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Effect of Proposed Training Program for Developing Some Physical Performance Characteristics (Maximal Strength, Explosive Strength, And Velocity) On Improving Volley ball Blocking And Attacking Skills: A field study on U17- Amel Gouraya Cadet Team

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Abstract:

Physical abilities are one of the most important requirements for successful skill performance ,the sport of volleyball is a fast paced, dynamic game that demands a good level of physical and mental fitness. Volleyball players are required to possess quickness and agility during the course of play. The aim of this study was to examine the effect of some physical performance characteristics. The results suggest that there is a relationship between physical abilities and skills in volleyball sport.

KEY WORDS : Explosive Strength, maximal strength ,Speed of Performance, Attacking, Blocking in Volleyball.

الملخص:

تعتبر القدرات البدنية من أهم متطلبات الأداء المهاري الناجح الذي يعتمد على إستراتجية التحضير البدني، وبما أن لعبة الكرة الطائرة هي رياضة مواقف سريعة فهي تَعتبر القدرات البدنية القاعدة الهامة التي يستطيع اللاعب التحرك بها للوصول إلى الكرة بسرعة أو الوثب إلى الأعلى، لهذا هدفت هذه الدراسة لمعرفة تأثير بعض الصفات البدنية الخاصة ، وكانت أهم التوصيات هو أن هناك علاقة بين القدرات البدنية والمهارية في رياضة الكرة الطائرة

الكلمات المفتاحية: القوة الإنفجارية– القوة القصوى– سرعة الأداء– الصد– الهجوم– الكرة الطائرة.

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1-Introduction:

Modern sports training is a process-based educational planning, which includes modern and sophisticated scientific methods. Cureton (1981) considers men's physical activity (PA) using motor activities as one of the educational processes that aim to develop and evolve the body (Cureton, 1981, p. 138). According to Martin (1973), physical fitness (PF) is a key component in athletes' level of athletic achievement that is based on the interactive contribution of the energy systems; the different vital systems of the human body, in general, and the human muscular system, in particular. Physical fitness (PF) helps to promote strength, speed, endurance and mobility capabilities, which are associated with the required physical characteristics (Marten, 1973, p. 109). The sport of volleyball is a fast paced, dynamic game that demands a good athletes' level of physical and mental fitness during the course of play that requires the volleyball players' quickness and agility. The game has been positively and significantly affected by the modern methods of training and preparing players a different physical and skill levels. Muhammad Subhi (1997) believes that the special physical fitness in volleyball is represented in the body competence in facing physical, psychological, planning and skill requirements of the game (Muhammad Subhi Hassanein et al., 1997, p. 31), especially blocking and attacking. Matsudaira () states that physical strength is an essential component of hitting/or spiking in volleyball, while performance velocity is a decisive factor in attacking. Therefore, the correlation between these two physical and skill factors is achieved in a system known as a scheme developed and managed by a specialized coach, through which a team player or team players can develop and evolve their potential capacities, which results in an improvement in individual and collective performances. Many experts believe that fitness elements are a cornerstone for all physical activities because they work to impart basic physical characteristics in a comprehensive and balanced manner to the individual (Platnov; 1994, Matviv; 1996, Shepherd; 1999). Fitness elements differ from one sport to another according to the nature and type of physical activity. On this basis, the specific preparatory phase (SPP) aims to increase the volume of general exercises associated with various sporting activities while encouraging sports specialization in

athletes and therefore enabling them to optimize the best physical preparation (Imad al-Din Abbas Abu Zaid, 2005, p. 37). The latter contributes furthermore to improving the common techniques in volley ball. The capacity to delay the onset of fatigue proves the athlete's skill efficiency, especially after many different repetitions. It is not possible, for example, to perform the movement of blocking by a blocking wall player who is unable to jump vertically at an appropriate time to a maximum highest point. The same is true for an attacking player, whose movement is characterized by performance velocity. Because the sport of volleyball depends on the anaerobic energy system by 80%, in which the high-intensity interval training (HIIT) on the athletic performance is in the range of 15-30 seconds.In an analytical study about the various positions and tasks in the game of volleyball, Julian Tolle (2006)says that the players' contacts that take place over the net, such as attack and block, require high levels of vertical jumping ability and explosive strength, while other skills require high levels of velocity in the performance of a given movement. Based on the above, the main - and most relevant - question is: Does developing some special physical performance characteristics (explosive strength, maximal strength, and performance velocity) have an effect on improving attacking and blocking skills in volleyball?

