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Original article

THE EFFECTS OF A PRE- AND POST-EXERCISE WHEY PROTEIN SUPPLEMENT ON PROTEIN METABOLISM AND MUSCULAR STRENGTH AMONG ELITE WRESTLERS

AHMED SHARAWY

Abstract

Purpose. Whey protein is a high-quality dairy protein that contains all the amino acids the body requires for muscle protein synthesis. Evidence suggests that whey protein, found naturally in milk, increases muscle protein synthesis that in combination with resistance exercise can improve body composition. The aim of this study was to determine the effects of a pre- and post-exercise whey protein supplement on protein metabolism and muscular strength among elite wrestlers.

Methods. Eighteen male wrestlers volunteered to participate in this study. Subjects were randomly divided into supplement pre -exercise (S1; n = 10, 21.3 ± 2.9 y, 175.7 ± 4.9 cm, 86.7± 9.8 kg) or supplement post -exercise (S2; n = 8, 20.8 ± 2.03 y, 172.6 ± 5.7 cm, 85.3± 7.9 kg). subjects were tested for maximal strength (1-RM) on the squat , chest and arm exercises. S1and S2were consumed the whey protein (optimum) 1.4 g/kg.bw/day supplements after immediately following of training session for S1 group and 40 minutes prior to training session for S2 group, all subjects for a period of twelve week, three days weekly.

Results. There was a significant difference between the two experimental Groups (S1 and S2) in total protein, albumin, urine and Creatinine and muscular strength for S2 group.

Conclusions. The best way to supplement the whey protein was immediately following the training workout.

Key words: whey protein, protein metabolism, Muscular Strength, wrestlers.

Introduction

Wrestling is a sport with a long history. It was first made an Olympic sport by the Greeks in 708 B.C.E., and thereafter became popular in the ancient world.

Wrestling is a form of combat that uses the body as a weapon. Using nothing but the body, a wrestler must use strength, tactics, domination and sheer will to overcome his opponent. Each competitor wrestles his opponent, not for life or death, but for the pin, and glory and fame.

But glory, fame and victory are made possible by a well-developed and well-balanced skills set that makes the wrestler effective from all wrestling positions. Any weakness in your skills set will give your opponent a competitive advantage that could lead to your defeat.

At the highest competitive levels, the more conditioned wrestler will always win. When a wrestling match extends into the fifth, sixth and even seventh minute, conditioning will determine victory or defeat. When your opponent is the only thing standing between you and glory, you want to make sure that you make a statement - you want to make sure that you are ready.

To achieve top condition, the wrestler must eat right, train right and use the best available nutritional supplements. If even one area of your athletic program is off, your performance will suffer. Wrestlers train hard and eat hard, but what about supplementation?

Protein has long been the favored macronutrient for wrestlers. The logic is simple: if you want big muscles and muscle is made of protein, then eating more protein equals more muscle. This simple rationale is more fiction than fact, but it is difficult to convince athletes that protein is not the most important nutrient for sports performance. Flip through the pages of any health and fitness magazine, and it is easy to see why athletes worship at the altar of protein- men with bulging muscles who look like cartoon heroes and women with perfectly toned bodies without a drop of cellulite smile from the magazine pages and claim that the latest protein powder, shake, or supplement is all it takes to achieve the perfect body. (Rosenbloom, 2009)

Evidence exists to indicate that these types of athletes have protein needs that are one to two times that of the Recommended Daily Allowance. Not all sources of protein are of the same quality, however. Protein sources that contain all of the essential amino acids are considered to be complete proteins, while those that do not contain all of the essential amino acids are considered to be incomplete. Protein sources with a higher concentration of the branched-chain amino acids (BCAAs) (e.g., leucine, isoleucine, valine) and the other essential amino acids are of a higher protein quality and are more effective at promoting protein synthesis (Burke et al. 2001). Recent improvements in the processing of proteins from food (e.g., soy protein, egg protein, casein, whey, etc.) in the form of nutritional supplements have resulted in high amounts of essential amino acids and low amounts of dietary fat.

In recent years, milk constituents have become recognized as functional foods, suggesting their use has a direct and measurable effect on health outcomes.1 Whey, a by-product of cheese and curd manufacturing,

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was once considered a waste product. The recognition of whey as a functional food with nutritional applications has elevated whey to a co-product in the manufacturing of cheese. (Walzem et al. 2006) The two primary sources of protein in milk are the caseins and whey. After processing occurs, the caseins are the proteins responsible for making curds, while whey remains in an aqueous environment. The components of whey include beta-lactoglobulin, alpha-lactalbumin, bovine serum albumin, lactoferrin, immunoglobulins, lactoperoxidase enzymes, glycomacropeptides, lactose, and minerals. (Walzem et al. 2006) Today, whey is a popular dietary protein supplement purported to provide antimicrobial activity, immune modulation, improved muscle strength and body composition, and prevention of cardiovascular disease and osteoporosis.

Whey is a dairy protein that is a by-product of the cheese making process. In its raw state, whey contains substantial amounts of fat and lactose (milk sugar). The primary difference between isolate and concentrate is that the isolate is more pure. In other words, isolate contains more protein with less fat and lactose per serving. Based on whose figures you go by, whey isolate usually contains between 90-94% proteins while whey concentrate has a protein ratio of 70-85%. (Keri, 2004)

Whey protein has long been considered the "Gold Standard" of protein for serious athletes who work hard to develop and sustain a lean, strong and well-defined physique. Research studies support this belief. Athletes need more protein in their diet, often as much as twice the recommended daily allowance. The protein they choose makes a difference and here are several reasons why whey protein is a preferred choice for athletes of all types.

• Whey protein is a naturally complete protein, meaning that it contains all of the essential amino acids required in the daily diet. It has the ideal combination of amino acids to help improve body composition and enhance athletic performance.

• Whey protein is a rich source of branched chain amino acids (BCAAs), containing the highest known levels of any natural food source. BCAAs are important for athletes since unlike the other essential amino acids, they are metabolized directly into muscle tissue and are the first ones used during periods of exercise and resistance training. Whey protein provides the body with BCAAs to replenish depleted levels and start repairing and rebuilding lean muscle tissue.

• Whey protein is an excellent source of the essential amino acid, leucine. Leucine is important for athletes as it plays a key role in promoting muscle protein synthesis and muscle growth. Research has shown that individuals who exercise benefit from diets high in leucine and have more lean muscle tissue and less body fat compared to individuals whose diet contains lower levels of leucine. Whey protein isolate has approximately 50% more leucine than soy protein isolate.

• Whey protein is a soluble, easy to digest protein and is efficiently absorbed into the body. It is often referred to as a "fast" protein for its ability to quickly provide nourishment to muscles.

• Whey protein helps athletes maintain a healthy immune system by increasing the levels of glutathione in the body. Glutathione is an anti-oxidant required for a healthy immune system and exercise and resistance training may reduce glutathione levels. Whey protein helps keep athletes healthy and strong to perform their best. (United States Dairy Export Council, 1999)

Serum protein electrophoresis involves and placing a serum sample onto a semi-solid gel. An electrical current is then applied to this gel, causing the individual proteins within the serum to move along the length of the gel.

The proteins will settle out on the gel in bands, according to their size and electrical charge. The protein bands are then stained with a special dye so that they can be seen. After the gel has dried, a special instrument called a densitometer measures the bands.

In general, protein electrophoresis is not sensitive enough to allow visualization each of the hundreds of individual proteins that are found in serum. Instead, broad groups of proteins with similar size and electrical charge are measured. The major groups, or fractions, of proteins include alpha, beta, and gamma globulins. (Cribb et al. 2006)

Although more studies need to be carried out to make a definitive statement regarding timing of protein intake relative to exercise and its effect on muscle mass and/or strength gains, it is likely that an athlete who consumes protein (plus carbohydrate) sooner and more often after exercise would provide a better environment for anabolism based on other evidence showing that the rate of synthesis of new muscle proteins has a ceiling and that consumption of protein above a certain level would not stimulate protein synthesis further. How much protein would have to be consumed to maximally stimulate muscle protein synthesis is not known; however, large protein meals, in excess of the protein required to maximally stimulate muscle protein synthesis, would not likely offer any benefit to athletes if consumed after resistance exercise. In this situation, amino acids in excess of those used to support protein synthesis would be directed toward oxidation and ultimately lead to increased urea production. (Julius, 2008).

Hence, the aim of this study was to determine the effects of a pre- and post-exercise whey protein supplement on protein metabolism and muscular strength among elite wrestlers.

Methods. Participants

Eighteen male wrestlers volunteered to participate in this study. Subjects were randomly divided into supplement pre -exercise (S1; n = 10, 21.3 ± 2.9 y, 175.7 ± 4.9 cm, 86.7± 9.8 kg) or supplement post -exercise (S2; n = 8, 20.8 ± 2.03 y, 172.6 ± 5.7 cm, 85.3± 7.9 kg). subjects were tested for maximal strength (1-RM) on the squat , chest and arm exercises.

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S1and S2were consumed the whey protein (optimum) 1.4 g/kg.bw/day supplements after immediately following of training session for S1 group and 40 minutes prior to training session for S2 group, all subjects for a period of twelve week, three days weekly. subjects were tested for maximal strength (1-RM) on the squat , chest and arm exercises. participation in a training program) current or past history of anabolic steroid use; any metabolic disorders or taking any thyroid, hyperlipidemic, hypoglycemic, antihypertensive, or androgenic medications; 4) ingested any ergogenic levels of creatine, HMB, thermogenics, ribose, pro-hormones (i.e., DHEA, androstendione, etc.) or other purported anabolic or ergogenic nutritional supplements within 6 months prior to beginning the study and to not take any additional nutritional supplement or contraindicated prescription medication during the protocol.

Participants agreed not to undertake any physical activity, nor seek any remedy for muscle soreness, other than the supplement provided, for the duration of the study. All participants were informed verbally and in writing, as to the objectives of the experiments, together with the potential associated risks. All participants signed an informed consent document approved by the Human Research Ethics Committee.

Statistical analysis

All statistical analyses were calculated by the SPSS.V.16 (Statistical Package for the Social Sciences). The results are reported as means and standard deviations (SD). ANOVA analysis was used to compare the variation of the different variables between the three groups for static strength and regional bone. Least Significant Difference Test "LSD" was used to compare group means in variance analysis results which were found statistically significant. Differences in means were considered significant if p, 0.05.

Results

Table 1. Mean ± SD and (T)Test between pre – tests and post - tests in Protein Metabolism, Dynamic strength and Static Strength for experimental group 1 .

Variables	Experimental group 1		Sig.
	Before	After	
Total protein	**6.44±0.25**	**6.76±0.27**	**Sig.**
Albumin	**3.31±0.33**	**3.39±0.39**	**Sig.**
Urea	**22.52±2.31**	**24.73±2.46**	**No Sig.**
Creatinine	**0.70±0.06**	**0.78±0.08**	**Sig.**
Leg extension	**43.29±1.49**	**46.97±1.83**	**Sig.**
Barbell Bench Press	**87.38±2.42**	**90.46±2.68**	**Sig.**
Barbell front raise	**72.64±2.42**	**78.37±2.76**	**Sig.**
LS	**83.45±3.21**	**86.33±2.98**	**Sig.**
BS	**65.2±2.56**	**70.34±3.91**	**Sig.**

Table 1 shows that: significant difference between pre – tests and post - tests in all variables except urea variable.

Table 2. Mean ± SD and (T)Test between pre – tests and post - tests in Protein Metabolism, Dynamic strength and Static Strength for Experimental group 2 .

Variables	Experimental group 2		Sig.
	After	After	
Total protein	**6.48±0.27**	**6.98±0.22**	**Sig.**
Albumin	**3.33±0.30**	**3.66±0.36**	**Sig.**
Urea	**23.11±3.48**	**25.81±3.51**	**No Sig.**
Creatinine	**0.69±0.05**	**0.78±0.06**	**Sig.**
Leg extension	**42.78±2.13**	**47.67±1.91**	**Sig.**
Barbell Bench Press	**88.56±2.74**	**93.59±2.68**	**Sig.**
Barbell front raise	**72.55±2.54**	**79.88±2.78**	**Sig.**
LS	**83.33±3.76**	**89.09±2.76**	**Sig.**
BS	**64.9±2.56**	**72.34±3.91**	**Sig.**

Table 2 shows that: no significant difference between pre – tests and post - tests in all variables except urea variable.

Table 3. Mean ± SD and (T) Test between post - tests in Protein Metabolism, Dynamic strength and Static Strength for experimental and control groups

Variables	Experimental group	Control group	Sig.
Total protein	**6.76±0.27**	**6.98±0.22**	**Sig.**
Albumin	**3.39±0.39**	**3.66±0.36**	**Sig.**
Urea	**24.73±2.46**	**25.81±3.51**	**No Sig.**
Creatinine	**0.78±0.08**	**0.78±0.06**	**No Sig.**
Leg extension	**46.97±1.83**	**47.67±1.91**	**No Sig.**
Barbell Bench Press	**90.46±2.68**	**93.59±2.68**	**Sig.**
Barbell front raise	**78.37±2.76**	**79.88±2.78**	**No Sig.**
LS	**86.33±2.98**	**89.09±2.76**	**No Sig.**
BS	**70.34±3.91**	**72.34±3.91**	**No Sig.**

It is clear from Table (4) significant differences at 0.05 between post - tests of the two experimental groups in all the variables, except for Urea, Creatinine, Leg extension, Barbell front raise, LS and BS variables.

Discussion

The main findings from this study were the significant Improvements between the two experimental groups (pre and after workout) for after immediately the workout training

In this study of strength-trained men, whey protein supported positive net protein balance that created a favorable environment for muscle hypertrophy. It is also important to note that the amount of protein needed to stimulate muscle growth is not large more, is not necessarily better when it comes to muscle growthV10 g of whey protein was sufficient to build muscle.

Generally, Whay protein is one of the most popular (and most advertised) protein supplements to athletes.

Researcher believe that when the wrestlers take the whey protein after immediately the workout training, this is the most important time to take in a fast acting protein drink.

If you were to only have one protein drink per day, this is the time of day to take it. because ingest a fast acting protein source such as whey protein isolate which blast of insulin.

Insulin kicks the body's glycogen making machine into high gear. Glycogen is considered the principal storage form of glucose and is found mainly in liver and muscle. Glucose supplies the bodies active tissues with energy.

Therefore, insulin will speed up the movement of glucose and amino acids into cells which are what you definitely want and secondly, it activates a special enzyme which is essential for glycogen synthesis.

According to Burke et al. 2001, training is work on the consumption of glycogen muscle to produce the energy required for performance, shall enter the body in the use of amino acids to turn it into glucose, and here comes the role of Whey-protein in the renewal and the speed of the glycogen muscles, and this is confirmed by Tipton, et al. 2004, of the Whey-protein is one of the best supplements that reduce the speed of demolitions within the muscle tissue, so as to contain a Beta-lactoglobulin rate ranging from 50-55%, which is a major source of supply of the muscles during training acids essential amino and glycogen.

Layman, 2003, indicated that the Whey-protein is characterized by value of high biological as well as the speed of digestion and absorption, as it contains Hydro Whey-purified the best way Hydra in the world to be the lighter molecules of Whey-peptide, making it the fastest uptake in muscle.

The findings with the study of (Burke et al. 2001, Buckley et al. 2003, Brinkworth et al. 2004, Cribb et al. 2006, Kerksick et al. 2006, Julius et al. 2008, Walter et al. 2010) in that supplement of Whey protein increases the muscle strength and improves the level of performance skills.

Additional research has shown that ingesting a protein supplement after exercise triggers the release of growth hormone. Great news for building muscle.

And the key could be the amino acid leucine, one of the BCAAs. Whey protein has the highest amount of BCAAs of any protein. After exercise, leucine stimulates signaling pathways to stimulate muscle protein synthesis.

Tipton, et al. 2004 and Nicole & Wayne reported that leucine serves as a crucial regulator of protein synthesis and is donor of nitrogen to alanine and glutamine, important amino acids in muscle protein synthesis.

Researchers are excited about this ‘‘leucine trigger, as it may have important implications not only for muscle growth for healthy athletes.

Whey protein with Strength training has been reported to cause muscle fiber hypertrophy, associated with an increase in contractile protein, which

contributes to an increase in maximal contractile force (Sale et al 1990).

Strength training also reduces mitochondrial density and suppresses oxidative enzymes activity which can cause impede endurance capacity, but has minimal impact on capillary density or in the conversion of muscle fiber types from fast twitch (type II fibers) to slow twitch (type I fibers) (Nelson et al 1990, Sale et al 1990).

In contrast, endurance training usually causes little or no muscle fiber hypertrophy, but it does induce increases in mitochondria content, citric acid enzymes, oxidative capacity and the possibility of muscle fiber conversion from fast twitch to slow twitch (Nelson et al 1990).

Because, skeletal muscle makes up 40% to 45% of body weight and is the largest storage site for amino acids.1 However, muscle is more than just protein; it also contains water, fat, glycogen, and some minerals. One pound of muscle contains 70 to 105 g of protein, and to build a pound of muscle, it is estimated that 10 to 14 g of additional protein is needed each day, although others dispute this claim.

In addition to possible growth of muscle, protein is a highly versatile nutrient and is involved in other functions that are crucial to sports performance: cell regulation, muscle repair, immune function, neurological function, nutrient transport, and structural support. (Caleb et al. 2010)

Practitioners most often suggest protein in the range of 1.2 to 1.4 g/kg per day for endurance athletes and 1.2 to 1.7 g/kg per day for strength athletes.3 However, most athletes are very likely to be involved in both endurance and strength activities, so a general range of 1.2 to 1.7 g/kg per day is frequently the shorthand recommendation in practice.

Conclusion

Guidelines for protein quantity were derived from nitrogen balance studies. As (Carol De Nysschen, et al. 2009) nitrogen balance may be adequate for establishing protein needs to prevent deficiency, but it is likely inadequate to quantify optimal intakes for muscle adaptations needed by endurance or strength-trained athletes.

Amino acid oxidation, another technique used in research to determine protein needs during exercise, is also not the perfect measure. Immediately After A Workout is the best time to take it because the body needs raw materials to rebuild and recover with. If the wrestlers don't supply the raw materials through eating, the body will break down muscle from elsewhere in body in order to rebuild the damaged areas.

