Ovidius University Annals, Series Physical Education and Sport / SCIENCE, MOVEMENT AND HEALTH
Vol. XIII, ISSUE 2 supplement, 2013, Romania
The journal is indexed in: Ebsco, SPORTDiscus, INDEX COPERNICUS JOURNAL MASTER LIST, DOAJ DIRECTORY OF OPEN ACCES JOURNALS, Caby, Gale Cengace Learning, Cabell's Directories

Science, Movement and Health, Vol. XIII, ISSUE 2 supplement, 2013
September 2013, 13 (2), 129-136

THE EFFECTS OF CORE STRENGTH TRAINING (WITH AND WITHOUT SUSPENSION) ON LIPID PEROXIDATION AND LUNGE SPEED FOR YOUNG FENCERS

AMR HAMZA[1]

Abstract
*Purpose***.** Core strength has been subject to research since the early 1980s. The research has highlighted the benefits of training these processes for people with back pain and for carrying out everyday activities. However, less research has been performed on the benefits of core training for elite athletes. Hence, the purpose of this study was to investigate the effects of two types of the core training (with sling and without sling) on Malondialdehyde (MDA), Creatine kinase (CK) as markers to lipid peroxidation, physical variables (core strength test, static strength and dynamic strength) and lunge speed for young fencers.
*Methods***.** Eighteen young fencers (mean ± SD age, 13.2 ± 1.9 years. High, 149.64 ± 6.31 cm. Weight, 47.22 ± 5.77 kg. Training experience 5.12 ± 2.05 years), all participations divided into equally into (3) groups (two experimental groups -12 young fencers) and (control group -6 young fencers) from the Alexandria fencing club, the first experimental group performed the core strength training with the sling which contain (Swiss ball and body weight exercises) for (10) weeks , the second experimental group performed the core strength training without sling which contain (Swiss ball and body weight exercises) for (10) weeks and the control group practiced the traditional training only. The data collected from urine and blood, and lunge speed test by using off camera 100 frames / second). Physical abilities tests (core strength test, static strength and dynamic strength) before and after the programs for the three groups. All participants were fully informed about the aims of the study, the procedures and the training, and gave their voluntary consent before participation. The experimental procedures were in agreement with the ethical human experimentation.
*Result*s. Statistical analyses showed that there was a significant difference between the two groups in the lung speed test only for the experimental group with the suspension. And there is no significant difference between the two experimental groups in biochemical & physical variables, the improvement in both.
Conclusions. Finally, Core strength training, for 10 weeks, resulted in an increase in physical variables (core strength test, static strength and dynamic strength) and lung speed, and decreases the urine Malondialdehyde (MDA), and increased of Creatine kinase (CK) for young fencers .These results have to be taken into account by coaches in order to better understand and implicated of these concepts for technical effects of training.
Key Words: Core strength training, Sling, Malondialdehyde, Creatine kinase, young fencers.

Introduction

Fencing competition is held in three forms of blades, foil, epee and sabre. The foil and epee are more commonly used regionally. Both are dull with a pair of small wires that run from the handle to the tip, where there's a button. The object is simple; touch your opponent hard enough for the button to be pushed and you receive a point. The first to either five or 15 points, depending on the game, wins. The customary "en guard" position varies with the weapon, but is generally a partial squat position with the forward foot perpendicular to the back foot. The most common attacks are ballistic movements initiated from the "en guard" position, with the weapon arm in extension for a thrust or a cut, depending on the weapon. Advances and retreats are performed while maintaining the partial squat of the guard position. Defense is accomplished by evasion, retreat, and parrying the opponent's weapon with contact and pressure from the defender's blade. (Rippetoe, 2000).

