

"Hormonal Adaptations of Some Pre-Pubertal Training Programs for Boys"

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ABSTRACT

The research aimed to study the relationship between the effect of using three types of different training programs (strength - speed - endurance) on changing the concentration of some anabolic hormones (growth hormone GH, testosterone TS, and cortisol) and assessment of the state of anabolic versus catabolic metabolism in pre-pubertal children. 15 active players from the athletics team for juniors under (15) years old, were randomly divided into (3) groups (n = 5): one for speed training, the second for strength training, and the third for endurance training . Blood samples were collected from the study group immediately before and after implementing the training programs. Hormones concentration was determined by using the radioimmunoassay method. A significant difference in the level both of TS and GH concentration appeared after the strength program ($P < 0.05$), and only for TS concentration by the speed program ($P < 0.05$), while the increase in testosterone after the endurance training program did not appear significantly. The significant change of the increase in the level of cortisol concentration after the endurance program ($P < 0.01$), compared to the effect of the force or speed program in not causing any significant increases. Despite the higher level of cortisol concentration after the speed program than the strength program, this rise was not significant, whether after the force or speed program. In conclusion, interest in conducting research studies aimed at examining and evaluating the impact of the usual activities that children are exposed to within the training programs for the various activities, especially in the field of endurance, strength, and speed on the secretions of the hormone testosterone, growth, cortisol, which is reflected in the judgment on what is valid for implementation of these activities and achieves the general fitness goals of pre-pubertal children

Keywords : Groth Hormone ; Training programs ; Metabolism ; Children athletes ; Testosterone, Cortisol

INTRODUCTION and RESEARCH PROBLEM

Changes in the concentration of plasma hormones under the influence of exercise have become of interest to many researchers as a result of the structural and physiological importance of these hormones, and in this it turns out that exercise can produce the same anabolic effects that sleep does, especially with regard to stimulating GH secretion (7). Rather, positive lifestyle modifications such as regular aerobic and resistance exercise programs and/or healthy calorically restricted diet can favorably affect endocrine and metabolic functions and act as countermeasures to various age-related diseases (25).

On the basis of this, the study of the relationship between the effect of using intensity, duration of exercise, and the type of physical activity used on changing the concentration of secretion of anabolic hormones was the focus of some previous studies (7,24). The objectives of some studies were also

directed towards conducting research comparisons between neuromuscular adaptations and hormonal profiles in pre-pubertal children under the influence of training exercise (31).

One of the most important goals pursued by exercise training is with regard to improving adaptations and performance in sports training (24), despite this, the information available in specialized scientific references and research studies about the impact of the participation of young athletes in implementing various training programs on hormonal levels It remains limited to this day, compared to the group of studies aimed at identifying acute and chronic hormonal responses in high-level athletes. Research efforts continued thereafter to clarify the therapeutic effects of exercise and the functional role that anabolic hormones such as (GH) and (TS) may play in muscle growth and in controlling protein synthesis (5). In that, the results of a group of research work conducted on humans and experimental animals indicated the possibility of changing the concentration of anabolic hormones and growth processes depending on the different levels of physical activity, the characteristics of the exercise used (7). The results of the 2001 study conducted by Alon, E. et al., (6) showed that typical levels of exercise performed within strength, endurance or kinetic coordination can help improve body weight by increasing the amount of daily energy consumed, and in raising fitness levels. Especially in view of the ideal stimulation that these programs of short duration can play in achieving more building processes under the influence of hormonal secretion.

Determining the appropriate time for the start of strength training in its relationship to the needs of children and youth and planning long-term training is one of the important components to raise the efficiency of sports performance, and to reach the necessary building for competitive performance.) on the importance of using strength training in childhood, which helps reduce the level of total weakness of the muscles of the body, for the auxiliary muscle group, in addition to reducing the state of muscular imbalance. Although there are previous opinions confirming the uselessness of using weights exercises with children as a result of the increased chance of generating the risk of injuries that accompany children's implementation of weight exercises, there are doctors and exercise scientists who confirm in recent decades the possibility and importance of children's implementation of weight exercises provided that These exercises are purposeful, safe, and consistent with the child's level of maturity (26, 34). Since training children athletes has become a very important process during the implementation of long-term training plans, we still need to take into account the physiological, anatomical, and biomechanical factors specific to the nature of children's performance, while emphasizing at the same time the importance of understanding the hormonal responses and adaptations accompanying the implementation of special training programs This reduces the chance of acute and chronic injuries that a large segment of children may be exposed to, especially as a result of not being aware of the characteristics of this age group and the appropriate loads.