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Original article

THE IMPACT OF MOVEMENT COORDINATION PROGRAM ON THE COMPLEX SKILLS AMONG SOCCER BEGINNERS

ASHRAF OSMAN

Abstract

The aim of this study to identifying a learning program for attaining motor coordination components and knowing its effect on some compound skills' performance for soccer juniors, the research was applied on 9-10 years old in vertical method on Ahly Club Academy players- Mansoura branch, the researchers used experimental method with designing two groups: experimental and controlled, the researchers reached to the presence of statistical differences between pre and subsequent measures in motor coordination measures, they recognized the effect through compound skill performance for soccer juniors for the benefits of subsequent measure in which the suggested learning program showed positive effect in attaining compound skills' performance under research. In the light of the research results, the researchers recommended with the necessity of caring for learning methods which based upon merging motor coordination components with compound skills' performance when teaching at soccer junior and caring for compound motor components and setting them in degraded shape to suit individual differences between learners to be more interesting as what happens in matches to achieve learning principles and the researchers also recommend with conducting similar studies on a different sport games.

Key words**:** Complex skills, movement coordination, soccer.

Introduction

The scientific development of sports in education and training is a goal sought by the countries of the world to provide the knowledge and concepts in a simple for teachers and trainers to prepare well for sports to reach the upper levels and thus the educational process of modern is the educational process planned based on sound science is working on the access of learners to the target of (integration in athletic performance), where required to achieve this goal the teacher planning and organizing abilities of his players physical, technical, mental, and their attributes moral, psychological and administrative, in a unified framework to reach their highest level of athletic performance, and there was already a clear improvement in the level of Soccer teams At the global level in general, which should be taking with him ways to cope with the scientific development.

There is no doubt that the renderings skill as a vehicle to yield the final processes of education and training of interest to many researchers in various sports activities including Soccer, because they are popular sport in the world.(Casa, 1997 and Mohamed 2004) motor skills composite represent models for various forms for a range of skills of individual merge with each other and overlap the final stages to form the beginning of the skill of the following, which performed learner in the position of my game to achieve a particular goal, learner who does not master the skill performance composite are forced to focus on the ball and the way of more than a focus on tactically in the sense that the learner is focused only on playing the ball and cannot be observed accurately and awareness of the movements of his or competition on the field, which affects negatively in the accuracy of its implementation, but it can be acquired through the learning process aimed at performance skills to properly and quickly and economically solve motor tasks that appear during play different positions. The synergy is an important part of the complex motor skills, so they should be integrated with the motor skills within the framework of one brings the two together effectively to improve the composite performance skills of the learner in Soccer. Therefore, consistent with (Massad 2005;Amralla, 1994; Bassim, 2000) that the synergy of the components of fitness important, which is directly related to performance skills and learn to master the motor skills to bring it to the stage mechanism It is one of the most important qualities of athletic performance, especially for movements of the vehicle, the more complex vehicle movement has increased the need for compatibility with a high degree of motion. (Abuela 1997; Jihan 1999) that the synergy associated with much of the physical attributes such as speed, agility and precision, shows the correlation compatibility as soon as the performance requirements of motion in time, as they appear recipe agility and precision in the requirements movement in terms of formal and spatial any move the body and its parts with the required accuracy, and therefore the synergy in the simplest sense means the performance of motor sound speed, accuracy and agility required with economy of effort and fewer errors, and that it can develop the components of synergy through the steps of educational and diverse and scalable in difficulty, as the compatibility of motor cannot develop and his mastery of the image sound only after the occurrences of the constant so that the nervous system to send nerve signals exchanged between the stop and excitement for more than a

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muscle at the same time, in different parts of the body and the greater the parts working and moving of the body the greater the difficult exercise, and so the development of motor components of the compatibility exercise is done by the learner exercises odd or even using the tools or devices with or without this so-called quality of exercise.

The foregoing opinion researchers, the implementation of performances skill vehicle that is characterized by the Soccer require consensus kidneys to all parts of the body during the performance, so the development of a synergy for the player especially the novice, including covered by the different components has an important role in learning and the acquisition of those performances skill vehicle in Soccer foot, and the rise in the degree of perfection of the performances skill composite only processes of education and training, but is also associated with the ability to focus attention and control his skill combined and the greater the mastery of individual skills skill vehicle, the less the effort of the learner and it affects the use of all his thinking and his attention in various other duties, and master soccer player skills to the vehicle, can the use of and alternatives to different types of technique against his rival (solutions), which makes them confused and distracted to make preparations and the great diversity of skills. Through the work of researchers in the field of education and training of Soccer noticed the following:

Some learners do not have the ability to perform adequate renderings of vehicle various skills.

Lacking some learners to complete mastery of the stages of skill renderings of the vehicle.

Lacking in most of the learners to perform skills in a way that economic effort as making more effort plus required as a result of the involvement of muscle groups is required. It is also during follow-up researchers for research in terms of education and training, note that the majority of previous studies and research objectives are not enough to gain synergy and link composite skill through an educational program for beginners in Soccer. For but not limited to the goal of some of these studies identify the impact of educational programs at the level of performance skills and tactical such study (Farouk 1993), while aiming at others to give the learners' performances motor vehicle such as the study of Mohamed, 2005;Samia, 1989) , also aims some studies to analyze the performances motor vehicle and identified the quantity and quality, such as the study of (Amralla, 1994) , while the aim of some studies to develop batteries for measuring the performances of integrated and the development of standard levels have such a study Aburayya 1999, AbdulBasset& Adel, 2001), as well as the contribution of skills composite (combined) on the performance of tactical Soccer, such as studying M. I. Sultan (2004), the aim of some studies to develop batteries for measuring the compatibility of its components and the development of standard levels as studies of(Starousta, 1984, Sharma, 1992, Vladimir, et al. 2001). It here crystallizes the idea of research in the work of educational program to acquire the components of the synergy and knowledge of the impact on some of the performance skill vehicle for beginners in Soccer, where the applied research stage Sunni important is the starting point to young adulthood, where the teacher or coach interested in this age group teaching learner more complex motor skills that allow him to further achievement and excellence. And the belief of the researchers of the importance of this stage, which represents the nucleus and the basis in the upbringing of generations, sports, and based on that junior Soccer today are the future of the game and the mainstay of national teams for the attention given to their upbringing and the upbringing of a sound means to check on the future of Egyptian soccer.

The research aims to identify: (impact of educational programs to acquire the components of the compatibility of motor skill performances of some vehicle for beginners in Soccer), through:

1.Educational program designed for compatibility of the components of the motor starters in Soccer.

2. Identify the impact of the program on some of the educational components of the compatibility of motor skill and performances in the vehicle when junior Soccer.

3. Identify the percentage of improvement in the compatibility of motor skill and performances under discussion for beginners in Soccer.

Was selected a sample of (30) junior in Soccer was born in 1998, (10:9) years in the manner deliberate of players Academy Ahly Mansoura Branch, and was the exclusion of certain learners and their number (8) due to lack of regularity of each, bringing the total sample 22 novices in Soccer.

Basis for formulating the educational program:

1. Educational program for the proposed 8 (eight) weeks.

2. The number of modules within the week, three units.

3. Time module from 70 to 80 minutes.

4. Into account the appropriate frequencies for each exercise.

5. Into account the inter-breaks to reach members of the research sample of the natural state.

6. Presentation of a model taking into account the performance of the motor boat by the researchers.

7. Into account to provide information and clarify the technical aspects of the correct functioning of the erosion of falling into the errors.

8. Be consistent with the characteristics of the educational program age group in question.

9. An educational program that takes into account the logical sequence of exercises organized in terms of quality difficult.

10. An educational program that takes into account individual differences among learners.

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11. To challenge the contents of the educational program, including the capacity of learners allowed arousal Motive to learn to achieve the goal of education.

12. Take into account the needs of learners' educational program of the movement and activity.

13. The educational program provides the opportunity to participate and practice for both educated at the same time.

14. Take into account the educational program to provide the resources and the right place to implement the program.

Statistical analysis

All statistical analyses were calculated by the SPSS statistical package. The results are reported as means and standard deviations (SD). Differences between pre and post tests were reported as mean difference ±95% confidence intervals (mean diff ± 95% CI).

Results

Table 1. The age, Anthropometric Characteristics and Training experience of the Group (Mean ± SD)

Variables	N	Age [years]	Weight [kg]	Height [cm]
	30	9.15 ± 1.9	34.54 ± 4.1	134.22 ± 5.2

Table 1 shows the age and anthropometric characteristics of the subjects. There were no significant differences were observed in the anthropometric characteristics and age for the subjects.

Table 2. Mean ±SD of Transfer the balls, accuracy of correction, Speed of passing 6 balls, Kicking in circles and Free Streaming for the control and experimental groups

Variables	Control			Experimental		
	Pre	Post	change%	pre	post	change%
Transfer the balls	26.21 ± 0.39	5.58 ± 0.47	5.10	5.23 ± 0.16	34.92 ± 0.54	13.19
Accuracy of correction	176.23 ± 3.68	179.11 ± 4.15	1.63	177.65± 3.54	184.23 ± 4.32	3.70
Speed of passing 6 balls	22.14 ± 3.11	23.77 ± 2.64	7.36	22.25 ±2.31	26.16 ± 2.12	17.57
Kicking in circles	81.14 ± 2.5	85.15 ± 2.3	4.94	81.41 ± 2.5	90.24 ± 2.6	10.85
Free Streaming	21.14 ± 3.11	22.77 ± 2.64	6.36	21.25 ±2.31	25.16 ± 2.12	12.57

Table 2. Shows the mean scores and percentage changes for on Transfer the balls, accuracy of correction, Speed of passing 6 balls, Kicking in circles and Free Streaming for the control and experimental groups. The t-test showed a significant change between pre-and post training scores for all variables (P≤ 0.05) for the experimental group .However no significant differences were shown between pre-and post training scores for all variables inthe control group (P≥ 0.05) .

Discussion

And condolences to the researchers and the presence of statistically significant differences between the measurements pre and post in the components of synergy and the level of performances skill vehicle for an emerging football for the benefit of measuring the post that the tutorial traditional contains the routes and methods of teaching to improve the performances skill vehicle with conventional methods used which lead to an improvement in the renderings skill vehicle by extension, but a small percentage will take time and considerable effort compared to the proposed educational program, which Madt by the proportion of the improvement in the synergy of the components (11.49%: 218.18%), and skillful renderings of the vehicle (9.21%: 56.95%). The results of the study in a table (2), for comparing the measurements pre and post experimental group of the existence of statistically significant differences at the level of (0.05) in the components of a synergy showed the rates of improvement increased significantly (27.86% of the speed of motor - 11.49% Fittness - 45.21% for the sense of time - 218.18% for accuracy - 210.53% for the sense of distance) While the results showed in Table (15), for comparing the measurements pre and post experimental group of the existence of statistically significant differences at the level of (0.05) in performances of complex skills and showed rates of improvement increased significantly (53.91% for the receipt with the rotation and then scroll - 48.30% for the receipt and Running with the ball and then scroll - 9.21% for the receipt and then running and then direct

correction of the movement - 56.95% of receipt and then dribbling and shooting) And condolences to the researchers and the presence of statistically significant differences between the measurements pre and post in the components of synergy and the level of performances skill vehicle for an emerging football for the benefit of measuring the post that the tutorial proposal has helped to raise the efficiency of the nervous system and the increasing interdependence between sensory nerves - which affected within the program - motor nerves, which works on continuous improvement in the composite skill performances, as was the reactionary role of nutrition in terms of reform contributed a great deal from the mistakes of youth and thus improved outcomes composite skill performances of the experimental group. And condolences to the researchers of this progress to the educational program proposed, which included its contents on the exercises quality standardized to acquire the components of the synergy which has contributed to the development of performances skill of the vehicle and a pop-up requirements for performance skills in football and the appropriate age group (sample) to enable the emerging guidance which aims to movements, that reflected in the high level of skill performances vehicle (under discussion).Also consistent with results noted by the study of (Sharma, 1992**) t**hat the training exercises led to the qualitative improvement of the interoperability capabilities of different stages of the Sunni, especially for beginners. Also (Sharkey, 1986) pointed that this age group is to perform the type of activity exercises a private practitioner, to acquire the components of physical fitness. The researchers attributed this improvement in the complex skills for the players to take advantage of the positive effects of the educational program which included types of exercise skill in progressive difficulty which led to the benefit of education at From the foregoing we find that the first hypothesis of the research, which states "There are significant differences between pre and post measurements for the experimental group and control group in the components of the level of synergy and skill renderings vehicle in question in favor of dimensional measurement" has been achieved.

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Original article

EFFECT OF COMPLEX TRAINING WITH LOW-INTENSITY LOADING INTERVAL ON CERTAIN PHYSICAL VARIABLES AMONG VOLLEYBALL INFANTS (10-12 AGES)

KHAZHAL KAKAHAMA SAEED

Abstract

Purpose. Complex training involves the completion of a resistance exercise prior to a plyometric exercise. A classic example is to perform vertical jumps or depth jumps after the completion of a back squat exercise. The term 'complex training' is credited to Verkhoshansky et al. (1973). The present study was conducted to assess the outcome of complex training with low-intensity loading interval on certain physical variables among volleyball infants (10-12 ages).

Methods. The sample was twelve volleyball girls at sport Aphrodite club. were classified by two group (experimental group ten girls and control group ten girls), the experimental group was participated in complex exercises to nine weeks , three time weekly, the control group participated in the traditional training.

Results. Baseline results showed that: the experimental group had significantly higher than the control group in physical abilities and Significant improvements were observed in power and strength for the experimental group when comparative with the control group.

Conclusions. Complex exercises with low-intensity loading interval are safe and benefit for power & speed. Recent research suggests that it may be necessary to allow three or four minutes rest between the weight training and Plyometric conditions.

Key words: Complex Training, Volleyball, power.

Introduction

Children involved in sports should be encouraged to participate in a variety of activities and develop in a wide range of skills. The success of young children can serve as a powerful inducement for others to follow. Most Olympic sports have selection processes that attempt to identify future champions and initiate specialized training at the younger age. This means that preparation for competition at the highest level is starting for many sports persons in their early teens and many of them achieve high standards of performance reaching finals or even the victory rostrum. This suggests that growing children can accept training loads compatible with performances, required for success at world level (Anderson, 2000).

Power is determined from work per unit of time and considered to be a fundamental aspect of successful athletic performance, especially in sports that require speed, agility, and explosive actions (Chu, 1998). Volleyball is a dynamic, fast-paced game. requires a variety of physical attributes (speed, power, flexibility, strength and balance) and specific playing skills. Therefore, participants need to train and prepare to meet at least a minimum set of their requirements to cope with the demands of play**.** (Erin2001). At the elite level, players train for 30+ hours per week. Training includes skill, strength and conditioning programs. The purpose of strength training for volleyball is not to build big muscles, but to develop the physical attributes necessary to improve a player's performance. Strength training is very important to volleyball and should not be developed independently from other abilities such as agility, quickness and endurance. Power refers to the state of applying force. When quickness (speed) is integrated with maximum strength, power is the outcome. Power is a determinant quality that is required in any type of jumping or quick change of direction. Consequently the optimal training techniques to maximize power and the transfer of Power to athletic performance have received considerable attention from researchers and sport conditioning coaches. More recently, a number of researchers and practitioners have advocated the use of complex training (CT) techniques, a term credited to Verkhoshansky & TETYAN, 1973. Although the term has been used to describe slightly different approaches to training, CT generally involves the execution of a resistance-training exercise using a heavy load (1–5RM) followed relatively quickly by the execution of a biomechanically similar Plyometric exercise. The combination of Plyometric training and weight training are thought to be useful for developing athletic power. More specifically, complex training alternates biomechanically similar high load weight training exercises with Plyometric exercises, set for set, in the same workout. An example of complex training would include performing a set of squats followed by a set of jump squats. Anecdotal sources have described the application of complex training (Chu, 1998; Ebben & Blackard, 1998; Fees, 1997; Fleck &Kontor, 1986; Reddin, 1999; Roque, 1999). A number of studies demonstrate the effectiveness of Plyometrics compared to non-exercising control groups (Blakey & Southard, 1987; Diallo et al. 2001; D.J. Gehri et al. 1998). Other studies demonstrate an enhancement of motor performance associated with Plyometric training

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combined with weight training or the superiority of Plyometrics, compared to other methods of training (Adams et al.,1992; Delecluse, et al., 1995; Duke & D. BenEliyahu,1992; Fatourous, et al., 2000; Ford, et al., 1983; Lyttle, et al.,1996; McLaughlin, 2001; Potteiger, et al. 1999; and Vossen et al 2000). The evidence indicates that the combination weight training and Plyometrics are effective. One way to combine the two forms of training is complex training or the contrast method.

Jones, et al. 1999, compared the effects of maximum concentric acceleration training versus traditional upper-body training on the development of strength and power. Power was tested with a seated medicine ball throw and a force platform plyometric push-up. While all participants (n = 30), completed the identical training program, the control group were required to perform their exercises with routine concentric velocity. The experimental group accomplished the concentric phase of each repetition as fast as possible. Previous studies had shown that as long as the participants attempted to accelerate the bar during contraction, training would increase strength over a wide range of testing velocities.

While no significant group effects were found for any of the tests in the study of (Jones, et al. 1999) substantial training by group contact indicated that the experimental group increased significantly more than the control group. Their percentage increases were over two times more in both the 1-RM bench press (+ 9.4 versus + 2.8) and the seated medicine ball throw (+ 8.6 versus + 3.8), than the control. These results confirm previous research for improving strength and power was correct and that the intent to maximally accelerate concentrically with heavy weights may be better than slower heavy weight training.

Unfortunately, many people mistakenly believe that strength training is an inappropriate and unsafe activity for youth. Conceptually, this does not make sense. If strength training is safe and effective for your frail elderly clients, it is even better for healthy young people with full movement capacity and plenty of energy. Indeed, no serious injury has ever been reported in any prospective study on youth strength training. Not only is strength training safe for kids, but it may actually help reduce the number of injuries they sustain during other physical activities. According to the American College of Sports Medicine (ACSM), 50 percent of preadolescent sports injuries could be prevented, in large part, by enrolling kids in youth strength and conditioning programs (ACSM l993). On a more anecdotal front, we have personally conducted regular strength training classes for children 6 to 12 years old for the past 17 years without experiencing a single injury. however there are still problems with the list linked to the process of training that require practical solutions is the responsibility of trainers and specialists in the game of volleyball as required by the search for means and methods of modern scientific enhanced tests help to raise the level of physical performance and skills of the players, especially Among novices to receive training in physically intensive sport-specific, as it found that the training weights is primarily intended for the development of muscle strength as well as achieve its advantages have been confirmed to be effective in achieving this purpose and then to raise the level of performance skills, and training Plyometric has been designed also to achieve the development directly to the ability of muscle and then to the level of performance in the various activities.

