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Original article

EFFECT OF FUNCTIONAL POWER TRAINING ON BIOCHEMICAL & CERTAIN PHYSICAL VARIABLES FOR YOUNG HANDBALL PLAYERS

KAMAL Mohamed Emeesh[1]

Abstract

Aim. Functional power training involves performance work against resistance in such a manner that the improvements in strength directly enhance The performance of movements so the an individual's activities of daily living are easier to perform simply stated, the primary goal of functional training is to transfer improvements in strength achieved in one movements to enhance the performance of another movements by affecting the entire neuromuscular system. The aim of this study was to investigate that Effect of functional power training on oxidative stress and certain physical variables for young Handball players.

Methods. Twenty young Handball players, divided into (2) groups. the experimental group (n = 10) performance functional power training And control group (n = 10) performed traditional exercise. Blood and urine samples were collected before and after (10) weeks. Serum uric acid (UA), creatine phosphokinase and urinary malondialdehyde (MDA) were evaluated. As markers of oxidative damage to lipids and proteins, statistical analysis of the results was carried out with the use of SPSS software.

Results The experimental group had significantly higher than control group in Serum uric acid (UA), and creatine phosphokinase and urinary malondialdehyde (MDA), and the experimental group had significantly higher than control group in core stability test, balance . In addition, No significant different was found between the experimental group and the control group in power and strength .

Conclusion. Under the condition of our study, functional power intervention to twelve week has beneficial effect on oxidative stress and core stability test, balance for Handball players.

Key words: Functional Training, Handball players, Power Balance

Introduction

The goal of exercise programs is to provide the body with an adaptation. An adaptation is an enhancement of bodily movements, resulting in aesthetic or athletic improvements.

The movement theory mimics daily and sporting actions and helps the body improve these activities, which is an adaptation. Training muscles increase their power. This is an adaptation.

The theory that works best is a combination of training muscles and movements. Training a movement will make the body move more efficiently. At the same time, if a muscle is weak, the fastest way to make it stronger is to isolate it. Train the movement first because a movement requires more energy. Train the muscle second. The combination of movements and muscles is hard to beat. (Cunningham, 2000)

Functional training is old news in the sports and rehabilitation world, but it wasn't until just a few years ago that it really came to my attention because I started seeing it catch on in a big way inside our health clubs. All of a sudden, the trainers had medicine balls, core balls, core boards, rubber tubing, stability balls, rollers and foam pads all over the place, whereas just five years ago, there wasn't a ball to be found in the entire joint (O'Boyle, 2004)

The idea behind functional power training is that the body is integrated, with hundreds of muscles working together to perform a variety of functions. Functional programs are designed to mimic everyday activities. These activities range from moving furniture to swinging a golf club.(9)

Functional power training simply means training our bodies to better perform the types of movements we use for everyday living. The time spent developing this specific strength, flexibility and agility have the optimum carry-over into daily activities. (Mackelvie et al., 2002)

Functional Power is a combination of all elements of fitness to produce peak performance for your specific needs. Whether your goal is to look better, feel better, or perform better - Functional Power Training will help you achieve your fitness goals. Functional Power begins with a thorough evaluation of your current fitness level to uncover your strengths and weaknesses. Based on the results of your evaluation, a program will be designed to complement your strengths and improve your weak points. (O'Boyle, 2004)

Functional Power goes beyond where some fitness programs fall short. We realize that to have power requires a balance of joint mobility,

[1] Faculty of Physical Education, Port Saied University, EGYPT
E-mail address: amr297@aswu.edu.eg
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endurance, muscle flexibility, balance, speed, agility, quickness, body composition, and "mindfulness"; as well as attention to appropriate rest/sleep, nutrition, medical health, and stress levels. Our programs vary for everyone to include all aspects of fitness. (Maryg, 2003)

As a strength and conditioning coach for college Handball players, there are four goals that must be accomplished with my strength training program. These goals include:

