International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 02, 2020
ISSN: 1475-7192

A compressive study between jump vs land phase by some biomechanics and EMG variables during spike in volleyball

[1]Lecturer. Mohammad A. Hassan; [2]Asst. Prof.Safaa A. ismeel; [3]Asst.Prof.Nagham Salih Neamah

Abstract

The purpose of this study was to investigate the amount of some biomechanical variables (fly angle/land, horizontal displacement HD, angle of knee and hip, impulse and braking impulse) and electromyography (Area under curve AUC, Time Before Peak TBP and Time After Peak TAP) for targeted muscle groups in leg (LAT. GASTRO , TIB.ANT., RECTUS FEM., BICEPS FEM.).The subjects (10 M, age 20 -24 years) who were participated in Iraqi league during spike in volleyball. The technical that depended to record muscle activity was (Myotrace 400 from Noraxon company) and to determined biomechanical variables we used (Techno DYNAFOOT©), DYNAFOOT2 software is compatible with computers, laptops and tactile tablets under Windows operating system and equipped with a Bluetooth connection. Also we used Casio digital high speed camera (320f/s) to investigate joint angle and analysed by Kinovea v.8.15 software. The result come to show us there is a significant differs between two types in EMG variables so in some biomechanics.

KEY WORDS: *Electromyography, volleyball, Biomechanics, Impulse, Dynafoot, Kinematics, Kinetics.*

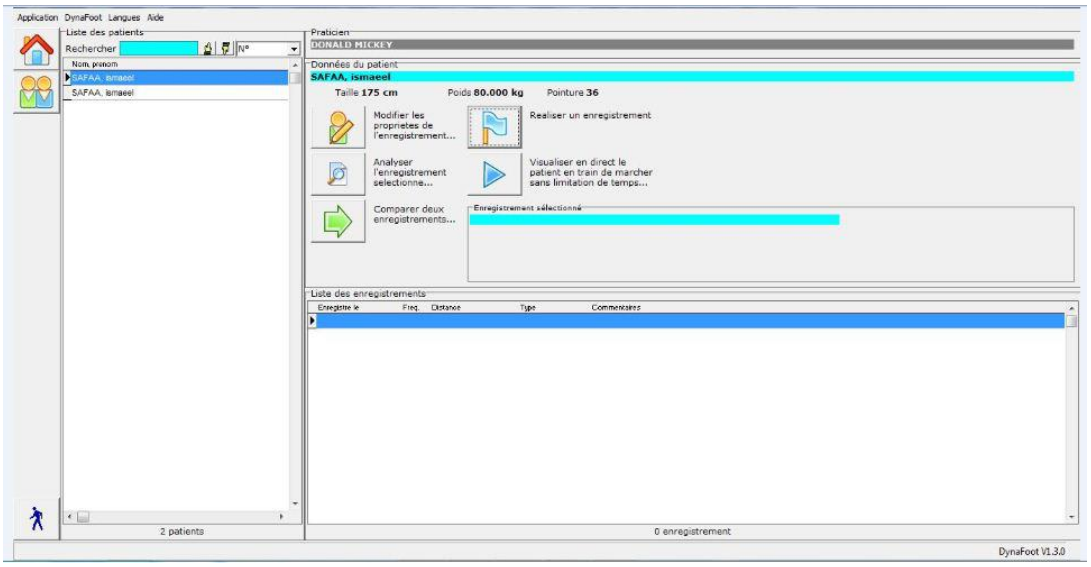
INTRODUCTION: The volleyball is most popular today. For many people volleyball is highly skilled game, which dominates the competitive element for some it is sport for fun and recreation. (Saggar 1994) Every sport activity needs certain movements, procedure to tackle a particular task, which refers to technique.(Sirirat 2015) The overhead movement skills are to project the objects for horizontal distance with accuracy and effectiveness by velocity enhancing. Biomechanical variables were depend on each both side (kinetic & kinematic), we are could identify on kinematic by observer and analyse it, but the other side we need to use tools and equipment to capture it like force platform and Electromyography method.(Mork PJ,2005) Recordings of electromyographic (EMG) signals can have duration of hours when muscle function needs to be continuously monitored, as in the monitoring of working activities. Hunter etal.(2005) measured GRF impulses for one single step at the16-mmarkofa typical 25-m sprint in 36 non-specialist athletes.Theseauthors showedthatrelative (i.e.normalizedtobodymass) IMPH and IMPHþ were the strongest predictors of sprint velocity. Mero(1988) studied the first contact following the starting-blocks push-off in 4 sprinter sand showed that IMPV was not significantly correlated to running velocity, whereas IMPHþ was .However, they didnot detail the correlations with IMPH and IMPH. Kawamorietal.(2012) showed that relative IMPH and IMPHþ measured at 8 m were significantly correlated with 10-mtime, butrelative IMPV and IMPHwere not. The authors therefore discussed the "lack of evidence that smalle braking impulse was associated with better sprint acceleration performance". The main limitation of these studies is that impulses were only measured in frequently steps and changing in sprinting or inside the once step, but thies study is go to study the load happined during push and stance period