Fleck & Steven, 2000, observed that extensive studies are also needed to examine the response of females, children and men to parodied resistance training programs and also to parodied models other than the conventional resistance or power training model. T. Burger, et al 2000, also reported that complex training is just as effective if not more effective as conventional training in a 7 week study.

Faigenbaum, et. al. 1999, revealed that children can experience similar gains in upper body strength and endurance within 8 weeks of training using conventional strength training and complex training.

Here summed up the problem of search in the possibility of using a vehicle training (weightlifting and Plyometric) in a manner interval load being one of the styles characteristic of the development of more than ability at one time. The present study was conducted to assess the outcome of complex training with low-intensity loading interval on certain physical variables among volleyball infants (10-12 ages).

Materials and Methods

Experimental Approach to the Problem

Two groups (experimental and control), performed a pre and post- training designed intervention in which Vertical Jump Test (VJ),Standing Long Jump Test (SLJ), Seated Medicine Ball Throw (SMBT), Quadrant Jump Test (QJ) and 30 Second Endurance Jump(EJ) were recorded. The experimental group (EG) (10 girls) trained 3 times a week on complex training for nine weeks. The control group (CG) (10 girls) continued their normal training, while the experimental group completed a complex training program to see whether this type of training modality would have a positive or negative or no effect on physical tests.

Samples:The sample was twenty volleyball girls at sport Aphrodite club were classified by two group (experimental group ten girls and control group ten girls) , (11 ± 1.36 years old; 143 ± 4 cm height; and 41 ± 5 kg weight), Training experience of all the participants ranged from 1 to 2 years. Subjects were required to read and complete a health questionnaire and informed consent document; there was no history of coronary heart disease, diabetes or recent surgery.

Training Protocol: The 9-weeks in-season training program consisted of a set of resistance exercises followed by a series of Plyometric exercises with low - volume interval . All sets of the weights exercise with a

recovery of 100 seconds/set. This is followed by a four minute rest before performing all sets of the matched Plyometric exercise with a recovery of 120 second/set.

Testing Procedures

Subjects were assessed before and after an 9-weeks training program Tests followed a general warm-up that consisted of running, calisthenics, and stretching.

Vertical Jump Test (VJ)

The subject stands side on to a wall and reaches up with the hand closest to the wall. Keeping the feet flat on the ground, the point of the fingertips is marked or recorded. This is called the standing reach height. The athlete then stands away from the wall, and leaps vertically as high as possible using both arms and legs to assist in projecting the body upwards. Attempt to touch the wall at the highest point of the jump. The difference in distance between the standing reach height and the jump height is the score. The best of three attempts is recorded.

Standing Long Jump Test (SLJ)

The subject stands behind a line marked on the ground with feet slightly apart. A two foot take-off and landing is used, with swinging of the arms and bending of the knees to provide forward drive. The subject attempts to jump as far as possible, landing on both feet without falling backwards. Three attempts are allowed.

Seated Medicine Ball Throw (SMBT)

The subject sits with their back to a wall, on a mat facing the area to which the ball is to be thrown, and with the feet extended and slightly apart. The ball is held with the hands on the side and slightly behind the center. The ball is brought to the chest, and then thrown vigorously out as far as possible. The back should remain in contact with the wall at all times. Three attempts are allowed. The distance from the wall to where the ball lands are recorded. The measurement is recorded to the nearest 10 cm. The best result of three throws is used.

Quadrant Jump Test (QJ)

This is a non running type agility test, measuring the ability to move around in a small space with maximum speed, while maintaining balance and control (coordination). A quadrant is marked out on the floor, as illustrated in the diagram (3 feet is about 90 cm). Mark the starting line and number each quadrants. The subject stands with both feet together at the starting line. On the command 'go', they jump ahead across the line into the first quadrant, then in sequence successively into quadrants 1, 2, 3, 4, 1, 2, etc. This pattern is continued as rapidly as possible for 10 seconds. After a rest repeat the trial. The subject's score is the number of correct jumps less a penalty deduction. One point is awarded each time the subject lands with both feet entirely within the correct quadrant during the 10 second trial, with a penalty of 0.5 point subtracted each time the subject touches a line and for each time the subject lands with one or both feet in an incorrect quadrant.

30 Second Endurance Jump (EJ)

The subject Stand comfortably with both feet flat on the ground, perpendicular to the hurdle. The timing starts from the first movement. The athlete jumps off both feet and lands on both feet on the other side of the hurdle, then back again. The test continues for 30 seconds, with the total number of jumps counted. The total number of completed jumps in the time period is recorded

Statistical analysis

All statistical analyses were calculated by the SPSS statistical package. The results are reported as means and standard deviations (SD). Differences between two groups were reported as mean difference ±95% confidence intervals (mean-diff ± 95% CI).Student's t-test for independent samples was used to determine the differences in fitness parameters between the two groups. The $p<0.05$ was considered as statistically significant.

Results

Table 1. Complex training protocol.

Complex	Exercise	Reps	Rest/Set
Complex 1	**Squats**	3 × 12RM	100 sec.
	Vertical Jumps	3 × 10	120 sec.
Complex 2	**Bench Press**	3 × 12RM	100 sec.
	Medicine ball chest pass	3 × 10	120 sec.
Complex 3	**Barbell Lunge**	3 × 12RM	100 sec.
	Step Jumps	3 × 10	120 sec.
Complex 4	**Lat Pull down**	3 × 12RM	100 sec.
	Medicine ball overhead pass	3 × 10	120 sec.
Complex 5	**Abdominal crunches**	3 × 12RM	100 sec.
	Medicine ball sit up and throw	3 × 10	120 sec.
Complex 6	**Decline press**	3 × 12RM	100 sec.
	Zigzag drill	3 × 10	120 sec.

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Table 2. Age, anthropometric characteristics and physical variables of the experimental group (Mean ±SD)

Variables	Mean	Standard Deviation	coefficient of skewness
Age [years]	11.06	1.36	0.89
Height [cm]	143.25	4.00	0.77
Weight [kg]	41.32	5.21	-0.93
Training experience	2.11	.05	0.84

Table 2 shows the age, anthropometric characteristics and physical variables of the subjects. There were no significant differences were observed in the anthropometric characteristics.

Table 3. Pre – Post measurements of physical variables and performance level for control group

Variables	Pre – measurements	Post – measurements	change%	T sign.
	Mean ± SD	Mean ± SD		
SMBT	4.21 ± 0.39	4.38 ± 0.47	4.04	**No Sign.**
SLJ	126.23 ± 3.68	129.11 ± 4.15	2.28	**No Sign.**
VJ	21.14 ± 3.11	22.77 ± 2.64*	7.71	**Sign.**
QJ	7.11 ± 0.91	7.59 ± 0.38*	6.75	**Sign.**
EJ	18.14 ± 2.5	19.15 ± 2.3	5.57	**No Sign.**

Baseline results showed that: The post tests had significantly higher than the pre tests in VJ and QJ , no significant differences were observed in high SMBT , SLJ and EJ , adding the high Significant improvements were observed in VJ 7.71% and less Significant improvements were observed in SLJ 2.28%.

Table 4. Pre – Post measurements of physical variables and performance level for experimental Group

Variables	Pre – measurements	Post – measurements	change%	T sign.
	Mean ± SD	Mean ± SD		
SMBT	4.23 ± 0.16	4.52 ± 0.54	6.86	**Sign.**
SLJ	127.65 ± 3.54	133.23 ± 4.32	4.37	**Sign.**
VJ	22.25 ±2.31	24.16 ± 2.12	8.58	**Sign.**
QJ	7.14 ± 0.98	8,07 ± 0.64	13.02	**Sign.**
EJ	18.41 ± 2.5	21.24 ± 2.6	15.37	**Sign.**

Baseline results showed that: The post tests had significantly higher than the pre tests in physical abilities and high significant improvements were observed in EJ 15.37% and QJ 13.02% and less Significant improvements were observed in SLJ 4.37%.

Table. 5 Mean ±SD and the significant for (SMBT), (SLJ), (VJ), (QJ) and (EJ) between the control and experimental groups

Variables	Control group	Experimental group	Sig.
SMBT	4.38 ± 0.47	4.52 ± 0.54	Sig.
SLJ	129.11 ± 4.15	133.23 ± 4.32	Sig.
VJ	22.77 ± 2.64	24.16 ± 2.12	Sig.
QJ	7.59 ± 0.38	8,07 ± 0.64	Sig.
EJ	19.15 ± 2.3	21.24 ± 2.6	Sig.

Baseline results showed that: The experimental group had significantly higher than the control group in physical abilities and significant improvements were observed in power and strength for the experimental group when comparative with the control group.

Discussion

The present study was conducted to assess the outcome of complex training with low-intensity loading interval on certain physical variables among volleyball kids (10-12 year). In fact that complex training stimulates the neuromuscular system. That is, it activates both the muscular fibers and the nervous system, so that slow-twitch fibers behave like fast-twitch fibers. (Chu,1998). Furthermore, resistance training increases motor neuron excitability and reflex potentiation, which may lead to better training conditions for subsequent Plyometric exercises , higher EMG activity was discovered in the hamstring muscles

during depth jumping indicates that more fast-twitch fibres were being recruited, which in time could have provided more propulsive power. This fact may have contributed to the increments observed in the present study. It is postulated that the resistance exercise will have a performance enhancing effect on the Plyometric activity. (Ebben & Watts, 1998).These results are Consistent with previous studies demonstrate an enhancement of motor performance associated with Plyometric training combined with weight training or the superiority of Plyometrics, compared to other methods of training (Adams, et al.,1992; Clutch, et al.,1983; Delecluse, et al., 1995; Duke & BenEliyahu,1992; Fatourous, et al., 2000; H.T. Ford et al., 1983; Lyttle et al.,1996; McLaughlin, 2001; Potteiger, et al. 1999; and Vossen et al, 2000). The evidence indicates that the combination weight training and Plyometrics are effective. one study compared the effects of strength training and complex training in boys and girls (8.1 ± 1.6 years). Results demonstrate that children attain similar gains in upper-body strength and endurance using either strength or complex training programs (Faigenbaum, et al., 1999). In addition to studies using children as subjects, other training studies examined the effects of a three-week complex training program with seven division I college female basketball players. Pre and post test results reveal improvement in the 300 m shuttle, 1 mile run, VO2 max, 20 yd dash, pro agility run and the t-test, reverse leg press and back squat. The data show that the complex training program was effective in eliciting statistically significant improvement in the 300-meter shuttle.

To explain the relation between leg power and performance level the previous studies have reported significant differences in the electromyographic (EMG) activity of the gastrocnemious and quadriceps muscle groups between trained and untrained athletes Schmidtbleicher & Gollhofer, 1985; Neubert, et al., 1998). The hamstring muscles are activated immediately after first contact and immediately after the feet leave the ground (Viitasalo, et al ., 1998).

Duke & BenEliyahu, 1992, conducted similar study and suggested that it would be logical to combine resistance training, plyometrics and speed training in the same session to increase power. Anecdotal evidence suggests that this is the optimal method for maximum power conversion. Gemar (1998) reported that resistance training and plyometric training on high school children showed significant differences in the performance of vertical jump, standing broad jump and 30 meters sprint. Zepeda & Gonzalez (2000) reported that plyometric training enhances speed within 3 to 8 weeks period and resembles the training effect produces as a result of 30 to 50% of 1RM of three weeks.

Conclusions

Finally, complex exercises with low-intensity loading interval are safe and benefit for power & speed. Recent research suggests that it may be necessary to allow four minutes rest between the weight training and Plyometric conditions. And the kids should practice the complex training in form of funny and games not form of competition to avoid the injury .

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Original article

INFLUENCE OF BI-COMPETITIVE TRAINING ON IMPROVING THE PERFORMANCE CAPACITY OF JUNIOR FEMALE GYMNASTS

POTOP VLADIMIR[1], CRETU MARIAN[2]

Abstract

The ***purpose*** of this paper is the presentation of bi-competitive training influence on improving the performance capacity of junior female gymnasts. With that end in view, we considered that, by providing an optimum relationship between the means content of bi-competitive training and the requirements of the training category within the same stage of preparation, we shall influence the performance capacity and the successful participation in the scheduled competitions.

Methods.The study was organized during five months of training (16 May 2011 - November 5, 2011), applied to a single gymnast, 10 years old, junior IV category, level 2, with the training objective to participate in the National Championships junior IV, level 2, Buzau; "Sergiu Popa" Memorial Gymnastics Competition, Junior III, level 3, Focsani; National Team Championship of Juniors III, level 3, Deva and in Individual National Championship Junior III, level 3, Focsani. Gymnast's evolutions in the preparatory stages of training sessions and competitions were monitored by using video methods of technical analysis, statistical - mathematical method and graphical representation method.

Results. The analysis of means content used in the bi-competitive preparation of female gymnasts junior IV showed that the training sessions aimed at the improvement of technical elements specific to category IV level 2 and at the learning of higher difficulty technical elements required by category III on every apparatus. To highlight the level of performance capacity indices within the bi-competitive training, 5 strength tests were applied, also 3 verification training sessions in each competitive stage and the results obtained on apparatuses in the 4 competitions, as for Score A1 (difficulty value – category requirements), Score B – execution score and FM - final mean

***Discussions*.** The study focused on the physical and technical training programs, monitoring statistically the development of muscle strength and the dynamics of technical elements learning on different apparatuses. Study results show that the bi-competitive training refers to the improvement of performance capacity in women's artistic gymnastics at junior level IV, which during training sessions aimed both at improving the category elements and at learning new and more difficult elements required for participation in competitions of a higher level than gymnast's age. This training depends entirely on the competitive calendar, on gymnasts' training level and on competitive effort characteristics at different levels of training; this methodological orientation is rare in artistic gymnastics - only with talented children and good working conditions. The analysis of physical training level highlights an improvement of abdominal muscle strength, back and scapular-humeral belt strength, arms and legs strength - spring, all these having a great influence on learning and perfecting the technical elements at apparatus, as required by Junior III category level 3.As for the results of performance capacity indices during the 4 competitions, we noticed an increase of exercises difficulty value on apparatus, an improved execution technique of highly difficult elements and the increase of the final score value on apparatus. Regarding the correlation of performance capacity indices between competitions, we observed insignificant differences of difficulty value at $p > 0.05$ in terms of requirements of the training category; significant differences of the technical execution score between the first and the second competition at <0.01, while in the contest 3 and 4 the differences are insignificant at $p > 0.05$ and significant as for the final score between competitions.

Conclusions. The training optimization by improving the elements of category IV on each apparatus and the learning of some technical elements necessary for category III in the same training session lead to the bi-competitive training in women's artistic gymnastics. An optimum relationship provided between the content of means in bi-competitive training and the requirements of the training category within the same stage of preparation will influence the performance capacity and the successful participation in the scheduled competitions. For a correct application of this form of competitive training, its efficient utilization during training sessions is recommended only if we take into account the specific methodological aspects that allow us to use it.

Keywords: *artistic gymnastics, means, performance, planning, bi-competitive training.*

Introduction

Artistic gymnastics is currently experiencing a new level of development in terms of contents and assessment of exercises. The new modifications of the Code of Points addressing the difficulty of technical elements, granting of bonuses and last, but not least, the specific requirements of each apparatus, have determined new directions and trends of the training (Potop, 2008).

The high level of performances in modern sport requires continuous improvement of all aspects of athletes' training. This level and further increase of the

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capacity for performance depend directly on a number of factors and ways to improve sports training (Dragnea, 1996).

The contents of sports training summarizes those structural elements based on functional and methodological rules and laws that determine sports performance (Niculescu, 2003).

Because the performance sport field requirements are continuously increasing and the achievement of high performances is more and more difficult, we are witnessing nowadays a transfer and adaptation of new technologies from other fields to training field (Grigore, 2001).

The development of the capacity for performance involves strategies differentiated per stages, determined by the acquisitions level and by the bio-psycho-pedagogical rules to be observed. The achievement of sports performance is determined by several factors, whose boundary is an important prerequisite for planning and modeling the training (Dragnea, Mate-Teodorescu, 2002).

Bi-competitive training in artistic gymnastics involves the content of the means on two training levels within the same training session, in pre-competitive and competitive period, aiming at the participation in two competitions with different categories of classification (Potop, 2006).

The goal of competitive preparation during workouts is to reduce the strain induced by stressing factors, to develop athletes' capacity for cognitive and lucid analysis of sports situation and to strengthen the technical answers that can be used in future competitions (Potop, 2005).

The training optimization by improving the elements of category IV on each apparatus and the learning of technical elements necessary for category III during the same workout lead to bi-competitive training in women's artistic gymnastics (Potop, 2011).

Competition is considered an activity that summarizes the results of athlete's and coach's work after a long period of time. Depending on competition nature, the focus is on compulsory and freely chosen working program, highlighting the continuity of training stage and the number of micro-cycles (.Smolevskij, Gaverdovskij, 1999).

The development of a training program for a certain period is an important stage involving from the beginning the modeling of the main quantitative and qualitative indices of workout content in conformity with athletes' level and duration of the intended training cycle (Vieru, 1997).

Some specialists believe that competitive means represent a component of training, called full component, which is practiced during sessions and micro-cycles specific to the end of the pre-competitive stage and of the competitive period. By introducing competitive means, the mentioned structures are entirely conceived according to the model of the competitions in which athletes will participate. Matveev ,1986, proposed a classification of competition means according to the motor structure of sports branches, dividing them into classes, groups, subgroups and forms of exercises, because gymnastics is placed in the sets of exercises of polyathlon competition, with a periodically renewed content, under the form of sport art (Teodorescu, 2002).

Purpose

The purpose of this paper is to show the influence of bi-competitive training on the improvement of performance capacity of junior female gymnasts. That is why we have considered that by providing an optimum relationship between the contents of bi-competitive training means and the requirements of preparation category within the same training stage we shall influence the level of performance capacity and the successful participation in the scheduled competitions.

