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Biomechanicalanalysis of some variables and EMG of the muscles during the performance of the snatch lift in weightlifting

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التحليل البيوميكانيكي لبعض المتغيرات والنشاط الكهربائي للعضلات خلال اداء رفعة الخطف في رفع الاثقال

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الملخص

تعد عملية المتابعة والتقييم من اهم عوامل نجاح الخطط الموضوعة, وما نجده من تقدم واضح وملحوظ في العمليات التدريبية جاء من خلال التفاعل الموضوعي بين عناصر التدريب الجيد وبين استخدام الوسائل الدقيقة لتوفير المعلومات الرصينة لتقييم مسيرة التدريب البناء. وبذلك فأن عملية الوقوف على نقاط القوة والضعف من خلال مسيرة العملية التدريبية يكون لها الاثر الكبير في اختصار الجهد والزمن والتكاليف. ولطبيعة فعالية رفع الاثقال فأن الرباع (والشباب على وجه الخصوص) لا يمكنه البقاء في فئة وزنية واحدة بسبب التطور البدني وزيادة القوة, لحدود معينة.

اصبح من المهم متابعة مسيرة التدريب للرباعين خلال مراحل انتقالهم من فئة لاخرى وتقييم انجازاتهم بناء على متطلبات كل فئة وللرفعتين الاولمبيتين الخطف والنتر. وبذلك عمد الباحث على تحليل اداء الرفعة بيومكيانيكاً في محاولة لتقييم مستوى الاداء في ظل الانتقال من فئة وزنية لأخرى بسبب التطور في المستوىوالنمو البدني. وتم استخدام كاميرا تحليل سريعة ومنصة قوة بالإضافة الى جهاز تسجيل النشاط الكهربائي للعضلات. وتم تحليل رفعة الخطف خلال وحدة تدريبية. وتم الوصول الى نتائج تصب في مصلحة تقويم الاداء التدريبي والفني فضلا عن تحديد بعض نقاط الضعف التي من شأنها ان تتضاعف ان لم يتم وضع حلول لها.

Abstract

The process of follow-up and evaluationis one of the most important factors for the success of the plans developed, and whatwefind of clear and noticeableprogress in training processes came through the objective interaction between the elements of good training and the use of Accuratemeans to providesolid information to evaluate the process of constructive training. , The process of strengths and weaknessesthrough the thus of the course of the training process will have a major impact on reducing effort, time and costs. Due to the nature of

weightliftingeffectiveness, the quadruple (and young people in particular) cannotstay in one weight class due to physicaldevelopment and increasedstrength, to certain limits.

It has become important to follow the training process for the liftersduringtheir transition from one category to another, and to evaluatetheirachievementsbased on the requirements of eachcategory, and for the two Olympic liftings, kidnapping and winter. Thus, the researcheranalyzed the performance of the lift mechanically in an attempt to assess the level of performance in light of the transition from one weightcategory to another due to the development in the level and physicalgrowth. Rapid analysis camera and strength platforms wereused in addition to the muscle activity monitor. The hijackheightwasanalyzedduring a training unit. And resultswerereached in the interest of evaluating the training and technical performance, as well as information someweaknessesthatwould double if no solutions were put in place.

Introduction

The interconnectedness betweendifferent sports sciences such as learning, sports training and physiotherapies one of the scientificfields that have enteredinto the development of the sportingachievements of the variousgames ,which help researchers and show them the importance of these sciences in order to developlevels of motor performance and achievements of various sports activities.

Hence the correlationbetweentheoretical sciences and the level of performance in sportingevents are closelyrelated ,and thustechnology and modern equipmenthad a greatspace in revealingmanydetails of work topics fromkinematicanalysis, laboratory tests, or direct and fieldmeasuringdevices ,and amongthese modern technologies is a technique. Record the electricalactivity of skeletal muscles from the surface of the skin.

Since the work of the muscles during the performance of exercises or movementsisassociatedwith a type of electricalLactivity for that muscle group, which expresses the level of activity of this muscle group, which soften an indicator of muscle strength .In addition, the use of force pads or a foot scanner can provide a true and more accurate reading of the amounts of power produced and exerted interactively on the ground to benefitfromitsphysicalprinciples as reactions imposed on the raised weight, and thus the amount of force imposed on the ground is, in fact, an expression of the extent of the outcome. Force on the one hand and the amount of force distribution on the other hand during the levitation stages.

