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DETERMINING THE EXPLOSIVE POWER LEVEL OF THE LOWER LIMBS TO THE WOMEN'S VOLLEYBALL TEAM *CSU MEDICINA* TG. MURES IN THE COMPETITIONAL SEASON OF 2022-2023

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ABSTRACT. Introduction: Explosive lower body strength in volleyball is a constant challenge for every coach and physical trainer who is involved in training a team. The concern is mostly important not only due to the vertical jump but also due to the movement in the field. During the game of volleyball, because of the small dimension of the court, the first 2-3 steps, the starting steps are crucial in the successful execution of each phase during the game. **Methods:** To detertoase of or area of interest in a representative volleyball team, we applied two tests using the optojump device, as follows: 15 sec jumps test and 30 sec jumps test. **Objective:** These two tests were performed at the beginning of the training season in order to see the level of explosive strength parameters **Results:** These parameters were analyzed for each subject as well as for the entire tested team. The average height reached by the center of gravity for the entire team during the 15 sec jumps test is 20.1 cm, while the average jumps in the 30 sec jumps test is 16.6 cm. Analyzing the explosive force parameters shows the direction in which the team's physical training should be designed.

Keywords: *volleyball, optojump, explosive power*

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REZUMAT. ***Determinarea nivelului forţei explozive a trenului inferior la echipa de volei feminin CSU Medicină Tg. Mureş în sezonul 2022-2023.*** **Introducere:** Forţa explozivă la nivelul trenului inferior în jocul de volei reprezintă o provocare constantă pentru fiecare antrenor şi preparator fizic care este angrenat în pregătirea unei echipe. Preocuparea este în mare parte importantă nu doar datorită desprinderii pe vertical, ci şi datorită deplasării în teren. În jocul de volei, terenul are dimensiuni mici, iar primii 2-3 paşi, paşii de pornire, sunt cruciali în executarea cu succes a fiecărei faze din timpul jocului. **Metode:** Pentru a determina parametrii ariei noastre de interes la o echipă reprezentativă de volei, am aplicat două teste cu ajutorul dispozitivului Optojump, după cum urmează: 15 sec. *Squat Jump* şi 30 sec. *Squat Jump*. Aceste două teste au fost efectuate la începutul sezonului de pregătire, cu scopul de a vedea nivelul parametrilor de forţă explozivă la începutul pregătirii. **Rezultate:** S-au determinat înălţimea la care ajunge centrul de greutate în timpul fiecărei sărituri, timpul de zbor şi timpul de contact cu solul. Au fost analizaţi aceşti parametri la fiecare jucătoare, cât şi per ansamblu, la toată echipa testată**.** Media înălţimii la care ajunge centrul de greutate la nivelul întregii echipe, în timpul testului de 15 sec. *Jumps*, este de 20.1 cm, în timp ce media săriturilor la testul de 30 sec. *Jumps* este de 16,6 cm. Analiza parametrilor de forţă explozivă ne arată direcţia în care trebuie proiectat antrenamentul de pregătire fizică al echipei.

Cuvinte-cheie: *volei, optojump, forţă explozivă*

INTRODUCTION

The testing was done at the women's volleyball team CSU Medicina Târgu Mureş at the beginning of the season 2022-2023. The number of participants to the test was 14 volleyball players. The competition they participated in was A2 Romanian National Championship. Volleyball is characterized by a great number of jumps, skips, hops and other kinds of take-off (Abendroth-Smith & Kras, 1999). Explosive lower body strength in volleyball is a constant challenge for every coach and physical trainer who is involved in training a team. Maximal strength represents the support in the development of dynamic strength and subsequently, of explosive strength (Bompa & Carrera, 2006). The explosive power in volleyball. During the match, a volleyball player performs over 100 jumps in either of the four elements: attack, block, serve or playing the ball. The number of jumps differs according to the player's role and his specialization (Lobletti et al., 2010). The aim of the plyometric regime is to develop the ability of the muscles to generate maximal work in the shortest possible time. This occurs as an effect of the reduction in the time required for the switch from a stretch to contraction (Smith, 1996). The follow-up of a physical training program through plyometric exercises determines increases in the speed of execution and the height of jumps (Lehnert et al., 2009; Myer et al., 2006). The vertical

