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Original article

EFFECTS OF TEN WEEKS OF INSTABILITY RESISTANCE TRAINING (BOSU BALL) ON MUSCULAR BALANCE AND THE LEARNING LEVEL OF FENCING BASICS

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Abstract

Aim. The instability resistance training (BOSU ball) program could provide greater training adaptations through predominant neural adaptations in the early period of a training program. The use of unstable training environments has been purported to enhance movement specific effects through increased activation of stabilizers and core muscles. The purpose of the present investigation was to describe the effects of ten weeks of instability resistance training (BOSU ball) on muscular balance and the learning level of fencing basics.

Methods. 30 female students from faculty of physical education for girls (age 17.8 +/- 1.9 years) participated in this study. The sample was distributed equally into two groups, the experimental group contains (15 female students) and the control group contains (15 female students), the experimental group participated in the (BOSU ball) program for 10 weeks and the control group participated in the traditional program that used in the faculty. All participants completed the tests before and after the 10-week programs.

Results. The data revealed that significant improvement in balance and learning level of fencing basics.

Conclusions. The findings indicated that the (BOSU ball) exercises for 10 weeks could an increase in balance (static and dynamic) and improvement of the performance level of the fencing basics. These results have to be taken into account by teachers in order to better understand and implicated of these concepts in educational lessons.

Key words: BOSU ball, lung, fencing.

Introduction

With the information revolution in the twenty-first century, science became the primary language to reach the desired goals in all areas worldwide, and especially the sports field. The world has become a small village where we can look forward to everything new of methods and means of modern educational techniques, moreover, the scientific development isdeveloping in a tremendous speed associated with the speed of transferring information and experiences which enriched the educational process to achieve its goals in the best ways to reach the highest possible level of performance.

Education in the sports field has been affected by this scientific and technological revolution, lately attention increased to achieve better levels and achieve superior results, and planning depends on the scientific methods both in the shape and organizational features, in line with the rapid development of the methods and means of education and training used in physical education with the aim of developing and promoting the physical performance to reach the skills performance in order to achieve the best possible results in performing the sports activity.

The physical preparation in its various stages and types (general and private) is considered the basis where coaches build their plans according to the requirements of the sports activity. It is a general adaptation of an individual to be able to practice the game and all it requires to develop the basic physical qualities as requirements of activity that will improve the player's skills performance. (Mohamed, 1994)

The specific physical preparation as it leads to the development of the dynamic qualities of the performance style, as it develops certain needed qualities to overcome the sporting activity difficulties. Moreover, the physical preparation is closely related to the development of the basic skills for the practiced activity to help mastering and developing. (Kamal, 2007)

Sport coaching aims to promote the specific physical qualities for various activities which lead to improve and develop different physical abilities (power, speed, agility, endurance, balance, flexibility, accuracy and coordination) which significantly affect acquiring the physical and skills fitness which in turn lead to performing and mastering the basic skills in a good manner through practicing activity in a regular and evolving manner. (Kemal, et al., 1998)

Fencing is an open-skilled combat sport that was admitted to the first modern Olympic Games in Athens (1896). It is art of managing the sword, floret

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and sabre for attack and defense. It is a combat sport, which is performed with two opponents, in confrontation of ability, reflex, skill and technique, aiming to touch the opponent.

Lukovich (1997) defines the objectives of fencing as the tip touch using the floret and the sword, or that of cut and sabre tip, seeing that the valid surface specified according to the particular rule of each weapon. This way, sabre and floret are weapons of convention, by virtue of the controlled use of rules. The sword, in turn, maintains the sports framing based on its origin – the essence of the duels.

Its practice is regulated by the FédérationInternationaleD'Escrime (FIE), founded in 1913 and headquartered in Paris, in France. However, despite its sports regular mentation being not so old, its practice is directly linked to the evolution of the races itself, once the history of management of weapons derives simultaneously to the humankind itself, aimed for one of the most primary aspects of the innermost of an animal – the instinct for survival.

