122, ano 13, jul. 2008.

GIL, A. C. **Como elaborar projetos de pesquisa.** 3. ed. São Paulo: Atlas, 1996.

MARINS, J. C. B.; GIANNICHI, R. S. **Avaliação e prescrição de atividade física: guia prático.** Rio de Janeiro: Shape, 2003.

MARQUES, M. A C.; GONZÁLES-BADILLO, J.J. **O efeito do treino de força sobre o salto vertical em jogadores de basquetebol de 10-13 anos de idade.** Revista Brasileira de Ciência e Movimento, v. 13, n. 2, p. 93-100, 2005.

MARQUES JUNIOR, N. K. **Treino de força para melhorar o salto vertical do atleta de voleibol.** Efdeportes. Revista digital, Buenos Aires, n. 81, ano 10, fev. 2005a.

_____; **Preparação de força especial para voleibolista.** Efdeportes. Revista digital, Buenos Aires, n. 70, ano 10, mar. 2004.

_____; **Adaptação fisiológica do treino de força em atletas de desportos de potência**. Revista Mineira de Educação Física, v. 13, n.2, p. 43-60, 2005b.

MORAES, A. M. de; PELLEGRINOTI, I. L. **Evolução da potência dos membros inferiores durante um ciclo de treinamento de pliometria no basquetebol masculino.** Efdeportes. Revista digital, Buenos Aires, n. 94, ano 10, mar. 2006.

MOREIRA, A.E.C. **Efeito do treinamento pliométrico na força explosiva em atletas de futebol sub-20.** Vila Velha, 2007. Monografia (apresentado ao curso de Educação Física, Esporte e Lazer) – Centro Universitário Vila Velha.

PLATONOV, V. N.; BULATOVA, M. M. **A preparação física.** Rio de Janeiro: Sprint, 2003.

RODRIGUES, L. R. et al. **Comparação entre três diferentes métodos de treinamento para o aprimoramento do salto vertical de jogadoras de voleibol.** Efdeportes. Revista digital, n. 118, ano 12, mar. 2008.

ROWLAND, T.W. **Fisiologia do Exercício na Criança.** 2. ed. São Paulo: Manole, 2008.

SILVA, P.; OLIVEIRA, G. **Análise biodinâmica e neuromuscular da musculatura extensora do trem inferior no salto de impulsão vertical.** Efdeportes. Revista digital, Buenos Aires, n. 67, ano 9, dez. 2003.

THOMAS, J.R.; NELSON, J.K. **Métodos de pesquisa em atividade física.** 3. ed. Porto Alegre: Artmed, 2002.

VILLARREAL, E. S. S. de; **Variables determinantes em el salto vertical.** Efdeportes. Revista digital, Buenos Aires, n. 70, ano 10, mar. 2004.

VRETAROS, A. **Considerações acerca da prescrição de exercícios pliométricos no tênis de campo.** Efdeportes. Revista digital, Buenos Aires, n. 56, ano 8, jan. 2003.

PRISCILA RANGEL SAMPAIO
Rua Presidente Lima, nº 1015, Centro, Vila Velha – ES.
cep. 29100-330.
priscilarangel_ef@hotmail.com

EFFECTIVENESS OF PLYOMETRICS AND POWER TRAINING METHODS ON VERTICAL JUMP PERFORMANCE IN CHILDREN'S VOLLEYBALL

ABSTRACT

Becomes evident on literature that the devecopment of the explosive strengh for vertical jump is essential on volleyball players. Therefore, present studies main objective is to verify with method of explosive trengh training is more effective (plyometrics or power training) to optimize the development of the vertical jump, after 16 week of training on teenagers volleyball's athletes (14 to 17 years old). For this, 20 volleyball athletes from kids and youth category of both genders, mode two experimental groups (plyometric's group and power training's group) and execute a training of eight weeks with two weekly section. Vertical Jump (VJ) test were mode before and after training for data avaliation. The results obtain from both groups were compare through the T of Student's test paired and through the andire of varience (ANOVA). There have been on both groups non-significant improvement.