jump is important in volleyball because of the need to hit the ball around the opponent on the opposite side of the net (Schaal, 2011). The maximum exploitation of an athlete's potential is possible only when the training is systematically planned in the long-term (Neagu, 2015, p. 47). The test execution was made in the training hall after warming up for 30 minutes. The warm-up consists in 10 minutes easy running, 10 minutes of stretching and 10 minutes of running school. Owoeye et al. (2018) showed that neuromuscular exercises significantly reduced the risk of ankle sprain in juvenile football and basketball players. Zakaria et al. also found there was no significant difference between dynamic stretching and dynamic plus static stretching in the prevention of lower limb, core and back injuries in high school male football players After warm-up, the tested subjects started with the 15 sec. jump and after all the subjects were tested, the second test was made 30 sec. jump.

METHODS

The testing was done with the Optojump device. It is an innovative system of analysis and measurement that brings a new philosophy of assessment and optimization of performance to the world of competitive sport: it is designed for the development of a specific and customized training programme for the athlete, based exclusively on precise objective data. It is an optical measurement system consisting of a transmitting and receiving bar (Microgate, n.d.). In order to determine the level of explosive force, two tests were used: 15 sec jump test and 30 sec jump tests. Vertical jumps were performed for 15 seconds and 30 seconds. During the test, the hands were positioned on the hips.

Table 1. The anthropometric data of the tested team CSU Medicina Tg. Mureş

Subject	Kg	H
A. C.	51	176
A.B.	76	188
B.D.	77	181
M.F.	73	191
D.M.	68	187
N.E.	67	179
C.A.	52	163
D.A	57	173
P.E.	63	171
G.D.	61	185
C.M.	67	182
P.D.	56	176
M.M.	69	185
S.L.	66	172
S.A	51	176

Figure 1. Representation of the Optojump Device

With the help of Optojump software we analyzed:

- The ability to jump high and reach maximum height quickly represents a success in volleyball (Potteriger et al., 1999). Explosive strength in the lower extremity is responsible for a good jump (Smith, 1996).
- The height to which the center of gravity reaches for each player tested and also for the whole team. We determined the value of the best result and the value of the worst result.

Figure 2. Representation on the Optojump analysis software

OBJECTIVE

To determine the level of explosive power in the tested volleyball team; analyzing and interpreting the results obtained; identifying the best and the worst result; the average of the results obtained by the whole team; indication of the direction in which to do the physical training.

RESULTS

These parameters were analyzed for each subject, as well as for the entire tested team. The average height reached by the center of gravity for the entire team during the 15 sec jumps test is 20.1 cm, while the average jumps in the 30 sec jumps test is 16.6 cm.

Table 2. Results in 15 and 30 sec jump test

Subject	15 sec jump test (average) cm	30 sec. jump test (average) cm
A. C.	19.3	14.1
A.B.	18.3	15.6
B.D.	20.9	17.9
M.F.	18.6	15.7
D.M.	18.0	14.1
N.E.	19.4	14,1
C.A.	24.3	20.0
D.A	22.4	19.3
P.E.	18.7	16.0
G.D.	19.2	15.5
C.M.	21.5	17.3
P.D.	20.3	17.0
M.M.	22.2	18.9
S.L.	17.6	13.8
S.A	21.3	19.3

The average result in the 15 sec. jump test for the tested team is 20.1 cm, with a minimum average on subject S.L. of 17.6 cm and maximum average on subject C.A. of 24.3 cm.