Fencers are usually subjected to hard practice to improve their performances. To minimize errors during movements, they have to follow personalized training programs and the final outcomes depend on the knowledge of the movements. (Bernd & Emil 2007)

Merlin C. Wittrock an American educational psychologist introduced the Generative Learning Theory in 1974. The Generative Learning Theory is based on the idea that learners can actively integrate new ideas into their memory to enhance their educational experience Wittrock theorized that these learners processed information actively, by generating relationships between what they already knew and what they were encountering anew. He provided insight into how students who were successful at mastering new material made sense of new information they encountered and built up their working knowledge of a subject.

Wittrock's theory of generative learning had a simple premise. He theorized that individuals generate their own meanings of new material they encounter by building relationships between the new material and their prior knowledge. The fundamental premise of Wittrock's theory was that people enhanced their learning through this act of generating their own personal knowledge of information they received. The greater thegenerative activity engaged in by a participant while the new material is received, the greater is the learning that occurs. The learner may see relationships between incoming information and something already known. The learner may perceive a new relationship between one element of the new information and other elements within it. Whether a learner sees relationships between incoming information and prior knowledge, or within different segments of incoming ideas, what was common to both these activities was generativity. The act of generating ideas about the information and forming relationships between incoming information and a growing body of knowledge was the key to improved learning.

Therefore, interesting in the modern teaching methods and tools in the sport field has increased and reaching it has become of the main and fundamental roles for those interested in researching this area, and responsible for the educational process aiming to develop and promote the sports level and achieve the best levels and the highest results.

Bosu Ball is considered by the modern means that assists in acquiring the basic physical fitness elements, which in turn have a better impact on performing the basic skills in different activities. It is a strong rubber hemisphere fixed to a solid circular base of industrial non-slipping fibres, and the ball is limited with prominent lines on its full rotation not slip from above or from the side and can be used and work on it from all directions.

The Bosu Ball as an assisting mean contributes to the acquisition of the specific physical qualities and general fitness. Moreover, the assisting methods provide sensory experiences in performance thus enrich the educational situation and establish information in the mind of the learner. (Bodour, and Soher, 2007)

Fencing is one of the team games that positively and obviously affected by the evolution and development of the teaching and training methods to reach the best standards with the player. (Mohamed, 1995)

Fencing is one of the main subjects in the curriculum of the faculties of physical education and sports, where skills are taught and mastered through several semesters, where the female students must reach the highest physical and skill levels that enable her to perform well after graduating and applying that in the work field.

For the female student to reach the best performance stage and mastering at fencing she must promote physical and skill levels through appropriate programs in terms of the approved curriculum, with the best means, teaching methods and modern exercises achieve the best effectiveness of the learning process.

Basic skills are the backbone of the game especially in the learning process, the physically and skilful unprepared female student loses control over the ball while moving under the law of the game in order to achieve the best results. (Mounira, 2000.)

After reviewing the scientific references, researches and information network, it became obvious to the researcher that fencing of the games

that have special physical requirements such as (power, speed, agility, endurance, balance, flexibility, accuracy and coordination), as all plays a significant role in determining the student skills performance which requires exerting high-capacity for mastering dribbling, passing, and shooting. (Kamal and Mohamed 2002; Laila, et al., 1999; Mohamed, 1995; Mounira, 2000).

The researcher believes that the Bosu ball of the modern assisting tools in the field of physical fitness that affects the development of (power, motor speed, agility, endurance, balance, flexibility, accuracy and coordination), which in turn leads to a significant obvious effect on the physical performance and promoting physical and functional efficiency for the female student and therefore affect the performance, development and mastering the skills performance of the game. Learning and mastering the skills affects the efficiency of vital devices of the female student and therefore raise the technical and aesthetic level of the required performance (8: 24), because of developing the skill performance level depends on the development of the physical abilities and elements. (Laila, et al., 1999).