Methods and procedures

The study was organized throughout 5 months of training (from May 16, 2011 to November 5, 2011), applied to only one gymnast of 10 years old, Junior IV category, level 2, having as preparation goal the participation in the National Championship of Junior IV, level 2, Buzău (19-21.05.2012); „Sergiu Popa" Memorial Gymnastics Contest, Juniors III, level 3, Focşani (27-28.05.2012); Teams National Championship Juniors III, level 3, Deva (16-18.06.2012) and Individual National Championship Juniors III, level 3, Focşani (2-5.11.2012).

We monitored gymnast's performances during preparatory stages in training sessions and competitions, using the video method for technical analysis, the statistical-mathematical method and the graphical representation method.

Tests for checking up physical fitness level:

- *arms strength*, climbing the rope by means of hands and legs (sec.);
- *abdominal strength*: hanging leg raise up to the grip point on rib stall (maximum number of correct reps);
- *back strength*: torso extensions hands behind neck (maximum number of reps);
- *scapular belt, back and abdominal strength*: strength handstand from legs astride seated support (maximum number of reps);
- *explosive strength*: stretched legs up and down jumps on trampoline edge - 30 sec. (number of reps);

Content of bi-competitive training means

The bi-competitive training was materialized by verifying the initial training of Junior IV category, then by turning into good account the learning of highly difficult elements necessary for Junior III category during competitions 2 and 3 (Memorial and Qualifications); the bi-competitive training was completed by the participation in the Individual National Championship.

Training objectives: improvement of category IV performances and learning of technical elements necessary for category III on each apparatus in various stages of training throughout the same training mezzo-cycle.

- Physical training: improvement or maintaining of development level of muscle strength or specific joints mobility.
- Technical training:

1. Handspring vaults: improvement of front handspring and learning of Tsukahara vault with backward tucked / piked salto.

2. Asymmetric bars: preservation of category IV training level by performing the full exercise; improvement of free cartwheel and backwards Stalder on low beam and learning the 360º twist backward stretched salto dismount and the backward tucked double salto dismount (with or without help) needed to category Junior III.

3.Beam: improvement of category IV and III elements, focusing on the correct execution of full exercises.

4.Floor: improvement of acrobatic elements, learning of the following acrobatic elements: backward tucked double salto and backward stretched saltos with 540º and 720º twist.

- Artistic training: improvement and correction of mistaken elements and of artistic saltos in full exercises on beam and on floor.

Training contents on apparatus was made in an individualized manner, depending on apparatus sequence during training session; the training was achieved by number of reps, made with or without assistance, assessed as successful or unsuccessful attempts.

Results

To highlight the level of indices of performance capacity during bi-competitive training, there were applied 5 strength tests, 3 verification training sessions in each pre-competitive stage and the results achieved on apparatus in 4 competitions in terms of Score A1 (difficulty value – requirements of category), Score B – execution score and MF –final score.

Table no. 1. Results of physical training

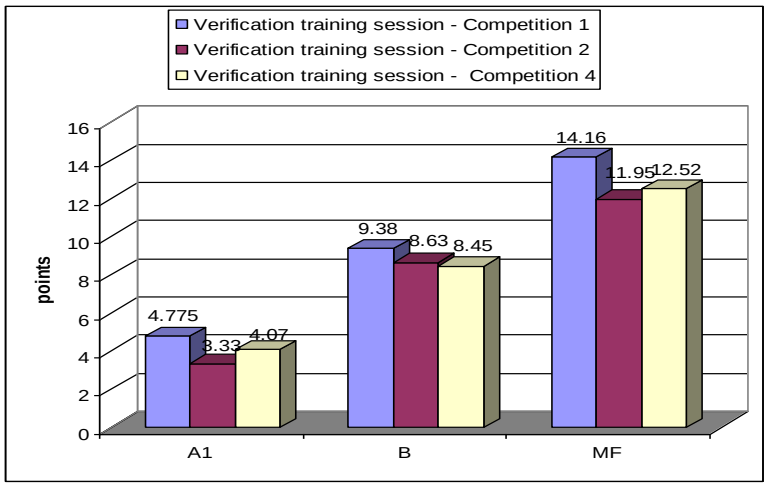
Fitness test	**Mezzo-cycle 1**	**Mezzo-cycle 2**	**Mezzo-cycle 3**
Arms strength (sec.)	21	18	16
Abdominal strength (reps. no)	16	18	15
Back strength (reps. no)	26	28	26
Scapular belt strength (reps. no)	4	8	11
Explosive strength (reps. no)	28	30	34
Statistical indices			
Mean	**19**	**20.4**	**20.4**
SEM	4.28	3.96	4.2
SD	9.59	8.87	9.39
CV %	5.04	43.5	46.06

In table no.1 are listed the results of physical training level in the three pre-competitive mezzo-cycles, in terms of arms, abdominal, back, scapular belt and lower limbs strength in NC of Jun..

Table no. 2. Results obtained in verification training sessions

Apparatus	Verification training session - Competition 1			Verification training session - Competition 2			Verification training session - Competition 4		
	A1	B	FS	A1	B	FS	A1	B	FS
Ss	5.100	9.500	14.600	4.000	8.200	12.200	4.000	8.700	12.700
Pi	3.700	9.300	13.000	2.500	8.700	11.200	3.200	8.600	11.800
B	5.100	9.400	14.500	3.400	8.200	11.600	4.400	8.300	12.700
S	5.200	9.350	14.550	3.400	9.400	12.800	4.700	8.200	12.900
Statistical indices									
Mean	**4.775**	**9.38**	**14.16**	**3.33**	**8.63**	**11.95**	**4.07**	**8.45**	**12.52**
SEM	0.35	0.04	0.38	0.31	0.28	0.35	0.32	0.12	0.25
SD	0.72	0.08	0.77	0.62	0.57	0.7	0.65	0.23	0.49
CV %	15.04	9.09	5.47	18.6	6.58	5.85	15.9	28.1	3.93

Legend: A1 –difficulty value (requirements of category); B – execution score and FS – final score.
Ss- handspring vaults, Pi- asymmetric bars, B- balance beam, S- floor.



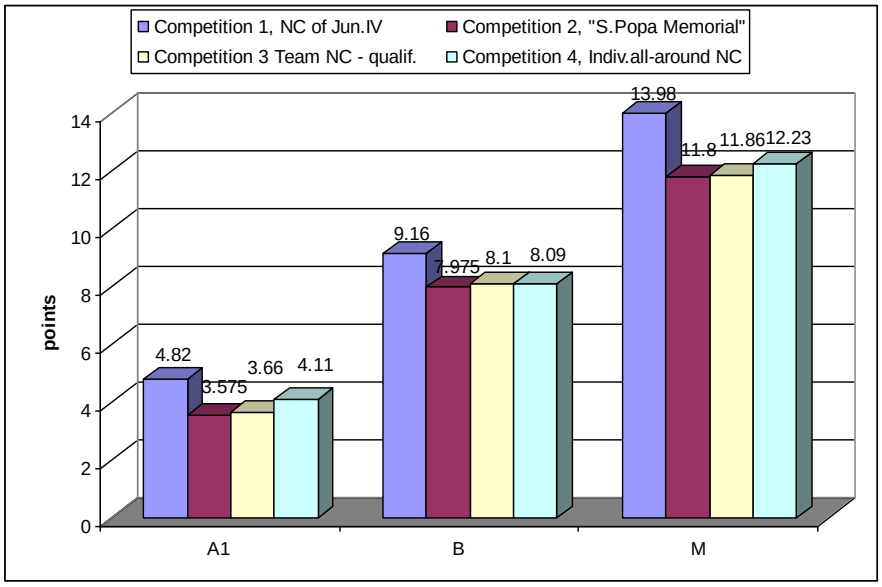
Graph 1. Results obtained in verification training sessions

In table no. 2 and graph no. 1 are shown the results achieved in the verification training sessions throughout three training pre-competitive mezzo-cycles as for score A1(difficulty/ contents), score B (execution, penalties/mistakes) and final score.

Table no. 3. Results obtained in competitions

No.		Competition 1 NC of Jun.IV			Competition 2 „S.Popa Memorial"			Competition 3 Team NC -qualif.			Competition 4 Indiv.all-around NC		
		A1	B	M	A1	B	MF	A1	B	MF	A1	B	MF
Ss	S1				4.000	8.000	12.000	4.000	7.500	11.500	4.000	8.350	12.350
	S2							4.000	7.300	11.300	4.000	8.400	12.400
	FS	3.700	9.100	12.800						11.500			12.375
Pi		4.900	8.900	13.800	2.500	7.600	11.100	2.500	8.500	11.500	3.200	8.550	11.750
B		5.100	9.300	14.400	3.400	7.800	11.200	3.400	9.200	12.600	4.400	7.100	11.500
	AS.										4.400	8.100	12.500
S		5.200	9.300	14.500	4.400	8.500	12.900	4.400	8.000	12.400	4.00	8.050	12.750
	AS.	5.200	9.200	14.400									
Statistical indices													
Mean		**4.82**	**9.160**	**13.98**	**3.575**	**7.975**	**11.800**	**3.66**	**8.100**	**11.86**	**4.11**	**8.09**	**12.23**
SEM		0.28	0.07	0.32	0.41	0.19	0.41	0.33	0.34	0.26	0.21	0.21	0.17
SD		0.64	0.17	0.71	0.82	0.38	0.83	0.74	0.77	0.59	0.52	0.52	0.44
CV %		13.23	18.26	5.11	23.10	4.84	7.09	20.22	9.52	5.01	12.71	6.43	3.61

Note: FS – Final score, AS –Apparatus score



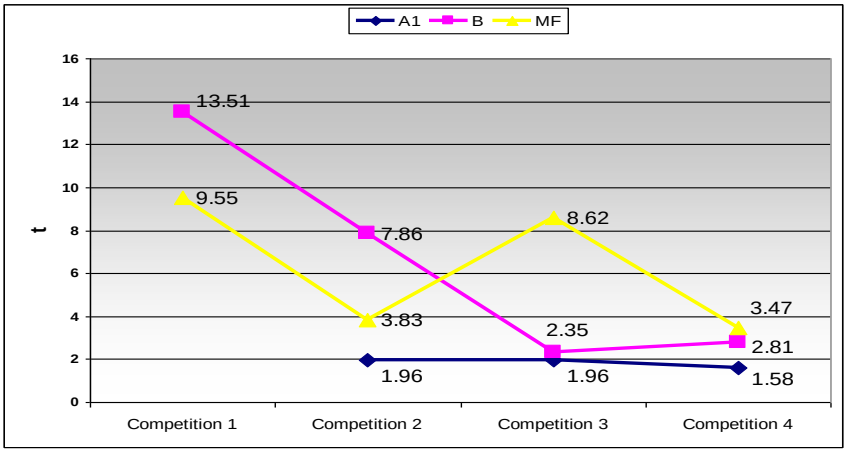
Graph no. 2. Results achieved in competitions

Table no. 3 and graph no.2 show the results obtained in competitions as for score A1 (difficulty), score B (execution) and final score.

Table no. 4. Results of performance capacity indices correlation

No.		Competition 1 NC of Jun. IV			Competition 2 „S.Popa Memorial"			Competition 3 Team NC -qualif.			Competition 4 Indiv. all-around NC		
	t, P	A1	B	FS	A1	B	FS	A1	B	FS	A1	B	FS
Competition 1 NC of Jun.IV	A1		13.51 <0.001	9.55 <0.001	1.96 >0.05			1.96 >0.05			1.58 >0.05		
	B					7.86 <0.01			2.38 >0.05			2.81 >0.05	
	FS						3.83 <0.05			8.62 <0.01			3.47 <0.05

Table no. 4 Highlights the results of performance capacity indices correlation of score A1, B and final score between competitions.



Graph no. 3. Correlation of performance capacity indices

Discussion

The research refers to a case study applied to a single gymnast of category Junior IV, level 2, who was in bi-competitive training on two levels of preparation within the same training mezzo-cycle.

The analysis of the means content applied in gymnast's bi-competitive training proved that the preparation focused on the improvement of technical elements of category IV, level 2 and on the learning of higher difficulty elements on each apparatus, elements necessary for Junior III category of training.

The objectives of physical training aimed at improving or maintaining the level of muscle strength development and joints mobility, while the artistic training focused on the improvement and correction of mistaken elements, vaults and artistic elements of the full exercises on balance beam and floor.

The analysis of physical training level highlighted an improvement of abdominal muscles, of back and scapular-humeral belt strength, of arms and lower limbs strength – the spring, all these having a great influence on learning and improving apparatus technical elements necessary for Junior III category, level 3.

Study results showed the influence of bi-competitive training on the improvement of the capacity for performance in women's artistic gymnastics at Junior IV level. The training content was intended to ensure the preparation continuity both by improving category elements and by learning new elements of greater difficulty needed to participate in competitions of higher level than gymnast's age. This preparation depends entirely on competition calendar, on gymnast's training level and on the features of competitive effort at different levels of training; this method is rare in artistic gymnastics and is used with talented children and good working conditions only.

The contents of training means on each apparatus was individualized, depending on gymnast's training level; apparatus sequence during workouts varied and the training was governed by the number of reps, performed with or without help, assessed as successful or unsuccessful attempts.

Regarding the results obtained in the 4 scheduled competitions, we observe that in the National Championship Junior IV the score A1 has an average of 4.82 points, score B- 9.200 points and final score is 13.98 points; as for competitions 2 and 3, which were held during the same competitive mezzo-cycle, at a shorter period of time, the results of scores A1, B and MF do not represent significant differences between competitions, but the achieved performances allowed the gymnast to qualify for the Individual National Championship in which we notice an improvement of the training level by the increase of difficulty score A1 of 4.11 points, the improvement of execution technique of 8.09 points and the increase of the final score of exercises on apparatus, with an average of 12.23 points (table no. 3).

Regarding the correlation of performance capacity indices between competitions, we noticed insignificant differences of difficulty value at $p>0.05$, in terms of training category requirements; significant differences of the technical execution value between the first and the second competition at <0.01, while in competitions 3 and 4 the differences are insignificant at $p>0.05$; there are significant differences of final scores between competitions (table 4 and graph 3).

Conclusions

The training optimization by improving the elements of category IV on each apparatus and by learning the technical elements necessary for category III during the same training session lead to bi-competitive training in women's artistic gymnastics.

The results of performance capacity indices during the 4 competitions highlight the increase of the difficulty value of exercises on apparatus, the improvement of execution technique of highly difficult elements and the increase of final score value on apparatus.

An optimum relationship provided between the content of means in bi-competitive training and the requirements of the training category within the same stage of preparation will influence the performance capacity level and the successful participation in the scheduled competitions.

For a correct application of this form of competitive training, its efficient utilization during training sessions is recommended only if we take into account the specific methodological aspects that allow us to use it.

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Original article

THE ROLE OF WATER TAI CHI ON NEUROLOGICAL COMPONENTS IN AEROBIC AQUATIC PRACTICE IN THE ELDERLY

STAN AMELIA ELENA[1]

Abstract

Objective. The aim of this study as to examine this form of aquatic exercise is the best way to keep the fitness, through an environment without weight applications on joints and bones, practiced in old age.

Methods. I used old people with age between 60 – 75 years (8 males and 10 female) and a set of exercises that were influenced by balance, agility and coordination. The study was conducted in swimming pools, using water means. Data investigated were recorded in the questionnaires.

Results. People that did not exercised in the one month that I held the experiment, they experienced some deterioration of neurological components, and those who did participated, they maintened the level of fitness.

After analyzing the parameters of physical training was found that the average duration of execution on the entire group was kept at the initial time duration for the 4 men and 4 women present at final testing.

Conclusions. As a health exercise, Tai Chi helps to improve balance, lower blood pressure and promote relaxation without impact, practiced in water.

After analyzing the questionnaires have come to the conclusion that people participating in water activities during the study maintained a higher level of well being, pain relief, and self-confidence.

People who were not involved in any sports activity for a month experienced some illness and anxiety to lack of socialization, an increase in weight, it reappeared some limitations in mobility, joint pain and inflammation recurred.

***Key words*:** balance, agility, coordination, aerobic aquatic.

Introduction

Aquatic aerobic provides development of level of fitness and fun in a safe environment for practice and an opportunity to socialize, important in old age.

Neurological components: balance, agility and coordination affect aquatic aerobic activity in shallow water, and their changes due to aging, influence the ability to practice physical activity.

Aquatic exercises must be carefully selected according to the ultimate goal of each participant. General principles of preparation, when applied to the aquatic environment will enhance the final result.

The physical techniques of Tai Chi are characterized by the use of leverage through the joints based on coordination in relaxation, rather than muscular tension.

The slow, repetitive work involved in the process of learning how that leverage is generated gently and measurably increases, opening the internal circulation of chi (life energy) and increasing circulation. This is beneficial for elderly trough exactly this kind of exercise, without strength.

Thus, the blood supply to muscles increases, and more blood flow means there are more nutrients available to help cells and tissues regenerate, and speed up healing. This is helpful for mind and body also.

Tai Chi – the solo form - is complete, natural range of motion over the center of gravity. Accurate, repeated practice of the solo routine can: retrain posture, encourage circulation throughout the body, maintain joint flexibility, promote balance and coordination, practiced on land and in water also.

Shallow aquatic aerobics is a combination of arm movements and rhythmic working and action of the legs, performed in a vertical position while the body is submerged, the water level between the ribs and shoulders.

Because water is denser than air, aquatic exercise is a great environment. Activities on land are based on gravity to provide the required load in the development of fitness. In the aquatic environment load is carried mainly by the resistance provided by the water. Although many of the land exercises are applicable to the aquatic environment must be combined with better training methods designed to provide functionality of movements and improved fitness levels.

Fascination of water, its relationship with people and with civilization that we went through is not random. Water gave to people hope, that using it, will become wiser and more resistant in the face

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of all life's challenges.

Movement in the water and swimming have crossed the borders of relaxation, of leisure in recreation of the medical recovery, people encountered in this environment spiritual fluid.

This relatively new activity has become an ideal alternative to traditional land-based programs that are contraindicated for people with musculoskeletal problems, like elderly people. Lord S., Mitchell D, Williams P. and, later, Morris S., analyzing the balance mechanism, they proposed a number of recovery programs in aquatic environment and made therapeutic principles for the management of balance disorders.

Special considerations for aquatic aerobics. Additional considerations to aquatic aerobic include stability of the muscle groups, body alignment and strengthening the abdomen.

Components of fitness. A well designed fitness program will consider the following components: cardiorespiratory resistance, strength and muscle strength, mobility and body composition. All have the same importance for fitness; they must be in balance. The biggest advantage of any fitness program is a normal quality of life.