2- General objective of the study:

The study aimed to:

1) Developing special physical performance characteristics (explosive strength, maximal strength, and performance velocity) has an effect on improving attacking and blocking skills in volley ball.
2) Developing explosive strength has an effect on improving blocking and attacking skills.
3) Developing maximal strength has an effect on improving blocking and attacking skills.
4) Developing performance velocity has an effect on improving blocking and attacking skills.

3- Procedural definition of the concepts mentioned in the research:

Explosive Strength:
It is the ability to overcome resistance with high speed (Thollet Julien, 2006, p. 16).

maximal strength:
is the maximum force a muscle can exert in a single maximal voluntary contraction (Thollet Julien, 2006, p. 16).

Speed of Performance:
The ability of the player to move from one place to another quickly to carry out special movements of the game with or without the ball (Thollet Julien, 2006, p. 17)

Attacking:
It is a direction of the ball performed by the player and is in the air after a vertical rise along the grid so that his movements are consistent, consistent and with correct timing (Arie selinger & Joan Ackermann-Blount, 1992, p. 99).

Blocking:
It is a process that takes place against and near the net, performed by one or three players by jumping to the maximum height with the arms stretched high and forward (Arie selinger & Joan Ackermann-Blount, 1992, p.100).

4- The methodological procedures used in the study:

4-1 Method and tools: This approach uses experiment to prove hypotheses and take a series of necessary actions to control the influence of other factors than the experimental one (Atoui and Jawdat, 2000, p. 193).Besides, the adopted one-group pretest-posttest design is employed in which the same dependent variable is measured in one group of participants before (pretest) and after (posttest) a treatment is administered:

EXPERIMENTAL GROUP: PRETEST --- TREATMENT --- POSTTEST.

-Sample:

Table 1: shows moderation and homogeneity of the sample in growth variables (n = 8)

Numb	Variab	Measurem	Arithme	Standar	Medi	Torsion

er	le	ent Unit	tic Mean	d Deviation	an	Coefficient
1	Age	Year	16,63	0,574	16,52	-1,213
2	Training Age	Yea	1,35	0,494	1,02	0,814
3	Height	Cm	182,17	3,326	182	0,093
4	Weight	Kg	76,51	3,531	76,51	-0,069

Research Variables:

The variables of this study were identified as follows:

-Independent variable: three selected physical performance characteristics; and

- Dependent variable: blocking and attacking skills were examined as dependent variables.

- A set of physical fitness tests was defined in this study as follows

a.Sargent Jump (Vertical Leap) Test :

Purpose: to measure the leg maximum muscle strength from standstill. (Sargent D., 1921, p. 188).

b. Running vertical jump (with run-up)

Purpose: to measure the leg maximum muscle strength with run up. (Hassanein Mohamed, 2001, p. 236)

c.Speed test (6m x 3):

Purpose: to measure performance velocity.(Hassanein Mohamed, 2001, p. 255)

Scientific Coefficients of Physical Tests:

Stability testing:the stability was evaluated using 6-days test-retest reliability method on the same first survey sample of four (4) Amel Gouraya cadet volleyball players, selected from outside the original study sample.

Table 2: shows the results of Pearson correlation coefficient for determining test-retest reliability

Number	Tests	Coefficient of Stabilit	n-Sample	Level of significance	Degree of freed	Tabular-	Significance

		y	Size		om	value	
01	Vertical Jump (from Stands till)	0.922	04	0.05	07	0.666	Statistically significant
02	Vertical Jump (with Run-Up)	0.863					
03	Speed test 6mx3	0.946					

-Validity of instruments (study tests):a test has content validity if it measures what it claims to measure. This estimate also reflects true differences among individuals on the characteristic being measured(Aouis and Khair El Din, 1999, p. 53)

Table 3: shows the results of validity coefficient square root of test's reliability coefficient