Given the importance of these skills where the skills performance in fencing depends upon, and through teaching the theme of fencing (Bodour and Soher, 2007) (theme number 135) (attachment -1), the researcher noted the low physical performance and the physical fitness levels, that affected their skilful and tactical performance levels as well as lack of the provided time in the credit hours system in order to complete the education process in a good manner which affects the output of the educational process and the performance of skills by the female students in a good style and mastering performance during the lesson.

Hence, the researcher considered utilizing the modern assisting means and tools through an innovative teaching program using the Bosu ball as an innovative tool for performing physical exercises in the specific physical preparation part of the lecture to develop and master the physical performance in fencing generally, which especially would in turn affect some offensive skills.

The researcher has noted through teaching, training and researching in fencingexperiences the rare use of this tool in the area of team sports despite the low cost, easy performing and well utilizing of the pitch spaces, as well as what the physical fitness practical performance has proved with the success of this assisting tool in promoting the physical fitness and using it as a motivation and excitement element to the female students in order to improve their physical level in its various components. Thus, using assisting and modern tools to improve the physical performance in turn affects the skill performance level, which achieves a good level for fencing teachers and coaches to ensure the effectiveness of the educational and training processes.

This study aims to identify the effect of the suggested training program using a Bosu ball on each of the following:

- The specific physical elements of the fencing skills on topics as (legs and arms muscular power, motor speed, agility, balance, flexibility, accuracy and coordination).
- Performing the basic skills on topics (dribbling, passing accuracy, passing speed, shooting accuracy, jumping distance at shooting, and speed of shooting with running).

Methods

30 female students from faculty of physical education for girls (age 17.8 +/- 1.9 years) participated in this study. The sample was distributed equally into two groups, the experimental group contains (15 female students) and the control group contains (15 female students), the experimental group participated in the (BOSU ball) program for 10 weeks and the control group participated in the traditional program that used in the faculty. All participants completed the tests before and after the 10-week programs.

Equipments and tools:

- Bosu ball for performing and applying the program.
- Restameter for measuring height.
- Medical scale for measuring weight.
- Measuring tape for length and distances.
- Stop watch for measuring time.

Medical ball of 1KG in weight for performing tests.

Table: (1) Time distribution of the educational unit

No.	Unit's parts	Time
1	Administrative affairs (attendance and absence– information about the unit that will be taught).	10 minutes
2	General warm up	10 minutes
3	Specific physical fitness	30 minutes
4	Main part	60 minutes
5	Final part	10 minutes

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Thatis conducted for both the experimental and control groups in the same order and under the same conditions and timing in all parts of the unit except for the part of the specific physical fitness where exercises with the Bosu ball were conducted as an assisting tool to develop the specific physical fitness elements and promote the basic skills, concerning the remaining parts (General physical preparation – the main part- the final part), there is no differences in teaching between the experimental and control groups, as table (2) illustrates a model of the educational unit workout when using the Bosu ball.

Post-measurements: The Post-measurements were conducted after completion of applying the program for both groups on 17, 18.05.2011 for the physical and skill tests on topics and under the same circumstances of the pre-measurements.

Tests (physical tests – skills tests).

- Specific physical fitness tests: the researcher presented the questionnaire to solicit expert opinion (professors of not less than 20 years ' experience in teaching or training fencing) with the aim of determining the appropriate physical fitness tests for the research sample. The researcher accepted the tests that have gotten at least 75% of the expert's approval, as follows:
- Balance (walking on the Swedish seat with closed eyes) (Skills tests: After reviewing references of the skills performance tests of the skills on topics (fencing (1) theme); the researcher presented the questionnaire to solicit expert's opinion (in the fencing field) for determining the appropriate tests measuring skills on topics. The researcher accepted the tests that have gotten at least 75% of the expert's approval, as follows:

- Footwork.
- Lung.