1. Increase maximum strength
2. Increase explosiveness
3. Enhance functional movement
4. Prevent injury

The best way to increase maximum strength is by training with a basic power lifting routine. My training program incorporates maximum effort lifts and dynamic effort lifts for the main movements. These exercises are done in the 1–5 rep range and are performed explosively, usually between 70–80 percent of a max. Explosiveness is achieved in two ways. The first is through the dynamic effort lifts of power lifting program. The second way train for explosiveness is by incorporating Plyometrics into the programs. And Enhanced functional movement is achieved through exercises that relate directly to the movements that my Handball players will use on the mat. Wrestling involves a lot of core movement, especially in the hips. To improve power in this area, a lot of medicine ball work. Woodchoppers are not only a great way to increase functional power but can also act as a good warm up.

Continuing the exercise an adaptation of the cardiovascular system is verified, with increase of the cardiac rhythm and cardiac force, increase of the arterial pressure, adaptation of the respiratory system, increase of the sanguineous flow, increment of the metabolism, rise of the glucose concentration in the blood, increase of glycolysis in the liver and muscle. All these factors, in set, contribute for a good performance of the physical exercise (Guyton and Hall, 1998). The presence of oxygen, although indispensable, can become dangerous, promoting oxidative stress. The increase of the volume of oxygen favors the production of reactive oxygen species (ROS), unchaining of oxidative stress, with all the baleful consequences (Sayre et al., 2001), (Sousa et al., 2005). The ROS increase can compromise the antioxidant (chemical and enzymatic) defense available in the organism.

Free radicals are capable of independent existence and are produced in all living cells.

Reactive oxygen species (ROS) or reactive nitrogen species (RNS), e.g., superoxide (O2), hydroxyl (OH•), alkoxyl (RO•), peroxyl (ROO•), and hydroperoxide (ROOH) can oxidize other biological molecules, including carbohydrates, amino acids, fatty acids and nucleotides.

Previous data shows the high level of lipid peroxidation from detection the malondialdehyde (MDA) represented the oxidative stress in the body (Halliwell and Gutteridge, 1999). Scavenging of all free radicals produced in vivo by both enzymatic- and non-enzymatic antioxidants usually occurs. Antioxidant enzymes include superoxide dismutase, glutathione peroxides and catalase. The main non-enzymic antioxidants include glutathione (GSH), vitamin E and vitamin C (Cooper et al., 2002) proposes to total antioxidant capacity (TAC) in the biological system. The potential sources of free radical generation in exercising muscle are mainly from mitochondria, xanthine oxidase, prostanoid metabolism, catecholamines, NAD (P) H oxidase and secondary sources such are phagocytosis or calcium accumulation (Jackson, 2000).

The aim of this study was to investigate that Effect of functional power training on oxidative stress and certain physical variables for young Handball players.

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), Seated Medicine Ball Throw (SMBT) , leg power (LS) back strength (BS) by dynamometer , Dynamic strength test (DST) and Performance levels of landing in floor exercise (LFE) were recorded. The experimental group (EG) (10 young Handball players) trained 1 hour per day 3 times a week on function training besides the wrestling training for ten weeks. The control group (10 young Handball players) continued their normal training, while the experimental group completed a function training program to see whether this type of training modality would have a positive or negative or no effect on (VJ), (SMBT), (LS) and (PLL).

Samples

Twenty young Handball players, divided into (2) group. the experimental group (n = 10) performance functional strength training And control group (n = 10) performed traditional exercise. Blood and urine samples were collected before and after (10) weeks. Serum uric acid (UA), creatine phosphokinase and urinary malondialdehyde (MDA) were evaluated. As markers of oxidative damage to lipids and proteins. Subject's parents and coaches were required to read and complete a health questionnaire and informed consent document; there was no history of injuries, diabetes or recent surgery.

Testing Procedures

Subjects were assessed before and after a 10-weeks of complex training program All measurements were taken one week before and after training at the same time of day. Tests followed a general warm-up that consisted of running, calisthenics, and stretching.