Motor skills is an area managed by nervous system of the body and in particular „the coordonative capabilities that allow the individual to learn, organize, control, and transform movement" (Adami, 2002)

Balance, agility and orientation

Balance, or postural stability „refers to the body′s ability to control and maintain its position against an outside force, or the force of gravity, or – in the water – buoyancy" (Adami, 2002, p.16). Particularly perspicacity, „static or dinamic, it is based on information received from the neuromuscular system and the senses" (Adami, 2002) and is intermediate by systems like visual, vestibular and somatosensory. „Balance is the most basic part of coordination because it is intrinsic to all the other capabilities. Training for balance in water is both effective and safe." (Adami, 2002, p.17)

„Agility is based on maintaining balance, and refers to the body′s ability to move quickly in various direction while maintaining a stable center of gravity" (Adami, 2002, p.16).

„Orientation is a skill that is based on both balance and agility. It refers to the body′s ability to maintain balance while modifying its position in relation to itself, to objects, and to other forces" (Adami, 2002, p.16).

Methodology

Tai Chi promote health and self-defence and „has become a popular form of exercise for balance training" (Kisner, Colby, 2007, p.266) in which one movement flows into the next without pauses. „Water is the ideal medium for thai chi because it is inherently balancing for chakras" (Katz, 2004, p.65) consisting in a whole body movements or forms that are performed slow, soft, relaxed, „with an emphasis on awarness of posture alignament and synchronized breathing" (Kisner, Colby, 2007, p.266).

Older people can benefit from the aquatic exercises. To ensure the safety and effectiveness of exercising, they must:

~ work in a comfort zone;

~ use perceived exertion to determine the optimal intensity pace;

~ drink plenty of water before, during and after practice;

~ train muscular strength;

~ include mobility exercises;

~ maintain a simple exercise program;

~ out in preparation aquatic and;

~ sense as a way of socializing.

Although it is unlikely that anyone drowning during aquatic fitness activities, there are people who fear into deep water, where they can not reach the bottom. In this situation may be limited to exercising in water depth between the waist and ribs (to protect the lumbar spine), near the edge of the basin. Over time, becoming familiar, most people gain confidence and lose the fear of water.

Low blood pressure is not necessarily a contraindication for aquatic aerobics, but if requested too much to practice in water can enhance the situation.

Aqua aerobics is safe for almost everyone, with very few exceptions. The most important thing is to adapt training to the needs and remit and objectives of each.

The elderly can benefit from the exercise in water. To ensure an effective medium of practice, they should:

~ work in their comfort zone;

~ use perceived exertion to determine intensity pace;

~ drink plenty of water before, during and after practice;

~ perform aquatic training and muscle strength;

~ include mobility exercises and range of motion;

~ maintain a simple activity program;

~ keep a pleasant social work program.

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„Physical benefits of aquatic activities are well documented, like aquatic immersion, that is the ideal environment for imitating the imponderability. Physiological benefits came from two different sources: biological effects of water and physical and therapeutic benefits of participation in aquatic activities.

Although adapted aquatics activities not focus on the therapeutic exercise in water, warm water facilitates therapeutic purposes and is useful for treating certain diseases and ailments." (Stan, 2012)

Methods

The subjects were older people, former swimmers and people who participate in aquatic activities at the swimming pool into the Faculty of Medicine and Pharmacy Carol Davila from Bucharest because in here the water is maintained around the 30^0 C.

The participants in the study choose to help me in this project - 8 males and 10 female, from which 4 women and 4 men attended the acvatic program, the rest choose to stay on the side during the study. The age of the participants: form 60 to 75.

The study held place on the 03 – 28.09.2012 (on a period of 4 weeks, twice a week, with 30 minutes per session).

The aquatic exercise program included programs designed to encounter the needs and the lifestyle of all participants. So, I prepared programs to increase cardiovascular capacity, relax, strengthen and tone, or improve flexibility.

Program 1

Warm-up	5 minutes	Tai Chi walking forward Tai Chi walking backward
Workout for seniors	20 minutes	Relaxation with - foot massage - hand massage - shoulder shrubs - seated forward bend - hip hugs - neck rolls Water Tai Chi with - circle water spray right - circle water spray left - roll the ball - ying yang Water Pilates - single leg stretch - leg circles Water Yoga - mountain - cat

Relaxation	5 minutes	Rhythmic breathing Rolling down the wall

Program 2

Warm-up	5 minutes	Lion Sun salutation
Cardio – Aerobic Workout	20 minutes	Water Tai Chi with - tai chi opening - circle water spray right - circle water spray left - tai chi closing Deep water exercises - treading - jogging - jumping jacks - walking Water Pilates - ballet legs - tub turn Water Yoga - shark circle - water wheel - cat
Relaxation	5 minutes	Rhythmic breathing Rolling down the wall

Program 3

Warm-up	5 minutes	Sun salutation
Strenght Toning Workout	20 minutes	Water Pilates - leg circles - tub turn - corkscrew - spinal twist - clam - leg kicks Water Yoga

		- upward dog - downward dog - plank - toe lock - water wheel
Relaxation	5 minutes	Breath retension

Program 4

Warm-up	5 minutes	Breath of fire Alternate nostril breath
Relaxation Workout	20 minutes	Relaxation - shoulder shrubs - seated forward bend - diamond asana - aqua arms Water Tai Chi - tai chi opening - roll the ball - full moon - tai chi closing Water Yoga - child' s pose - cat - chest expansion
Relaxation	10 minutes	Back float

Program 5

Warm-up	5 minutes	Breath of fire Alternate nostril breath
Flexibility Workout	20 minutes	Water Tai Chi - circle water spray right - circle water spray left - hands like clouds - ying yang - full moon Water Yoga

			- mountain - warrior - toe lock - chest expansion Water Pilates - spinal twist - mermaid/merman - single leg stretch
Relaxation	10 minutes		Rolling down the wall Calming breath

Tabel 1

Meetings made	September / day							
	4	6	11	13	18	20	25	27
Program 1		x	x	x				
Program 2		x	x	x				
Program 3					x	x	x	x
Program 4	x				x	x	x	x
Program 5					x	x	x	x

Discussion

Tai Chi combining "physical movement, breathing techniques, and cognitive tools to strengthen the body, relax the mind, and balance the flow of life force" (Vasile, L. 2011).

The complex sense of balance achieves a complex function, which combines the sensorial reception with the cortical organization and the effector programme.

The reverse is that any deterioration of the body balance has negative effects on all coordination even determining psychical disorders, an inability to correctly plan the postural conditions, etc. In these conditions we consider that hydrokinesitherapy is the best solution of treatment in the less severe balance disorders and the postural control, originating from the idea that water instability makes the task of stabilizing the body on the mobile surface of the water more difficult, which in time provides the improvement of the labyrinthine function (Vasile, Macovei, 2010).

Any balance disorder is associated with feeling anxious, which exacerbates the disease itself. Sometimes even panic attacks can occur and people with such disorders can experience extremely unpleasant sensations. (Vasile, L., 2011).

Balance, agility and coordination are important not only in sports performance. The balance may be negatively affected by aging „cell loss, changes in synapse morphology, electrophysiologic alterations, and changes in the supporting microenvironment have all been noted in portions of the vestibular systems" (Sloane, Baloh, Honrubia, 1989, pp.462). „Balance and its neuromuscular foundations also deteriorate with age. Although less predictable than strength, balance too has been shown to be responsive to training" (Wolfson, et al., 1996, p:498). Because balancing in a sensitive-sensory-motor adjustment, it also co-operates with the psychomotor systems, assuring the coordinations of the movement in space, the normal body posture in progress, the maintaining the gravity centre (center of mass) in the supporting basis, the availability of mobilizing the segment in any direction, etc.In an attempt to improve balance and agility to counter the effects of aging water Tai Chi offers a feel of greatly

energized and a higher capacity of relaxation and also improved form. Level „beginner" in exercises for balance include staying in a foot, walking on toes, walking on heels, standing on the tips. The „intermediate" level may include the execution of movements with eyes closed or practice exercises standing on one leg.

The level of „advanced" may include complex exercise with eyes closed.„Measures of postural steadiness are used to characterize the dynamics of the postural control system associated with maintaining balance during quiet standing. Studies that evaluated the relative sensitivity of center-of-pressure (COP)-based measures to changes in postural steadiness related to age.

A variety of time and frequency domain measures of postural steadiness were compared between healthy young adults and healthy elderly adults." (Prieto, Myklebust, Hoffmann, Lovett, Myklebust, 1996, pp.956)

Balance and coordonation can be incorporated into each part of the aquatic aerobic. For example, „during the walking warm up, the individual may begin with forward walking and backward (retro) walking, followed by step-sliding, tandem walking forward and backward, side stepping, and braiding. Exercises such as the mini or hlf squat and the toe raise, which werw originally performed bilaterally (bipedal), may be modified to unilateral (monopedal) squats and toe raises to incorporate the element of balance.

Activities that requuire changes of direction or that include a flight stage, such as cross-country skiing in chest-deep water, hopping, or jumping jacks, can help improve proprioception as well as cardiovascular endurance." (Koury,1996, pp.73).

The workout program that will improve strenght, flexibility, balance, or aerobic capacity can consist in exercises that incorporates techniques from water yoga, tai chi, Pilates performed in a pool, and swimming or synchronized swimming fugures.

To meet the individual fitness requirements and to create a unique workouts the instructors must know diseases affecting the elderly because these have a great impact on balance activities, and also the circular movement in the joint of the limbs.

Not every kind of balance and agility exercises may be appropriate. It must known the characteristics of Tai Chi workout and „the therapeutic recreationale for why Tai Chi may affect posture and balance include de following" (Wayne, Krebs, Wolf, 2004, pp 226). „The slow, continuous, even rhythm of the movements facilitates sensorimotor integration and awareness of the external environment" (Kisner, Colby, 2007) after addressing the underlying musculoskeletal problems. (see Figure 1)

Degenerative joint changes in the cervical spine can cause a decrease in the functioning of the cervical articular mechanoreceptors. This affects proprioception and postural stability.

The rate of falling in water is much slower than on land because of the high impedance ratio of water. The ankle strategy and a stepping response can be practised at various depths, using shallower water as a progression. Arm or leg movements can be done in unipedal stance.

This makes use of turbulence and the metacentric effect to challenge balance. Continuous weight shifting from one leg to the other „facilitates anticipatory balance control, motor coordination, and lower-extremity strength" (Kisner, Colby, 2007), „and can be done by moving the centre of gravity first within and later outside the base of suport" (Campion, 2000, pp.323), including rotation movements. Movement within and reaching outside the base of support in various directions are encouraged. Other activities that can enhances postural alignment and perception of orientation include „turning in a cicle, stepping up and down, practising timed standing with a narrow base of support or in unipedal stance, and timed standing with the eyes closed" (Campion, 2000, p.323).

The balance exercises can be performed in lying, sitting and standing position, in shallow or deep water, for a challenging variation or for less resistance, without pauses or accelerations in motions.

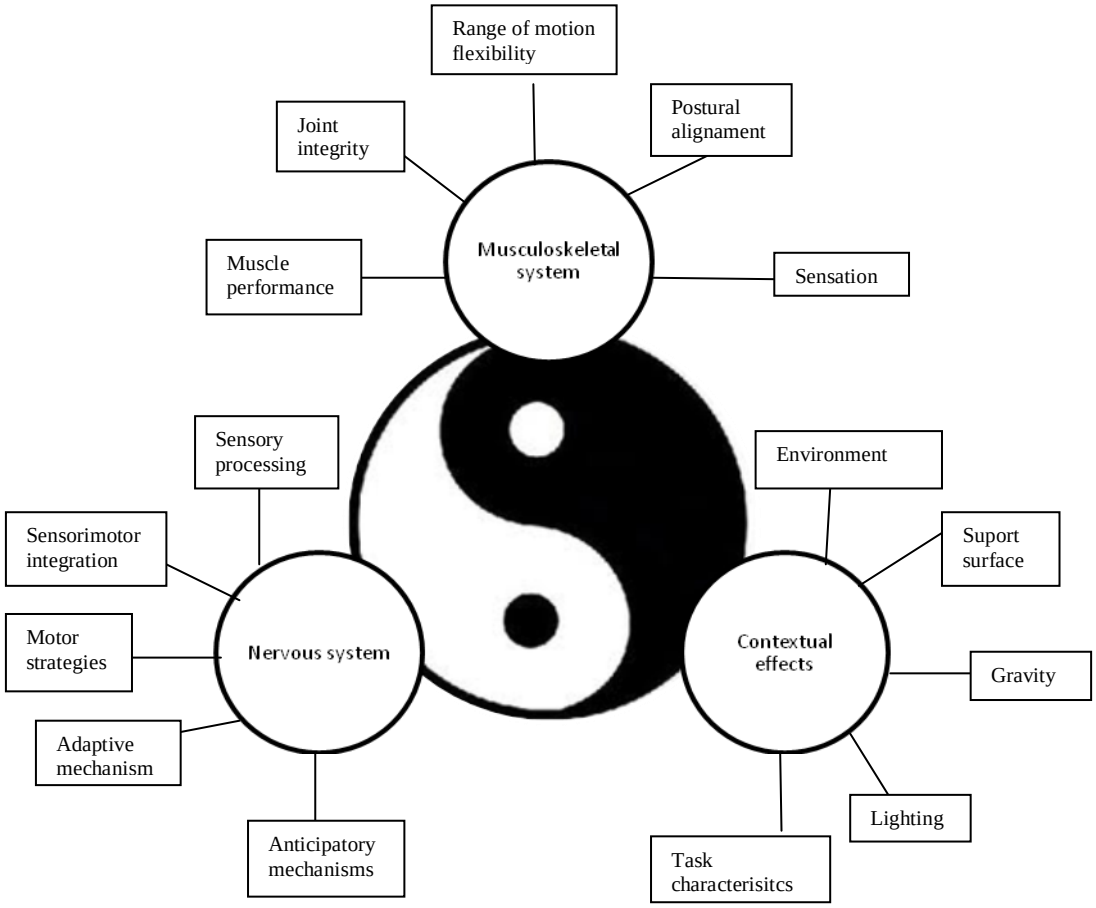

Figure 1 Interactions of the musculoskeletal and nervous systems and contextual effects for balance control (Kisner C., Colby L. A.,2007)

Pacients has to be appropriate for these type of exercises because most of the aspects in water tai chi are mental, not physical. Instructors must ensure that this form of difficult practice based on meditation it is done with constantly focus on the breath and small movements. „Tai chi performed while standing three times per week over a 6 – month period reduced the number and risk of falls and improved balance in community – residing, but inactive, elderly individuals" (Li F, Harmer, Fisher, 2005, p.127). Also, gestures being sequences of coordinated motor responses, their improvement suppose the adjusting of the command program and this can be realized in our opinion through water rehabilitation (Vasile, Macovei, 2010).

It can be created many exercise programs that can develop balance, agility and coordination as it is known the level of training.

Questionnaires

Questionnaire no. 1

1. Name and surname
2. Age
3. Sex
4. Length of aquatic exercise and swim practice
5. Assess to what extent use physical activity and recreational by placing a * in that column:

Aspect analyzed		Frequency of use		
		High	Medium	Low
a.	Practice exercise on land			
b.	Practicing aquatic exercises			
c.	Completion of laps in swimming pool			
d.	Participation in organized programs of relaxing in the pool			
e.	Participation in recreational activities in the pool			
f.	Participation in leisure activities and recovery on land			

6. Indicate how often participate in programs carried out in the basin and for what period of time, by drawing a * right:

- Daily
- 2-3 days a week
- Weekly
- Monthly
- 15 minutes per session
- 30 minutes per session
- More than 30 minutes per session

Questionnaire no. 2

Analyzed aspect	Manifestation intensity				
	Very poor	Poor	Average	Good	Very good
To what extent do you feel satisfied with aquatic programs?					
1. Reduce pain	1	2	3	4	5
2. Increase or maintain range of movement (flexibility)	1	2	3	4	5
3. Improve strenght	1	2	3	4	5
4. Improve cardiovascular fitness	1	2	3	4	5
5. Control body weight	1	2	3	4	5
6. Increase postural awareness	1	2	3	4	5
7. Promote relaxation	1	2	3	4	5
8. Utilize functional patterns that may be very difficult or impossible to accomplish on land	1	2	3	4	5
9. Improve equilibrium reactions	1	2	3	4	5
10. Improve vital capacity	1	2	3	4	5
11. Provide opportunities for socialization and recreation	1	2	3	4	5
12. Psychological influences in terms of enhance mood, self-esteem, body image	1	2	3	4	5

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Original article

BACK MUSCLES STRENGTH DEVELOPMENT BY MEANS OF INCREASE AND DECREASE OF EFFORT LOAD DURING GIANT SETS IN BODYBUILDING FOR MASSES

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Abstract

The aim of the study is to highlight methodological issues on the back muscle strength development by combining methodological procedures in masses bodybuilding.

Methods. The study was conducted in three stages over a period of two months (March-April 2011), performing three workouts per week, monitoring the effective use of strength exercises to develop back muscles in the same muscle area by means of giant sets during workouts. In this context, we conducted a case study in "Tonik Fitness Club" in Bucharest, applied to two athletes of 28 and 34 years old. We recorded subjects' evolutions during the training session, using statistical and mathematical method and graphical representation method.

Results. The study content highlights the training programs depending on muscle zone and the specific methodological aspects, the weekly training program per muscle groups, the stages of study carrying out, the test and control trials applied in terms of anthropometric measurements and of back muscle strength development, and the application of the methodical procedure of effort load increase and decrease within the giant sets in a training micro-cycle.