Fromhereemerged the importance of the research, whichdeliberatelycombined modern technologies thatgiveaccurateresultswith the approved and traditional methods and to identify their values as a

diagnostic method for the performance of the quartet or can be used to evaluate the course of the individual training process for the quadrant itself, especially when a suitable researchsampleisavailable.

Researchproblem:

Since the sport of weightliftingischaracterized by itsspecificity and individuality in terms of training and performance, due to the physical and physical characteristics of each quadrant, itis possible to determine the type and form of its performance, but the overall process requiresthattherebe a clear, scientific and concrete identification of the training path and evaluation and evaluation of the training vocabulary in particular. And my topic .The researchproblemisevidenced by the factthatKarrer Mohammed previouslyachievedadvanced Arab, regional and international centers within the weight category69) kg ,(and now , according to the requirements of performance, physical development and growth, the weightedwasforced to leave his class and enter the races of the category77) kg ,(whichwouldbedominatedObeiebiggest on the weightlifter being , regularcompetitorsowners of thinner or higher , and itshall be the specialists that Amdo by the academic and research aid in an attempt to support the training process by evaluating physical performance and detect weaknesses for a sing and processing effort possible , and therefore the international weightlifter was the focus of the work of The researchisunderstudy.

Research objectives:

1-Identify the values of some variables Albyumkanikih and electrical activity of the muscles during the stages of raising the performance of the kidnapping.

2- Knowing the quantities of the distribution of the force on the ground during the stages of the kidnapping lift.

3-Identify the relationship between the values of some biomechanical variables and the electrical activity of the muscles and the force exerted on the ground during the stages of the kidnapping lift.

Researchhypothesis:

-The presence of a statisticallysignificantrelationshipbetween the values of some biomechanical variables and the electricalactivity of the muscles and the force exerted on the ground during the stages of the kidnapping lift.

Research areas:

The temporal domain:1-5/3/2014

Spatial domain :Weightlifting Training Center / Wasit / Al Kut

The Human Sphere :International Rabbi KarrarMuhammed Jawad

Kineticanalysis and performance:

Talha pointed out " ,The process of teaching and training mathematicalskillsrequires, in a basic degree, thatthose in charge of

themlearn the rules of kineticanalysis, whichdepend on the basic principles of both anatomical kinematics ,biomechanics and other sciences related to movement, and the ability to kinematicanalysisdependprimarily on the analytical thought, which must be the distinguishing characteristic." For kinesiology students ,by following the steps of kinetic analysis of some skills , this thought can bedevelopedamong students of the Faculty of Physical Education . [1]. After the movementwasfollowing a normal follow-up, and by watching only to identify the strengths and weaknesses in its path, the need to use scientificdevicesthat keep pace with the advanced performance reached by all sports and all stages of movements that are performed, by dividing the movementintoseveral interrelated parts untilitisknown and understood. The nature of these parts and thenfinding the relationshipsthatwillbelinkedbetweenthem. The process of fragmenting the movement aims to know the general character of the movement or a general phenomenon, and thisiscalledkineticanalysis.

"In the sport of weightlifting, wefindthat the principle of determining the level of movementcoherencebetween performance and quadrants is clear and can be diagnosed and can bedetermined to identify the true values of the influence of one of themwith the other, such as the amount of movementthat the trunkgenerates at the full extension thatgives the characteristic of maximum acceleration has a clear return on the acquisition of the column of gravity. This amount of high movement, in otherwords, the biomechanical correlationbetween body parts and the devicereachesclear degrees(2).

Determine the amount of electrical signal to the surface of the muscles (3)

Besides that the visualpresentationsprovide information related to the capacitance of the surface electrical signal, this signal has been quantitativelyprocessed .This treatment yielded) yielded (numbers describing and expressing the amount of muscle energy consumed.

Method(summit - to – summit)

It issued in the recorded raw surface electrical signal .These values show the quantity and shows the amount of energy muscle measured from the highest peak to the lowest point during the course of the recorded signal or may represent a width and thickness of the recorded signal Ha Typically, the style of the top - to - the summit gives the overall rate or signal during the designated period of time.

It is often the voltages values rate at the top of style - to - summit during the rest ranges between 2-10 Micro volts , takingintoaccount the distance betweenAllakotain and the amount of fat under the skin , whichisalreadyconsidered a particular factor to indicate the hyphen as well as the muscle targetmeasurement, and body posture LaboratoryDuring the

signal recording process, as well as the characteristics and specifications of the capacitor or signal amplifier used in determining the surface signal.