Static strength test (LS) (BS)

A Takei leg and back dynamometer was used to measure the static leg strength. The subjects stood on the dynamometer platform and crouched to the desired leg bend position, while strapped around the waist to the dynamometer. At a prescribed time they exerted a maximum force straight upward by extending their legs. They kept their backs straight, head erect and chest high. 3 trials were allowed to the subjects and the best score was taken. Subjects had a rest between the trials (Jensen & Fisher).

Standing Stork Test (SST):

To assess the ability to balance on the ball of the foot.

- the athlete Remove the shoes and socks (they might cause you to slip or gain extra leverage). Place your hands on your hips.
- Place one foot flat against the inside of the other leg's knee.
- There should be one foot that is resting flat on the floor (the one you're standing on) – lift your heel off the ground and put all of your weight on the ball of that foot.

the athlete should practice for about a minute before testing and the test begins counting from the moment you lift your heel from the ground

Handgrip Strength Test

The purpose of this test is to measure the maximum isometric strength of the hand and forearm muscles.

The subject holds the dynamometer in the hand to be tested, with the arm at right angles and the elbow by the side of the body. The handle of the dynamometer is adjusted if required - the base should rest on first metacarpal (heel of palm), while the handle should rest on middle of four fingers. When ready the subject squeezes the dynamometer with maximum isometric effort, which is maintained for about 5 seconds. No other body movement is allowed. The subject should be strongly encouraged to give a maximum effort.

Dynamic balance

Dynamic balance is very important at sports which need to many joint awareness, and overall proprioception. Balance test investigated by 5 m-timed-up-and-go-test (5m-TUG). Subjects performed 5-TUG with time taken to rise from a chair, walk a set distance 5 m, turn around, walk back and sit down. Each subject was given 2 practice trials performed to familiarize. All subjects completed three trials with 1 min recovery between trials. The least time for each trial was recorded.

Blood test

Blood is drawn from a vein (venipuncture), usually from the inside of the elbow or the back of the hand. A needle is inserted into the vein, and the blood is collected in an air-tight vial or a syringe. Preparation may vary depending on the specific test.

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 (meandiff ± 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. Anthropometric Characteristics Training experience of the Groups (Mean ± SD)

Group	N	Age [years]	Weight [kg]	Height [cm]	BMI [kg/m^2]	Training experience
Experimental	10	13 ± 1.9	45 ± 2.9	148 ± 3.1	20.5 ± 1.8	3 ± 0.5
Control	10	14 ± 1.2	43 ± 3.1	149 ± 2.2	19.4 ± 1.1	3 ± 0.3

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

Table 2. Mean ± SD and " T" Test between two Groups (experimental and control) in Standing Stork TestDynamic balance , Handgrip Strength , Static strength test (LS) , Static strength test (BS) and Performance level of running shoot

Variables	Experimental group		Control group		T test	Sign.
	Before	After	Before	After		
Standing Stork Test	32.11 ±2.09*	38.31 ±3.11	32.74 ±3.19	33.85 ±2.89	4.60	S
Dynamic balance	10.16 ±1.15*	12.46 ±1.43	9.92 ±0.87	10.03 ±1.08	5.93	S
Handgrip Strength	25.68 ±2.54	26.16 ±2.63	25.31 ±2.46	25.87 ±3.02	0.32	NS
Static strength test (LS)	59.42 ±3.84	62.22 ±4.89	59.25 ±4.26	60.74 ±4.38	0.98	NS
Static strength test (BS)	37.51 ±4.26*	45.22 ±3.79	38.05 ±4.37	40.31 ±3.28	4.27	S
Performance level	3.01 ±0.41*	4.13 ±0.73	2.97 ±0.59	3.06 ±0.62	4.86	S

Table 2 shows that:

1.Significant Difference between experimental group and control group in Standing Stork Test , Dynamic balance. Static strength test (BS) and Performance level of Running shoot for posttest to the experimental group.