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 2. Age, Anthropometric Characteristics and physical variables of the Groups (Mean ± SD)

Variables	Mean	Standard Deviation	coefficientof Skewness
Age (years)	19.55	1.65	0.34
Height (cm)	166.76	2.54	0.45
Weight (kg)	72.44	3.28	1.11

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

Table 2. Mean ± SD and "T" sign. Between two Groups (experimental and control) in muscular balance and the learning level of fencing basics

Variables	Experimental group		Control group		T sign.
	Before	After	Before	After	
footwork	3.12 ±0.44	3.22 ±0.28	3.25±0.26	4.74 ±0.38	**Sign.**
Lung	3.51±0.26	3.22±0.41	3.05±0.37	4.31±0.28	**Sign.**
Static Balance	3.15±0.65	3.38 ±0.39	3.10±0.32	4.66 ±0.54	**Sign.**
Dynamic balance	4.61 ±0.08	6.50 ±0.05	4.62 ±0.08	5.59 ±0.06	**Sign.**

The t-test showed statistically significant differences between the post measurements for the experimental and control groups in all variables of and Performance Level of basics offensive fencing for the experimental group.

Discussion

In light of the aims and hypothesis of the research and verifying its validity and the results reached out through the statistical processes of the data, the researcher discussed the results as follows: there are statistically significant differences at the significance level of 0.05 between the average of the pre and post measurements of the experimental group in the physical and skill variables in favour of the post measurement. The researcher returns that to using the Bosu ball as an updated tool in the specific physical preparation part, because the exercises of this group were directed to develop the fencing specific physical fitness elements. Moreover, the female students accepted practices with the Bosu ball and positively used it, in addition to its effect on some physical fitness elements which in turn positively affected the fencing basic skills. That is consistent with both (Romero-Franco, et al., 2011; Young et al., 2001) where their results indicated that the exercises using the Bosu ball in the training program have good impact on increasing power and speed elements with their types and training on the Bosu ball has the effect of resisting the body mass and influencing the working muscles, which in turn has a positive impact on the sports skills.

Moreover, that may be due to using an assisting tool to develop physical fitness elements which led to improve the learning process in a better manner and provoking the female students' enthusiasm to work and also the challenge of being able to perform on the ball and away from repetition, routine in performance. Age requirement and its fast rhythm require the use of every modern thing in order to attract the attention of the female students, provoking their enthusiasm to work, and promoting their physical and skill performance level, which are consistent with (Zainab, 1991) . As indicated that the assisting educational tools have a positive effective influence on the learning process and editing it in the best feature as it provokes enthusiasm and the activity of the female students leading to diversity and excitement in the exercises.

The researcher also returns the progress in the physical level, which in turn affected the skill level for their close relation to each other, wherein the pitch we cannot separate between them as both affects the other, and this is consistent with the indication of (Kamal, 2007). The researcher noted that in spite of some researchers and experts ignores and avoids the importance of balance in fencing as a game and as an essential element for being developed among the physical fitness elements, as indicated by the experts questionnaire and some of the references, and agreed upon by both Laila Labib et al., (10), (Kamal, 2007) (Galal, 2000), but the researcher had measured the balance element as the main element developed and promoted by the ball, where the balance element interferes with developing all the other elements as well as the fencing basic skills.

The research results illustrated that developing balance affected the neuromuscular coordination which in turn affected the jumping distance in the jump shoot as well as accuracy in both passing and shooting, as indicated by (Kamal and Mohamed, 2002.) that the balanced landing has landed yet after a fencing skill requirement through high or long jump, where the player's balanced landing correlates to the fencing motor skills, whether the player in the position of the ball or not according to the skill, that is consistent with the study of (Young et al., 2001) that using Bosu ball assisted in gaining balance as an important element for achieving changes in runners' results along with minimizing and reducing the risks of injury and developing the centre of stability and balance which in turn affects the physical and skill performance levels.