Discussion. The study focused on the training programs over two months, monitoring statistically the development of back muscle strength through the application of the procedure of effort load increase and decrease during giant sets in bodybuilding for masses. From the analysis of training programs content we noticed that three giant sets of exercises were used, performed in four series; each exercise within the giant sets was applied by means of the procedure of increasing and decreasing effort load. Study results emphasize the anthropometric measurement results: the study subjects have the age mean of 24.75, with a size of 175.2 cm and a weight of 83.75 kg at initial testing and a decrease by 2.12 kg in final testing. Regarding the chest perimeter, the inspiration is averaging 89.5 in initial testing and an increase of 2.25 cm in final testing; the expiration is averaging 85.25 cm in initial testing and an increase of 1.75 cm in final testing, while the amplitude has an average of 4.25 cm at initial testing and an increase of 1.0 cm at final testing. As for arms perimeter, at the initial testing of the right arm they had an average of 38.25 cm and 0.65 cm increase in final testing, the left arm - an average of 38.88 cm at initial testing and an increase by 0.12 cm in final testing. From the analysis of back muscle strength, it was noticed an increase by 4.5 reps in "pull-downs" final testing, an increase by 16kg of the load in " cable machine chest pull-downs ", with an average of 84kg at initial testing and 100 kg in final testing, performed with 13 reps at initial testing and a decrease by 4 reps in final testing. In "seated rowing at machine" there is an increase of the average by 16 kg of load, with an average of 92kg at initial testing and an average of 108kg in final testing, with 11 reps performed in initial testing and a decrease by 2 reps in final testing.

Conclusions. The study results show that the regular exercising leads to a decrease of body weight, an increase of thoracic amplitude, of arms perimeters and last, but not least, to strength development per different muscle groups.

The study highlights methodological issues on the back muscles strength development by combining methodological procedures in bodybuilding for masses, by increasing and decreasing effort load during giant sets. And the effective use of strength exercises for back on the same muscle area by means of giant sets during a training session helps to improve muscle endurance and to increase strength at different machines. Also the division of back muscles areas during each training micro-cycle emphasizes the dynamics of muscle strength and the possibility to combine muscle groups together during a training mezzo-cycle.

Keywords: bodybuilding, strength, giant sets, muscle groups and performance.

Introduction

Bodybuilding separated as an independent discipline. It can be practiced as a performance sport, but its various available means make it very popular and we can identify it in the lesson of physical education, in the sports training specific to branches requiring the development of motor skill, strength, alone and/or in relation with others, in kinetotherapy too. Bodybuilding is the sport in which practitioners seek to develop a proportional body, with massive and symmetrical muscles, but also trying to reduce as much as possible the fat layer under the skin (Hîtru, 2002).

To this end there are used exercises with dumbbells, barbells, cable machines or other types, but also aerobic exercising such as cycling, jogging, swimming, etc. Nutrition also is very important for a bodybuilder training because it must serve a double purpose: to provide the necessary basis for the increase of muscle mass, but in the same time to

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reduce the fat layer (Voicu, 1995).

Bodybuilding is a very creative sport, in which athlete and coach decide upon sets, reps and training speed, in order to get the highest level of exhaustion, followed by a period of rest and recovery (Muraru, 2008). It is the process of muscle development by a combination of workouts with weights, increase of the number of burnt calories and rest. Sports performance achievement would not be possible if the athlete would not „ hold" in its genetic code a certain motor quantity and quality. More than in the other sport branches and fields, bodybuilding highlights human body aesthetic aspect and motor skills as well.

By its specific nature, training in bodybuilding has a deeply formative character, much more as this one is its very purpose. This character is found mainly at somatic level, but due to duration and to high effort we can not neglect the mental aspects that bodybuilding exerts on its practitioners. Therefore, we shall also find in bodybuilding workouts some working principles that we have divided depending on the acting direction, on the level to which it applies and on their specific character as well (Chirazi, Ciorba, 2006).

The development of each individual's motor skills is a progress of biological, morphological, physiological, biochemical type, which leads to the improvement of tissue structures and to the increase of functional capacities of the cardiovascular, enzymatic, respiratory systems, all carriers of oxygen to muscle tissues. Human body expresses its power by making efforts in which the mechanical work is present or not. This effort is meant to overcome, to maintain or to give up, depending on the resistance to be defeated. It is necessary to distinguish between muscle power and strength. Strength means to overcome resistance without time condition while power refers to the mechanical work done per unit time (Bota, Prodescu, 1997).

Mechanical work is proportional to the size of the force that performs it and the length of the way on which this body is moved. Thus, if an athlete lifts a barbell of 20kg f, he makes a mechanical work twice bigger than if he lifts a barbell of 10 kg f and vice versa. At the same time, if the same athlete lifts a barbell 2 m high, he makes a mechanical work twice bigger than if he lifts it up to 1 m only (Gavrilescu, 2010).

In the light of the modern biochemistry and physiology data, the achievement of athletes' muscles functional hypertrophy, during strength workout, requires the following elements (Demeter, 1981): intense biological stimulant, proper contribution of proteins and presence of endogenous anabolic hormones, in necessary quantities.

For most sports, the relative importance of strength related to the other factors is not safe. A certain sport is based on the continuous observation and development of strength/power: to one extreme are placed the sports in which these factors are of major importance, to the other extreme are placed the sports in which these factors are not given their importance. Consequently, these sports can be called sports with limited power/strength or *dependent* sports, *associated* sports with strength/power and *independent* sports in terms of strength / power (Sports Physiology Collection: Sport of High Performance, 2006).

In the course of bodybuilding exercises, different types of effort are made, which tend, as essential elements, to practitioner's modeling in and on the proper competitive orientation.

As the bodybuilding is a complex sports branch, the isometric type efforts (isometric contractions – in which the muscle shortens under a passive tension) are combined with the isotonic efforts (isotonic contractions – in which the muscle does not change its dimensions, but only its tension status).

The volume, the amount of work done includes the preparation duration; the number of kilograms, or tons/weights lifted in a training session or a preparation stage, as well as the number of reps and sets per exercise or training session. In the strength training, the intensity is expressed as a percentage of the load or of a maximum repetition (Bompa, 2002).

Strength is human capacity (biological and psychological) to overcome external resistance measured in kilograms, using barbells and dynamometry. From physiological and biochemical point of view, muscle strength exercise includes: activating a large number of motor units, frequency of the associated nervous impulses, the degree of synchronization of different motor units and the bio-chemical and structural particularities of the muscles involved in the effort (Nicu, 1993).

The strength workout and the static contractions workout are designed to produce the maximum possible overload for each muscle or group of muscles targeted. After years of experiments and researches, it was found out that the most efficient method to maximize overload is to use sets of strength partial exercises. Using the most powerful set for most exercises means to utilize"the last centimeters of the grip" that you have. Thus, one can exercise with maximum load without being exposed to injury (Bodybuilding, 2007)

The bodybuilding workouts focus on the alternation of muscle efforts with rest, on a strict diet, on a really hygienic daily life. Thus, the bodybuilding has established itself as a social reality because its field is well defined, holding a great variety of exercises, with specific training methods and principles, and because it has a multiple utility, as it is accessible to all ages, it can be practiced by men and women as well and the physical effort can be very accurately and finely dosed.

In bodybuilding, the main objectives (muscle development and definition, muscle harmonization and strength development) are achieved by means of exercises with weights. When we talk about food intake (component of training in bodybuilding, subject matter of a special chapter) we refer to the actual food, to nutritional supplements, as well as body rebalancing with

minerals and vitamins. In other sports activities, food intake is part of the restoration and recovery means. In bodybuilding, because of the particular importance that food intake has in different moments of the competitive calendar (sometimes it is more important than the effort made during the training itself) we have considered it as a distinct side. The matters related to recovery in bodybuilding refer on rest, massage, restoration. When we talk about bodybuilding training principles, we shall detail some aspects of mental preparation.

Methodical procedures for strength development (Dragnea, Mate-Teodorescu, 2002):

1. Weightlifting procedure: it is achieved by load progressive increase, by weights increase and decrease, by load increase step by step and in full swing.

2. Isometric procedure – it is the procedure used for the development of muscular mass, the contraction duration is 9-12 seconds; the pause between reps is 90-120 seconds.

3. Circuit procedure – it is the most common methodical procedure of motor skills development, created for the development of main muscle groups strength, inclusively for the development of strength under endurance conditions. The exercises used in circuit must be known by the athlete, must be accessible in terms of volume, intensity and complexity of physical effort; the sequence of exercises must engage in effort the key muscle groups of human body. It is not recommended to make 2 successive exercises for the same muscle group. The difficulty of exercises must increase progressively. The dosage of physical effort in this type of exercises must be strictly individualized – individual sheets.

According to the number of exercises used in circuit we have:

- short circuits – 6-7 exercises;
- average circuits – 8-9 exercises;
- long circuits 10-12 exercises.

4. Isotonic and rapid contractions procedures – used for explosive strength development, namely for strength under speed conditions (recommended for vascularity and muscle definition).

5. Procedure of efforts repeated up to overflowing – it involves a large number of reps with average weights; the efficiency of this procedure is obvious after the installation of the real fatigue. It is a very good procedure for novice bodybuilders, as it is the foundation of muscle development.

6. Power-training procedure – is used to develop explosive strength; it is recommended for obtaining the competitive vascularity and muscle definition necessary for contest. It consists of 3 exercise groups:

- group 1 – exercises with average weights;
- group 2 – exercises with maximum weights;
- group 3 – aerobic exercises.

A work program includes 12 exercises divided into 3 groups, each one including 4 exercises. After running a group of exercises, the rest is 3-5 minutes.

The main **purpose** of the study is to emphasize the methodical issues regarding back muscles strength development by a combination of the methodical procedures in bodybuilding for masses.

Study hypotheses:

We believe that an effective use of back strength exercises for the same muscle group by means of giant sets during a training session will help improve muscle strength and will increase strength at different machines.

Dividing back muscles areas during each training micro-cycle will highlight the dynamics of muscle strength and the possibility to combine muscle groups together throughout a training mezzo-cycle.

Place of study conduct, subjects

To address these methodological aspects of the back muscle strength development, we conducted a case study in the Sports Club „Tonik Fitness Club" of Bucharest.

The subjects of the study were 2 athletes, aged 28 and 34, respectively, practitioners of fitness for masses till the present moment.

Duration and stages of study conduct

The study was conducted over a 2 months period (March – April 2011), four ties a week.

Stages of study carrying out:

1. *Initial* stage (6.-11.III.2011), initial testing of measurements and control trials.
2. *Fundamental* stage (13.III-20.IV.2011), applying the training programs.
3. *Final stage* (23.-27.IV.2011) final testing of control measurements and trials.

Methods

- *Bibliographic study* - theoretical documentation of the paper
- *Observation method* – observation of subjects' performances during preparation;
- *Method of experimental study* – method in which the study hypotheses were confirmed or invalidated.
- *Statistical-mathematical method* – meant to calculate the main statistical indices (KyPlot).
- *Method of graphical representation* – it contributed to a more efficient interpretation of study results.

Control tests and trials applied

To point out subjects' evolution regarding the development of back muscles, we used the control tests and trials below:

A. Anthropometric measurements: Size (cm); Weight (kg); Thoracic perimeter (cm): inspiration, expiration and thoracic amplitude; Arms perimeter (cm): right and left

B. Control tests applied:

1. Bar pull-downs with large grip, assessed by maximum number of reps;

2. Cable machine chest pull-downs, assessed by number of reps with maximum weight;

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3. Seated row with large grip, assessed by number of reps with maximum weight.

Content of training program

Back width is one that proclaims you a true bodybuilder. We believe that referees too notice you initially on stage, even if you are relaxed, if they see you have a very broad back. Bodybuilders with broad back and shoulders and a small waist draw attention wherever they are (Bodybuilding and Fitness, 2011).

To highlight the methodological aspects of back muscles strength development by ***progressive increase of effort load throughout giant sets*** in performance bodybuilding, we shall introduce training programs depending on muscle area and the specific methodical aspects. Modern training technique in the workout with weights involves working with sets of reps, in which weight is managed so as the muscle receives continuously the proper request (Ş. Damian, in "Giant sets" presents that training methodical procedure that enables the performance of two or more different exercises, without any pause between them, addressing the same muscle group (Oprea, 2009).

Weekly training program:

- Monday : back + triceps + abdomen + cardio
- Wednesday: shoulders + legs + abdomen
- Friday: chest + biceps + abdomen + cardio

Example: a training model:

MONDAY: BACK + TRICEPS

1. Exercise with giant sets: Bar chest pull-downs with large grip + Cable machine pull-downs with large grip

Exercises		**Set I**	**Set II**	**Set III**	**Set IV**
Bar pull-downs	no. of reps	10	10	10	10
Cable machine pull-downs	kg	41	49	57	65
	reps	10	10	10	10

2. Exercise with giant sets: Bar chest pull-downs with large grip + Cable machine pull-downs with large grip + Machine seated row

Exercises		**Set I**	**Set II**	**Set III**	**Set IV**
Bar pull-downs	no. of reps	8	8	8	8
Cable machine pull-downs	kg	73	81	89	97
	reps	10	10	10	6
Seated row	kg	40	48	56	64
	reps	10	10	10	10

3. Exercise with giant sets: Bar chest pull-downs with large grip + Cable machine pull-downs with large grip + Machine seated row + "Smith" machine pull-downs

		Set I	**Set II**	**Set III**	**Set IV**
Bar pull-downs	no. of reps	8	8	8	8
Cable machine pull-downs	kg	89	81	73	65
	reps	10	10	10	6
Seated row	kg	72	80	88	96
	reps	10	8	6	3
"Smith" machine pull-downs	kg	64	72	80	88
	reps	10	10	10	10

TRICEPS:

1. Forehead „Z" bar extensions from supine position on bench + push-ups at parallel bars

		Set I	**Set II**	**Set III**	**Set IV**
Forehead „Z" bar extensions from supine position on bench	reps	10	10	10	10
	kg	33	41	49	57
Parallel bars push-ups	reps	10	10	10	10

2. Forehead „Z" bar extensions from supine position on bench + push-ups at parallel bars + string extensions at cable machine

		Set I	**Set II**	**Set III**	**Set IV**
Forehead „Z" bar	reps	10	10	10	6

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extensions from supine position on bench	kg	65	73	81	89
Parallel bars push-ups	reps	10	10	10	10
String extensions at cable	reps	10	10	10	10
machine	kg	20	25	33	41

3. Forehead „Z" bar extensions from supine position on bench + push-ups at parallel bars + string extensions at cable machine + „Z" bar extensions with supine grip

		Set I	**Set II**	**Set III**	**Set IV**
Forehead „Z" bar extensions	reps	10	10	10	6
from supine position on	kg	65	73	81	89
bench					
Parallel bars push-ups	reps	10	10	10	10
String extensions at cable	reps	10	8	10	10
machine	kg	49	57	49	41
„Z" bar extensions with	reps	33	41	49	56
supine grip	kg	10	10	10	10

Results

Table no.1. Anthropometric measurements

No.	Full name	Age (years)	Weight (kg)		Size (cm)
			Initial	Final	
1	C.A.	29	85	83	176
2	P.V.	34	71	69.5	168
Statistical indices					
Mean		31.5	78	76.25	172
S.E.M.		2.5	7	6.75	4
S.D.		3.53	9.8	9.54	5.65
Variance		12.5	98	91.12	32
Coef. Var.		0.11	0.12	0.125	0.03
Sum		63	156	152.5	344

Analyzing the results of anthropometric measurements, the subjects of the study have an average *age* of 24.75 with a *size* of 175.2 cm, while the *weight* at initial testing is 83.75kg and a decrease by 2.12kg at final testing, showing a high homogeneity and significant differences between tests (table no. 1).

Table no.2. Anthropometric measurements

No.	Full name	Thoracic perimeter (cm)						Arms perimeter (cm)			
		Inspiration		Expiration		Amplitude		Right		Left	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
1	**C.A.**	111	112	108	110	3	4	41	41.5	40.5	41
2	**P.V.**	112	114	108	110	4	4	42	42.5	42.5	43
Statistical indices											
Mean		11.5	113	108	110	3.5	4	41.5	42	41.5	42
S.E.M.		0.5	1.0	0	0	0.5	0	0.5	0.5	1.0	1.0
S.D.		0.71	1.41	0	0	0.71	0	0.71	0.71	1.41	1.41
Variance		0.5	2.0	0	0	0.5	0	0.5	0.5	2.0	2.0
Coef. Var.		0.01	0.01	0	0	0.2	0	0.02	0.01	0.03	0.03
Sum		223	226	216	220	7	8	83	84	83	84

The thoracic perimeter, at *inspiration* shows an average of 89.5 at initial testing and an increase by 2.25cm at final testing, at *expiration* the average is 85.25cm at initial testing and an increase by 1.75cm at final testing, while the *amplitude* is 4.25cm at initial testing and an increase by 1.0 cm at final testing, having a high homogeneity in all cases and significant differences between tests at inspiration and expiration and *insignificant differences* between tests in terms of thoracic amplitude (table no. 2).

Arms perimeter – at initial testing, *right arm* has an average of 38.25cm and an increase by 0.65cm at .final testing, *left arm* has an average of 38.88cm at

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initial testing and an increase by 0.12cm at final testing, with high homogeneity at both tests and significant differences between tests (table no. 2).

Table no.3. Results of control trials

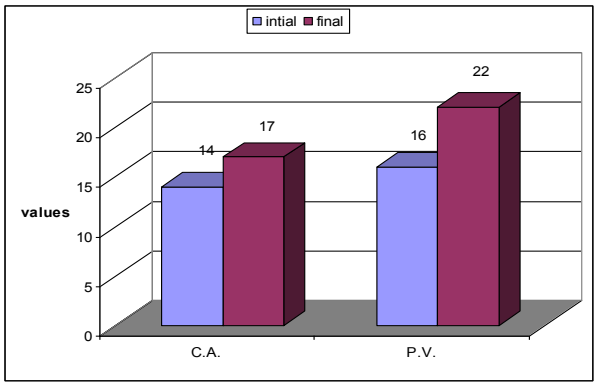
No.	Full name	Bar pull-downs, reps no.		Cable machine chest pull-downs, kg/ reps no.				Machine seated row, kg/ reps no.			
		Initial	Final	Initial		Final		Initial		Final	
				Kg	reps	Kg	reps	Kg	reps	Kg	reps
1	C.A.	14	17	80	12	96	8	88	12	96	10
2	P.V.	16	22	88	14	104	10	96	10	120	8
Statistical indices											
Mean		15	19,5	84	13	100	9	92	11	108	9
S.E.M.		1	1	4	1	4	1	4	1	12	1
S.D.		1.41	2.5	5.6	1.4	5.6	1.4	5.65	1,41	16.9	1.4
Variance		2	3.53	32	2	32	2	32	2	288	2
Coeff. Var.		9.42	18.1	6.7	10.8	5.6	15.7	6.14	12,8	15.7	15.7
Sum		30	39	168	26	200	18	184	2	216	18

1. Bar pull-downs, assessed by maximum number of reps, at initial testing - 15 reps, at final testing – 19.5 reps (table no. 3, fig.1a and graph 1).