Number	Tests	Coefficient of Stability	n-Sample Size	Level of significance	Degree of freedom	Tabular-value	Significance

01	Vertical Jump (from Stands till)	0.960	04	0.05	07	0.666	Statistically significant
02	Vertical Jump (with Run-Up)	0.928					
03	Speedtest (6mx3)	0.972					

-Quantitative observation: the researcher observes and seeks to collect (quantitative) data, using a pre-prepared tool (Amer Ibrahim Qandilji, 2012, p. 260)

In the present research paper, anote card, which is officially endorsed by expert specialists of the Scientific Committee during the 9th All Africa Games (AAG), in Algiers (Algeria) 2007, was adopted. Student's Notecards - Term Of Use.

Statistical tools:

A SPSS software was used for data processing.

*Percentages; Standard Deviation; chi-square ($\chi 2$) statistic; Arithmetic Mean; Median; Torsion Coefficient; Pearson's correlation coefficient (Pearson's r); Student's t-test; Effect size (r^2).

- The scientific foundations of the tool:

Training Program:

Table 4: demonstrates the training program for the specific preparatory phase (SPP) in volleyball

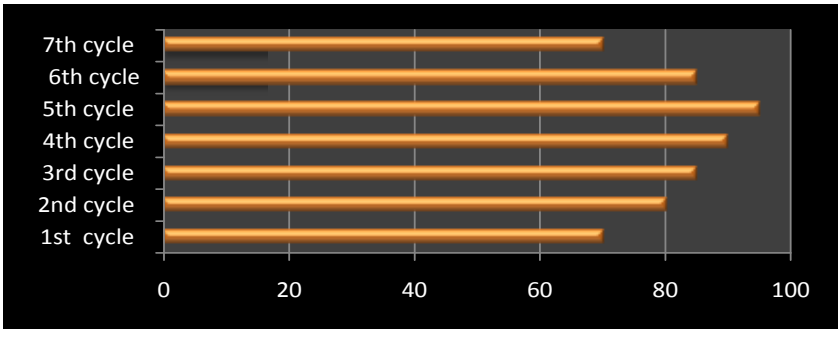
Developed Physical	Session number	Maximum Intensity	Hourly Volume	Objectives (Development)	friendly encounters

characteristics		(%)			
Power Elements Neuromuscular Elements Dominant Objectives Power Capabilities Power	40	65%-95%	45 Min 60 Min	Anaerobic Capacity Explosive Strength Maximal Strength Jump Power Speed & Agility Reaction Time Performance Velocity Coordination Prevention	3
Nb: hourly volume represents physical activity performed during each session					

Program Basis:

A 7-weekprogressive training program was planned. The program includes40exercise sessions; 5-6 times a week, 45-60 minutes per session, each at an intensity between 65%-95% of HRmax.

Figure 1: represents exercise intensity/per week during a specific preparatory phase (SPP)



4-2 Presentation and Analysis of Results:

This section covers the results of the first phase of this study.
The first sub-hypothesis was as follows:

✓ Developing explosive strength has an effect on improving blocking and attacking skills .

Running Vertical Jump (With Run-Up)

Table 5: shows student's t-test results for SJ with Run-Up

Statistical Scales / Tests	N-Sample Size	Mean	Standard Deviation	Calculated t-value	Tabular t-value	Level Of Significance	Degree Of Freedom	Statistical Significance
Pre-test	08	2.91	0.18	2.86	2.14	0.05	07	Significant
Post-test	08	3.22	0.24					

As set forth in Table 7 above, it is clear that the arithmetic average and standard deviation results of the participants' pretest-posttest scores were 2.91, and 3.22; and 0.18, and 0.24; respectively. For a significance level of 0.05 and 7 degrees of freedom, the calculated t-value, and tabulated t-value are 2.86, and 2.14; respectively. It can be therefore revealed that there are statistically significant differences at the level of significance ($p \leq 0.05$) and thus.

The second sub-hypothesis was as follows:

✓ Developing maximal strength has an effect on improving blocking and attacking skills.

