World Journal of Sport Sciences 3 (S): 663-667, 2010
ISSN 2078-4724

A Comparative Study of Some Kinematical Characteristics for Front Jump Set Between Male and Female Volleyball Players

Mahmoud Mohammed Mohammed El-Tayeb

Department of Sport Games Training,
Faculty of Physical Education for Men, Alexandria University, Egypt

Abstract: The study aims to kinematically compare the front jump setting techniques between male and female volleyball players through recognizing the quantitative differences in some kinematical variables of male and female techniques. The sample has been selected intentionally from some premier league clubs players with a total of 10 players. Five male players (age: 25.3±2.5years; height: 188.0±3.5cm; body mass: 83.2±6.0 kg; mean ±SD, respectively) and five female volleyball players (age: 23.6±2.2 years; height: 178.0±5.1cm; body mass: 79.2±5.5 kg; mean ±SD, respectively) participated in this study. The researcher used the descriptive methodology using surveying approach by video and analyzing using the computer two synchronized digital video cameras (Panasonic - nv.3000EM) to record the subjects. A dependent sample t-test was used to test the variables between male front jump setting performance (MJS) and female front jump setting performance (FJS). The results indicated that MJS had significantly greater resultant CM velocity than FJS at takeoff. The MJS also had greater jump height, vertical displacement, velocity, angular velocity than FJS at contact ball. Shoulder velocity, angular velocity was larger in MJS but with no significant difference ($p = 0.106, 0.357$). The MJS had significantly greater resultant in ball angle, angle of projection and height release than FJS at contact ball. The MJS also had greater ball R. Velocity than FJS at contact ball. But there was no significant difference ($p = 0.46$) in ball y. velocity. The FJS had significantly greater resultant ball x. velocity than MJS at contact ball. This study provides information for coaches in teaching volleyball setting techniques.

Key words: Volleyball · Jump setting · Kinematical variables

INTRODUCTION

Setting is a fundamental skill of winning volleyball teams and one of the most important offensive weapons in the competition. It is the main joint between offense and defense because it aims for preparing attack. Setting techniques have received considerable attention in the volleyball literature. However, universal agreement on the proper or best method of executing the setting technique has not been attained [1, 2]. The published resources available to the volleyball coach and player are replete with the subjective and conflicting information of the various authors [3-5]. Few research studies have been conducted on setting techniques and even fewer focus on set variations such as stationary setting for front or back setting [2]. Numerous technique changes and new techniques have evolved in recent years as the level of volleyball has reached new heights in the world. Jump sets are one of the most important setting types and tactics. A setter must be able to deceive the defense with respect to set destination and time of delivery. Disguising the type of set that is being executed is essential in good levels of play in volleyball. Such deception by the setter frequently allows the hitter to attack against a single blocker or a poorly positioned defense which enhances the offense's scoring opportunities. Additionally and equally important is learning what the defensive players should be keying in on which will enable them to read the setter and establish a successful defense [1]. Recently, various statistics and scientific studies showed that the Egyptian men's volleyball team has good performance in the International Volleyball Competition on one hand. But on the other hand, with inferior stature, the Egyptian women's volleyball team performance in the International Volleyball

Corresponding Author: Mahmoud Mohammed Mohammed El-Tayeb, Department of Sport Games Training, Faculty of Physical Education for Men, Alexandria University, Egypt.

Competition. The purpose of this study was to kinematically compare the front jump setting techniques between male and female volleyball players through recognizing the quantitative differences in some kinematical variables of male and female techniques. It is important to study the differences between these two performance as well as it is necessary to know more about the components of skill performance and what this knowledge can achieve in simplifying training and teaching procedures. Studying results can provide useful information for coaches to train volleyball front jump setting techniques on one hand and improving performance level on the other hand.

MATERIALS AND METHODS

The sample has been selected intentionally from some premier league clubs players with a total of 10 players. Five male players (age: 25.3±2.5years; height: 188.0±3.5cm; body mass: 83.2±6.0 kg; mean ±SD, respectively) and Five female volleyball players (age: 23.6±2.2 years; height: 178.0±5.1cm; body mass: 79.2±5.5 kg; mean ±SD, respectively)participated in this study. The researcher used the descriptive methodology using surveying approach by video and analyzing using the computer synchronized two digital video cameras (Panasonic - nv.3000EM) to record the subjects. A dependent sample t-test was used to test the variables between male front jump setting performance (MJS) and female front jump setting performance (FJS).Each subject performed five successful male front jump setting performance (MJS) and female front jump setting performance (FJS) into the valid area (Fig. 1). Twenty-one body landmarks (head, ears, shoulders, elbows, wrists, fingers, hips, knees, ankles, heels and toes) were digitized and analyzed with the motion track amusement system (Fig. 2). The x and y CM of 2 D data were calculated by sum of CM of segment in x and y direction and divided by body mass. The jump height was defined as the height from the vertical displacement of CM at takeoff to the highest point. The CM horizontal displacement was defined from the takeoff to the ball impact.