Fencing sport is required of skill, speed, and power. Skill is improved by long years of practice and experience under the guidance of expert coaching. Traditionally, Fencers need specific parts of all the physical qualities to succeed in competition and to prevent them from getting injured. With greater levels of strength and agility fencers find 'explosive' lunge movements and getting around the piste easier, All the training is designed to progress individuals so the type and intensity of fitness training done with our fencers is dependent on the individual level and age of the fencers involved in the sessions. As such training might be introductory, general, and (relatively) easy for the novice fencers, or they might be designed to be very tough and very fencing specific for elite fencers (with everything in-between) (Rippetoe, 2000). However, the days are gone when elite competitors in any strenuous sport can rely on the practice of sport skills as their sole source of conditioning. Resistance training, or more

Sports specialist at the faculty of medicine, Zagazig University, EGYPT
Email: ashamza@zu.edu.eg

specifically a correctly resistance training program, is the choice of athletes all over the world, regardless of sport, for the development of the strength necessary to compete at the elite level. As the athlete rises through the competitive ranks, the first and easiest improvements occur as the athlete achieves the success facilitated by natural talent for the sport and the conditioning provided by the practice of sport skills. Eventually even the most talented people reach the point where progress comes only through increased intense training, eventually approaching the limit of potential. The percentage of potential achieved and the rapidity of its achievement are functions of training efficiency (Ibrahim, 2010).

Competitive fencers can obviously benefit from an increase in strength. Stronger muscles can be faster muscles (Dengel, 1987; Fox, et al. 1987). Studies have shown increases in contraction speed when weight training was used in conjunction with sport skill practice (Dengel, 1987). Improved sprint performance subsequent to weight training demonstrates the application of strength to speed production (Delecluse, 1997).

Power is the application of force with respect to the time of application. In a practical sense, power is the ability to apply maximum force in a minimum amount of time, the ability to recruit the maximum number of motor units in a muscular contraction, or the ability to "explode". This concept is tremendously important to all combative sports where contact with an opponent, even indirectly through a fencing weapon, is involved. Attacks and parries are effective only if they transmit sufficient force through or to the opponent's weapon. The muscles involved with the extension, the grip, the parries, as well as all ground-reaction activity, e.g. lunge, ballestrae, advance and retreat, etc., benefit from an increased ability to generate power. Power production can be enhanced by both increasing absolute strength and through the use of explosive exercises that specifically develop power (Hakkinen, et al. 1989), and will be addressed in the recommended program.

In general, to produce movement in fencing the muscles must produce strength, or to produce fast movement, the fencer must use a well-trained nervous system to activate this force production from the muscle. As such strength underlies almost all physical tasks.

Training for strength is normally thought of as something that stereotypical strength athletes. However, there are numerous types of strength training with only one type designed to 'get big', these are generally categorized as: Strength-endurance training (associated with muscles working under fatigue), Hypertrophy training (associated with growth and getting big), Maximal strength training (associated with strength increases without growth), and Power/Explosive strength training (associated with fast powerful movements). Fencers should aim to become well-conditioned enough to train explosive strength and strength endurance. (Amr, 2008)

Classic literature classified the musculature of the core as being controlled by "local" and "global" muscular systems (Bergmark, 1989). The "local" system consists of all the muscles that originate and insert at the vertebrae, with the exception of the psoas muscles which flex the hip joints (Bergmark, 1989). The role of the "local" system is to control the curvature of the lumbar spine, aid in the coordination and control of motion segments, and provide sagittal and lateral stiffness to maintain mechanical spinal stability (Bergmark, 1989). On the other hand, the "global" system acts to transfer forces from the thoracic cage and the pelvis out to the extremities. The muscles of the "global" system have longer moment arms of force, as well as larger cross-sectional areas than the muscles of the "local" system, making them ideal for force production (Arokoski, et al., 1999).

Balance and stability are very important parts of sports and athletic performance (Cook, 2003), especially in fencing sports (Osama, 20008). Sling exercises to develop the core strength are one of the most used training methods to develop speed, power and balance in athletes. When performing sling training the balance is defined as maintaining a position with no movement for a certain time (Dudgeon, et al. 2011). An individual with good stability have a greater possibility to develop force from extremities than a person with inferior stability (Cook, 2003). One of Suspension Training (ST) fundamental principles is to challenge balance to force the individual to work more with his/her stability (Norwood, et al. 2007). Core stability in athletes has in later years shown to influence performance. Training on gym balls has shown good results for core stability but not for sport specific performance (Fitness Anywhere, 2010). Studies with similar sling training equipment as the (ST), for example Red Cord, have shown to increase strength, stability and sport specific performance.

Suspension Training (ST) is a relatively new mode of exercise that uses the exerciser's own body weight as resistance. Suspension training employs an assortment of upper and lower body exercises which all require the individual to maintain balance while performing the various exercises (Dudgeon, et al. 2011).

