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Original article

Effect of kettlebell training on bone mineral density and certain skillful variables for young soccer players

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Abstract

Aim. Kettlebell has become one of the most popular gym utensils due to its great versatility and effectiveness in increasing strength, endurance, agility, and balance. The aim of this study was to investigate the effectiveness of kettlebell training on bone mineral density and certain skillful variables for young soccer players.

Methods. (30) young soccer under (12) years from the soccer school in Kafr El-Sheikh Sports Club. Dividing the research sample into two groups of (15) participants for the experimental group, (15) for the control group. The data collected before - after the training programs for the two groups.

Results. Statistical analyses showed that: Significant Difference between the Pre- Posttests for the experimental Group in (Push Pull Legs and Barbell Bench). Significant Difference between the Posttests for the experimental and control groups in (Wall pass speed, shooting speed, shooting accuracy on a divided target, longest distance throw-in, running in form of (∞) around pillars, kicking distance) for posttest of the experimental group. Significant Difference between the Posttests for the experimental and control groups in back BMD (L2-L4) and BMD. Femoral Neck of dominate leg

Conclusions. Under the results of our article, that ten weeks of kettlebell training helped to improving physical & skillful variables and bone density for children in soccer.

Key words: Kettlebell Training, Strength, Soccer.

Introduction

In recent years, sport has developed greatly, as a result of its association with other sciences such as health sciences, biomechanics and others, which resulted in many opinions and studies, which resulted in results that provided sport with a lot of theories and information, which in turn contributed to the development of the level of performance and opened up new prospects for field research that enabled Determining the many benefits of practicing organized sports activity on different aspects of the human body and showing its benefits, which is reflected in performance levels.

Soccer is one of the team sports that has been positively affected by the development of sciences related to the sports field, as well as the development of training methods and methods, which effectively contributed to raising the level of players physically

and technically, which helped to achieve excellence and qualitative achievement in the field of Soccer globally.

Hanafi (1990) indicates that Soccer as a team sport is one of the important sports, which has been dealt with by a lot of research and studies, due to the large number of its basic skills and its diversity more than other sports, as Soccer is played with almost all parts of the body and in different ways. Seeking and guarding this goal in addition to the large area of the playing field and the required physical and skill preparation at a high level so that the player can bear the burdens during the match.

Abul-Ela Abdel-Fattah (1999) believe that muscular strength is one of the important physical abilities of sports, especially friction games such as Soccer, and its development is a necessity to reach the individual to a high level. Muscular strength is not

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only one of the physical abilities, but it is one of the most important physical abilities on which it depends for the development of other qualities such as speed, endurance, agility, and flexibility.

Owais Al-Jabali (2000) indicates that muscular strength is one of the physical abilities that contributes to a prominent role in perfecting and developing skillful and tactic performance and has a significant role in highlighting and appearing with certain physical abilities.

Abdel-Maksoud (1997) also adds that muscle strength is usually divided into maximum strength and speed of strength, endurance of force, and that there is a strong relationship between each one and the other two, and the training of one affects the other. The relationship between the three elements of strength and its impact on the level of achievement is because the level of maximum strength at the lower and middle levels has its effect on the level of performance.

Taha et al. (1989) also add that the level of performance of offensive skills in Soccer such as passing, dribbling, shooting and free running has an effective and important role in the results of matches and it is important to focus on it, especially in the junior stage because of its effective role in developing the level of performance of players in the future.

The American College of Sports Medicine (1998) and the American Academy of Pediatrics (1990) also indicate that the minimum age for starting weight and resistance training programs is 7: 8 years, considering the distance from the competitive performance of children, and that training is conducted considering individual differences and that excluding to be training to build muscle.

The researchers also noted that despite the multiplicity of research and studies in Soccer in all physical, physiological, psychological, and other aspects, an important factor was overlooked, and the researcher believes that it is the missing and important link where it is the basis on which the efficiency of performance and the ability to communicate in stadiums is built, which is the structure great for man.

Amr (2013) indicates that kettlebell is a physical training tool. This traditional kettlebell is a cast iron ball along with a handle on top. The handle facilitates its handling during the realization of specific movements for its use. It is important to mention that training with a kettlebell strengthens the whole body, because the exercises performed make all the muscles of the body work and that they quickly gain volume and strength. It should be noted that, this weight is one of the best known and used by athletes.

Although kettlebell is an ancient exercise, recently there has been an increase in the use and scientific

interest in the usefulness of kettlebell training for both recreational physical fitness and athletic strength and conditioning. The kettlebell is a free weight with an uneven weight distribution where the center of mass extends beyond the athlete's grip.

