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A Follow-Up Study to Evaluate the Explosive Power Training in Accordance with Some Biochemical Indicators Related to Bone Solidness in Young Handball Players

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Abstract

This study aims to identify the values of the explosive power and the significance of some biochemical signs related to bone stiffness and to identify the evaluation of explosive power training in three consecutive time stages among young players handball in young players handball. The researcher hypothesized that there are statistically significant differences in the results of the follow-up measurements for the explosive power tests, and there are statistically significant differences in the three follow-up measurements for the biochemical inference tests related to bone solidness among young handball players.

The researcher adopted the descriptive, follow-up design. The study included 16 young handball players who were randomly selected from Al-Jaish Sport Club who participate in the first-class tournament for the 2017-2018 sport season. The study variables included the explosive power, calcium, magnesium, inorganic phosphorus, cholesterol, and blood sugar. These variables were tested three times; the interval between one test and another was one month. The statistical package for social sciences, version 24 for windows was used for data analyses. The study results revealed that the stability of the non-improvement of the explosive power is attributed to the stability of no decrease in cholesterol and blood sugar that are linked with bone solidness. Furthermore, the maximum training for explosive power exercises helped in increasing the storage of calcium, magnesium, and inorganic phosphorous. Additionally, the training of young handball players requires familiarity of the trainers with all the biochemical and nutritional knowledge in order to improve the output of the explosive power and they have to include these knowledges in planning their training for such knowledges. The researcher recommends that the biochemical indicators associated with bone solidness should be given an importance when directing the players to the proper nutrition of the building and not being satisfied with the nutritional directions in order to energy only, and the need for periodic measurements for such a nutrition.

Keywords: Explosive Power; Biochemical Indicators; Bone Solidness

Introduction

Explosive ability is considered as an important specialized physical ability in various sports.The muscular strength; in general, has several definitions, including that by Al-Rabhdi "as the ability of a muscle or a muscular group to overcome external resistances regardless of their size and shape." [(5)]It shares the capabilities of muscular strength and kinetic speed, and it clearly appears to the arm in the types of shooting and remote passes of the handball.Many

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studies have investigated it to clarify the role of both the nervous and muscular systems of this output.The science of sport training physiology has presented the fact that the body works as a one unit.Thus, the bone solidness of the athletes in producing muscle strength cannot be disregarded.

Hole states that “the most of the skeletal muscles are welded to the bones, but this attachment is not made by the fibers of these muscles themselves, rather by the ends of the sarcolemma or by strong fibrous strands that join together to form the tendon or fascia”. [(10)] Sherwood presents "The importance of muscles to the bones lies in that the muscles move the bones according to the theory of levers or levers. A slight movement of a muscle attached to one end of the bone can lead to a much greater movement at the other end of the bone.The muscle strength is transferred to the bone through the tendons.The training designed tostrengthen and build muscle helps in preventing osteoporosis." [(14)]

Hole indicates that "One of the functions of the skeleton is the storage of some minerals such as calcium and phosphorus that the body may need at some time.The bone consists of (66%) of minerals and the remaining are organic materials existed mainly in bone cells." [(10)]

Zaytoon states that "Like other tissues of the body, the components of the bone tissue are in constant exchange with the components of the blood plasma. Demineralization may occur, especially when its consumption in food decreases or when theyare lost from the body excessively. It is clear that the availability of calcium, phosphorus, and magnesium in food is an important factor in the ossification process.Such a process involves precipitation of bone minerals in the matrix by a chemical-physical equilibrium that includes ions of Ca +2, Hpo4-2, po4-3.The phosphate ions are composed of organic phosphate esters by the alkylene phosphatase (ALP).Thereafter, these phosphates interact with calcium to form insoluble calcium.It is worth noting that the bone has two important components; the mold (pulp) that is rich in proteins, and minerals. [(3)]

Rude states that "Magnesium is the fourth most important mineral in the body which is important for maintaining health.Fifty percent of magnesium constitutes the exact percentage in the bones, while the other part is found inside the cells of tissues and organs and about (1%) is existed in the blood ". [(13)]

Guyton states that "Studies indicate that the bone is calcified positively to the compressive load that requires it carries. For example, the athletes’bones become heavier than those of non-athletes.Therefore, the continuous physical pressure triggers calcification and the structural structure of the bone.So, the lack of physical stress on the bones causes disruption (inefficiency of formation). [(4)]"As in the rest of the body, the bones strongly grow during movement and physical activity increases the bone mass," says Mayo Clinic. [(6)]

Al-Ali and Shaghati believe that each coach must follow the rules he/she finds suitable for the athlete as a basis for the success of the training, as follows: [(2)]
Planning and gradual increase in the amount of training during the preparation stages, and is gradually decreased during the competition period.