Suspension Training (ST) based training concept developed by Randy Hetrick, a former US Navy Seal. (ST) makes it possible to work out in confined spaces and in the absence of a gym. The training concept is based on three different fundamental principles: vector-resistance, stability and pendulum. The vector-resistance principle gives opportunity to adjust resistance by angle to the ground, lever and gravity. The stability principle comes into play due to a base of support and balance, and the pendulum principle due to the starting position in relation to the anchor point

Ovidius University Annals, Series Physical Education and Sport / SCIENCE, MOVEMENT AND HEALTH
Vol. XIII, ISSUE 2 supplement, 2013, Romania
The journal is indexed in: Ebsco, SPORTDiscus, INDEX COPERNICUS JOURNAL MASTER LIST, DOAJ DIRECTORY OF OPEN ACCES JOURNALS, Caby, Gale Cengace Learning, Cabell's Directories

(Fitness Anywhere, 2010). To date no research has examined the effects of ST training. Thus, the general purpose of the study was to examine if exercises performed with ST can activate muscles involved, in power development, to a similar extent as the muscles involved in the Hang Clean exercise.

Suspension Training (ST) has been demonstrated to be beneficial as part of the intervention for patients also with pelvic girdle pain after pregnancy (Stuge, et al. 2004). Regarding the treatment of patients with chronic WAD who have unsettled insurance claims, it has been argued that such a situation may influence the treatment outcome and/or the natural course of WAD in a negative way (Cassidy, et al. 2000; Holm, et al. 1999). One large insurance company (Gjensidige NOR) in Norway, starting in 1999, offered a new rehabilitation programme for patients with long-term WAD. It consisted of clinical evaluation and a treatment programme (New Sling Exercise Therapy, NSET) which included TP treatment plus a new exercise approach using sling exercises.

This exercise is performed while the pelvis or lower extremities are suspended in a sling. Exercises can be made easier using a sling and elastic cord to offset body weight or made more difficult using an unstable surface to perform the exercises (HyungKyu, et al. 2012). Research shows that sling exercises improve patient strength and proprioception by giving progressive loading using a close kinematic chain (Dannelly, et al. 2011). In particular, this exercise is reported to minimize the use of global muscles without pain while activating local muscles (Saliba, et al. 2010).

Single leg training is not two leg squats. Although the two legs squat are good, it doesn't sufficiently train "the single leg" component. The single leg component can provide massive levels of balance and proprioceptive work which have been shown to reduce injuries. The two legs squat, because it's done on two legs, does not require as much proprioceptive work. (HyungKyu, et al. 2012)

To our knowledge, sling exercises have not been used in previous studies of fencing sport. And the Traditional strength training is usually done with dumbbells, barbells and free weight plates. These can be used for a multitude of exercises such as squat, deadlift, lunge, bench press, shoulder press and many others. In later years, Core strength training has been given a lot of focus and has led to the development of new training equipment, such as sling training. We experienced promising results with the use of sling exercise in selected fencers. In addition, some fencing coaches in Egypt more attention to the development of the physical demands of the sport of fencing alongside the development of skills, based on these words (the best training for fencing is fencing itself). These words may be true, when we observed the foot work in fencing, we will find it similar exercises Plyometrics. but may result in a feeling of the players are bored to repeat the daily performance where the focus is on muscle groups specific may lack integration muscular performance, hence the importance of diversity in the use of forms and types of training used and the Force career, which is a key requirement for the performance of motor skills in both movements, advances and retreats, challenge, since the performance of these motor skills requires a performance strength and speed without disruption in the balance, to change the status of the weight of the body down while diversity in the performance of these skills.

However excessive resistance training program may increase oxidative stress and cellular damage (Liu, et al. 2005). And, the formation of free radicals results in lipid peroxidation during aerobic exercise which may cause cell and muscle damage. Malondialdehyde (MDA) has mostly been used as an end-product marker of lipid peroxidation (D. Bailey, et al. 2010). MDA levels during exercise are correlated with creatine kinase (CK) which is an indicator of muscle damage (Guzel, et al. 2007). Thus, the aim of the present study was to compare the effects of two types of the core training (with sling and without sling) on Malondialdehyde (MDA), Creatine kinase (CK) as markers to lipid peroxidation, physical variables (core strength test, static strength and dynamic strength) and lung speed for young fencers.