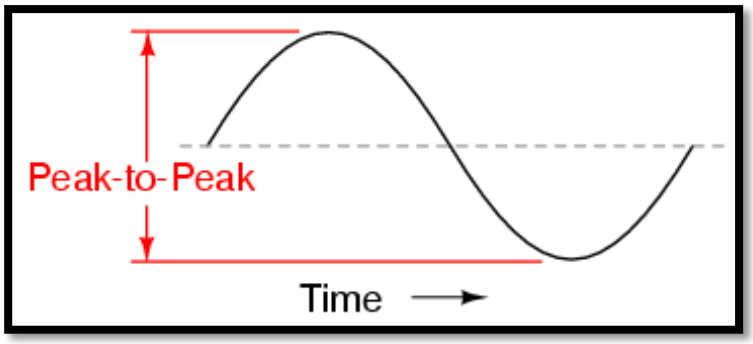


Figure 1
Method (summit - to - summit)

Power-time relationship(Force - Time):

That the force or tension generatedwithin the muscle isproportional to the time period of contraction , as the longer contraction indicates a greater force exertedaccording to the maximum limits of the level of tension in the muscle . The strength - time curve of staticmuscularaction , as " the length of time for contraction requiresgreater force to meet the high demands of work, and this leads us to agreewith the principle of fastermuscularwork in the sport of weightlifting to reduce the effect of fatigue and economics on effort".

It remains for us to distinguishbetween the power and time relationship and the time of the dominant force, which deals with the temporal moment of power projection, whichisdefined as) whenitbegan and whenitended and this moment in time has a relationship to the time scale of the position of the point of the body or part of the body (and thisdoes not meanthat the length of time may lead thus to paybetter power output on the contrary , but the push of force whenever the time of shedding power in the shortest time ledthereby to pay the power of better output , but you wantthisrelationship to clarifywhattheir) Exert (Muscle strengthduring a specifiedperiod of time" (.

Field research procedures

Researchmethodology : The tworesearchersadopted the descriptive approach in the method of correlational relations for its relevance and the researchproblem.

The researchsample : The researchsamplewasrepresented by the number of observations of the kidnapping lift performance of the international quartet, Karrar Muhammad Jawad, and itreached four attempts, with an intensity of %90 of the maximum achievement of the lift.

Devices, tools and means:

-Four-pole type electricalactivityrecordingdevice) MYo Trace400 (Produced by the light of Exxon Canadian company and software applications model (1:41)

-foot scanner device) foot scan (German origin.
-Fast video camera) 210 p / s(of Japanese origin, typeExilim.
-laptop typeDell
-Receivers supported by the companyNor axon.
-Video analysis applications and statistical software.

Determine searchvariables:

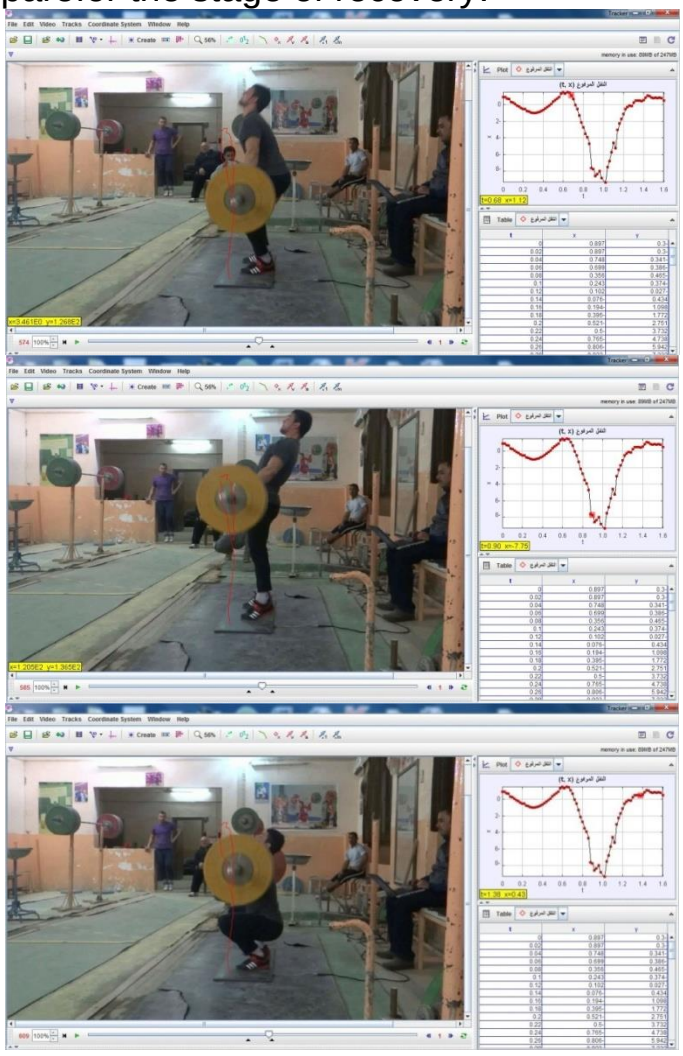
.1Lifting the stages of:

Was a divided lifting phase of the three basic stages - according to the point of view of the researchers - namely:

A - The first pull phase : It continues from grabbing the weightuntilit crosses the knee.

B - The stage of maximum acceleration :The previous stage will follow through the full extension of the body until the weightreachesitshighestpoint.

C - The stage of falling under the weight and fixation :In both levers thereis a transition from the stage of pulling up to the stage of falling under the weight and fixation to preparefor the stage of recovery.

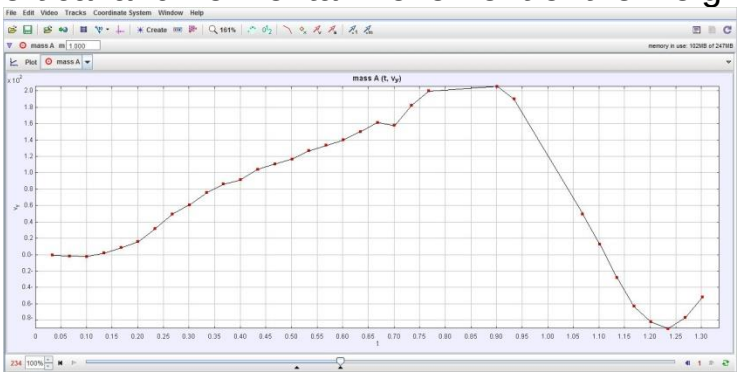


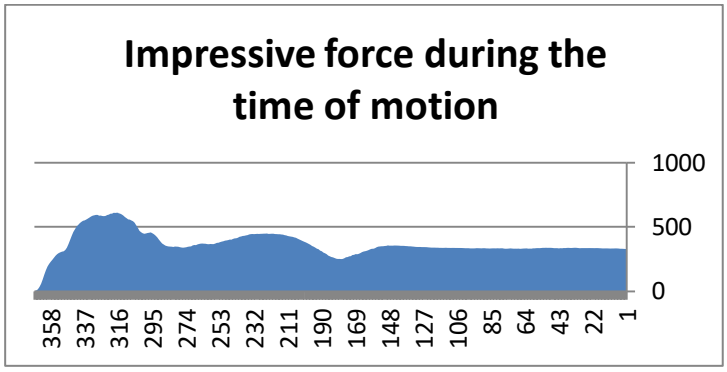
-2 Biomechanical variables:

Power on the ground

The speed of vertical and horizontal gravity

The amount of vertical and horizontal movement of the weight





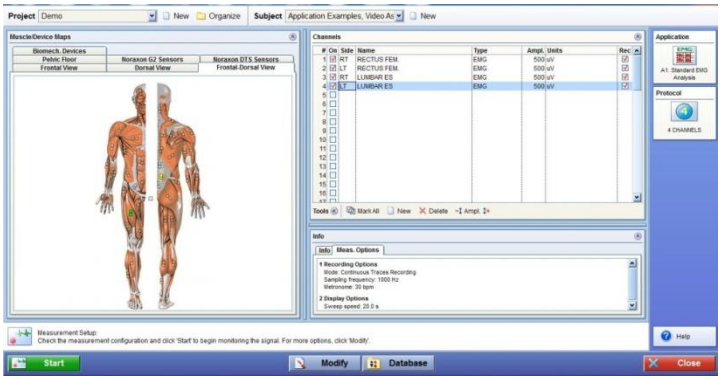
3-Electricalactivityvariables:

Wave crestduringphases.