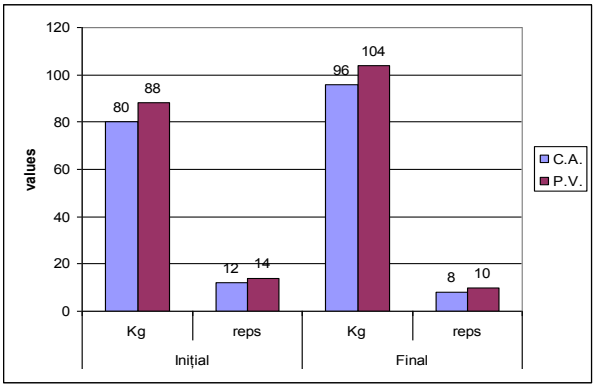
2. Cable machine chest pull-downs, assessed by number of reps with maximum weight**,** estimated by maximum number of reps at initial testing with an average of 84kg with 13.0 reps, and an average of de 100kg with 9.0 reps at final test (table no. 3, fig.1b and graph no. 2).

a b c

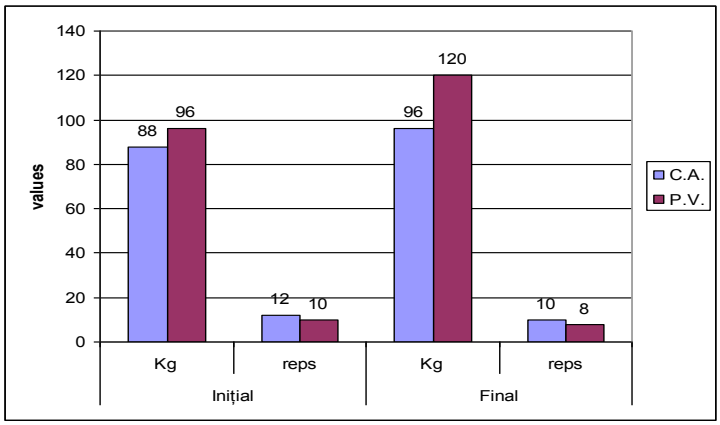
Figure 1. Exercises for back strength development



Graph no. 1. Bar pull-downs



Graph no. 2. Cable machine chest pull-downs



Graph no. 3. Machine seated row

3. Machine seated row for shoulders strength, assessed by maximum number of reps at initial testing, with an average of 92kg with 11.0 reps, while at final test it was recorded an average of 108kg with 9.0 reps, (table no. 3, fig.1c and graph no. 3).

Discussions

The study focused on preparation programs, throughout two months, monitoring statistically the development of back muscles strength by applying the procedure of increase and decrease of effort load during the giant sets in the bodybuilding for masses.

The analysis of the content of training programs means showed that three sets of giant exercises were used, performed in 4 series, each exercise of the giant sets was applied by means of effort load increase and decrease procedure.

Study results highlight the results of anthropometric measurements: the subjects of the study have an average age of 24.75, a size of 175.2 cm, and the weight at initial testing was 83.75kg with a decrease by 2.12kg at final testing. In terms of thoracic perimeter, at inspiration there is an average of 89.5 at initial testing and an increase by 2.25cm at final testing, at expiration the average is 85.25cm at initial testing and an increase by 1.75cm at final testing, while the amplitude – an average of 4.25cm at initial testing and an increase by 1.0 cm at final testing. As for arms perimeter, at initial testing the right arm has an average of 38.25cm and an increase by 0.65cm at final testing, the left arm – an average of 38.88cm at initial testing and an increase by 0.12cm at final testing.

From the analysis of back muscles strength testing, we noticed an increase by 4.5 reps at final testing at „ bar pull-downs", an increase by 16kg of the load at „cable machine chest pull-downs", with an average of 84kg at initial testing and 100 kg at final testing, performed with 13 reps at initial testing and a decrease by 4 reps at final testing. As for „machine seated row" we notice an increase of the load average by 16 kg, with an average of 92kg at initial testing and an average of 108kg at final testing, performed with 11 reps at initial testing and a decrease by 2 reps at final testing.

Conclusions

To highlight the methodological aspects of back muscle strength development in bodybuilding for masses, we conducted a case study in the Sports Club „Tonik Fitness Club" of Bucharest; during this methodical approach, we have applied control tests and trials.

The study results show that the regular exercising leads to a decrease of body weight, an increase of thoracic amplitude, of arms perimeters and last, but not least, to strength development per different muscle groups.

In the end of the paper we can conclude the following matters:

- the study highlights methodological issues on the back muscles strength development by combining methodological procedures in bodybuilding, by increasing and decreasing effort load during giant sets.

- the effective use of strength exercises for back on the same muscle area by means of giant sets during a training session helps to improve muscle endurance and to increase strength at different machines.

- the division of back muscles areas during each training micro-cycle emphasizes the dynamics of muscle strength and the possibility to combine muscle groups together during a training mezzo-cycle.

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Original article

COMPARISON OF SOME PULMONARY FUNCTION OF DIFFERENT NATIONAL WRESTLERS

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Abstract

Purpose. This study was conducted with the aim of determining and evaluating respiratory functions of National Seniors Wrestling teams of Turkey, Kyrgyzstan and Senegal.

Methods. Respiratory function tests were taken from voluntary wrestlers entering in the preparation camp before the International Yasar Dogu Seniors' Freestyle Wrestling Tournament. A total of 36 athletes participated in the study, including 12 from Turkey (T) (25,67±5, 32 years, 169, 17±8,93 cm, 73, 58±11,30 kg), 12 from Kyrgyzstan (K) (23,17±2,92 years, 167,33±6,41cm, 62,67±7,43 kg) and 12 from Senegal (S) (27,00±4,52 years, 176, 50±8,55 cm, 72, 33±10, 07 kg).

Results were carried out with SPSS 11.0 package software. While international differences were looked at using One-way ANOVA, the Tukey test was applied on the values yielding significant results, significance at the $p<0.05$ level was investigated..While significant differences at the $p<0.05$ level were detected in FVC and VC values and at the $p<0.01$ level in %FVC, %FEV1 and %VC values; no significant differences were observed among teams in PEF and MVV values ($p<0.05$) with regard to pulmonary functions among these countries.

Conclusion. As a result, it is considered that the differences detected in respiratory functions of athletes of the three different countries can stem from external-individual and racial factors/ethnic factors.

Key Words. Wrestling, Spirometer, Respiratory functions, National Athletes

Introductions

Researching the physical and physiological features of elite-level athletes holds a gradually increasing importance for researchers in terms of performance control and performance increase. When evaluated physiologically, pulmonary function tests as well as other physiological tests are also crucial in order to measure the performance conditions of individuals (Astrand, 1986). While it was reported in some studies that there is a positive correlation among physical activity, physical fitness and pulmonary capacities (MacAuley, 1999;Mehrotra and Twisk, 1998) it is expressed in some other studies that there is no such correlation (Biersteker, 1985). Specific pulmonary function tests also assist in determining the problems in the respiratory system as well (Sheety, 2005). Respiratory function levels are used as a reliable risk indicator particularly for COPD (Chronic Obstructive Pulmonary Disease) (Senior, 1998). In addition, high respiratory function levels facilitate the maintenance of a healthy life in the upcoming periods (Wang, 2004). It was stated in a study on health conducted by Buffalo that respiratory functions are a long-term determinant of the general survival rate for both genders as well and they can be used as an instrument in the general evaluation of health (Holger, 2000). Respiratory tests are also used in wrestlers as an indicator for their general health conditions, performance and give important information to trainers and athletes about respiratory system (William, 2004).

Wrestling is a branch of sport that entails the co-existence of various functional features, the anaerobic energy system is predominantly employed and factors such as quickness, strength, agility, flexibility, balance, muscular and cardiovascular endurance, coordination and a high aerobic capacity affect performance (William, 2004). Examining the research performed on wrestlers, it is seen that determining physical and physiological features of wrestlers as well as the effects of different training programs on these features and changes that occur in these features with weight loss have been investigated (Brown, 2006; Vardar, 2007). Research conducted on the respiratory functions of wrestlers is considerably limited (Ghosh, 1985). The need for conducting such a study was put forward with the aim of using pulmonary function tests commonly for the purpose of detecting the fitness conditions of individuals and presenting crucial information to trainers and athletes as an indicator of the health conditions of athletes (Astrand, 1986). Moreover, another reason is the existence of a significant correlation between Wingate test parameters, which are the determinant of anaerobic performance, and respiratory functions (Arslan, 2009) and that being said, anaerobic traits being dominant and in addition, respiratory functions also being affected by quite varied factors such as age, gender, ethnic group, exercise and so on. Due to these reasons, this study was conducted with the aim of determining and evaluating some respiratory functions of athletes of three different seniors' free style wrestling national teams.

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Methods

This study was carried out on athletes who participated in the preparation camp that was held in Ankara before the International Yasar Dogu Seniors' Freestyle Wrestling Tournament between January 23 – February 07, 2008. A total of 36 subjects from the national teams of Turkey (n=12), Kyrgyzstan (n=12) and Senegal (n=12) voluntarily participated in the study.

The heights of the subjects were measured by the Seca brand instrument that measures height and their body weights were measured by a digital bascule with a degree of accuracy of 0.01 kg.

One day before the pulmonary function tests were carried out, the athletes were warned about not using any drugs, smoking cigarettes within the last 24 hours, doing vigorous exercise at least 30 minutes before the test and eating heavy meals 2 hours before the test. The individuals having had upper or lower respiratory infection for the last 4 weeks were excluded from undergoing the test. In addition, individuals tested were asked to not wear clothes restricting their chest and abdominal motions. Subjects were informed about the test maneuvers before the test was conducted.

Before the pulmonary function tests, room temperature and barometric pressure were recorded and BTPS was made (Miller, 2005). Pulmonary function tests were carried out by a portable Cosmed Pony FX brand Spirometer (Italy) while subjects were standing.

Statistical analysis was conducted with SPSS 11.0 package software. Levene's test of homogeneity of variance was applied to the data after conducting a Kolmogorov-Smirnov test and normality test. The One-Way ANOVA test was performed on the data that exhibited normal distribution and whose variances were equal. Tukey multiple comparison test was implemented to determine the differences among the countries, significance at the $p<0.05$ level was investigated.

Results

Looking at (Table 1), no significant difference was found statistically among the physical traits of the subjects (age, height and body weight). When the subjects were evaluated in terms of their pulmonary functions (Table 2), it was observed that there were significant differences among the countries in FVC and VC values at the $p<0.05$ level between Turkey and

Senegal and at the $p<0.01$ level between Turkey – Senegal and Kyrgyzstan – Senegal in %FVC, %FEV1 and %VC values.

Table 1: Physical Traits and Comparison of Three National Teams

Parameters	Turkey (n=12)	Min.	Max.	Kyrgyzstan (n=12)	Min.	Max.	Senagal (n=12)	Min.	Max.	ANOVA	P
Age (year)	25,67±5,32	20	32	23,17±2,92	20	27	27,00±4,52	23	33	1,191	0,331
Weight (kg)	73,58±11,30	55	84	62,67±7,43	55	74	72,33±10,07	60	84	2,261	1,139
Height (cm)	169,17±8,93	155	180	167,33±6,41	162	176	176,50±8,55	168	191	2,184	0,147

P>0.05

Table 2: Comparison of Respiratory Values of Three National Teams

	Turkey (n=12)	Min.	Max.	Kyrgyzstan (n=12)	Min.	Max.	Senagal (n=12)	Min.	Max.	ANOVA	
FVC (lt)	5,07±0,71[a]	4,23	6,03	4,92±0,66	4,13	5,69	3,76±0,94[b]	2,38	5,31	5,001	0,022*
FVC%	106±6,99[c]	95	116	104,83±7,85[d]	91,00	113,00	72,50±13,21[e]	50,00	89,00	22,811	0,001**
FEV1 (lt/1.sn)	4,24±0,69	3,42	5,04	4,14±0,60	3,63	5,05	3,43±0,90	1,95	4,77	2,109	0,156
FEV1%	103,67±8,26[f]	94	114	103,83±8,93[g]	92,00	116,00	78,66±16,74[h]	48,00	96,00	8,814	0,003**
FEV/FVC%	83,33±6,25	74	92	84,00±5,32	74,00	88,00	90,33±6,08	82,00	98,00	2,570	0,110
VC (lt)	4,68±0,56[i]	3,94	5,34	4,59±0,54	3,95	5,20	3,68±0,77[j]	2,68	4,74	4,562	0,028*
VC%	94,00±3,69[k]	87	97	95,50±8,24[l]	83,00	108,00	68,00±9,54[m]	54,00	79,00	24,919	0,001**
PEF (lt/sn)	8,55±1,77	5,34	10,18	8,01±2,15	4,47	10,96	7,24±2,81	4,09	11,21	0,498	0,618
MVV (lt/dk)	158,65±38,58	107,60	214,40	148,68±32,82	101,50	193,50	151,45±55,77	69,90	223,10	0,084	0,920

p<0,05 **p<0,01 (a-b)* (i-j)* (c-e)** (d-e)** (f-h)** (g-h)** (k-m)** (l-m)*

FVC: Force Ventilation Capacity, **FEV_1**:Forced Expiratory Volüme in one second, **VC**: Vital Capacity, **MVV**: Maximal Voluntary Ventilation **PEF:** Peak Expiratory Flow

Discussion

In this study conducted with the aim of determining and evaluating some respiratory functions of athletes from three different countries, while there were no significant differences among countries with regard to their physical traits, significant differences were detected in FVC and VC values between Turkey and Senegal, in %FVC, %FEV1 and %VC values between Turkey and Senegal, and Kyrgyzstan and Senegal.It is reported in the literature that respiratory functions are influenced by various factors as internal-individual and external individual factors (Buist and Scanlan, 1995, Higgins, 1993).

It is stated that external-individual factors which affect pulmonary functions are environment, nutrition, alcohol, body heat and saturation of barometric pressure with water vapor, drug use, exercise, infections, air pollution, allergens and cigarettes, while individual factors are age, gender, ethnic group (Buist, 1995; Higgins, 1993; Rong, 2008), anthropometry(Scanlan, 1995), waist circumference (Higgins, 1993), body posture (Haern, 1968) and psychological factors (Buist, 1995).

In cases of the existence of age and height homogeneity, it is stated that the total pulmonary capacities and ventilation capacities differ among ethnic groups.

While it is noted that pulmonary and ventilation capacities of individuals who live in the Indian subcontinent are lower compared to Europeans (Haern, 1968; Miller, 2005), it was reported that the pulmonary function values of Western Africans are also slightly higher than Indians (Miller, 1970). It is considered in this study conducted as well that inter-athlete difference can stem particularly from extra-race/ethnic group and individual factors rather than age and anthropometric factors.

It is stated that as a result of regular sporting activities, increases were observed in individuals' physical and physiological development in addition to their respiratory functions (Callaway, 1988; Chandran, 2000; Nourry, 2005; Shivesh, 2007; Thaman, 2010), accordingly, pulmonary volume and capacities of trained individuals during exercise and rest are higher than of sedentaries (Durning, 1977; Ferraro, 1999; Ghosh, 1985).

Besides, it is also stated that some changes can occur in the respiratory dynamics of untrained individuals during exercise, albeit not at as high a level as top level trained athletes (Brown, 2006). Even though it is not known to what extent these changes depend on physical training, anatomical limitations or gender distinctions, it is logically accepted that the muscles of respiration of physically trained people are stronger and more durable (Brown, 2006).

In a study in which Gupta and Guastellan (Gupta, 2007) evaluated the pulmonary functions of 53 high school students (27 swimmers, 26 wrestlers and a non-athlete control group of 26), they stated that there was no significant difference statistically between FVC and FEV_1 values of athletes (swimmer-wrestler). On the other hand, they detected that there was a significant difference statistically in FVC and FEV1 values at the $p<0.05$ level between athletes (swimmer-wrestler) and non-athletes (Gupta, 2007).

As a result, they reported that training performed in high school students develops pulmonary functions but there isn't any difference between the types of training performed (in terms of training performed by wrestlers and swimmers) in terms of respiratory parameters.

In another study in which Ghosh et al. (Ghosh, 1985) determined the pulmonary capacities of athletes in different branches in India, they reported that VC, MVV and $\%FEV_1$ values of 21 wrestlers between the ages of 23-24 with a height of 169,4±6.1cm and body weight of 65,9±8,0kg are 4.02±0,73lt, 138,8±23,20lt/min and 90,8±6,4lt respectively (Ghosh, 1985).

The VC, MVV and $\%FEV_1$ values obtained in this study, which was carried out on wrestlers, were detected for Turkey as 4,68±0,56lt, 158,65±38,58lt/min, %103,67±8,26, for Kyrgyzstan as 4,59±0,54lt, 148,68±32,82lt/min, %103,83±8,93 and for Senegal as 3,68±0,77lt, 151,45±55,77lt/min, %78,66±16,74.

While the pulmonary function values of Turkish and Kyrgyz wrestlers were found to be higher than the values of Indian wrestlers determined by Gosh et al., the values of Senegalese wrestlers were found to be lower (Ghosh, 1985).

In another study in which Hearn and Edwards (Edwards, 1972; Haern, 1968) determined pulmonary respiratory capacities, it was reported that the respiratory values of individuals who live in the Indian subcontinent are lower than Europeans; in Miller et al. (Miller,1970), pulmonary respiratory values of Western Africans are slightly higher than Indians (Miller,1970). It was reported that due to the fact that Turkey is situated on the European continent, Kyrgyzstan is situated on the Asian continent but over India, Senegal is on the Indian subcontinent (Edwards, 1972; Haern, 1968), the pulmonary function values of Western Africans are also slightly higher compared to Indians (Miller,1970).

The results attained in this study, in which respiratory values are compared among ethnics group or countries, are backed up by the results obtained by Hearn (Haern,1968) and Edwards et al. (Edwards, 1972) in their studies. Finally, it is considered that distinctions detected in the respiratory parameters of athletes who participated in the research could stem from external-individual and racial factors.

Evaluating respiratory functions together with performance is suggested in studies to be carried out hereafter by covering internal and external individual factors as a whole.

Practical Applicaton: The present study reveals data resulting in comparative benchmark concerning

national wrestlers of different ethnicities and from various countries for further researches.