Methods

Eighteen young fencers (mean ± SD age, 13.2 ± 1.9 years. High, 149.64 ± 6.31 cm. Weight, 47.22 ± 5.77 kg. Training experience 5.12 ± 2.05 years), all participations divided into equally to (3) groups (two experimental groups -12 young fencers) and (control group -6 young fencers) from the Alexandria fencing club, the first experimental group performed the core strength training with sling which contain (Swiss ball and body weight exercises)for (10) weeks , the second experimental group performed the core strength training without sling which contain (Swiss ball and body weight exercises) for (10) weeks and the control group practiced the traditional training only. The data collected from urine and blood, and lunge speed test by using off camera 100 frames / second). Physical abilities tests (core strength test, static strength and dynamic strength) before and after the programs for the three groups. All participants were fully informed about the aims of the study, the procedures and the training, and gave their voluntary consent before participation. The experimental procedures were in agreement with the ethical human experimentation.

Procedures

Collection of blood and urine samples

Subjects provided fasting blood samples before the choline supplement and after one week. A blood sample (3 ml) was collected in an EDTA-containing Vacutainer tube and centrifuged at 4°C at 3000×g for 10 minutes. The plasma was decanted and frozen at - 70°C prior to analysis. Subjects also collected their urine for the subsequent five-hour period. The urine was kept refrigerated during the collection period. Urine malondialdehyde (MDA) were measured by a fluorometric assay and visually-read colorimetric assay.

The Core Muscle Strength & Stability Test (CMST)

The objective of this evaluation is to monitor the development and improvements of an athlete's core strength and endurance over time.

Flat surface
Mat
Watch or clock with second counter

Conducting the Test

Position the watch or clock where the player can easily see it
Start in the Plank Exercise Position (elbows on the ground). Hold for 60 seconds
Lift right arm off the ground. Hold for 15 seconds
Return right arm to the ground and lift the left arm off the ground. Hold for 15 seconds
Return left arm to the ground and lift the right leg off the ground. Hold for 15 seconds
Return the right leg to the ground and lift the left leg off the ground. Hold for 15 seconds
Lift left leg and right arm off the ground. Hold for 15 seconds
Return left leg and right arm to the ground.
Lift right leg and left arm off the ground. Hold for 15 seconds
Return to the Plank Exercise Position (elbows on the ground). Hold this position for 30 seconds

Static strength test (LS) (BS)

A 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.

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 are used, with the 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 stands 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 (two 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.

Dynamic balance test (DBT):

Tools used

A belt of rubber introduced 3 cm from the plastic clip is installed in the middle of the back of a piece of sponge square 10 × 10, thickness 3 cm.
Powder "Badra" magnesium bicarbonate "Manezia."
Roll of adhesive plaster Showing 2 cm.
A rectangular piece of 20 × 20 cm from the carpet pile with a medium.
Meters measure the "bar.

Performance specifications

Turn around 360 on the submitted one foot (10 - consecutive sessions) at a rate R/W, from a standing position opened, arms aside, followed by stability 2s - and then walks in a straight line a length of 4 meters, fixed on the ground with a strip of plaster display 2 cm.
Turning around "360 degrees" to an author one foot (10 - consecutive sessions) at the session / s from a standing position opened, arms aside, followed by stability 2s then worked 5 handspring forward in quick succession on a selected line tape Blaster 2 cm on the ground long 4 meters, ending the development stand.

Instruction of the test

The deviation is measured in a straight line 4 meters to the right or left hand while walking to end, so that the distance is measured in centimetres from a straight line to the middle of the distance between the two editions of "thumb" feet on the ground.
Deviation measured during five consecutive handspring fronts and ended the rapid development of stand on the straight line, and along the "4-meter" so that the distance is measured in centimetres from a straight line to the middle edition of "fingerprint" square piece of sponge on the ground during handspring.
Evaluation is the extent of deviation from the straight line during the walk as well as during handspring as an indicator of dynamic balance.