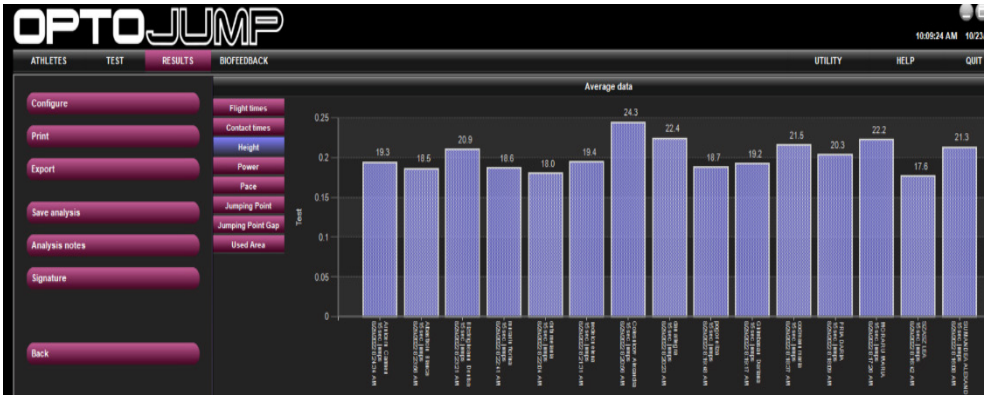

Figure 3. Graphical representation in 15 sec jump test

The average result in 30 sec jump test for the tested team is 16.6 cm, with a minimum average on subject S.L. of 13.8 cm and maximum average on subject C.A. of 20.0 cm.

Figure 4. Graphical representation in 30 sec jump test

As we can observe, the same subject obtained the minimum value and maximum value on both tests. In the 30 sec jump test, the average of the flights obtained is lower compared to the result obtained in the 15 sec jump test.

CONCLUSION

As we can see, the direction in which physical training should be oriented to the tested volleyball team!!!?:

- increasing strength parameters in all forms of manifestation;
- increasing speed parameters in all forms of manifestation;
- increasing the explosive power indices;
- increasing the level of explosive power in condition of endurance.

All these indications must be applied and introduced in the physical training of the tested volleyball team.

In physical training, the exercises must imitate the motor pattern specific to the game of volleyball. It is important to note that the test used to find out the level of the explosive power at the lower limbs must be performed periodically throughout the entire competitional season depending on the obtained results we can model the physical training according to the needs of the tested team.

REFERENCES

Abendroth-Smith, J., & Kras, J. (1999). The volleyball spike. *Journal of Physical Education, Recreation and Dance*, 70 (3), 56-59.

Bompa, T, Carrera, M.C. (2006). *Teoria şi metodologia antrenamentului*. *Periodizarea*. Ed. Tana, Bucureşti.

Lehnert, M., Lamrová, I., Elfmark, M. (2009). Changes in speed and strength in female volleyball players during and after a plyometric training program. *Acta Univ. Palacki Olomuc.*

Lobletti, R., Cleman, S., Pizzichillo, E, Merni, F. (2010) Landing techniques in volleyball. *J Sport Sci.*

Neagu, N. (2015). *Manual tehnic cu privire la optimizarea pregătirii fizice specifice înotătorilor, pentru studenţii din Universitatea Politehnică din Bucureşti* [*Technical manual on the optimization of physical training specific to swimmers, for students at the "Politehnica" University of Bucharest*], București, România.

Potteriger, J.A., Lockwood, R., Haub, M., Dolizal, B., Almuzanini, K., Schroeder, J., & Zebos C. (1999). Muscle power and fiber characteristics following 8 weeks of plyometric training. *J Strength Conditioning*.

Schaal, M.L. (2011). *Physiologic performance test differences by competition level and player position.* Master Thesis. Boise State University. Available at http://scholarworks.boisestate.edu/cgi/viewcontent.cgi?article=1189&context=td

Smith, T. (1996). Off-season vertical jump training for junior high volleyball players. *J Strength Conditioning.* 24-28.

MicroGate (n.d.). *What is Optojump*. Retrieved from: http://www.optojump.com/What-is-Optojump.aspx.

Owoeye, O.B.A., Palacios-Derflinghe, L.M., Emery, C.A. (2018). Prevention of Ankle Sprain Injuries in Youth Soccer and Basketball: Effectiveness of a Neuromuscular Training Program and Examining Risk Factors. *Clin. J. Sport Med.* 2018; 28: 325–331, doi: 10.1097/JSM.0000000000000462.

Zakaria, A.A., Kiningham, R.B., Sen, A. (2013) Effects of Static and Dynamic Stretching on Injury Prevention in High School Soccer Athletes: A Randomized Trial. *J. Sport Rehabil.* 2015;24 :229–235, doi: 10.1123/jsr.2013-0114.