METHODS: Ten young male (mean= 20years, std=0.3) players were attend in as a subject for this study they were at the Iraqi league. The subjects were good players and have been practicing the technique of spike for quite a considerable time. The test for performance of the technique of spike was conducted indoors on the Volleyball court of Hella. On the word of command "go" the subject passed the ball to the setter and goes for the spiking technique taking 3 - 5 strides. The camera (320 f/s) (Casio Ex-FC 100, Japan) was stand on the side of players vertical on the sagittal plane with width enough to full view of all spike skill, Dynafoot (DYNAFOOT©) is a wireless system for plantar pressures and gait spatial-temporal

[1] College of PE, University of Babil, Babil, Iraq
[2]College of PE, University of Diyala, Diyala, Iraq
[3]College of PE, University of Babil, Babil, Iraq

parameters analysis was used to investigate and measuring pressure and force sheds in two different points (jump and land) Three successful trials were collected. Kinematic data were examined and analysed using Kinovea V. 0.8.21 the variables were (horizontal displacement, hip angle, knee angle and fly/land angle). DYNAFOOT software v1.3.0 (figure 1) used to measure the force amount .EMG (Myotrace 400 four channel) from Noraxon used to record muscle activity during spike in volleyball. The muscle groups investigated was (LAT. GASTRO, TIB.ANT., RECTUS FEM and BICEPS FEM.) there is much of various variables in EMG but this study depend on; area under curve (AUC), time before the peak (TBP) and time after the peak (TAP) for each of two stage of skill (jump & land).
Researchers make to do every important steps for test as:

1- Prepare the subject by shaving the skin on a chooser muscles and fix the electrodes on it.
2- Wear the mini force platform inside shoes (figure2).
3- Insure that the signal of EMG and DYNAFOOT linked with PC.
4- Explain the propose of the test and the skill that will doing then give everyone three attempts.
5- Fixed the camera and record the test field including the subject.
6- Data was collected and ready to analyse it.



variables were significant different shown in table1.

Table 1
Results of mechanicals variables

Phase	Biomechanical				
	fly/land angle (deg.)	Horizontal displacement knee (cm)	knee angle (deg.)	hip angle (deg.)	Amount of (I,BI) (N)
Impulse	84 (±3)	13 (±4)	165 (±16)	158 (±14)	2875 (±112)
Braking impulse	87 (±5)	16 (±5)	124 (±11)	167 (±7)	2314 (±78)
T test	0.93	2.02	2.13	1.96	2.56
P value	0.41	0.04*	0.03*	0.05*	0.01**

Significant in P value equal or more (0.05)