Core Strengthening Protocol

The overload principle advocated in sports medicine is a nemesis in the back. In other words, the progressive resistance strengthening of some core muscles, particularly the lumbar extensors, may be unsafe to the back. Functional progression is the most important stage in the core-strengthening program. A thorough history of functional activities should be taken to individualize this part of the program.
The researcher adopted the application of core strength training on the following:

- That the focus is on strengthening the muscles and the stability of the centre
- At the end of the module extend the training given for muscle relaxation in order to return to normal.
- Training method used, you see a high intensity training system using a ring.
- Loads within the circuit training are through the change between the time of performance and comfort between the exercise and also between groups.
- The circuit includes (5) exercises in the (3-5) groups.

Ovidius University Annals, Series Physical Education and Sport / SCIENCE, MOVEMENT AND HEALTH
Vol. XIII, ISSUE 2 supplement, 2013, Romania
The journal is indexed in: Ebsco, SPORTDiscus, INDEX COPERNICUS JOURNAL MASTER LIST, DOAJ DIRECTORY OF OPEN ACCES JOURNALS, Caby, Gale Cengace Learning, Cabell's Directories

Statistical analysis

All statistical analyses were calculated by the SPSS statistical package. The results are reported as means and standard deviations (SD). Differences between the three groups were reported as mean difference ±95% confidence intervals (meandiff ± 95% CI). ANOVA-test for samples was used to determine the differences in fitness parameters, urine and blood samples between the three groups. The p<0.05 was considered as significant statistically.

Results

Table 1. Mean ± SD, change rate and "F" sign. Among the three groups in SLJ, SMBT, DBT, CMST (LS), (BS), (Urine MDA), (CPK) and Performance speed of Lunge

Variables		Experimental group With sling			Experimental group Without sling			Control group			F sign
		Before	After	Change %	Before	After	Change %	Before	After	Change %	
SLJ(cm)		177.32 ±2.34	183.14 ±3.02	3.43	176.57 ±2.09	181.82 ±2.11	2.97	176.81 ±2.09	178.11 ±2.11	0.74	Sign
SMBT (meter)		5.78 ±0.38	5.99 ±0.56	3.63	5.81 ±0.39	5.87 ±0.47	1.03	5.76 ±0.41	5.81 ±0.45	0.87	Sign
DBT (cm)	Deviation to the right(A)	8.74 ±1.64	6.63 ±1.90	31.92	9.02 ±1.84	7.78 ±2.01	13.75	9.11 ±1.74	8.91 ±1.85	2.20	Sign
	Deviation to the left (A)	10.36 ±1.75	8.85 ±2.01	14.58	10.40 ±1.81	9.01 ±1.92	13.37	10.43 ±1.73	9.79 ±2.01	6.14	Sign
	Deviation to the right(B)	11.76 ±2.02	9.67 ±2.41	17.77	11.55 ±2.31	9.12 ±2.15	23.37	11.62 ±2.11	10.73 ±2.06	7.66	Sign
	Deviation to the left (B)	11.89 ±2.74	9.97 ±2.86	16.15	12.18 ±2.70	10.36 ±2.77	14.94	11.97 ±2.53	11.36 ±2.40	5.25	Sign
CMST (Degree)		5.66 ±0.16	7.77 ±1.34	37.30	5.31 ±0.23	7.23 ±0.94	36.16	5.20 ±0.56	5.86 ±0.78	12.70	Sign
LS (KG)		55.14 ±3.84	59.19 ±3.94	6.87	54.68 ±3.71	57.31 ±4.11	4.81	55.02 ±3.86	56.39 ±4.03	2.49	Not Sign
BS (KG)		37.51 ±4.26*	45.22 ±3.79	20.55	38.05 ±4.22	43.25 ±3.71	13.67	37.98 ±3.95	40.36 ±3.48	6.27	Sign
Urine MDA (Mmol /L)		10.14 ±1.36	9.41 ±1.87	7.20	10.18 ±1.22	9.73 ±1.74	4.42	10.11 ±1.34	10.03 ±1.19	0.79	Sign
CK (umol/L)		182.55 ±16.32	197.64 ±17.84	8.27	184.42 ±15.34	198.64 ±16.71	7.71	181.90 ±15.24	183.28 ±17.32	0.76	Sign
Lunge Performance speed (frame)		0.36 ±0.03	0.30 ±0.07	16.67	0.37 ±0.03	0.32 ±0.06	13.51	0.37 ±0.04	0.35 ±0.07	5.41	Sign