Standing Vertical Jump (From Standstill)

Statistical Scales / Tests	N-Sample Size	Mean	Standard Deviation	Calculated t-value	Tabular t-value	Level Of Significance	Degree Of Freedom	Statistical Significance
Pre-test	08	2.76	0.062	2.50	2.14	0.05	07	Significant
Post-	08	2.84	0.067					

test								

Table 6: shows student's t-test results for SJ from standstill

As seen in Table 8 above, the arithmetic average and standard deviation results of the participants' pretest-posttest scores were 2.76, and 2.84; and 0.062, and 0.067; respectively. For a significance level of 0.05 and 7 degrees of freedom, the calculated t-value, and tabulated t-value are 2.50, and 2.14; respectively. It can be therefore revealed that there are statistically significant differences at the level of significance ($p \leq 0.05$) and thus.

The third sub-hypothesis was as follows:

Developing performance velocity has an effect on improving blocking and attacking skills:

Standing Vertical Jump (From Standstill)

Table 7: shows student's t-test results for Speed test (6m x 3)

Statistical Scales / Tests	N-Sample Size	Mean	Standard Deviation	Calculated t-value	Tabular t-value	Level Of Significance	Degree Of Freedom	Statistical Significance	Effect size
Pre-test	08	74.5	20.57	0.01	2.14	0.05	07	Non-significant	0.9
Post-test	08	76.37	31.25						

4-3 Discussion and interpretation of the results:

- Discussion and interpretation of the first sub-hypothesis was as follows:

the proposed program affects the level of force-velocity (F-V) characteristics of the leg muscles. This is attributed to the fact that the programmed sessions have an effective role in improving the level of force-velocity (F-V) characteristics of the leg muscles that are based on the moderating factors, i.e. linear velocity, elevation angle, and centre of gravity (COG) of the human body during elevation. Skill-based training sessions therefore focus on building powerful legs to

target the core strength muscles of the legs and accordingly, most gross motor (physical) skills; such as digging from fast-twitch muscles that lasts shorter than 0.5 seconds, require explosive leg strength performances. Claude Gacquemoude (2002) believes that developing explosive strength requires developing muscular endurance in terms of maximum strength and stretch tolerance so that the work is balanced between the two goals. Since the sport requires a variety of movements, there are three main types of movements that players use most frequently, Squat(Partial squat; Parallel squat; and Deep squat); Kinetic Chain (open and closed kinetic chain(KC) exercises), and Shoulder Stretches (shoulder opening exercise)employed in this experiment. It should be further noted that a circuit style training, which is based on a series of workshops has been adopted with variation in objectives. Also, specific supplemental workshops were directly aligned with trampoline exercises (single-leg bounces and jumps, vertical jumps, box jumps, and hurdle jumps at a predetermined height). The selection of these exercises were typically based on fast-twitch characteristics to target the core strength muscles of the legs, and thus, in turn, to increase maximal capabilities of leg muscles in participants. To reduce the impact of excessive tiredness and fatigue, a descending hierarchical training process, starting physical exercises with weighting in a descending manner from lifting heavier weights to lifting lighter weights safely, was designed and adopted. Following this, the participants were subjected to sets of maximal eccentric contractions to promote greater gains in muscular strength. Claude Jacomode (2002) believes that there is a divergence in muscle attachment sites as a result of using braking technique during jump training work. However, compared to concentric contractions, eccentric contractions seems to be more effective to increase muscle strength hup to 130%with results; ranging from 100 to 130%, appear after 8-week weights training workout. The technique also helps to reduce the reaction time (RT)in athletes.For this reason, the majority of specialists consider it appropriate for volleyball because it directly affects the development of jumping agility. Indeed this is a fact confirmed in studies by Ghandour (2010), Abdel Bari (2009) and Hunter (2002) state that plyometric training and sport-specific exercises have a positive effect on developing and improving the maximal capabilities of leg muscles. As regards the force-velocity

(F-V) characteristics, Al-Sayed and Ziadeh (2002) note that force-velocity (F-V)characteristics is one of the most is one of the basic physical qualities of volleyball players required in building a blocking wall or in spiking a volleyball. Most movements and technical skills in volleyball center around force-velocity (F-v) profile on jumping performance.For this, the present research purpose necessitated the use of the dynamic effort (DE) method training, especially for the middle-blockers and the attackers.