A gradual increase in the intensity of training during the preparation stages until it reaches its peak during the competition period (the inverse relationship between the amount and intensity).

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Diversification in using training methods, approaches, and means

Working to develop all kinds of endurance

Paying attention to recovery running next to each high-load exercise

Considering individual differences and training work for athletes

Giving nutrition great importance to improve the level of athletes.

In order to correct the paths of sports training planning, it is necessary to pay attention to the structural constructive evaluation for consecutive stages of time.This would be separated by equal periods by investigating the biochemical indicators that have a role in producing the muscular ability of young handball players due to the importance of this ability in many skills. It is not possible to ignore the most important support factor in the production of explosive power; the bones.Furthermore, the subject cannot be confined to the muscular and nervous systems in the production of this kind of strength.Thus,since this is one of the applications of the fields of sport physiology and its support for the training process, the research problem lies in the lack of studies that deal with bone solidness in the handball and the researcher's attempt to contribute to providing the fields of knowledge for beneficiaries to apply in improving explosive training exercises that need to be improved and considering the players' nutrition in a healthy way that is free of guidelines unexplored academically.Thereafter, improve their condition in line with the goals that coach aimsto withthe goals of advancing and maintainingplayers' health and safety.

This study aims to (1) identify the explosive power values of young players with handball in three consecutive time stages, (2) identify the level of some biochemical indicators related to bone solidness among young handball players in three consecutive time stages, and (3) identify the evaluation of the explosive power exercises according to some biochemical indicators related to bone solidness among young handball players.

The researcher hypothesized that:

1. There are statistically significant assumptions between the results of the three consecutive measurements of explosive power tests for young players with handball.

2. There are statistically significant assumptions between the results of the three consecutive measurements of biochemical significance tests for bone stiffness among young players with handball.

Methods

A descriptive, follow-up design was used to guide this study.

Sample and Sampling

The boundaries of the study community are young handball players in Baghdad clubs participating in the sports season (2017/2018) in each of the clubs (Al-Karkh, Al-Khalidoon, Al-Jaish); youth category (N = 41). Al-Jaish club players were randomly selected in the simple draw method (n = 16) who represent (39.024%) out of the original community, and (6) players from Al-KarkhSport Club were also randomly selected as a pilot study, and to make sure that their results without significant outlier values, the researcher tested them for

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homogeneity in some influencing variables including the body mass index and chronologic age and trainingage, reaching convolution transactions values for them (0.834, -0.546, -0.904), respectively, which is defined between (values 3+), which means the distribution equinoctial).

Tools and Tests

The researcher has reviewed several specialized studies that deal with the explosive power in the handball.It became clear that the importance of the explosive power of the arms is more important than the rest of the capabilities according to the specificity of this game by hand, and some studies and available scientific sources have been reviewed to identify biochemical indicators that are considered as indicators for laboratory tests that indicate bone solidness which include calcium, magnesium, phosphorus, cholesterol, blood sugar.The researcher adopted a medical ball throw test (ball weighs 2 kg) for the farthest possible distance from sitting on the chair and tying the trunk with a belt to measure the explosive power of the two arms.The researched biochemical markers used the following tools (Emirati-made plastic injection, German anticoagulant tubes to preserve blood samples, medical cotton, a medical wallet to store the test tube blood samples, an antiseptic solution, and a Japanese-made Haematolog Analyzes) made in the year of manufacture (2012) to estimate each of the following semantics as follows:

1. Calcium estimation

It was measured by reacting the calcium ions with the substance (O-Cresol phathalein Complex one) in a basic medium to form a complex with a purple color, and the absorbability of this complex is directly proportional to the calcium concentration in the model

2. Magnesium estimation

In the basal medium, magnesium ions form a complex with the substance (Xylidyl blue) and the increase of absorbability is proportional to the concentration of magnesium in the blood serum (Glycoletherdiamin-N, N, N, 'N,' - tetra acetic acid) is used to eliminate calcium interference.

3. Inorganic phosphorous estimation

The inorganic phosphorous interacts with Ammonium molybdate in the existence of Sulfuric acid to produce phosphor-molybdate whose color intensity is proportional to phosphorous concentration.