In this, Tudor, B. 2000 (32) and Wieneck, 2000 (34) indicate the importance of taking care of the content of endurance training programs that are offered to children in the pre-pubertal stage, due to the low efficiency of endurance in children and the level of maximum oxygen consumption compared to adults. . From a medical, educational and educational point of view, it becomes clear to us that children need aerobic endurance training and not need to carry out anaerobic endurance training in all cases. In this, Wieneck, 2000 (34) emphasizes the importance of endurance training being an essential component of multilateral development during childhood Endurance training modules are implemented as part of or alongside technical training.

The training programs that are suitable for young boys and girls are not suitable with young children, whether in terms of the nature of the content of the exercises used, their intensity, duration, or the incomplete recovery periods given between exercises, all of which confirms that working with children

must be based and based on The reality of studying the characteristics of a group of responses and adaptations accompanying the implementation of their training programs, especially with regard to the effect of these programs on influencing the hormonal level and its reflection on determining the characteristics of the anabolic and catabolic state in children, and based on the above, the research objectives can be summarized in the following:

1. Evaluation of the effect of using (3) types of different training programs (strength, speed, endurance) on making adaptations of some anabolic hormones (GH), testosterone (TS), and cortisol in pre-pubertal boys.
2. Assessment of the build-to-demolition condition associated with the implementation of the specific types of training programs under consideration (strength, speed, endurance) by determining the testosterone/cortisol ratio of pre-pubertal boys.
3. Determining the possibility and effectiveness of using any of the three specific training programs under consideration (strength, speed, endurance) in light of the change in the concentration of (GH, testosterone (TS), and cortisol, and the ratio of testosterone to cortisol in pre-pubertal boys.

Subjects and Methods

The research sample:

The research sample included (15) young athletes who were deliberately chosen from among the players of the athletics team for juniors under (12) years, who had previously trained in athletics competitions for a period between one and a year and a half at Nasr City Sports Club, and their ages ranged from Between (10-12) years old, and the sample was divided into (3) equal groups, with (5) players within each group, so that group (1) includes players who train in sprints, and group (2) includes players who train On strength and ability races, while group (3) includes players who train in endurance races, and they were homogenized as shown in the following table (1).

Table (1) Description of the research sample in the variables of age - height - weight

Variables	SMA	standard deviation	Mediator	skewness
Age	11.07	0.55	10.9	0.157
Length	148.41	3.518	148	0.167
weight	430.75	2.57	43.5	426

(n=15)

It is clear from Table (1) that the values of the skew coefficients were limited to (± 3), which indicates the homogeneity of the research sample in the variables of age, height, and weight.

Method used:

The researchers used the experimental method due to its suitability to the nature of the research. The researchers used the following tools, equipment, and equipment:-

Medical scale for measuring body weight in kilograms.,a rheostat for measuring height in centimeters.,athletics track.,medical balls with a weight of 1,2,3 kg,weight training hall.,elastic cords.,off hours and meters to measure.

Steps to carry out the search:

Before implementing the pre and post measurements of the experiment, the researchers had to adjust some variables so that this would not negatively affect the results of the experiment. This included ensuring the following: None of the children in the research sample felt tired as a result of previous physical exertion, not suffering from emergency diseases such as cold or flu.and the number of hours of sleep to ensure his complete comfort.

Tribal measurements:

Tribal measurements were conducted during rest and before implementing the specific training programs under discussion (strength, speed, endurance program). The implementation procedures included the following: Measurement of height by means of a rheostat in centimeters, measuring weight using a medical scale in kilograms and determining the level of concentration (testosterone, growth hormone, cortisol) by drawing a 5 cm venous blood sample from each player, measurements to determine the concentration level of the specific hormones under consideration were carried out using the radioimmunoassay method, while the ratio of testosterone to cortisol was determined mathematically.