- Discussion and interpretation of the second sub-hypothesis was as follows:

The proposed training program affects the level of maximal strength (MS) of the leg muscles.It should be noted that an8-week weights training workout (basically 2 or 3 sessions per week) during a specific preparatory phase (SPP) was performed using different intensities (light or heavy weights)and approaches, according to athlete's age, ability, development level and workouts volume. It should also be pointed out that two basic maximal strength training (MST) approaches; training induced hypertrophy (muscle fiber size increase) and training-induced modification in autonomic nervous system were adopted. Both approaches were implemented for eight (8) weeks, with one (1) session per five (5) training units (TU) strength training.This is in line with the study of Delorme (1996), who emphasizes that there are certain methods suitable for the development of maximal dynamic strength in volleyball players, due to specificity and performance of the game, which is characterized by a need to maintain speed and flexibility, through two specific methods including; above-average-load-training (with many repetitions over multiple sets) and max-load-training. In light of the fact that two important principles were also relied upon in this research, the first was the *overload principle (OP)*; the coach must adjust individually the training load (TL) of an athlete according to individual differences(position, task and total sport participation); i.e, the individualization principlemust be taken into account to improve weaknesses and strengths,as Maureen (1993) argues that the coach must continuously increase training loads (TL) in order to ensure the level of stability in athletes, and the second was the progression principle(PP); this entails that progression in load intensity in volleyball game is based mainly on the degree of development of the player to maintain the level of competition and

functional adaptation and periods in sport.. It is for this reason that the development of maximal strength has always been a major role in the development of the vertical jump of volleyball players.

- Discussion and interpretation of the third sub-hypothesis was as follows:

the proposed training program affects the athlete's performance velocity level. It's worth to note that the proposed program focused on developing performance velocity, which is one of the most important capacities that a volleyball player needs in most positions and in total sport participations by developing anaerobic, non-lactic energetic branch that is considered the first source of energy for players' speed abilities (SA), especially if it is related to complex techniques; such as, building a blocking wall or spiking a volleyball.According to a study conducted at the Institute of Human Physiology, University of Siena, Italy; related to physical requirements and their relationship to the new rules of vollyeball game, the server has 5 seconds or less to perform the serve and accordingly the researchers concluded that the percentage of serves (%) is very high (Fontani et al., 2002). This result confirms the role of the anaerobic, non-lactic branch in volleyball, in which a greater importance needs to be given to anaerobic capacity exercises (10-20 seconds hard effort), in contrast to the anaerobic capacity exercises. Where very little emphasis has been placed on it, at the stage of planning of the physical-training program. It is further worth to note that as mentioned above, the nature of the activity is dependent upon the short distance and quick workout (Reps: 5-6/Set) to search for acceleration between players at different competition levels, with clear milestones and an estimated completion timeline (3-6 sec) to attain the goals. In point of fact, it is remarkable to note that Cometti (1997) argues that developing performance velocity requires kinematic coordination. Based on this, the development of velocity is important in volleyball due to the nature of movements, which are mostly complex movements that must be performed with fastest possible time.

Conclusion:

The present paper examines the effect of some physical performance characteristic son improving volleyball blocking and attacking skills. From the outcome of our quasi-experimental research, it is possible to

conclude that there was a noticeable improvement in certain sport-specific physical abilities, namely; MS, ES, and PV, in volleyball athletes. The results implies that the good physical preparation has an important role in optimizing skill performance, which in turn contributes to improving both individual and collective performances among players.The conversion of strength into explosive power and speed with drills to improve block and attack techniques increases vertical leap to the highest point possible.PV and RT are a keystone for a successful attacking or blocking in whatever strategic position on a volleyball court. As a matter of fact, the results should be applicable also to outline drills and training programs that help to enhance individual and collective performances. Further research will be needed to validate special planning processes that will be based on sound scientific foundations to develop skills and physical abilities, in view of its positive impact on athletes' level of performance. The work will involve the use of modern training methods for sports-specific physical preparedness, with an emphasis on exercises that are related to physical and motor skill development to meet the requirements of the game.

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