4. Cholesterol estimation

Cholesterol is calculated after oxidation and enzymatic degradation. The reagent (Quinoneimine) consists of hydrogen peroxide and (4-amino phena3 one) in the presence of phenol and peroxidase.

$$\text{Cholesterol ester} + H_2O \xrightarrow[\text{Esterase}]{\text{Cholesterol}} \text{Cholesterol} + \text{Faffyacid}$$

Cholesterol

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$$\text{Cholesterol} + O_2 \xrightarrow[\text{Oxidase}]{} \text{Cholestene-3-one} + H_2O_2$$

$$2H_2O_2 + \text{4-amino phena3one} + \text{phenol} \xrightarrow[\text{Peroxidase}]{} \text{Quinoneimine} + 4\ H_2O$$

5. Blood Sugar estimation

After the enzymatic oxidation, the glucose is estimated by the presence of the enzyme glucose oxidase as the hydrogen peroxide produced under the stimulation of the peroxide enzyme reacts with phenol and 4-amino phena3 one to give the red-colored quinoneimine reagent.

$$\text{Glucose} + O2 + H2O \xrightarrow[\text{Acid}]{\text{Glucose Oxidase}} \text{Gluconic} + H2O2$$

$$2H2O2 + \text{4-amino phena3one} + \text{phenol} \xrightarrow[\text{Peroxides}]{} \text{Quinoneimine} + 4\ H2O$$

The pilot study was conducted on October 25th, 2017. The main study was conducted through three measurements; with a one-month interval. The study included a sample of (16) youn handball players. The researcher did not intervene in the training content or using any experimental variable with them. This was dome by performing the explosive power test for the arms, followed by drawing a blood sample (5cc) from each participant and sending them to the laboratory for making the biochemical tests related to bone solidness. Data were analyzed using the statistical package for social sciences (SPSS), version 24 for windows, Chicago, IL. Percent, mean score, standard deviation (SD) skewness, Levene test for homogeneity, F-test, and Sidak-test were used.

Study Results

Table 1. Statistical parameters for explosive power for arms and some biochemical indicators related to bone solidness over time

Tests	First Test		Second Test		Third Test		Skewness	Sig.	Ass.
	Mean	SD	Mean	SD	Mean	SD			
Explosive power for arms	526.13	18.096	526.44	21.516	515.31	14.342	0.408	0.667	NS, H
Calcium	8.179	0.036	8.554	0.056	9.161	0.06	0.60	0.553	NS, H
Magnesium	4.203	0.094	5.244	0.244	6.091	0.245	0.368	0.694	NS, H
Phosphorous	6.3	0.35	7.236	0.513	8.068	0.362	0.282	0.756	NS, H
Cholesterol	147.13	5.365	147	3.967	147.31	4.922	1.774	0.181	NS, H
Blood sugar	91.5	3.011	92.06	3.586	89.81	5.076	2.978	0.061	NS, H

N = 16; Ass. = Assessment; H = Homogenous; NS = Non-significant; Significant at $P < 0.05$,

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In order to know the significance of the differences between the results of the three consecutive measurements of both the explosive power test for the two arms and the researched biochemical indicators, the F-test for repeated measures on the same sample was used, as displayed in the results in Table (2)

Table 2. Measurements for the three tests for each of the explosive power of the arms and some biochemical indicators related to bone solidness

Indicators	n	Source of variance	Sum of squares	df	Mean square	F-test	Sig.	Ass.
Explosive power for arms	16	Between groups	1284.125	2	642.063	1.934	0.156	NS
		Within groups	14941.125	45	332.025			
Calcium	16	Between groups	7.867	2	3.933	1480.85	0.000	S
		Within groups	7.722	45	7.722			
Magnesium	16	Between groups	28.621	2	14.31	334.153	0.000	S
		Within groups	28.52	45	28.52			
Phosphorous	16	Between groups	25.022	2	12.511	72.556	0.000	S
		Within groups	24.992	45	24.992			
Cholesterol	16	Between groups	0.792	2	0.396	0.017	0.983	NS
		Within groups	0.281	45	0.281			
Blood sugar	16	Between groups	43.875	2	21.938	1.38	0.262	NS
		Within groups	22.781	45	22.781			

Ass. = Assessment; NS = Non-significant; S = Significant

Table (2) reveals that F-test values overt time for each of the explosive power for arms, cholesterol, and blood sugar were statistically non-significant. This indicates that there are no statistically significant differences over time. For calcium, magnesium, and phosphorous, there are statistically significant differences over time. In order to identify the significance of these differences in favor of specific time, the one-sample Sidak test was used (Table 3).