Blood sampling protocol:

1. Medical cotton and alcohol for disinfection.
2. A set of plastic syringes for drawing blood samples.
3. A set of glass tubes for placing blood components and preservatives for coagulation (heparin).
4. Centrifuge for the separation of blood components and its speed is about 3000 revolutions per minute.
5. 5. Ice Box to place tubes of blood components to conduct analyzes to determine the concentration level of the specific group of hormones under investigation (growth hormone, testosterone, cortisol) by using the radioimmunoassay method.

Training program design :

First, the design of the endurance program:

Because prepubescent children have a lower level of cardiac output, and the low efficiency of the blood to carry oxygen as a result of a decrease in the number of red blood cells, immaturity and low lung volume compared to adults, in addition to the high level of energy consumption of metabolic movement, an increase in the rate of Heat absorption, and a low level of heat adaptation associated with a decrease in the rate of secretion of sweat resulting from limited and immature sweat glands, an increase in the central temperature, which occurs with the onset of perspiration, in addition to the inability of pre-pubertal children to produce more lactic acid, and their rapid sense of fatigue, which leads to a sudden and intermittent halt in performance, and based on all these reasons and some other physiological factors Which shows the limited physiological efficiency of children, specialized scientific references (26,32,34) indicate that pre-pubertal children in all cases need aerobic endurance training and do not need anaerobic endurance training. Pre-puberty boys and after the implementation of the warm-up part, which lasted for a period ranging from (15-20) minutes during each unit of the training program

training units. Focus during the implementation of the endurance program on the aerobic endurance exercises shown in Annex (1), As stated, for example, in the following table:

Table (2) The model of the endurance program used for the research sample of pre-pubescent boys

forms of training	running distance	activity speed	number of attempts	period of rest period
toys and games	-	Medium to Fast (play for a while)	2-4	variable
switch (running stations)	40-200m or yards	medium	2-4	2-3 minutes -
Non-violent aerobic activity such as jogging with a regular pace	20-60 minutes	low and steady	1-2 It depends on the distance traveled	-

Second, the design of the speed program:

The ability of pre-pubertal children to perform rapid movements gradually increases in the first stage of development in both sexes (boys and girls) until the end of the last stage of development, although most of the speed gains that are achieved with age development until entering puberty do not come Only from the sprinting skills that are being trained. Rather, the better implementation of a set of exercises aimed at improving the motor coordination at the level of the movements of the legs, arms and the whole body helps in the efficiency of speed work, meaning that the main objective of implementing the speed training program for the research sample of pre-puberty boys It consists in reaching the adaptation of the nervous system to the various and varied range of movements that are implemented and in line with the characteristics and requirements of this age stage.

Accordingly, according to what was stated in specialized scientific references (26,32,34), children are not expected to respond to training or reach the same level of skill performance that adults have until they reach the stage of neuronal maturity, due to the different physiological functions and their association To a large extent, by biological age, not by chronological age.

The content of the specific speed training program under discussion may include what is included in Annex (1) and as stated, for example, in the following table (3):

Table (3) :Speed training model for the research sample of pre-pubescent boys

forms of training	Duration of work or distance of activity	Number of repetitions	Period rest (Accurate)
the games	20-30 minutes	1-2	-
sequences	10-15 meters at the start of the program or 10-15 yards at the end of the program	3-5	2-3 minutes
Training speed	10-50 meters or	4-6	3-4

	10-20 yards		
Training speed with rotation and change of running direction	5-15 meters or 10-15 yards	4-8	2-3

During the implementation of the content of the speed training program for pre-pubescent boys, and in the light of some models of speed exercises shown in Table (3), the following were taken into account:

1. Training to implement the models of speed exercises gradually, so that the training at the beginning of the program is to implement the forms of speed exercises that take place in a straight line during the performance distance ranging from 5-15 meters, before moving in the middle of the program to the implementation of more difficult exercises such as running Zigzag or run with a quick spin during the performance distance of 40-50 meters.
2. That the focus on developing the technical performance of the movements of the legs and agricultural and motor control during the implementation of the various forms of play is part of the components of the speed training allocated to the research sample of pre-pubertal children.
3. The duration of play within the speed training units shall not exceed (20) minutes, and it is required before implementing this good group warm-up (20) minutes with attention to the cooling-down part at the end of the training unit or when changing playing roles.
4. Interest in obtaining the research sample of pre-pubescent boys with intervals of rest of (2-3) minutes between repetitions of performance, with a focus on the pleasure of performance while using sequence forms with short performance distances and times.
5. Reducing as much as possible the training stress or the research sample's feeling of fatigue and pain resulting from the performance associated with speed exercises by implementing a speed exercise with a duration of no more than (4) to (6) seconds.