RESULTS AND DISCUSSION

Table 1 showed the variables of the joints and CM kinematic variables of the male front jump setting performance (MJS) and female front jump setting performance (FJS). The MJS had significantly greater resultant than FJS at takeoff variables of vertical displacement (wrist, Elbow, Shoulder and Knee) and also CM height, CM takeoff Velocity. There was no significant difference between male and female in Variables of hip and ankle displacement (Fig. 3-6).

Table 2 showed the variables of the Joints and CM kinematic variables of the male front jump setting performance (MJS) and female front jump setting performance (FJS). The MJS had significantly greater resultant than FJS at contact ball variables of wrist, Elbow and shoulder's vertical displacement, wrist velocity, elbow velocity, angular velocity and also Elbow angle, Shoulder angle and CM height. There was no significant difference between male and female in variables of Shoulder velocity, angular velocity Although it was larger in FJS (p = 0.106, 0.357) (Fig. 3-6).

Table 3 showed the ball kinematic variables of the male front jump setting performance (MJS) and female front jump setting performance (FJS). The MJS had significantly greater resultant ball angle, angle of projection and height release than FJS at contact ball. The MJS also had greater ball R. velocity than FJS at contact ball. There was no significant difference in ball y. velocity (p = 0.46). The FJS had significantly greater resultant ball x. velocity than MJS at contact ball.

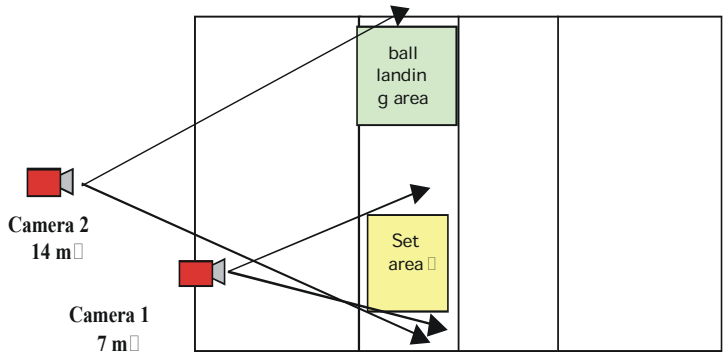

Fig. 1: Experimental set-up showing tow camera area

Fig. 2: body landmarks

Table 1: Limb Joints and CM kinematic Variables of the male front jump setting performance (MJS) and female front jump setting performance (FJS) at takeoff

Joints and CM kinematic Variables	(MJS) Mean ± S.D	(FJS) Mean ± S.D	t	p
Wrist Vertical displacement (m)	2.262±0.0320	2.138±0.067	3.709**	0.006
Elbow Vertical displacement (m)	1.826±0.0350	1.712±0.047	4.278**	0.003
Shoulder Vertical displacement (m)	1.916±0.0430	1.824±0.032	3.75**	0.006
Hip Vertical displacement (m)	1.078±0.0500	1.036±0.068	1.103	0.302
Knee Vertical displacement (m)	0.628±0.0540	0.536±0.066	2.391*	0.044
Ankle Vertical displacement (m)	0.216±0.0180	0.20±0.0150	1.486	0.176
CM height (m)	1.212±0.2590	1.172±0.258	2.44*	0.04
CM VR. Takeoff (m/s)	3.712±0.4093	2.39±0.6077	4.034**	0.004

(**p <.01) - (*p <.05)

Table 2: Limb Joints and CM kinematic Variables of the male front jump setting performance (MJS) and female front jump setting performance (FJS) at contact ball