The kettlebell was created to train Russian soldiers who called them "Gireviks". Later it began to become popular among athletes and ended up being marketed for the use of the public. Kettlebells are usually made of cast iron, although there are also some plastic and other materials. They resemble a cannonball with a very large handle and can weigh between 4 and 40 kilos.

The variety of movements which offered by kettlebells allows to carry out strength or cardiovascular workouts, and they are simple to incorporate into HIIT routines or functional workouts with which to tone your entire body.

Amr (2013) indicates that the kettlebell has become one of the most popular gym utensils due to its great versatility and effectiveness in increasing strength, endurance, agility, and balance.

Where Hammad (2000) indicated that the development of the growth of the skeleton and the efficiency of performing its duties in a child is an important influence on physical maturity. He adds that the importance of bones comes in that they provide the process of linking the joint, cartilage and ligaments, and form the general structure of the body, and that the surfaces of the bones are the areas of muscle fusion in the body, in addition to their important role in protecting soft tissues and being a huge and important store for calcium and phosphorous.

Amr (2013) indicates that the adult human body contains 1100 g of calcium, which is equal to 1.5% of the total body weight, and 99% of this amount of calcium is found in the upper system. The normal range of calcium concentration in the blood is 10 mg / dL. Its ability to maintain the balance in mineral elements and maintain the acid-alkaline balance of the lung and kidneys.

And Hammad (2000) adds that the importance of bones is not limited to the strength of building the body and protecting its internal organs, but it has an effective role in maintaining the balance of the work of vital organs in the body, which is reflected on the general health of the child and supports the theory of attention to the need for a strong superstructure and what it follows from the level of performance and achievement.

In addition to the opinions of previous scholars and emphasizing the great importance of the system for life in general and for sport in particular, the World Health Organization (2000) indicates that estimates in

the United States of America alone have reached the rate of osteoporosis more than (25) million people, and as a result of this disease, more than 250,000 (two hundred and fifty thousand) of these people may have a fracture of the thigh bone, about 240,000 get a broken wrist, 500,000 get a fracture of the spine and this is within one year and this is in addition to other less common fractures, the total is estimated at about (1.3) million broken bones. It occurs due to the low density and content of bone minerals and the lack of focus on the growth of this important living tissue in the early stages of growth and life, and all this happens in one year in one country in the world.

Statistics indicate that femur fractures resulting from osteoporosis cause severe impairment of basic activities of daily life, and that about (80%) of these injured are unable to walk after the first six months, and more seriously, about (20%) of these die within One year after a hip fracture.

Scientists believe that increased physical activity at a young age can contribute to optimal bone growth.

American Academy of Pediatrics (1990) also confirm that the results of a study conducted on pre-pubertal children of weightlifters showed that high-concentration resistance training is effective in increasing bone mineral density, especially in the vertebrae. It also showed an increase in muscle endurance for these boys, which confirms that this increase in muscle strength and increase in bone mineral density and bone mass is a direct result of stimulating the nervous system, as well as increasing the rate of neuromuscular compatibility, which confirms the absence of a role for testosterone and androgen at this stage, which is the hormone Responsible for increasing strength and muscle mass.

Witzke (2000) also confirms that strength and resistance training is especially important for young girls, because they are more exposed in old age to osteoporosis, because these exercises can increase bone mass, especially when these exercises begin before puberty.

Therefore, the researcher selected a sample of children non- puberty under (12) years from boys at the soccer School in Kafr El-Sheikh Sports Club.

The researchers believes that the device is a living substance that contains calcium as an essential element and other mineral salts and its role in maintaining balance in the work of the vital organs of the body as well as its supply to the blood with salts, and from it is affected by pressures and influences on it, such as The rest of the physiological parts of the body and the muscles, and this view is supported by Hammad (2000), who believes that exercise, especially strength exercises, is necessary for good bone growth. He adds

that although exercise has nothing to do with the length of the bones, it does cause an increase in the thickness and density of the bones by depositing more salt on it.

Amr (2013) stresses that the bones respond to stimuli and pressures on them, and changes or modifications occur in them, and these changes or modifications are either limited or general in all bones.

The researcher points out that in light of the development of numbers and global sports levels in recent years, the researcher sees that the owners of these numbers and levels are not ordinary individuals or just athletes who take traditional training doses, but they are characterized by physical and physical characteristics that have raised their skill and morphological levels, as they have enabled them to perform high training loads, which is difficult for The average athlete performed. This came because of benefiting from the interrelationships of the impact of exercise on the physical and physiological aspects, as well as considering the opinions, theories and the results of recent research that led to the identification of the impact of exercise on the functional aspects of the human body and the disclosure of the relationships between them and how to draw results to benefit from and apply them.