Second, the design of the force program

Childhood is one of the important stages during which children must be exposed to a set of activities that aim to achieve multi-faceted development, and based on that, the importance of children's exposure to strength training appears, and as an essential component of the group of activities that serve to raise fitness and improve the muscular condition and general health.

In this, Abdel Azir Al-Nimr and Nariman Al-Khatib (2005) indicate the possibility of developing strength in boys and girls during the pre-pubertal stage using weight training (259:2). Under the influence of strength training, the adaptation of the nervous system appears in cases where muscular strength increases without a significant increase in muscle size, especially when developing muscular strength in children (113:1). It may include the content of the specific strength training program under consideration as provided in Annex (1).

Strength Training Program Specifications:

The guidelines and recommendations that were taken into account when implementing a strength training program on the research sample of pre-pubescent boys are as follows:

1. The exercise environment shall be safe and free from risks.

2. Emphasis on the quality of the tools used and their suitability for the research sample of pre-pubescent boys.
3. The strength training used should be part of the general fitness and preparation program for children.
4. Suitable warm-up and cool-down periods used before and after strength training.
5. The duration of the training unit should be from (30-60) minutes, and the training should be performed during the unit using the few resistances for a number of performance groups (1-3), and the repetition within each group should range from (10-15) repetitions.
6. Avoid the wrong performance technique, especially in the field of the spine.
7. To perform each exercise during the full range of motion to achieve maximum muscular development and maintain flexibility.
8. Gradual and unpredictable increase in weight used.
9. Preventing children from competing with any type or form of performance that is implemented, whether through (weight lifting, power lifting, body building).
10. The presence of performance monitors from supervisors or juniors next to the children, especially in the nature of the performance technique, which is accompanied by the fall of the weight used.

Dimensional measurements:

It was implemented after (8) weeks from the beginning of the implementation of the specific training programs under discussion (the strength, speed, endurance program) during rest and at the same daily time for drawing blood samples in the measurements before the implementation of the training programs on the members of the research sample of pre-pubertal boys, The post measurements included determining the level of concentration (testosterone, growth hormone, cortisol) by using the radioimmunoassay method, according to the method of Ruchoft et al., 1996 (27). Banfi et al., 1992(9) and Schoneshoger et al., 1980 (29), respectively.

Statistical processing:

- 1- Arithmetic mean.
- 2- The standard deviation.
- 3- Torsion.
- 4- One-way analysis of variance.
- 5- Duncan's test for significance of differences.

RESULTS

The mean values of the hormonal variables after implementing strength, endurance, and speed training programs are given in Table (4) - Fig(1), Table (5) - Fig(2), Table (6)- Fig(3)., and mathematical determination of the ratio of TS to cortisol after implementing strength, endurance, and speed training programs is given in Table (7).

Table (4) : Change in the level of growth hormone concentration after implementing strength, endurance, and speed training programs

	before the program	force program	speed program	endurance program
Growth hormone (ng/ml)	0.25 ^{ad} ±0.03	8.2 ^{bc} ±0.54 (P<0.05)	3.4 ^{ad} ±0.04	1.21 ^a ±0.07

- The numbers represent the mean ± standard deviation.
- Similar scores in the same class have no statistically significant differences (a).
- The different scores in the same row with the presence of the level of significance (P<0.05) or (P<0.01) indicates that there is a difference and that this difference reaches the significant level.
- The different scores in the same row with no significant level (P<0.05) or (P<0.01) indicates a difference, but this difference does not reach the significant level.

