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NEW, SIMPLE METHOD OF KINESIOLOGICAL ASSESSMENT OF MUSCLE STRENGHT,APPLIED ON PARACHUTERS

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Abstract: Important kinesiology parameter which we track during sport training and competition is muscle force, which in biomedical term represents maximal muscle concentration under maximal pressure expressed in watts. Goal of Research was to estimate muscle strength of important muscle groups of parachutes, muscle flexor of under leg, underarm and but adductor and upper arm during sport parachutist jump. Sample included 20 trained sport-troopers parachutes of Serbian Military, which we tracked during 2007-2010.Research results point to significant fall of muscle strength: flexor of lower arm and but adductor, after sport-parachutist jump, within base significance p<0,005.Conclusion: parachutist jump as specific biomechanical activity of extreme sport, due to numerous external and internal factor which lead to statistical important muscle group strength fall and lower extremity.

Keywords: paratroopers, , method assessment of muscle strength.

INTRODUCTION

Muscule strength in kinesiological term includes ability of muscles to efficiently and significantly oppose pressure,while in fisical term it represents done work per time measurment, otherwords kinesiothe- rapicly represents maximal contraction of muscles under maximal load (Djurdjevic et al.,1999), degree of their distension, transverse cut of muscle fiber core number, state of porpriceptor like neuromuscle spindle, Golgi complex, stelat receptors, training, gender, age, genetical factors, psychological factors, external envirorment condition such as temperature and barometric.
(Djurdjevic, 2012; Kostic, 2002).

Muscule strength depends on numerable endogenic and egsogenic factors: starting length of muscle fiber, pressure (Andre et al. 2002).For effective and fast strenghten of muscle force vulnerabile and demanding population of pilots and parachutes of Serbian Army, we use in basic conditions training on isokinetic and isogravitational computerisation,dinamometric and gonio-metric device for movment aplitude (in different phasis of movement), determins frequency of load,time of break,optimal traning of marked muscle groups.This highly-resolutive,sofisticated device of Americ production is used in training program and aviation of modern world armies such as USA, France, Great Britain, Turkey and Italy.

Because of rapid,fast and significant growth + Gz speed increasment which stay constant per parachutist jump, and especi- ally in modern army aviation 3. and 4. gene- rations per performing certain manouver figures such as:„cobra“, “roller“, “bell“, “spiral“ and others, it comes to rapid and significant overflow of blood from central vascular base of central neuro system and heart forwards surface,which leads to loss of consciousness and convulsion, and therefore fatal outcome. Muscule mass and it's strength, especially „hamstring“, abdominal, lower extremities, significantly resists with it's tonus to blood overflow from central vascular base, making strong elastic barrier with anti G suit. By this, we accomplish succesful sport desant and training activity of parachute and pilot
(Clarkson et al. 1992).

THE RESEARCH GOAL,RESEARCH SAMPLE AND MEASURED VARIABLES

Goal of Research was to overview degree of lowering muscule strength of significant muscule groups of sport-desant parachutes of Serbian Military due to over flying with parachute „wing“ from 5000m height,in period of 2007-2010. Year,in order to find measurment for lowering fall of the same

Research sample included represen- tative population from 20 trained, sport-desant parachutes,members of sport team of Serbian Army „Sky Otters“ with significant international characteristics.All examinee were male gender. Per biological constitution, there were 15 „mesomorph“ and 5 „ektomorph“ according to Scheldon, BMI < 25,age 23-37, from whom 17 „right handed“ and 3

„left handed“ also with tested non dominant body parts. Tracked variables were: muscle strength of flexor forearm,therefor adductor of but and upper arm before and during parachute jump from 5000 meter height.

METHOD

Dynamometricly, in W, practically, cheap, newly included method tensiomeric, whose values were tested in pilots consisting of 5 examinee, comparing results with values of muscle force,tested using sofisticated computerized isokinetic device Cybex-340, we did not note significant deviations, so method of deter- mining muscle force „by Djurdjevic“, which will be explained in detils here, we can highly recommand in clinical and sport practice, especially in kinesiology, kinesiometry, and kinesiotherapy, as cheap, practical, reliable and appliable in terran conditions (Djurdjevic, 2012).