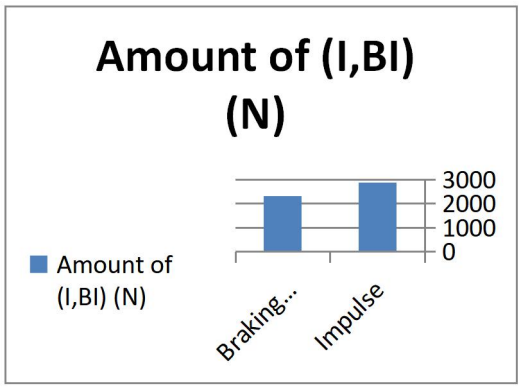
Table 2
Results of Electromyogrphy variables

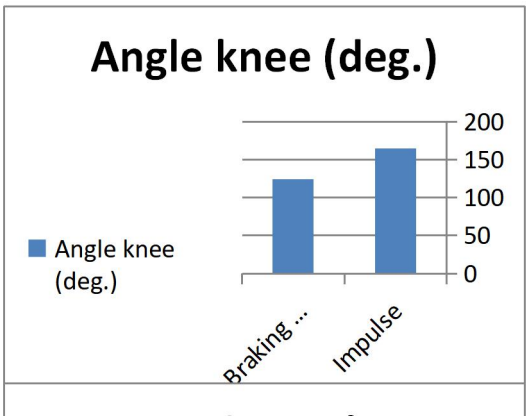
Muscle group	Impulse			Braking impulse		
	AUC (µv*s)	TBP (s)	TAP (s)	AUC (µv*s)	TBP (s)	TAP (s)
LAT. GASTRO	1820 (±34)	0.093 (±0.01)	0.113 (±0.02)	2536 (±212)	0.112 (±0.02)	0.213 (±0.03)
TIB.ANT.	1730 (±22)	0.083 (±0.01)	0.103 (±0.03)	2560 (±206)	0.108 (±0.03)	0.220 (±0.02)
RECTUS FEM.	1790 (±25)	0.099 (±0.03)	0.109 (±0.04)	2635 (±180)	0.117 (±0.04)	0.217 (±0.01)
BICEPS FEM.	1910 (±17)	0.089 (±0.05)	0.115 (±0.02)	2390 (±117)	0.121 (±0.01)	0.209 (±0.06)

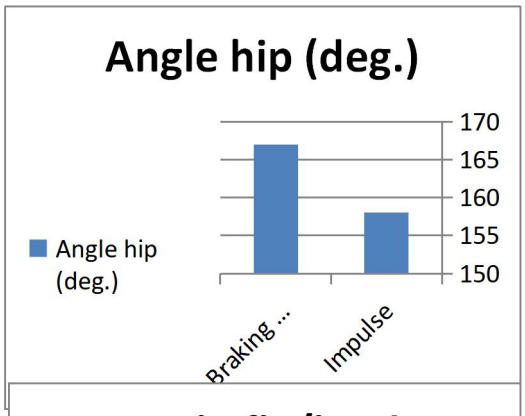
Table 3 show the difference in EMG variables between (I/BI)

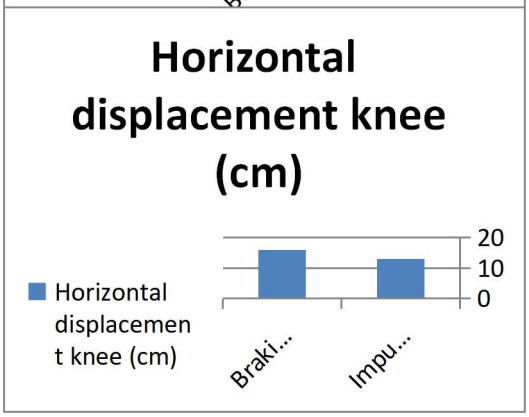
Muscle group	Variable	T	P
LAT. GASTRO	**AUC (µv*s)**	**2.91**	**0.001****
	TBP (s)	**2.34**	**0.03***
	TAP (s)	**2.11**	**0.04***
TIB.ANT.	**AUC (µv*s)**	**3.42**	**0.000****
	TBP (s)	**2.41**	**0.02***
	TAP (s)	**1.92**	**0.04***
RECTUS FEM.	**AUC (µv*s)**	**3.72**	**0.000****
	TBP (s)	**2.23**	**0.03***
	TAP (s)	**2.11**	**0.04***
BICEPS FEM.	**AUC (µv*s)**	**3.12**	**0.001****
	TBP (s)	**1.93**	**0.03***
	TAP (s)	**2.14**	**0.02***