Table (5) :Change in the level of testosterone concentration after implementing strength, endurance, and speed training programs

	before the program	force program	speed program	endurance program
Testosterone (ng/ dL)	20 ^a ±0.21	87.45 ^b ±2.1 (P<0.05)	50.37 ^c ±1.1 (P<0.05)	38 ^{ad} ±1.7

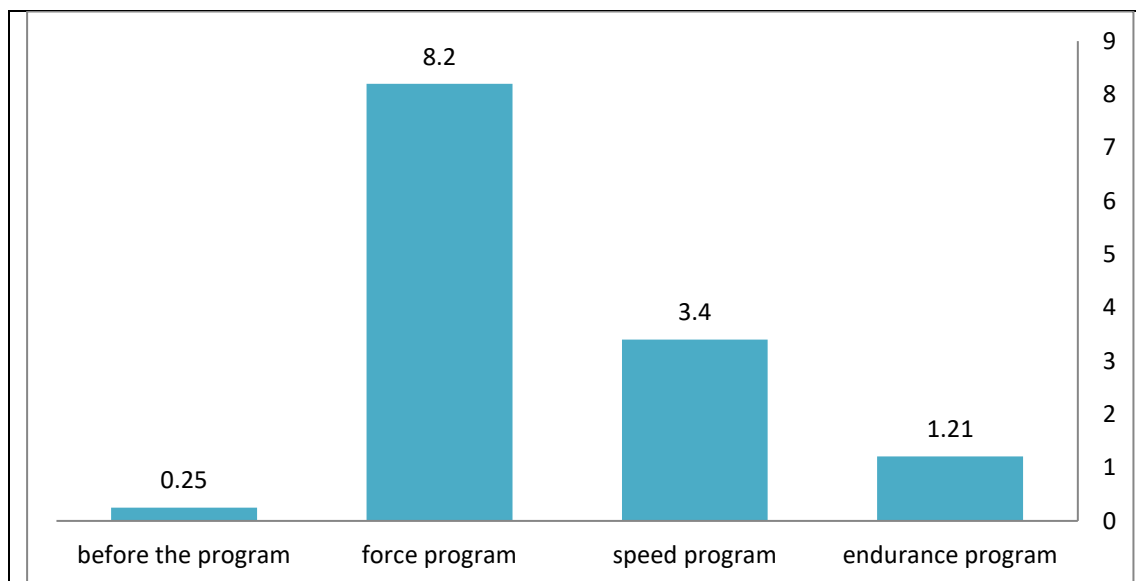
Table (6) :Change in the level of cortisol hormone concentration after implementing strength, endurance, and speed training programs

	before the program	force program	speed program	endurance program
cortisol hormone (µg/dL)	9.6 ^a ±0.22	12.32 ^a ±0.47	18.11 ^{ab} ±0.83	210.5 ^c ±3.5 (P<0.01)

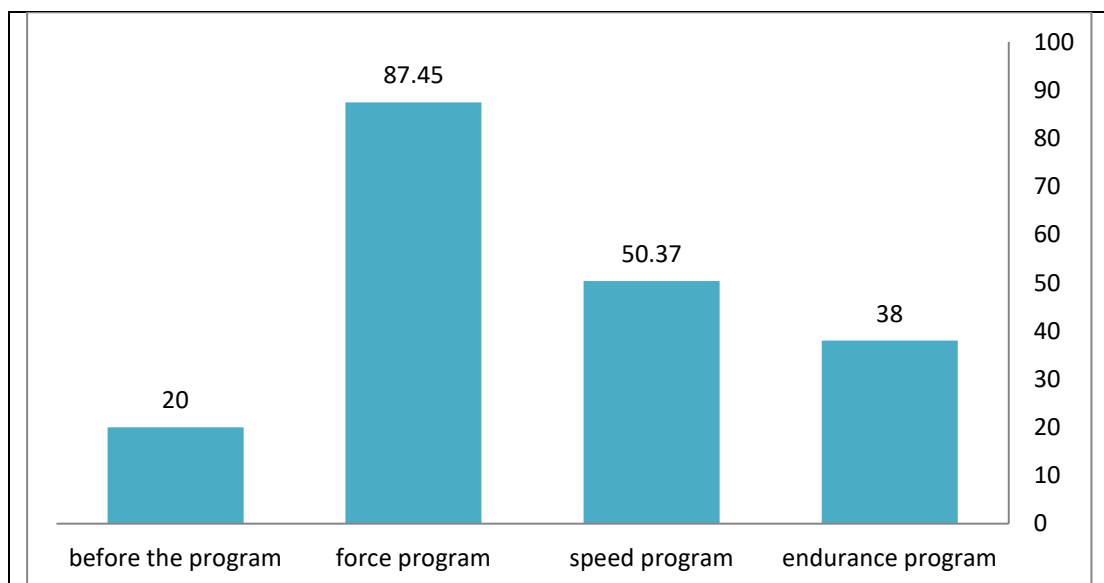
Table (7) Mathematical determination of the ratio of testosterone to cortisol after implementing strength, endurance, and speed training programs