Identify the muscles understudy:

Through the two researchers' experience in the field of the game and theirexperience in the field of electrical activity ,it was agreed on four more important muscles in line with the number of available device channels as shown in the figure:

- **The left and right quadriceps muscle**
- **Left and right dorsal Bône**



Experimentprocedure:

On 2/3/2018 ,a training center for weightliftingwasvisited in Wasit Governorate in the city of Kut, to ensure appropriate research conditions for conducting the fieldexperiment by preparing the location for filming and preparing the necessaryequipment and tools for that . On the nextday in the afternoon, the researchsamplerepresented by the international quarter, Karar Muhammad Jawad, wasprepared and informed of the mechanism for implementing the experiment and its positive consequences for itthrough the data thatwillbereached . After the creation of the place and time selectingappropriate it has to create a weightlifter to record the electrical activity of the muscles in addition to the adoption of the foot scanner to record BanathAlmetza ment with the camera placed on the side of Food tabla.

The experiment and videographer data were recorded and analyzedwithmysoftwareTracker And the Kenova In addition to the program applications footscan And the Myotrace 400 For impressed force and electrical activity, respectively.

Statistical means:

- Arithmetic mean
- standard deviation
- Simple correlation coefficient

Research results

Throughstatisticalanalysis and treatments, the results of the research were as follows

Results of analysis and processing of snatch lift data

variable	The first stage		The second phase		Thirdlevel	
	P	s	P	s	P	s
Impressive power	27.69815	1303.75	25.205	1186.41	38.71	1350.3
O vertical	0.01479	0.9175	0.019	1.23	0.017	1.101
O Horizontal	0.007071	0.02	0.009	0.027	0.007	0.0202
Vertical momentum	2.692582	94.5	3.473	121.905	3.096	108.6
Horizontal momentum	0.474	12	0.569	14.4	0.711	18
Quadrant Activity Summit Right	29.68	392.5	26.420	349.325	44.52	588.75
The activitysummit of the left quadrant	16.77	402.5	15.26116	366.275	23.47	563.5
The activity apex of the dorsal right	42.204	332.5	52.33	412.3	52.75	415.625
The activity apex of the dorsal left	59.491	328.5	78,528	433.62	125.64	693.792

Table(1) shows the arithmetic mean and standard deviations of the variables under consideration during the hijacking stages

Results of correlationrelationshipsbetweenresearch variables during the hijacking stages

-1The first stage of the kidnapping lift

Dorsal 2	Dorsal 1	Quad 2	Quad 1	Momentum 2	Momentum 1	Speed	Speed	Power		
								1	Pearson Sig	Power
							1	. 847 153	Pearson Sig	Speed
						1	.560 440	. 634 .366	Pearson Sig	Speed
					1	. 890 110	663 337	. 885 115	Pearson Sig	Momentum 1
				1	. 216 784	-.073 927	-404 .596	138 862	Pearson Sig	Momentum 2
			1	-177 . 823	-.909 091	-.967-* 033	-407 593	-.615 .385	Pearson Sig	Quad 1
		1	-582 . 418	-.696 304	501 499	. 766 . 234	662 . 338	.367 . 633	Pearson Sig	Quad 2
	1	346 .654	-.495 505	062 938	807 .193	.537 463	. 887 113	.988* 012	Pearson Sig	Dorsal 1
1	-.015 985	. 812 .188	-.005 .995	-982-* 018	-.071 929	250 750	.447 .553	-.066 . 934	Pearson Sig	Dorsal 2

Significant at an errorlevelequal to or lessthan(0.05)

Table (3) shows the correlation coefficients and errorlevels for the search variables during the first stage of the hijacking

Table 3 shows us that the values of coefficients correlationweredifferent values according to the requirements phase or the needVaa Maly variable , and wefindthatAratt Batat moral realizedfromAlana live statistics, whichachieved values lowererrorlevels (0.05) is the peakelectricalactivity of the muscles of the Quartet The right with the horizontal velocity, and wefindthatexplainingthat the headweighs more on one of his legs than the other, and thisiswhatwefindclear in the layout of the foot scanner, and