The F-test showed that

Statistically significant differences between the pre and post measurements in the experimental group (with sling) in all physical – biochemical variables and Lunge Performance speed except leg strength test (LS) , and the improvement rate between 3.43% to 36.16%

Statistically significant differences between the pre and post measurements in the experimental group (without sling) in all physical – biochemical variables and Lunge Performance speed except leg strength test (LS) and the improvement rate between 1.03% to 37.30%

Not Statistically significant differences between the pre and post measurements in the control in all physical – biochemical variables and Lunge Performance speed except leg strength test (LS) and the improvement rate between 0.74% to 12.70%

Statistically significant differences between the post measurements for the three groups in all physical – biochemical variables and Lunge Performance speed except leg strength test for the experimental group (with sling)

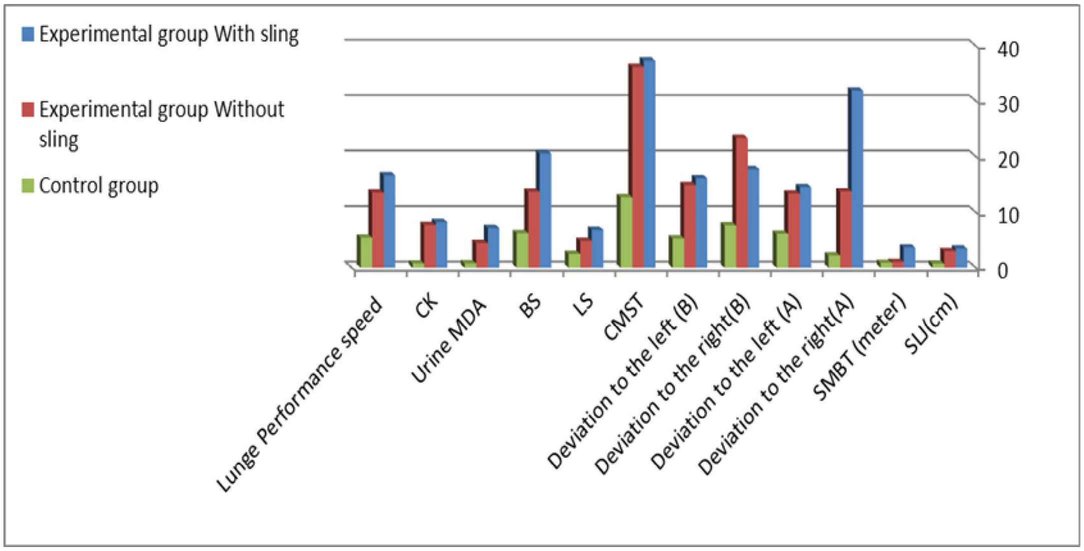

Fig 1 shows the improvement among the three groups.

Discussion

This study aimed to explore effects of two types of the core training (with sling and without sling) on Malondialdehyde (MDA), Creatine kinase (CK) as markers to lipid peroxidation, physical variables (core strength test, static strength and dynamic strength) and lunge speed for young fencers. The results of the present study showed that the young fencers in two experimental groups performed better in all tests. Compared to the control group, Indeed, in a previous study has found larger muscular activation when training with free weights (OKC) in regards to training in a smith machine (CKC), this suggests that lesser stability gives a greater muscular activation (Schwanbeck, et al. 2009). No significant difference in muscular activation has been found in training on stable versus unstable surface, though the difference has been seen between concentric- and isometric activation and for maximal voluntary contraction (MVC) when comparing training on stable or unstable surface (Anderson, Behm, 2004). Sling training is defined as CKC and has shown great improvements in stability Prokopy, et al. 2008).

According to (Daruosh , et al. 2012) Several studies have indicated that following exercise, levels of lipid peroxidation and muscle-damage markers such as MDA and CK increase , but these increases seemed to be evoked only when participants performed at maximal intensity and not at lower intensities .