KEYWORD: explosive strength, plyometrics, power training, vertical jump, volleyball.

EFFICACITÉ MÉTHODES PLYOMETRIC ET POWER TRAINING LA PERFORMANCE DU SAUT VERTICAL DASN JOUERUS DE VOLLEY-BALL INFANTILE ET JUVENILE INFANTILE

RESUMÉ

L'evidence de la literature,que le developpement de la force explosive pour la performance du saut vertical est imprevible pour les joueurs de volley-ball. Tout de suite, l'objetif de cette etude est verifié quelle metode du entraînement de la force explosive la plus eficace (Plyomettre ou power training) pour rendre la realisation du saut vertival, apres 16 semaines de entraînement des athllètes adolescentes du volley-ball (14 á 17 années). Pour cela, 20 athlétes de voley -ball des cathegories infantile et juvenile infantile des deux sexes, formeront deux groupes experimentales (groupe plyomettre e groupe power training), et executeront um entraînement de 8 semainses avec deux séances par semaine. Pour effectuer l'evaliation des

données avant et apres entraînement nous realiserons le test Vertical Jump (VJ). Les resultats obtenues pour les deux groupes seront comparées através du test T de Student en parallèle et atraves d'une analine de variance (ANOVA). Nous ne verifiquerons pas améliorer la significatives les deux groupes .

MOTS CLÉS: Force explosive, plyomettre, power training, saut vertical, volley- ball.

EFICÁCIA DE LOS MÉTODOS PLIOMÉTRICOS Y POWER TRAINING EL RENDIMIENTO DE SALTO VERTICAL EM LOS JUGADORES DE VOLEIBOL INFANTIL E INFATO-JUVENIL

RESUMEN

Se evidencia en la literatura que el desarrollo de la fuerza explosiva para el desempeño del salto vertical es imprescindible en jugadores de voleybol. Luego, el objeto del presente estudio es verificar cuál método de entrenamiento de fuerza explosiva es el más eficaz (pliométrico o power training) para optimizar el desempeño del salto vertical, después de 16 semanas de entrenamiento en atletas adolecentes de vóleibol (14 a 17 años). Para esto, 20 atletas de voleybol de ambos sexos, de las categorías infantil e infato-juvenil formaron dos grupos experimentales (grupo pliometría y grupo power training) y ejecutaron un entrenamiento de ocho semanas con dos sesiones semanales. Para validación de los datos pre y post entrenamiento, fueron realizados los examenes Vertical Jump (VJ)

Los resultados obtenidos por los dos grupos fueron comparados mediante el examen T de Student emparejado y mediante el análisis de variancia (ANOVA). No se verifican mejoras significativas en ningún grupo.

PALABRAS CLAVE: fuerza explosive, pliometría, power training, salto vertical, voleybol.

EFICÁCIA DOS MÉTODOS PLIOMÉTRICO E POWER TRAINING NO DESEMPENHO DO SALTO VERTICAL EM VOLEIBOLISTAS INFANTIL E INFANTO-JUVENIL

RESUMO

Evidencia-se na literatura, que o desenvolvimento da força explosiva para o desempenho do salto vertical é imprescindível em jogadores de voleibol. Logo, o presente estudo objetivou verificar qual método de treinamento de força explosiva é o mais eficaz (pliométrico ou power training) para otimizar o desempenho do salto vertical, após 16 semanas de treino em atletas adolescentes de voleibol (14 a 17 anos). Para isto, 20 atletas de voleibol das categorias infantil e infanto-juvenil de ambos os sexos, formaram dois grupos experimentais (grupo pliometria e grupo power training) e, executaram um treinamento de oito semanas com duas sessões semanais. Para avaliação dos dados pré e pós treinamento foram realizados o teste Vertical Jump (VJ). Os resultados obtidos pelos dois grupos foram comparados através do teste T de Student pareado e através da análise de variância (ANOVA). Verificaram-se melhoras não significativas em ambos os grupos.

PALAVRAS CHAVES: força explosiva, pliometria, power training, salto vertical, voleibol.