thereforethisdifference in the amount of force projection led to an enlargement in the horizontal distance of the liftedweight and appeared clear in the close connectionbetweenit and the speed horizontal thisrepresents the emergence of force are kept on the edge of the body more thanothers , and thus influence ostensiblyclear as a result of the inevitablehappens where " the effect of the power of the body is different on the body of another and alter hismotormay have thiseffectrepresented by traction or pressure or other , a clearexplanation of the laws of Newton the effect of the power of the body on the body of another" (5) .Also, through the resultsabove, itiscleartousthat the quadrilateraldepends on the back muscles more than the two leg muscles in the snatch lift and we note thisthrough the correlation of the peakelectricalactivity of the left and right back muscles with the output of the exerted force at times and with the horizontal momentum at other times , whichis an indication that the pattern of motor performance hereis supported on this muscle group and maybe the nature of the performance of the weightlifter and adoption of thisapproach or method in the snatch , especially as we know that the elevation of the line of gravityrequiresAcquistionraisedgreater speed of the net t that the kineticpathis relatively longer.

2 -The second stage of the kidnapping lift

Dorsal 2	Dorsal 1	Quad 2	Quad 1	Momentum 2	Momentum 1	Speed	Speed	Power		
								1	Pearson Correlation Sig. (2-tailed)	Power
							1	572 428	Pearson Correlation Sig. (2-tailed)	Speed
						1	. 478 .522	957 * 043	Pearson Correlation Sig. (2-tailed)	Speed
					1	788 212	. 847 153	. 746 254	Pearson Correlation Sig. (2-tailed)	Momentum 1
				1	881 119	. 820 180	499 501	.656 344	Pearson Correlation Sig. (2-tailed)	Momentum 2
			1	.976 *	. 813	893	.384	. 734	Pearson Correlatio	Quad 1

				024	. 187	107	. 616	266	n Sig. (2-tailed)	
		1	-.490 510	-.660 .340	-830 170	-316 684	-832 168	-262 . 738	Pearson Correlation Sig. (2-tailed)	Quad 2
	1	-530 .470	688 . 312	681 .319	.880 120	.880 120	. 811 189	944 056	Pearson Correlation Sig. (2-tailed)	Dorsal 1
1	.382 618	-.985-* 015	360 640	.550 450	. 721 . 279	149 851	. 766 . 234	092 908	Pearson Correlation Sig. (2-tailed)	Dorsal 2

Significant at an errorlevelequal to or lessthan (0.05)

Table (4) shows the correlation coefficients and errorlevels for the search variables during the second stage of the hijacking

From Table(4)(itbecomescleartousthat the international kicker Kararwasperforming a monotonousmovement pattern, i.e. very close to the mechanism, and we note thisisclearthrough the acceptability of manycorrelationalrelationships even if the statisticalsignificanceis not recorded, and wefindthat the second stage of the kidnapping lift ischaracterized by acceleration and increased speed for weight. The lifted one and try to takeadvantage of the heightthat the weightreaches to enter underit and receive it at the mostappropriate time, as wefindthat the force variable recorded a moral correlationwith the horizontal velocity, and wefindfromour point of viewherethatthisconstitutes a mistakethat must beaddressed and dealtwithsince the force wassupposed to achieve a correlationwith The vertical speed in order to avoidanyinjury and to invest all the exerted effort , but the reason for this is thatthis stage ischaracterized by the presence of a large hook arc, and therefore the outcome of the force herewillbedirected by the largest percentage among the rest of the stages to the horizontal vehicle, whichreinforces the appearance of the large hook arc in the lifters , and thisisconsidered A form of force equilibrium, especially in lifting weights and in kidnapping in particular, as " whenever the movementis close to the base of support or the sides of the movement are distributedaside, itachieves a greateramount of stability " .(6)

3 -The third stage of the kidnapping lift

Dorsal 2	Dorsal 1	Quad 2	Quad 1	Momentum 2	Momentum 1	Speed	Speed	Power		
								1	Pearson Correlation Sig. (2-tailed)	Power
							1	-146 854	Pearson Correlation Sig. (2-tailed)	Speed
						1	. 478 .522	.442 .558	Pearson Correlation Sig. (2-tailed)	Speed
					1	788 212	. 847 153	373 . 627	Pearson Correlation Sig. (2-tailed)	Momentum 1
				1	881 119	. 820 180	499 501	760 240	Pearson Correlation Sig. (2-tailed)	Momentum 2
			1	.976 * 024	. 813 . 187	893 107	.384 . 616	.772 .228	Pearson Correlation Sig. (2-tailed)	Quad 1
		1	-.490 510	-.660 .340	-830 170	-316 684	-832 168	-262 . 738	Pearson Correlation Sig. (2-tailed)	Quad 2
	1	-530 .470	688 . 312	681 .319	.880 120	.880 120	. 811 189	073 927	Pearson Correlation Sig. (2-tailed)	Dorsal 1
1	.382 618	-.985-* 015	360 640	.550 450	. 721 . 279	149 851	. 766 . 234	. 218 782	Pearson Correlation Sig. (2-tailed)	Dorsal 2