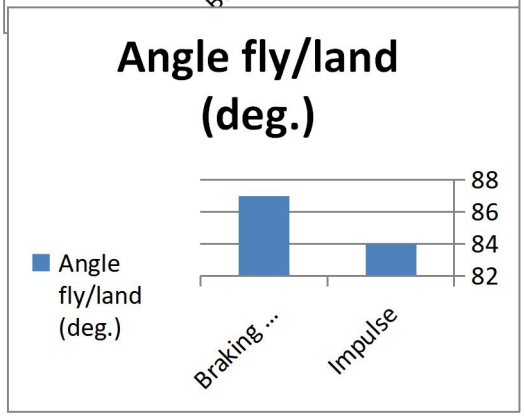
Significant in P value equal or more (0.05)

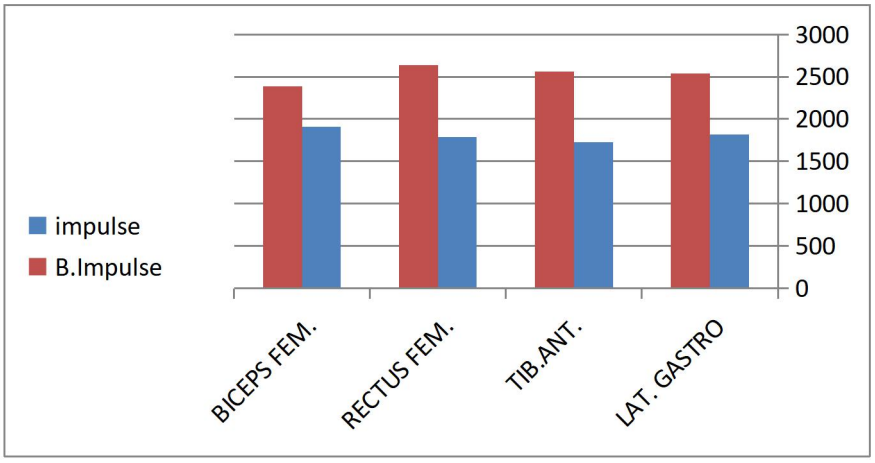

Amount of (I,BI) (N)
3000
2000
1000
0
Amount of (I,BI) (N)
Braking...
Impulse


Angle knee (deg.)
200
150
100
50
0
Angle knee (deg.)
Braking ...
Impulse


Angle hip (deg.)
170
165
160
155
150
Angle hip (deg.)
Braking ...
Impulse


Horizontal displacement knee (cm)
20
10
0
Horizontal displacement knee (cm)
Braki...
Impu...


Angle fly/land (deg.)
88
86
84
82
Angle fly/land (deg.)
Braking ...
Impulse


3000
2500
2000
1500
1000
500
0
impulse
B.Impulse
BICEPS FEM.
RECTUS FEM.
TIB.ANT.
LAT. GASTRO

These results came to show us the differs between two cases (impulse, braking impulse) in all variables that we determined, in table 3 show the difference in EMG variables between (I/BI), and we find that all of the variables came significance result proven that with P value under (0.05).