And refers (Vasankari, et al. 2001) to be characterized by free radicals-old short, making it difficult to measure but can be inferred from the existence and lineage by identifying the ratios Almalon bilateral Aldehyde MDA in the blood or urine . And had explained (Sn. Meydani, M. Hayek, 1992) that can be measured by TBARS in urine as a sign of the free ions. And this oxygen is material and extensive destruction super oxide resulting from escaped electron It is well known that during physical training increases maximum oxygen consumption from 10 to 20 twice (35 to 70 ml / Kg of weight / min) as well as the be free radicals resulting from flight oxygen increasingly, this has been mathematically estimate the amount of oxygen during training and that have the ability to free radical formation as follows: 0.6 x 3.5 ms l / Kg / minute and athletic training earns the player the necessary adjustment to reduce the levels of free radicals that contribute to the speed of fatigue

According to (Daruosh , et al. 2012) after training, CK peaks about 12-24 hrs post-exercise, with the increases in range from 100 to 600 IU, whereas after high-force eccentric exercise the increase does not begin until about 48 hours post exercise, with peak activity (generally 2000-10000 IU) occurring about 4 to 6 days post exercise. The current findings confirm that the resistance exercise can result in the formation of free radicals. These free radicals may play a role in the adaptation of the muscle tissues to the physiological stress caused by resistance exercise. Ischaemia-reperfusion during resistance exercise at the site of muscle, and post-exercise production of free radicals via oxidative burst from neutrophils, are key factors that must be taken to account while trying to decrease the muscle injury during this type of exercise.

Conclusions

Finally, Core strength training, for 10 weeks, resulted in an increase in physical variables (core strength test, static strength and dynamic strength) and lung speed, and decreases the urine Malondialdehyde (MDA), and increased of Creatine kinase (CK) for young fencers .These results have to be taken into account by coaches in order to better understand and implicated of these concepts for technical effects of training.

References

Amr, H., 2008, Effect of complex training on SOD gene expression, certain physical variables and lunge performance among young fencers, PhD thesis, faculty of physical education, Zagazig University (in Arabic)

Anderson, Kg. Behm, Dg., 2004, Maintenance of EMG activity and loss of force output with instability. Journal of Strength and Conditioning Research. 18(3): 637-40

Arokoski, J., Kankaanpaa, M., Valta, T., Juvonen, I., Partanen, J., Taimela, S., Lindgren, K., & Airaksinen, O., 1999, Back and hip extensor muscle function during therapeutic exercises. Archives of Physical Medicine and Rehabilitation, 80 (7), 842-850.

Bailey, D. M., Mceneny, J., Mathieu-Costello, O., Henry, R. R., James, P. E., Mccord, J. M.,Richardson, R. S. 2010. Sedentary aging increases resting and exercise-induced intramuscular free radical formation. Journal of Applied Physiology, 109 (2), 449-456. http://dx.doi.org/10.1152/japplphysiol.00354.2010

Bergmark, A. 1989 . Stability of the lumbar spine. A study in mechanical engineering. Acta Orthopaedica Scandinavica Supplementum, 230(60), 20-29.

Cassidy Jd, Carroll Lj, Cote P, Lemstra M, Berglund A, Nygren A., 2000, Effect of eliminating compensation for pain and suffering on the outcome of insurance claims for whiplash injury. N Engl J Med; 342: 1179–1186.

Cook, G., 2003, Athletic body in balance. Champaign, Ill: Human Kinetics.

Dannelly, B.D., Otey, S.C., Croy, T., Harrison, B., Rynders, C.A., Hertel, J.N. And Weltman, A., 2011, The effectiveness of traditional and sling exercise strength training in women. Journal of Strength and Conditioning Research 25 (2), 464-471.

Dannelly, Bd. Otey, Sc. Croy, T. Harrison, B. Rynders, Ca. Hertel, Jn. Weltmn, A., 2011, The effectiveness of traditional and sling exercise strength training in women. Journal of Strength and Conditioning Research. 25(2): 464-71.

Daruosh M., Lian-Y., Tengku-F & Saidon A., 2012, Effect of Single-Session Aerobic Exercise with Varying Intensities on Lipid Peroxidation and Muscle-Damage Markers in Sedentary Males, Global Journal of Health Science; Vol. 4, No. 4;48-54

Delecluse, C., 1997, Influence of strength training on sprint running performance. Sports Medicine 24 (3): 147-56.