Significant at an errorlevelequal to or lessthan (0.05)

Table(5) shows the correlation coefficients and errorlevels for the research variables during the third stage of the hijacking

From Table(5) itbecomescleartousthat the international quadrant, Karrar Muhammad, recordedcorrelation coefficients for the variables of his performance for the stabilization phase underweight, and becausethis quadrant ischaracterized by good physicalstrength, wefindthat the muscular balance between the twomost important muscle groups of the quadriceps, whichis the back and the leg, wefinditsynchronized at work at the moment of fixation and fallunderweight As itrepresents a stage of absorption of the momentum of a movingweightdownward and wefinditlinkedbetweenthem in a moral link and hereit must bepointed out thatthis stage ischaracterized by the curbing of the downwardmovement of the weight down by the action of gravity and that the individual performance of this quadrant ischaracterized by a high level , and thatthis moral relationshipisevidence of the strength of the lift The success of the lift and not the loss of the attempt , as seenMc Lester "The job of mechanicalis the transfer of energywhichis the product of the force inflicted on the body in the distance made by the direction of that force , norfill the mechanicwithout occurrence of change occurs in this place on the one hand and on the other hand, the job of mechanicaltwoforms positive and negativeexample , climb the ladder up making Positive workis the sameamount of workdone to go down the samenumber of stairs, but negatively(. 7) Here, wefindthat the mechanical work performed by the quadrant is to convert a form of kineticenergyintopotentialenergythrough absorption by strong fixation . In this table, confirmation that the snatch lift has a greaterspecificitythrough the hook arc generated in the second stage, as wefindherethat the amount of the downwardmovement of the gravity has a close correlationwith the top of the electricalactivity of the leg muscles, whichaccording to the researchers' viewisamechanicalinterpretation of the performance of the levers and levers where The resistancerepresented by the depth of the deviationexternallyforced the quadruple to pull the weighttowardsitagain, whichgainedhim a counter-momentumfrom the stabilization stage and thusrequired the leg muscles to fallunder the burden of stoppingthisgreatresistance . This isalsoconfirmed by the vertical momentum in the downward direction, as itrecorded an acceptable value from the correlation with the peak of the dorsal muscle activity, which is a natural result of a distinct performance of the quadrant in selecting the most appropriate muscles for the appropriatemotor duty .Confirmed) Isaac» (The final momentum of the full extension is the one that affects the traction force as the bar of gravitytravels at the maximum possible speed. This velocity pushes the bar of gravity to move upward at the end of the second drag phase and hereweget the maximum momentum, and the more momentunwaged the higher the height Of the ballast bar ,which in turn will have a corresponding effect in the landing and stabilization stage(. 8)

Conclusions:

1-It was found through the results of the research that the weight lifter Karar Muhammad Jawad was more dependent on one leg than the other in generating the necessary force to lift the weight, and thusitwasnecessary to codify exercises to develop the other man.
2-The high level of Rabba j enabled him to adopt the principle of levers in the technical and engineering recruitment to snatch as you need to top speed of the jerk.
3- The presence of functional synergy of the muscles of greatest importance in achieving an important motor duty, whichis stabilization of gravity.
4-The naturalgrowththat the quadruple experiencedbegan to force it to follow a new path of gravitythrough the quantities of horizontal movementthat express the presence of new paths at the samepreviousspeed.
5-The quadrilateralstillpossesses a large reservoir of force represented by the performance of the lifts with a high coordination of movementbetween the parts of the body.

Recommandations:

1- Inclusion of additionalassistiveexercises to enhance strengths and address a lack of strength in one of the two men.
2- Conducting an analytical study for the net gain, as it is considered a win-win lift.
3-Giving adequate attention to the mental aspects, as it enhances the investment of internalmechanicalenergy.
4-Conducting an analytical study for assistive exercises for the same quadrant.

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