2.No Significant Difference between two groups in Handgrip Strength and Static strength test (LS)

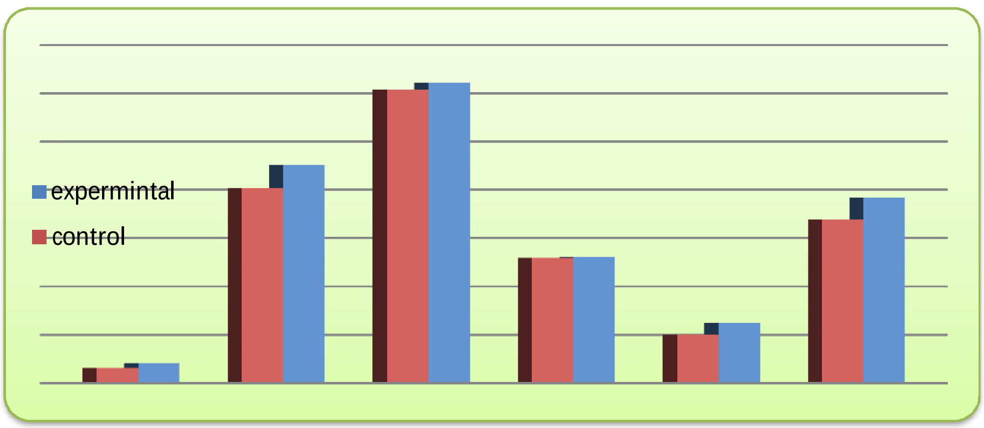

Fig 1 shows the differences between the two groups (experimental and control) in Standing Stork TestDynamic balance , Handgrip Strength , Static strength test (LS) , Static strength test (BS) and Performance level of Running shoot

Table 3. Mean ± SD and " T" Test between two Groups (experimental and control) in malondialdehyde (MDA),creatine phosphokinase (CPK) and Serum uric acid (UA)

Variables	Experimental group		Control group		T test	Sign.
	Before	After	Before	After		
MDA (mmol/L)	11.09 ±0.65*	10.11 ±0.58	11.11 ±0.37	11.10 ±0.88	4.13	S
CPK (umol/L)	185.22 ±18.25*	197.46 ±17.73	181.87 ±15.64	183.08 ±17.11	2.55	S
UA (umol/L)	298.78 ±49.74	277.61 ±63.63	283.41 ±38.46	275.87 ±55.02	0.09	NS

Table 3 shows that:

3.Significant Difference between experimental group and control group in malondialdehyde (MDA), creatine phosphokinase (CPK) for posttest to the experimental group.

4.No Significant Difference between two groups in Serum uric acid (UA)

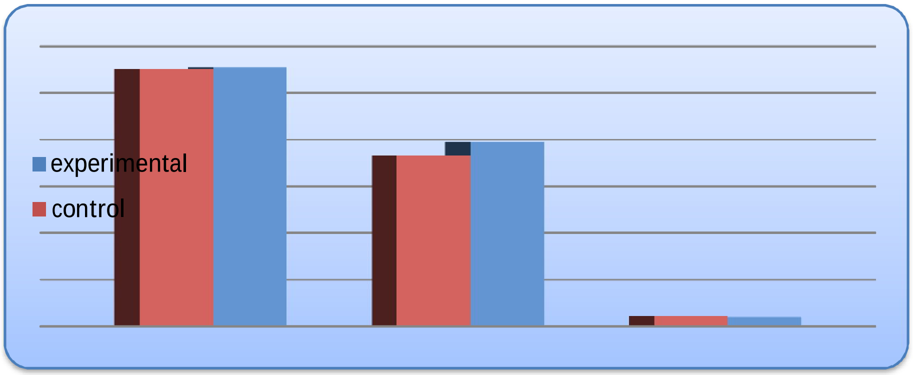

Fig 2 shows the differences between the two groups (experimental and control) in malondialdehyde (MDA), creatine phosphokinase (CPK) and Serum uric acid (UA)

Discussion

This study assessed the effects of an 10-weeks functional training program, on the power , complex movement performances, total protein , albumin concentration and erythrocyte SOD activities. Experimental results indicated that all variables were significantly increased in the experimental group only after the contrast training program.

The researchers believed that , the training program which designed and implicated on the experimental group were affected and improvement this variables .