Training using weights for pre-pubertal Soccer juniors is one of the most important training methods to raise the physical level and improve the density and content of bone minerals, which is reflected in the level of skillful performance of emerging talents and raw materials.

Kettlebells provide a unique tool for full-body ballistic exercise, which has benefits like those of traditional weightlifting, including improving muscle strength, power, endurance, aerobic capacity, and reducing body fat when used properly. Despite this, relatively few studies have examined kettlebell training, and there are significant gaps in the literature related to the use of kettlebell for strength and conditioning.

The aim of this study was to investigate the effectiveness of kettlebell training on bone mineral density and certain skillful variables for young soccer players.

Methods

(30) young soccer under (12) years from the soccer school in Kafr El-Sheikh Sports Club. Dividing the research sample into two groups of (15) participants for the experimental group, (15) for the control group. The data collected before - after the training programs for the two groups.

Tools and devices used:

The researcher used the following tools and devices to measure the research variables:

- Calibrated medical scale - for measuring body weight.
- Stadiometer device - to measure body weight and the body height from the ground.
- Kettlebell (weighs 5, 7, 10 kg).
- Soccer court.
- (DEXA) Dual X-ray energy Device, Norland brand (2000), which is in the Radiology Department of the Hospitals of the Faculty of Medicine, Kafr El-Sheikh University.

Physical tests:

- Push Pull Legs
- Barbell Bench

Skillful tests:

Results.

Table 1. Characteristics of groups (Mean \pm SD)

Group	N	Age [years]	Weight [kg]	Height [cm]
Experimental	15	11.45 \pm 0.32	36 \pm 3.81	145 \pm 2.71
Control	15	11.33 \pm 0.41	35 \pm 2.94	144 \pm 2.50

Table 1 shows characteristics of groups. There were no significant differences were observed between two groups.

Table 2. Differences significant between the Posttests for the experimental and control Groups in physical tests.

Variables	Experimental group		Control group		Sign.
	Before	After	Before	After	
Push Pull Legs	40.35 \pm 5.17	55.22 \pm 8.11*	39.75 \pm 3.41	42.87 \pm 4.11	S
Barbell Bench	16.11 \pm 3.15	27.35 \pm 6.24*	16.00 \pm 2.94	18.35 \pm 3.24*	S

Table 2 shows that:

- Significant Difference between the Pre- Posttests for the experimental Group in (Push Pull Legs and Barbell Bench)

Table 3. Differences significant between the Posttests for the experimental and control Groups in Skillful tests.

Variables	Experimental group		Control group		Sign.
	Before	After	Before	After	
Wall pass speed	14.57 \pm 1.75	22.14 \pm 1.47*	14.34 \pm 1.90	15.24 \pm 1.05*	S
Shooting speed	13.44 \pm 1.15	23.05 \pm 2.08*	13.50 \pm 1.39	14.79 \pm 1.44*	S
Shooting accuracy on a divided target	6.13 \pm 1.12	10.21 \pm 2.01*	6.11 \pm 1.18	7.64 \pm 1.32*	S
Longest distance throw-in	7.00 \pm 2.11	12.35 \pm 1.65*	6.75 \pm 1.88	7.40 \pm 1.21*	S
Running in form of (∞) around pillars	24.14 \pm 0.41	20.08 \pm 0.39*	24.00 \pm 0.32	22.10 \pm 0.14*	S
kicking distance	13.14 \pm 2.13	21.05 \pm 2.51*	13.27 \pm 2.00	14.27 \pm 2.37*	S

Table 3 shows that:

- Significant Difference between the Posttests for the experimental and control groups in (Wall pass speed, shooting speed, shooting accuracy on a divided target, longest distance throw-in, running in form of (∞) around pillars, kicking distance) for posttest of the experimental group.

Table 4. Differences significant between the Posttests for the experimental and control Groups in bone mineral density for back and dominate leg.

Variables	Experimental group		Control group		Sign.
	Before	After	Before	After	
BMD (L2-L4)	0.649 \pm 0.06	0.816 \pm 0.04*	0.651 \pm 0.08	0.655 \pm 0.09	S
BMD. F. N	0.839 \pm 0.03	0.955 \pm 0.08*	0.845 \pm 0.07	0.852 \pm 0.08	S

Table 4 shows that:

- Wall pass speed.
- Shooting speed.
- Shooting accuracy on a divided target.
- Longest distance throw-in.
- A running in the form of (∞) around pillars.
- kicking the ball with the right foot to the farthest distance.