Table 3. Significance of differences in the mean scores over time for each of explosive power for arms and some biochemical indicators related to bone solidness

Tests, measurement units, and difference in measurement			Mean differences	Significance	Assessment
Calcium	mml	1-2	-0.375*	0.000	Sig. in favor of T2
		1-3	-0.983*	0.000	Sig. in favor of T3
		2-3	-0.608*	0.000	Sig. in favor of T3
Magnesium	mml	1-2	-1.041*	0.000	Sig. in favor of T2
		1-3	-1.888*	0.000	Sig. in favor of T3
		2-3	0.847*-	0.000	Sig. in favor of T3
Phosphorous	mml	1-2	-0.936*	0.000	Sig. in favor of T2
		1-3	-1.768*	0.000	Sig. in favor of T3
		2-3	-0.831*	0.000	Sig. in favor of T3

Significant at $p < 0.05$; N = 16

Table (3) displays that there is no improvement in the explosive power for the arms for the young football players. The researcher could attribute this to the need for reconsidering in the planning for training of these players by the coach, considering their nutrition in a way that guarantees improving the storage of the phosphogenic and increasing the efficiency of

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the their release; in the muscular cells, in the light of their nutrition that guarantees improving the storage of phosphogene energy materials and increases the effectiveness of their release in musculercells to meet the requirements of this physical ability which remained in need of significant improvement in both sugar and cholesterol. For the calcium,it placement at the bone ends has improved to improve the bone structure and solidness as a result of the physical efforts that the player receives in that training extended to include an increase in magnesium as it chemically relates to the calcium level, but it did not help, despite its significanceinthe follow-up measures to improve the amount of explosive strength of the arms. For the inorganic phosphorous, this element cannot be synthesized in the body, but its atoms are separated and re-synthesized in molecules due to chemical energy release processes in the various stored energy compounds.For the cholesterol and blood sugar,despite their internal formation by absorption, digestion, and storage of different food compounds, they are supposed to decrease if the planning of explosive force training is optimal and proper, because the body's need appears clear to them after the recovering maximum performance. Furthermore, their increase in the body leads to decrease the bone solidness, especially the long ones, according to what the facts related to osteoporosis.The coaches should manage this in that the biochemical indicators that help the bonesolidness have an influential role in increasing the explosive strength in challenging the debility on the one hand and increasing support to remove it on the other hand.Hammad says that “The importance of the muscular strength is that it contributes to achieving any kind of physical exertion in all sports, and its contribution percentage varies according to the type of performance, and it contributes to estimating other physical characteristics or capabilities such as speed, endurance, and agility, and it is considered as an important determinant in achieving athletic excellence in most sports.”[8] Consistently, Hamdan and Khanjar state that “The regular exercise is useful to the bone, general health, and safety.” [1] In same line, Werner states that “Calcium minerals give solidness to the skeleton and its ions play an important role in most metabolic processes.”[15]Furthermore, Brown states that “The bone works as an ultimate reservoir for calcium circulation in the extracellular fluid (ECFs). The calcium enters the ECFs from the cavity or intestine by absorption and from the bones by resorption. The extracellular calcium leaves via the digestive tract, kidneys, or skin, and enters the bone through formation.” [9]

“The body’s need for magnesium also appears in more than 300 biochemical interactions, as it maintains the health of muscles, nerve functions, cardiac vitality, an integrated immune system, and maintaining strong bones. It also regulates blood sugar, blood pressure, metabolism processes and protein synthesis. So, it plays a role in preventing heart disease, hypertension, and diabetes mellitus, and the magnesium is absorbed in the small intestine and excreted through the kidneys.”[11]

Wolman states that “The skeleton greatly responds to extreme stress exercises, and this is clearly observed on professional tennis players, playing with the arm increases the intensity by about (30%) compared to others who do not use it. The other actual increase in bone density can be observed in the non-professional athletes’ skeleton in the runningsports whichincrease the density in the heel, thigh, and spine compared to others. For rowers, they clearly have an increased density in the spine.” [12]

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Conclusions and Implications

1. The stability of non-improvement of explosive power is ascribed to the decrease in levels of cholesterol and blood sugar which are linked to bone solidness among young handball players.

2. The extreme exercises of the explosive power exercises helped in increasing the stores of calcium, magnesium, and inorganic phosphorous among young handball players.

3. The training of young handball players requires coaches' acquaintance with all biochemical and nutritional knowledge to improve the output of the explosive capacity and they must include this knowledge in planning for these trainings.

The researcher recommends the following

1. It is necessary to pay attention to periodically measure the biochemical indicators linked to bone solidness as for other important biochemical indicators in the follow-up measurements.

2. It is vital to care for the biochemical indicators linked to bone solidness when directing the players about the sound nutrition for anabolism and not restricting the direction about nutrition for the sake of energy.

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