Exercise is not just important to general health, it helps build bone mass in youth and slows down bone loss in adults. Exercise is also a factor in helping to reduce the risk of falls as it strengthens muscles, increases flexibility, and improves coordination and balance. During physical activity bones receive messages that they need to work and be strong. When there is a lack of exercise, bones do not receive these messages and lower bone mass can result. Regular physical activity on a long-term basis maintains the benefits for cardio health. (Cress et al., 1996)

Both research and anecdotal evidence suggest that functional power training leads to better muscular balance and joint stability, which in turn results in fewer injuries and increased performance

Current research shows that using natural, continuous, and integrated movements incorporating the use of gravity along with your own body weight or free weights is the best approach to building power. This type of strength training is called "functional power training".

Functional power training has been shown to:

- Increase bone density, thereby reducing the risk of injury due to osteoporosis.
- Improve coordination through development of proprioceptive feedback mechanisms .
- Develop systems of muscles rather than individual muscles, thereby reducing the risk of tears in ligaments and tendons.
- Increase the strength and power to perform throughout a range of motion for a specific sport or activity.
- Increase resting metabolic rate by increasing lean body mass so more calories will be burned during inactivity.
- Improve use of oxygen throughout the body.
- Improve appearance through overall muscle tone.

Conclusion

Under the condition of our study, functional power intervention to twelve week has beneficial effect on oxidative stress and core stability test, balance for Handball players.

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References

Cooper CE, Vollaard NBJ, Choueiri T, Wilson MT, 2002, Exercise, free radicals and oxidative stress. Biochem Society Transactions 30: 280–384.

Cress ME, Conley KE, Balding SL, Hansen-Smith F, Konczak J, 1996, Functional training: muscle structure, function, and performance in older women, J Orthop Sports Phys Ther. Jul; 24(1):pp4-10

Cunningham C, 2000, The Importance of Functional Power Training,Personal Fitness Professional magazine, American Council on Exercise publication, April

Cymara PK, David EK, Chris AM and Donna MS, 2004, Chair rise and lifting characteristics of elders with knee arthritis :functional training and strengthening effects, J American Physical Therapy Association Vol. 83 · N. 1 · January

Guyton AC and Hall JE, 1998, Fisiologia Humana e Mecanismos das Doenças," Guanabara Koogan.

Halliwell B, Gutteridge JMC, 1999, Oxidative stress; adaptation, damage, repair and death. p.291-301. In Free radicals in biological and medicine. 3rd edition. Oxford University Press. New York.

Jackson MJ, 2000, Exercise and oxygen radical production by muscle. p.57–66. In C.K. Sen, L. Packer and O. Hanninen (eds) Handbook of oxidants and antioxidant in exercise. Marcel Dekker, Inc. New York.

Mackelvie RJ, Khan KM, Mckay HA, 2002, Is there a critical period for bone response to weight – bearing exercise in children and adolescents, asystematic review, the British journal of sports medicine, Vol. 36:pp250-257

Marjke JM, Bianca R, 2004, A Non-cooperative Foundation of Core-Stability in Positive Externality NTU-Coalition Games , University of Hagen , Sweden .

Maryg R, 2003, What Makes Functional Training? National Strength and Conditioning Association Vol. 27, N. 1, pp 50–55

O'Boyle M, 2004, Function training for sports, Human Kinetics Publishers; 1 edition.

PES online manual, Optimum performance training for the performance enhancement specialist, National Academy of Sports Medicine, 2001

Ron J, 2003, Functional Training #1: Introduction , Reebo Santana, Jose Carlos univ. , USA

Sayre M, Smith A, Perry G, 2001, Chemistry and biochemistry of oxidative stress in neurodegenerative disease," Current Medicinal Chemistry, Vol.8, pp. 721-738.

Sousa Jr, Oliveira PR, Pereira B, 2005, Exercício físico e estresse oxidativo. Efeitos do exercício físico intenso sobre a quimioluminescência urinária e malondialdeído plasmático," Rev Bras Med Esporte, Vol.11, pp. 91-96.