Dengel, D.R., George, T.W., Bainbridge, C., Fleck, S.J., Van Handel, P.J. And J.T. Kearney. 1987, Training responses in national team boxers. Medicine And Science In Sports And Exercise 19 (2): 277.

Dudgeon, W D; Aartun, J D; Thomas, D D; Herrin, J; Scheett, T. P., 2011, Effects of Suspension Training on the Growth Hormone Axis, Journal of Strength & Conditioning Research: March - Volume 25 - Supplement 1

Fitness Anywhere. 2010, TRX Suspension Training Group Course. User's Guide. San Francisco, Ca: Fitness Anywhere, Inc.

Fox, E.L., Bowers, R.W. And M.L. Foss., 1988, The physiological basis of physical education and athletics, 4th ed. Dubuque, IA: William C. Brown.

Guzel, N., Hazar, S., & Erbas, D. 2007, Effects of different resistance exercise protocols on nitric oxide, lipid peroxidation and creatine kinase activity in sedentary males. J Sport Sci Med, 6, 417-417.

Hakkinen, K., Mero, A., And H. Kauhanen. 1989, Specificity of endurance, sprint, and strength training on physical performance capacity in young males. J. Sports MED. Physiol. Fit. 29(1):27-35.

Holm L, Cassidy Jd, Sjogren Y, Nygren A. 1999, An analysis of insurance material from the Swedish Road Traffic Injury Commission. Scand J Public Health; 2: 116–123.

Hyungkyu, K., Jinhwa J. And Jaeho Y., 2012, Comparison of trunk muscle activity during bridging exercises using a sling in patients with low back pain, Journal of Sports Science and Medicine. 11, 510-515

Ibrahim, N.2010. Fencing, dar elnashr publishing, Cairo, Egypt. (In Arabic)

Liu, J.F., Chang, W.Y., Chan, K.H., Tsai, W.Y., Lin, C.L. And Hsu, M.C. 2005, Blood lipid peroxides and muscle damage increased following intensive resistance training of female Weightlifters. Annals of the New York Academy of Science 1042,255-261.

Meydani, Sn., Hayek, M., 1992, Vitamin E and immune response.. In: Chandra Rk, ed. . Newfoundland: ARTS Biosmedical Publishers and Distributors, 105-128.

Norwood, Jt. Anderson, Gs. Gaetz, Mb. Twist, Pw., 2007, Electromyographic activity of the trunk stabilizers during stable and unstable bench press. Journal of Strength and Conditioning Research. 21(2): 343-7.

Prokopy, Mp., Ingersoll, Cd., Nordenschild, E., Katch, Fi., Gaesser, Ga., Weltman, A., 2008, Closed-kinetic chain upper-body training improves throwing performance of NCAA Division I softball players. Journal of Strength and Conditioning Research. 22(6):1790-1798.

Rippetoe, M., 2000, Strength and Conditioning for Fencing, Strength & Conditioning Journal: April - Volume 22 - Issue 2 – pp. 42

Saliba, S.A., Croy, T., Guthrie, R., Grooms, D., Weltman, A. And Grindstaff, T.L., 2010**,** Differences in transverse abdominis activation with stable and unstable bridging exercises in individuals with low back pain. North American Journal of Sports Physical Therapy 5 (2), 63-73.

Schwanbeck, S., Chilibeck, Pd., Binsted, G., 2009, A comparison of free weight squat to Smith machine squat using electromyography. Journal of Strength and Conditioning Research. 23(9): 2588-91

Seiler, S. Skaanes, Pt. Kirkesola, G., 2006**,** Effects of Sling Exercise Training on Maximal Clubhead Velocity in Junior Golfers. Medicine & Science in Sports & Exercise. 38(5): 286.

Stuge, B., Lærum, E., Kirkesola, G., Vøllestad, N., 2004**,** The efficacy of a treatment program focusing on specific stabilizing exercises for pelvic girdle pain after pregnancy. A randomized controlled trial. Spine; 29: 351–359.

Vasankari, M. Akyüz, F. Turgut, A. Getsfrid, Wm., 2001**,** Effect of aerobic and anaerobic metabolism on free radical generation swimmers. MED Sci Sports Exerc; 33:564-7.