Upper limb Joints and CM kinematic Variables	(MJS) Mean ± S.D	(FJS) Mean ± S.D	t	p
Wrist Vertical displacement (m)	2.500±0.1270	2.276±0.033	3.794**	0.005
Elbow Vertical displacement (m)	2.304±0.0220	1.972±0.041	16.010**	0.000
Shoulder Vertical displacement (m)	2.236±0.0560	1.980±0.143	3.736**	0.006
wrist R. velocity (m/s)	2.560±0.1670	2.150±0.326	2.503*	0.037
Elbow R. velocity (m/s)	2.264±0.3740	1.498±0.427	3.014*	0.017
Shoulder R. velocity (m/s)	1.756±0.4540	1.264±0.398	1.822	0.106
Wrist angle (dg)	140.40±4.66900	163.80±7.9810	-5.650**	0.000
Elbow angle(dg)	172.80±4.86800	163.20±2.1680	4.028**	0.004
Shoulder angle(dg)	132.00±4.47200	105.00±15.605	3.719**	0.006
Wrist Angular velocity (rad/s)	11.688±3.4869	7.12±1.5961	2.664*	0.029
Elbow angular velocity (rad/s)	8.312±0.5350	4.314±0.901	8.529**	0.000
Shoulder angular velocity (rad/s)	8.136±3.3960	6.562±1.194	0.978	0.357
CM height (m)	1.658±0.0280	1.568±0.040	4.16**	0.003

(**p <.01) - (*p <.05)

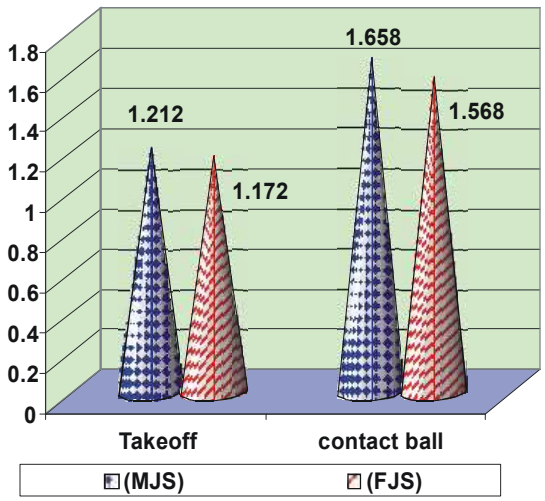

Fig. 3: The vertical displacement of the center of mass (CM) in takeoff and contact ball between male (MJS) and female (FJS))

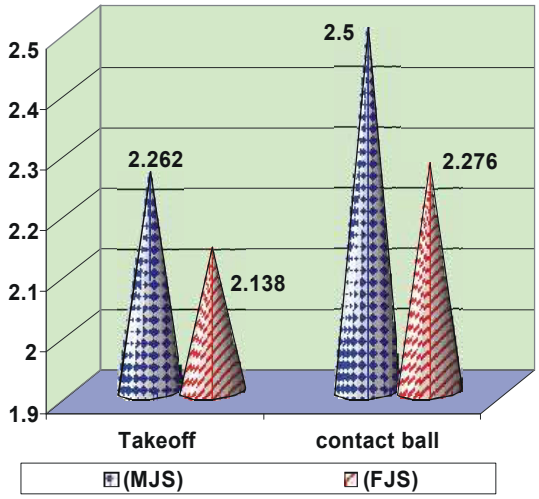

Fig. 4: The wrist vertical displacement in takeoff and contact ball between male (MJS) and female (FJS)

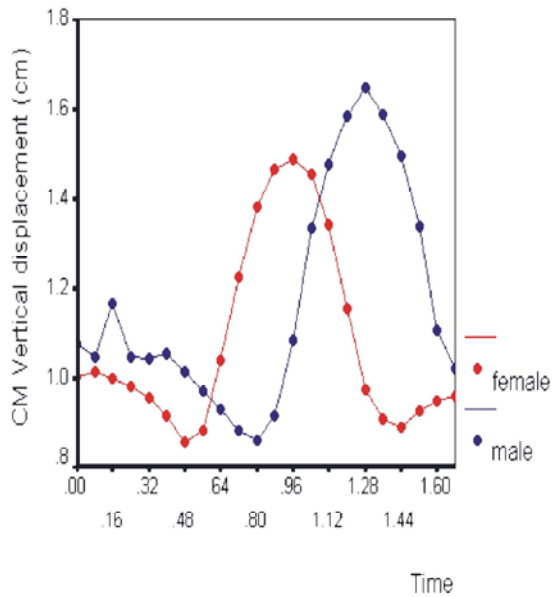

Fig. 5: The vertical displacement of the center of mass (CM) for male (MJS) and female (FJS))