The data collected in our study showed that ethnicity influenced pulmonary functions significantly. It is therefore suggested that non-individual factors could be effective in such studies

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Acknowledgements

The authors would like to thank the trainers of the three national wrestling team and the wrestlers for their participation in the study.

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Methods. We used Romanian university students (27 males and 97 females). The body fat percentage was measured by two methods: the skinfolds measurements...

Results. Body fat estimated with accu-measure caliper was moderate correlated with body fat estimated with FUTREX for women (r = 0.41)…

Conclusions. We cannot consider that one method of body composition analysis (skinfolds method or near-infrared method) is more accurate than…

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The aim of this study was to examine the relationship between skinfolds method (accu-measure caliper) and near-infrared method (FUTREX 1000 Personal Body Fat Tester) for body fat percent, fat mass and free fat mass estimations, in Romanian university students. We used Romanian university students (27 males...

Key Words: skinfolds method, near-infrared method, percentage of body fat, fat mass, free fat mass, Romanian students.

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Abstract

Objective. The aim of this study was to examine the relationship between skinfolds method (accu-measure caliper) and near-infrared method (FUTREX 1000 Personal Body Fat Tester) for body fat percent, fat mass and free fat mass estimations, in Romanian university students.

Methods. We used Romanian university students (27 males and 97 females). The body fat percentage was measured by two methods: the skinfolds measurements (accu-measure caliper) and near-infrared measurement (Futrex 1000).

Results. Body fat estimated with accu-measure caliper was moderate correlated with body fat estimated with FUTREX for women (r = 0.41) and for men (r = 0.55). Fat mass (skinfolds method) skinfolds method and free fat mass (skinfolds method) were moderate correlated with fat mass (near-infrared method), respectively free fat mass (near-infrared method) for women (r = 0.41, respectively r= 0.41) and correlated for men (r = 0.60, respectively r = 0.60).

Conclusions. We cannot consider that one method of body composition analysis (skinfolds method or near-infrared method) is more accurate than the other because we don't apply a gold standard method of measurement, for subjects. However, near-infrared method trends to have higher estimations of body fat, then skinfolds method on Romanian students.

Key Words: skinfolds method, near-infrared method, percentage of body fat, fat mass, free fat mass, Romanian students.

Introduction

The increase in obesity is a global phenomenon that is even being addressed by the World Health Organization (World Health Organization, 2003), as well as by medical and government organizations in the world.

One of factors that contribute to body composition changes, respectively to body fat percent grow up is physical inactivity or sedentary lives (National Institutes Of Health, 1998).

Factors, such as age, gender, level of adiposity, physical activity and ethnicity influence the choice of method and equation. To date, race-specific SKF (American Indian women, Black men, and Asian adults), BIA (American Indian women and Asian adults), and NIR (American Indian women and White women) equations have been developed (Heyward, 1996).

Infrared is not an indicator of body composition in the pre-adolescent population on an individual basis. This method continues to be no accurate, cost-effective means to assess individual body composition by a rapid, noninvasive methodology (Michael, Jan, Wendy, 2003).

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Larger prediction errors have been reported with the lower cost, hand-held Futrex 1000 model. Because of these errors, the manufacturer's equations for the Futrex 1000 are not recommended to assess body composition (Wagner and Heyward, 1999).

Kamimura et al. cannot consider that one method of body composition analysis (SKF method, bioelectrical impedance analysis, or NIR method) is more accurate than the other because they didn't apply a gold standard method, for patients on long-term hemodialysis therapy. However, the most simple, long-established, and inexpensive method of SKF thickness seems to be still very useful for assessing body fat (Kamimura, Jose Dos Santos, Avesani, Fernandes Canziani, Draibe, Cuppari, 2003).

In a healthy group of 29 subjects examined by Elia et al., NIR method had little or no advantage over other simple methods in predicting body composition measured by classical whole-body densitometry. NIR method was also found to underestimate body fat increasingly as the degree of adiposity increased. This under-estimation was found to be particularly marked in a small and separate group of grossly obese women, BMI greater than 50 kg/m^2, whose body composition was assessed by total body potassium as well as by densitometry (Dumitru, 1997).

Heyward et al. concluded that all three field methods, respectively SKF, bioelectric impendance and NIR compared with hydrostatic weighting, accurately estimate the percent of body fat for nonobese women; however, none of these three methods is suitable for estimating the percent of body fat for obese women (Heyward, Cook, Hicks, Jenkins, Quatrochi, Wilson, 1992).

One study concluded that, SKF is higher correlated with under water weighting than did FUTREX 5000 with under water weighting for males (0.95 versus 0.80), females (0.88 versus 0.63), and the whole group (0.94 versus 0.81) and FUTREX 5000 overestimated body fat in lean subjects with less than 8% fat and underestimated it in subjects with greater than 30% fat. Analyzing this, the authors concluded that, SKF give more information and more accurately predict body fat, especially at the extremes of the body fat continuum (McLean and Skinner, 1992).

The present findings indicate that, the FUTREX 5000 provide more accurate estimates of body fat percent than the FUTREX 5000A or FUTREX 1000 instruments (Smith, Johnson, Stout, Housh, Housh, Evetovich, 1997). Continued research with expanded populations is needed to further demonstrate and evaluate the utility of FUTREX 5000A device (Cassady, Nielsen, Janz, Wu, Cook, Hansen, 1993).

Conway et al. concluded that, body composition (percentage fat) estimated in 53 adults (23 to 65 years of age) by infrared interactance, is correlated with SKF ($r = 0.90$) measurements. They conclusioned that, the method is safe, noninvasive, rapid, easy to use, and may prove useful to predict percentage body fat, especially in the obese (Conway, Norris, Bodwell, 1984).

SKF method is still a reliable technique of BF estimation, but if it's not realized with the most accurately instruments the results trends to have errors in BF estimation and FM, respectively FFM (Cyrino, Okano, Glaner et al., 2003). The NIR method is still a questionable technique for BF estimation (McLean and Skinner, 1992; Michael, Jan, Wendy, 2003; Wagner and Heyward, 1999).

The objective of this study is to examine the relationship between skinfolds (SKF) method (accu-measure caliper) and near-infrared (NIR) method (FUTREX 1000 Personal Body Fat Tester) for body fat percent (BF), fat mass (FM) and free fat mass (FFM) estimation, in Romanian university students.

Methods

The subjects were white Caucasian and students at faculties of Ovidius University in Constanta. The aims and methods of the study were explained to the participants, who chose freely to participate in this study. As a result, the sample included 127 students (97 females and 27 males), with age between 18 and 23 years old.

Body height was evaluated with an error of 0.1 centimeters and body weight was evaluated with a calibrated digital scale, with an error of 0.25 kilograms. For this measurement the subjects were dressed summarily. BMI was calculated to estimate the category of weight for each subject by using the Quetelet formula (Dimitre, 1997).

Percent of body fat was estimated with two methods. The first method consisted in calculation of body fat percent with Jackson and Pollock, (1978), equation, for male subjects and Jackson, Pollock and Ward, (1980), equation, for female subjects. The abdominal (taken vertically with a broad grip, 5cm. lateral to the omphalion (centre of the umbilicus)), chest (taken obliquely along the natural cleavage line of the pectoral between the axilla and nipple) and thigh (vertical fold taken midway between the inguinal crease and proximal border of the patella) skinfolds were measured for …

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Results

In table 1 the differences between sexes were significant only for body height ($t = 9.838$) and body weight ($t = 5.841$).

Table 1. Physical characteristics of the subjects

	M ± SD	
Variables	**Males (n = 27)**	**Females (n = 97)**
Age (years ^{months})	$19^{7} \pm 0^{11}$	$20^{1} \pm 2^{8}$
Body height (cm)	1.789 ± 0.078 *	1.63 ± 0.059
Body weight (kg)	66.074 ± 11.135 *	52.722 ± 7.842
BMI (kg/m^2)	20.598 ± 2.929	19.811 ± 2.485

* differences between sexes, p<0.05.

BMI, body mass index; M, mean; SD, standard deviation; n, number of subjects.

In table 2 the differences between sexes were significant for all variables (BFskf, t = 13.278; FMskf, t = 6.346; FFMskf, t = 11.498; BFnir, t = 7.856; FMnir, t = 2.883; FFMnir, t = 9.861). All variables from SKF method had significant correlations with their correspondent variable from NIR method, when body height, body weight and age were controlled. BFskf was moderate correlated with BFnir for women (r = 0.41) and for men (r = 0.55). FMskf and FFMskf were moderate correlated with FMnir, respectively FFMnir for women (r = 0.41, respectively r = 0.41) and correlated for men (r = 0.60, respectively r = 0.60).

Table 2. Differences between SKF method and NIR method

	Skinfold method (Accu-measure caliper) M ± SD	
Variables	**Males (n = 27)**	**Females (n = 97)**
BFskf (%)	8.962 ± 4.407 * †	21.886 ± 4.704 *
FMskf (kg)	6.25 ± 4.006 * †	11.806 ± 4.085 *
FFMskf (kg)	59.824 ± 8.207 * †	40.915 ± 4.512 *
	Infrared method (Futrex 1000) M ± SD	
Variables	**Males (n = 27)**	**Females (n = 97)**
BFnir (%)	13.074 ± 5.988 †	22.805 ± 4.475
FMnir (kg)	8.97 ± 5.431 †	12.164 ± 3.615
FFMnir (kg)	57.104 ± 8.225 †	40.557 ± 5.486

* correlated with BFnir, FMnir and FFMnir for males, respectively for women, when height, weight and age are controlled, p<0.05;
† differences between sexes, p<0.05.

BFskf, body fat - skinfolds method; FMskf, fat mass - skinfolds method; FFMskf, free fat mass - skinfolds method; BFnir, body fat - infrared method; FMnir, fat mass - infrared method; FFMnir, free fat mass - infrared method; M, mean; SD, standard deviation; n, number of subjects.

……..

Discussion

Compared with the anthropometric reference data 1988 – 1994 from United States (National Health and Nutrition Examination Survey, 2005), body height for our subjects was slightly higher for men and slightly lower for women, compared with the corresponding values for Americans. The body weight was lower, for both men and women, compared with the corresponding values for Americans.

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Acknowledgments

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National Institutes of Health (NIH). Clinical Guidelines On The Identification, Evaluation, And Treatment Of Overweight And Obesity In Adults. The Evidence Report. Publication No. 98-4083, 1998 Sep: XI-XXX.
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Table 1. Physical characteristics of feminine subjects
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Variables	Subjects with dominant upper and lower right limb(n = 8)		Subjects with dominant upper and lower left limb (n = 8)	
Height (cm.)	163,25 ± 4,95	3,032%	162,5 ± 4,309	2,652%
Weight (kg.)	66,088 ± 7,343	11,111%	67,038 ± 5,352	7,984%
IMC (kg/m^2)	24,745 ± 1,827	7,383%	25,368 ± 1,439	5,673%
Percentage of body fat(%)	26,625 ± 2,873	10,791%	26,55 ± 2,964	11,164%
Fat mass (kg.)	17,739 ± 3,56	20,069%	17,91 ± 3,235	18,063%
The values are presented as M ± DS și CV%.				
IMC, index of body mass; M, mean; DS, standard deviation; CV, variability coefficient; n, number of subjects.				

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- Statistic data.
- The identification letter written in superscript (Home, Superscript).

Example: a – significantly different compared to the force ratio F150 Right side flexion/ F150 Left side flexion, 0º, for the subjects who practise football, respectively athletics (triple jump), F(2, 12) = 5,5;
- Identification letter.
- Hyphen.
- Statistic comment.

Table 2. Means of results of maximum isometric force ratios for feminine subjects who practise different sports

Force ratio	Handball (n = 5)	Football (n = 5)	Athletics (triple jump) (n = 5)
F130 Flexion/ F110 Extension (30º)	0,589 ± 0,109	0,556 ± 0,075	0,565 ± 0,05

	18,506%	13,489%	8,85%
F150 Right side flexion/ F150 Left side flexion (0º)	0,851 ± 0,044 [a b] 5,17%	0,942 ± 0,056 [c] 5,945%	0,919 ± 0,03 [d] 3,264%
F120 Right side rotation/ F120 Left side rotation (-30º)	0,972 ± 0,07 7,202%	0,825 ± 0,227 27,515%	1,052 ± 0,019 [e] 1,806%

a – significantly different compared to the mean of the force ratio F150 Right side flexion/ F150 Left side flexion, 0º, for subjects who practise football, respectively, athletics (triple jump), F(2, 12) = 5,5;
b – significantly different compared to the mean of the force ratioF150 Right side flexion/ F150 Perfectly ballanced left side flexion (when all the force ratios are equal to 1), 0º, t=7,572;
c – significantly different compared to the mean of the force ratio F150 Right side flexion/ F150 Perfectly ballanced left side flexion (when all the force ratios are equal to 1), 0º, t=2,316;
d – significantly different compared to the mean of the force ratio F150 Right side flexion/ F150 Perfectly ballanced left side flexion (when all the force ratios are equal to 1), 0º, t=6,037;
e – significantly different compared to the mean of the force ratio F120 Right side rotation/ F120 Perfectly ballanced lesft side rotation (when all the force ratios are equal to 1), -30º, t=6,12;
The values are presented as M ± DS and CV%; Significance limit established at p<0,05.

M, mean; DS, standard deviation; CV, variability coefficient; n, number of subjects; t, test t student ; F, test ANOVA.

- Statistic section (Home, Times New Roman, Size 10, Justify).

Figures

The tables which contain figures will be done on a single column. The counting (consecutive) and the title of the figure (conclusive and concise) will be written on the bottom left side immediately after the figure. The reference to the figure (the quotation in the text) will be found in the text that precedes the table which contains the figure. The figure, the number of the figure, the title of the figure, the statistical section (if necessary) and the abbreviation section will be a constitutive part of the table that contains the figure. When symbols, numbers or letters are used to identify the parts of the figure, each of them should be explained clearly in the statistical section.It is recommended that you merge the data in as few figures as possible. The lines of the table that contains the figure will be transparent. (Table Tools, Design, Borders, No Borders).

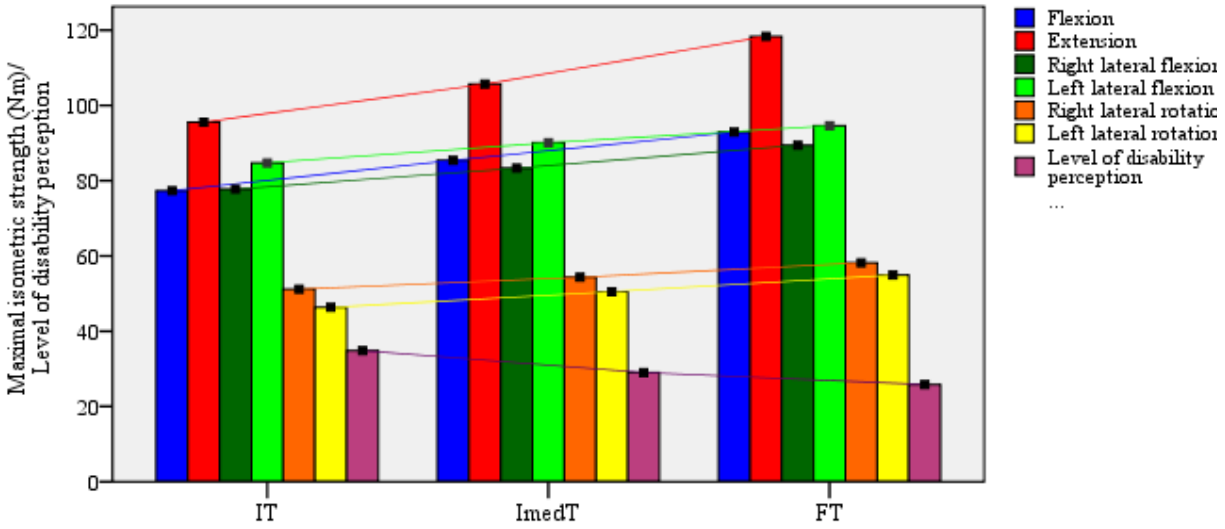

Figure 27. The evolution of means of maximum isometric force and the degree of perception at different tests.
Nm, Newton*meter; IT, initial testing; ImedT, intermediary testing; FT, final testing.

- Number and title of figure (Home, Times New Roman, Size 10, Justify).
- Abbreviations used in the figurewill be mandatory explained after the number and the title of the figure and/or the statistic section (Home, Times New Roman, Size 10, Justify).

The figures will have a resolution of minimum 250 dpi for a better understanding after the print The figures will be presented in original sizes in the text (sizes chosen by the author(s) of the paper), not to be subsequently modified. The electronic formats accepted are: Bitmap (.bmp), JPEG (.jpg, .jpeg) or GIF (.gif).
The results and the statistical explanations will be presented in one way – data in the table, figure in the table or text; these ways of presenting can be combined but they do not have to repeat themselves.

Measures

Length, height, weight and volume will be specified in metrical units (meter, kilogram or litre or their decimal multiples). Temperature will be specified in degrees Celsius (°C). Blood presure will be specified in mm column of mercury (mmHg). Other clinical measurements will be specified in the International System of Units (International System of Units (SI)).

Abbreviations and symbols

The standard abbreviations must be used. You should avoid introducing abbreviations into the title or in the abstract.An abbreviation in parantheses will be preceded by the full description, only the first time the abbreviation is used in the text and only if the abbreviation is not a standard measure unit .

Example: Body weight, body composition, resting metabolic rate (RMR), respiratory quotient (RQ), temperature, fasting serum glucose, insulin, free fatty acids, and ghrelin were assessed at baseline and after 21 d (12-h fast) and 22 d (36-h fast) of alternate-day fasting.

- Full description of the abbreviation the first time it appears in the text.
- Abbreviation written in parentheses the first time it appears in the text.

RMR and RQ did not change significantly from baseline to day 21, but RQ decreased on day 22 ($P < 0.001$), which resulted in an average daily increase in fat oxidation of ≥15 g.

- Abbreviations when appears for the second time in the text.

Bibliography

Wuthiekanun V, Chierakul W, Langa S, et al. Development of antibodies to Burkholderia pseudomallei during childhood in melioidosis-endemic northeast Thailand. Am J Trop Med Hyg 2006 Ian 12;74(10):1074-5.

- Home, Times New Roman, Size 10, Bold, Justify, First Line Indent 0,5cm, Two Columns.
- Home, Times New Roman, Size 10, Justify, First Line Indent 0cm., Hanging Indent 0,5cm, Two Columns.