Discussion: from the statistical processes we find several case in different variables, in mechanical's variables we find fly/land angle not sig. because of the length of the last step that it depend on it the distance before net; so, there is different requirement in fly angle with land angle. while the horizontal distance between (I/BI) its significant because the body still under effect of Inertia[1]. As 2nd law "everybody keep its movement situation". Also the knee and hip angle came in significant differs between (I/IB) because of the prepare phase for jump and the absorption and the suitable performance[2]. The most important variable here is the amount of Impulse that occurred in both phases, there is a significant difference for the braking impulse phase[3], that reason is the long time period the more amount impulse, and as we saw the period of first phase is shorter than the second[4], even if the force in the other result but the equation contain (F and T) and the time here so effective in the result[5]. When we look to the electromyography variables we find all of them came in significant differs between two phases during jump and land,three variables were detected (area under curve AUC, and time before peak TBP, and time after peak TAP) for four muscle group, they record significant level under 0.05 and the reason for these was the period of time and the require of movement even its depend on the structure of joins and working on keep it with safe mode in movement[6].

Conclusion: at last we can summaries the conclusions in:

- There is different between impulse phase and braking impulse phase in mechanical variables.
- The wide knee angle the less hip angle during good amount of impulse.
- To provide the effective of force on the knee joint, you should to keep long period of time shown as the horizontal distance.
- High stimulation in group muscle shown in impulse phase predicted on it by the time before and after peak.
- All of the above result can lead us to a knowledge that the different muscle group can work side to side, at firstly to keep a part healthy and secondly to do the project it have to.

References :

1. Howie, Erin K., et al. "Head, trunk and arm posture amplitude and variation, muscle activity, sedentariness and physical activity of 3 to 5 year-old children during tablet computer use compared to television watching and toy play." *Applied Ergonomics* 65 (2017): 41-50.
2. https://scholar.google.com, safaaismaeel, Force –Time function correlate with some biomechanical variables and visual capabilities during forehand derive in badminton
3. Basma Naem Mohsen; Safaa Abdelwahab Ismail; Rafid Habib Qadouri: PREDICTING THE ACCURACY OF SPIKE SHOOTING SKILL PERFORMANCE WITH THE SIGNIFICANCE OF SOME VOLLEYBALL PLAYERSu2019 MOTOR FEATURES. The Swedish Journal of ScientificResearch (SJSR) (Vol.2, No. 2).

---

[1] Howie, Erin K., et al. "Head, trunk and arm posture amplitude and variation, muscle activity, sedentariness and physical activity of 3 to 5 year-old children during tablet computer use compared to television watching and toy play." *Applied Ergonomics* 65 (2017): 41-50.

[2] https://scholar.google.com, safaaismaeel, Force –Time function correlate with some biomechanical variables and visual capabilities during forehand derive in badminton

[3] Basma Naem Mohsen; Safaa Abdelwahab Ismail; Rafid Habib Qadouri: PREDICTING THE ACCURACY OF SPIKE SHOOTING SKILL PERFORMANCE WITH THE SIGNIFICANCE OF SOME VOLLEYBALL PLAYERSu2019 MOTOR FEATURES. The Swedish Journal of ScientificResearch (SJSR) (Vol.2, No. 2).

[5] Safaa ismaeel, Maher Aref; **Comparative research of moment of force of forearm muscles among the beginners and skilled handballers**, Scientific theory journal "Uchenye zapiski universiteta imeni P.F. Lesgafta", No. 4 (134) – 2016.

[6] Ali shboot, safaa a. ismaeel; **An analytical study of some biomechanical variables and electrical activity of the muscles for the international weightlifter Mohammed Karrar. Physical education journal. Issue2, no.4,2015.**

4. Safaa ismaeel, Maher Aref; **Comparative research of moment of force of forearm muscles among the beginners and skilled handballers**, Scientific theory journal "Uchenye zapiski universiteta imeni P.F. Lesgafta", No. 4 (134) – 2016.
5. Ali shboot, safaa a. ismaeel; **An analytical study of some biomechanical variables and electrical activity of the muscles for the international weightlifter Mohammed Karrar. Physical education journal. Issue2, no.4,2015.**