Determination of muscle force in healthy muscle agonist,for example flexor of upper hand,we can execute precisely by tensio- meter,with help of physical postulates.We know that muscle force, executed work in time measurment (P=A/t), while done muscle work A = F•S•cos α. Muscle work is equal to product of pressure foce of byceps on device part for blood pressure pumped to ex. 50 mmHg, during what pressure inside jumps to ex. 210mmHg, therefore,real outcome of pressure 210-50=160 mmHg (conversion mmHg into pascals we get by multiplying with coficient 133,3), which values 160mmHg x 133,3 = 21328 pa per surface measurment folded mengetne of tensiometer fixal supracubital, dimension 14x10cm=0,014 m², so this pressure, otherwords muscle force per volume counts P (otherwords F)) = 21328 x 0,014 = 298,59N.Impact angle of active force of biceps is one of start pressure on mangetne untill end of compression of mangetne and it counts around 10°,and it’s cosinus counts 0,28,while passed trip lowerhand from semiflexion to complete compression of mangetne counts around 20cm (0,2m).Due to replacement of parameters, we get next values: A = F • S • cos α, otherowrds (21328 • 0,014) • 0,2 • cos 10°=298,59 • 0,2 • 0,98 = 58,52 Nm,and if P=A/t,and concentration lasts for ex. 1 second, than we have P= 58,52/1 =58,52W. Therefore strength of m.byceps brachi per flexion of lowerhand is 58,5W (Djurdjevic 2012, Djurdjevic et al.1999.).

RESULTS OF RESEARCH

From muscle group agonist, we examined muscle strength of lower and upper extremities, especially flexor muscles of lowerhand and but aductor, therefore flexor muscle of lowerhand and upductor of upperhand, expressed in wats, before and after parachutist overfly type wing.Results are presentated in table n.1 and tested by Student t-test for small even samples.

Tabel No.1 Strength of muscles reciever but and overholder of lowerhand expressed in W before and during parachutist jump.

Variable	X±SD		t-test	p
muscle force mm.adductores femoris.	strength before jump	Strength after jump	3,45	< 0.005
	112,34 ±0,18	98,95 ±0,42		
muscle force mm.flexores antebrachii.	54,75 ±0,12	48,84 ±0.34	3,67	< 0.005

By overviewing muscle strength of aductor but and flexor lowerhand, significant fall can be noticed, lowering of muscle strength per jump, compared to strength of same before jump, with high values of t-test and straight ange of significance p<0,005. Koda of muscle antagonist and flexor of lowerhand, and aductor of upperhand didnt show statistically significant lowering of muscule strength after parachutist jump,which to some degree corelates with some studies in world.

DISCUSSION

For it's purpose,parachute jump can be: sport-competetory, like jumps of our examinee in this research, but they can also be tactical desant and training.They are preformed with parachue type „wing“ or „cupole“ with around 5000 m and in avrege duration of 20 minutes. Parachute is „invisible“ for radar, so is unexpecting desant action (Ashenden et al.1999).

Untill fall of muscle strength of mentioned muscle groups, it comes probably due to multiple fisiological and biobernet reasons.Elevational position of arm,because forcing system string due controling parachute, during jump every time it affects on lowering muscle strength because of circulatory reaons, as well as so called dynamic strike during opening parachute,where acceleration comes close to 100m/s in couple seconds lowered to 5-7 m/s, with strong contraction and strike on shoulder area (Puffer, 2001).

Compression of Trigonum inguinale „Pouparti“ where veins are streched from inside out, so artery and n. femoralis, system of streches, occurs in majority para-chutes in 7. minute of jump to over-comming parestesis, lower extremities, always with reflection on neuromuscular status and in last stage on muscle strength of lower extremity, before all but reciever. Acceleration influences on lowering

strength of mentioned muscle groups, deceleration per opening parachute and per overjump, which fits free fall with around 3m of height.Hyperadrenalenemy during leaving craft from fear and euphory, occured during opening parachute, influences on lowering muscle force, followed by higher level of vanil-mandelic acid in urine (Beers, Berkow, 1999). Reflection on muscle force has also temperature distres and low temperature on large heights, because on every 1000m exponentional parabolic curve temperature falls around 5 degrees,so at 5000m in minus for over 20°C u related to basic conditions. Hypoxis on large heights on it's side has lowered partial pressure of oxygen with lowering muscular strength groups.Why there hasnt come to significan lowering of muscle force of flexor of lowerhand and aductors of upphand,we were not able to accurately determine,but it is most likely because lower engagement of these muscle groups during parachutist jump (Hockberger, 1990).

CONCLUSIONS

Sport parachutist flight by type wing,as specific cognitive and biomotoric pheno-menology of extreme sport, due to numerous endogenic and egsogenic biomotoric factors, lead to significant lowering of muscle strength: mm.adductores femoris and mm.fllexores antebrachii,influencing on sport results in following allaround competition or battle-desant influence per overjump.

Addition to eventual rejecting sedal belt with modern biokibernetic system of wind connections,as well as programic kinesitherapy preparations of parachutes could lower degree of muscle strength fall,which would be goal of our newer research.

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