The existence of statistical significant differences at the level of 0.05 between the average of the pre and post measurements of the control group in favour of the post measurement in the physical and skill level. The researcher returns that to the followed traditional method, which achieved concrete and acceptable results, where it's supposed and naturally that the traditional method should achieve progress and learning about the physical and skills performance as long as its subject of the scientific fundamentals. Moreover, the researcher studied both groups without bias and followed the same teaching method in the preliminary part specific for learning the basic skills on topics, as well as the final part specific except for the specific physical preparation, which depended on free exercises using body mass on solid ground and the resistance of muscles that helped to strengthen the main muscles, as well as repeating the exercise workouts and the athletic performance contributed to promoting and developing the physical and skills elements, that is consistent with the studies of each of (Mounir and Nermeen, 2008), and (Sahar and Nevein, 2003). The researcher returns that progress due to the type of the sample (physical education college female students of Kuwait), despite the good anatomical and physiological determinants of this sample, but in accordance with the customs and traditions they do not exercise in public life and therefore the initial practice as beginners within the

college will affect their physical and skill performance levels in an acceptable manner.

The existence of statistical significant differences at the level of 0.05 between the averages of the post measurements of both the control and experimental groups in favor of the experimental group in the research physical and skills variables, as well as the improvement rates between the two groups except for flexibility and arm muscular power of the physical variables, as the results shows no statistical significant differences between both post measurements, although the improvement of both but differences gave no evidence.The researcher returns the surpass of the experimental group than the control group due to using the Bosu ball in the specific physical preparation part highlighting the importance of using the suggested exercises for their positive impact on the physical performance, which is consistent with the importance of the modern equipments and tools as new inputs assists to reach better learning outputs giving excitement and motivation to work and exerting effort and avoiding routine and boredom in performance, which helps to develop the sport skills teaching methods in the physical education colleges in general and fencing theme in particular, as indicated by (Bodour and Soher, 2007) and (Nahed and Neli, 1997). The researcher agrees with the study of (Mounir and FNermeen, 2008) which proved that using a medicine ball as an assisting tool led to better results in significant improve in physical and skills performance in fencing especially in the upper part of the body for fencing female juniors. The researcher believes that the increased skill level is an indicator to identify the physical fitness level by measuring progress in performance; skill performance is related to the physical level and depends on what the female students own of the physical qualities that enable them to perform skills well. This was also referred to by (Moufti, 2001).

(Die and Karim 1998) mentioned that the legs muscular power element plays an important role in determining the skills performance of the player that require high performance to overcome body weight and gravity, this reinforces the main aim of the Bosu ball used in the research. The researcher believes that there are no statistical significant differences between the post measurements for the experimental and control groups in the physical variables (flexibility and arms muscular power) and that may be due to using exercises of body weight and resist gravity with the control group that contributed well in promoting the physical level to equate with the Bosu ball specific exercises of the experimental group in flexibility and arms muscular power. Both elements may need to a longer period of time, where training with the Bosu ball within the program mostly depended on coordination, speed, and legs muscular power exercises through the balance element. This is consistent with (Mounir, and Nermeen, 2008) that performing resistance exercises on a stable surface lead to strengthen the main muscles in a better manner. Although there are no statistical significant differences, the improvement rate for both variables shows surpass of the experimental group than the control group.

Conclusions

According to the data and information reached out by the researcher, in the limits of the research sample, the nature of the aim, in the light of statistical data processing and through discussing the results, the following conclusions were reached:

1. The suggested educational program using the Bosu ball positively affects the physical and skill level in the fencing (1) theme.
2. The traditional teaching method positively affects the physical and skill level in the fencing (1) theme.
3. The suggested educational program using the Bosu ball surpasses the traditional teaching method in the physical level and learning the basic fencing skills on the fencing (1) theme.

Recommendations:

In light of the research aims, and the results, thereof the researcher recommends:

1. Using the suggested program with the Bosu ball in fencing themes to raise the physical level, which has the greatest effect in raising the skill level.
2. Using the Bosu ball in physical fitness programs in corresponding themes such as volleyball and basketball as well as the theme of general physical fitness in the faculty of basic education.
3. Using the Bosu ball in a similar thesis in order to develop the elements of muscular power, balance, and agility and its effect on the high jump distance in the shooting with a high jump in fencing.

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