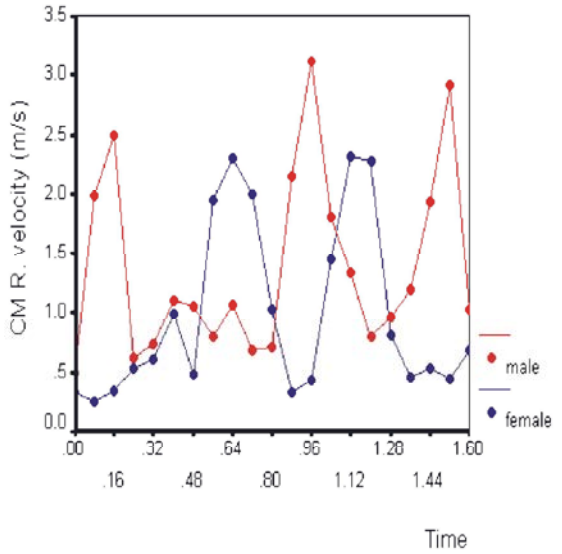

Fig. 6: The R. velocity of the center of mass (CM) for male (MJS) and female (FJS))

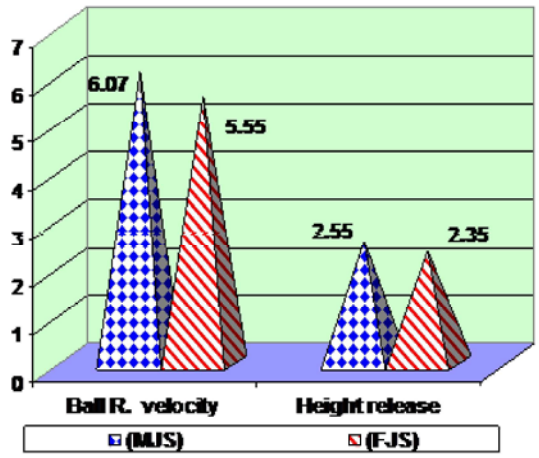

Fig. 7: Ball velocity, height release for front jump setting performance for male (MJS) and front jump setting performance for female (FJS)

CONCLUSION

The purpose of this study was to kinematically compare the front jump setting techniques between male and female volleyball players. The results showed that the male front jump setting performance (MJS) had greater values than female front jump setting performance (FJS) on CM velocity at takeoff, jump height, wrist vertical displacement, elbow vertical displacement, velocity, angular velocity, shoulder velocity, angular velocity, ball angle at contact ball, ball R. velocity. But the results showed that the female front jump setting performance (FJS) had greater values than male front jump setting performance (MJS) in wrist angle and ball x. velocity.

Recommendations: The study provides useful information for coaches training volleyball front jump setting techniques, the most important recommendations included the necessity of making use of the arithmetical values of the resulted kinematical variables mediums,

Table 3: Ball kinematic variables of the male front jump setting performance (MJS) and female front jump setting performance (FJS) at contact ball (Fig. 7)

	(MJS)	(FJS)		
Ball kinematic Variables	Mean ± S.D	Mean ± S.D	t	p
Ball angle- Angle of Projection)dg)	69.80±3.350	52.00±4.360	7.24**	0.00
Height release(m)	2.55±0.090	2.35±0.040	4.46**	0.00
Ball x. velocity (m/s)	0.600±0.62	2.194±1.05	-2.91*	0.02
Ball y. velocity (m/s)	4.90±0.450	4.65±0.560	0.78	0.46
Ball R. velocity (m/s)	6.07±0.330	5.55±0.220	2.95*	0.02

(**p <.01) - (*p <.05)

giving importance to training on the concluded kinematical indices which represent the difference between the two setting techniques when attempting to develop the technical performance of these two performance and giving importance to build some qualitative exercises in the light of the concluded kinematical indices which quantitatively differentiate.

REFERENCES

1. Ridgway, M.E. and J. Wilkerson, 1990. A kinematic analysis of the front set and back set in volleyball. 4th International Symposium on Biomechanics in Sports, Halifax, Canada, International Society of Biomechanics in Sports, pp: 240.
2. EL-Tayeb, M., 2004. Biomechanical analysis for some forms set-up for setters in volleyball. M.Sc. Thesis, Faculty of Physical Education, Alexandria University, Egypt, pp: 4, 5 (In Arabic).
3. Richards, J. and J. Wilkerson, 1984. The use of microcomputers for initiating the teaching of kinesiology through film analysis. Second national Symposium on Teaching Kinesiology and Biomechanics in Sports. Colorado Springs, CO, United States Olympic Committee, pp: 147-149.
4. Gozansky, S., 1983. Championship Volleyball chnigues and Drills. Parker Publishing, New York, pp: 200.
5. Hay, H. and B. Gench, 1985. Kinematics set and the row-set in volleyball. In: J. Terauds, (Ed.), Biomechanics in sports. Del Mar, CA, Academic Publishers, pp: 298-303.