Specifications of the training program:

- ▶ program duration (10) weeks.
- ▶ weekly training units. (3) units
- ▶ Total of training units (30) units.

Statistical Treatments:

The researcher used the following statistical treatments by SPSS version 24:

- Mean, standard deviation, skewness module, student T. test

- Significant Difference between the Posttests for the experimental and control groups in back BMD (L2-L4) and BMD. Femoral Neck of dominate leg.

Discussion

The researchers attribute the occurrence of these changes to the good planning of the kettlebell program, as this led to the improvement of the physical & skill variables and bone mineral density.

Abdel-Maksoud (1997) confirms that there are many justifications that point to the importance of giving boys training with resistance at an early stage, the most important of which are:

Achievement level: It indicates that strength is one of the important factors that affect the level of motor performance, especially in the complex motor performances in sports activity. Therefore, strength training is necessary for all levels of school sports, especially since it is known that the level of strength development provides appropriate conditions for the levels of abilities. The other is when the power is at a high level of development or limits it when the power level is low. The importance of strength training during childhood stages by the need for strength to reach an appropriate level so that children or boys can perform the necessary movements or tactics.

Prevention of defects and poor posture: It indicates that the most noticeable thing among children in primary schools is that a third and perhaps half of children suffer from poor posture or even defects in posture, which is mostly due to the lack of performance of motor activities and sports loads, and therefore it should be one of the most important training objectives at the beginning of the school age is to build a basic kinetic athlete that focuses on strength training in order to prevent and get rid of weakness and defects in body and with the aim of developing a level of harmonious abilities in a way that allows building a basic base suitable for performing all sports activities.

Developing the level of public health and preventing injuries: It also indicates, based on the opinion of physiologists, that resistance and medium strength training programs help to increase strength and reduce the risk of injury because of weak ligaments and muscles. With a higher level of strength and normal bone density, they will have a better chance of living.

This is also in agreement with the results of the study Taaffe (2004), where he indicated that the practice of football for long periods, especially in the pre-puberty period, leads to an increase in muscle strength and an improvement in the density and content of bone minerals than non-practitioners.

These results agree with the opinion of Brehm (2002) that good training has an effective effect on children's health in general and bones. Fleck & Kraemer (1993), Taha et al. (1989) also agreed that Resistance training for

pre-pubertal children should receive attention as it leads to an improvement in the density and content of bone minerals, as well as to improved neuromuscular performance and physical efficiency, and is considered a good preparation for youngsters for the needs of competition and training.

As Hammad (1998) indicate that exercise, especially muscular strength exercises, high-impact exercises, and weight-bearing exercises on the bones are necessary for good bone growth and that these exercises have nothing to do with the length of the bones, but they cause an increase in the width and density of the bones. By depositing more salt on it, which increases its strength.

Castill (1993) also confirms that weight training, resistance and impact training are the best exercises that contribute to maintaining the strength of muscles and bones, and the mechanical pressure on the bones because of motor activity leads to the deposition of calcium salts in bone cells, and on this the amount of bone building depends on the degree of strength Repetition in performance.

These results agreed with the results of the studies of Vicent (2003) and Mackelvin (2002) that the exercise of resistance training program by children under puberty led to an improvement in the bone mineral density of the thigh and spine, and the percentage of BMC improvement in the bones of the leg and thigh of the experimental group.

The researchers attributed this to the fact that exercise in general leads to maintaining the level of bone mineral density. This is consistent with the findings of Calbet et al (2001) that prolonged soccer practice, especially in the prepubertal period, can cause an increase in BMD of the femoral neck and spine.

It also agrees with Fagienbaum (2000) that physical activity and calcium intake influence increasing of BMD.

Both Abdel-Maksoud (1997) and Hanafi (1990) agree on the importance of muscular strength with its various elements to achieve basic and complex skills in Soccer such as shooting, jumping high, taking better positions on the field, and moving from defense to attack, and the player cover about eight thousand to twelve thousand meters running at different speeds during the match.

Fleck & Kraemer (1993), Taha et al. (1989) agree that the most appropriate way to develop muscle strength for players, juniors and pre-pubescent children in Soccer and other sports is weight training, as it gives the Soccer speed and the ability to perform well and makes him more the results of their research indicated that there was a development in the percentage of bone mineral density.



Conclusions

Under the results of our article, that ten weeks of kettlebell training helped to improving physical & skillful variables and bone density for children in soccer.

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