	Before the program (1:2)	force program (1:7)	speed program (1:3)	endurance program (6:1)
Testosterone/cortisol ratio	Approximate ly	Approximately	Approximately	Approximately

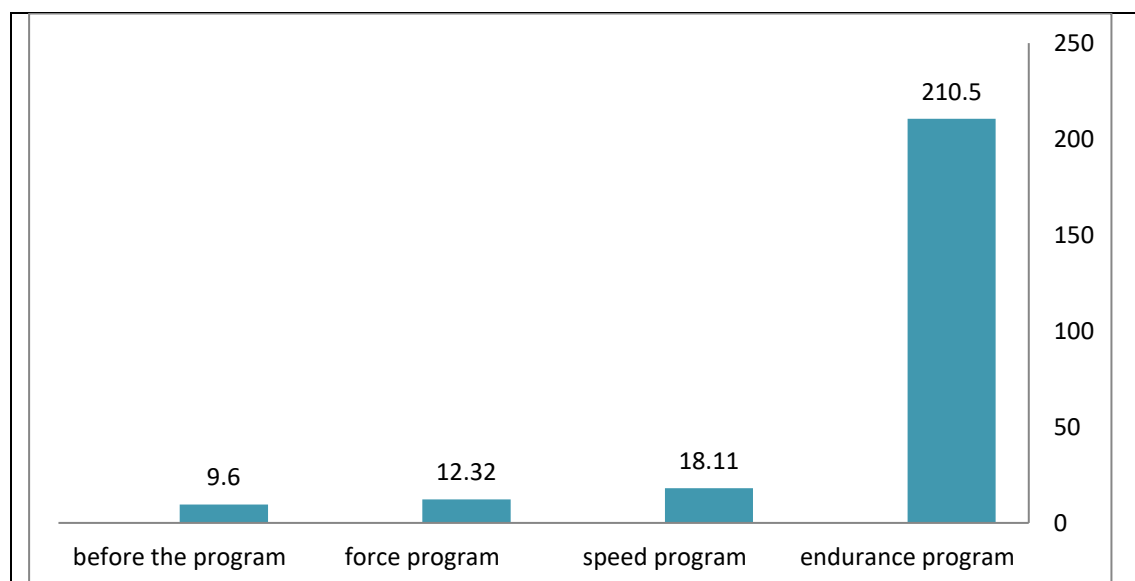
- The ratio of testosterone to cortisol was determined mathematically by dividing the averages.



Fig(1) :The change in the level of growth hormone concentration (ng/ml) after implementing strength, endurance, and speed training programs in the study sample of pre-pubertal boys



Fig(2):Change in the level of testosterone (ng/dL) concentration after implementing strength, endurance, and speed training programs in the study sample of pre-pubertal boys



Fig(3)The change in the level of cortisol concentration (µg/dL) after implementing strength, endurance, and speed training programs in the study sample of pre-pubertal boys

DISCUSS THE RESULTS

Anabolic hormones play a functional role in influencing the occurrence of anabolic processes in the muscles, and testosterone (TS) is one of the most important hormones used to achieve this. Aleksandar et al., 2013 (5) states that the primary function of testosterone (TS) is In increasing the production of proteins, especially in the prostate gland and testicles, testosterone is a male hormone that is created in the interstitial leyding cells of the testicle from cholesterol. This hormone (TS) is secreted in greater quantities than other male sex hormones, which are called androgens.

In general, testosterone is responsible for the expression of male secondary sexual characteristics, when the testes secrete testosterone (TS), we note that about 65% of it is bound to the specific protein testosterone binding globulin, and 30% of it is bound to the specific protein albumin Testosterone binding albumin , while 2-5% remains in the form of free testosterone (8), and based on what came from research results and under the influence of strength training, the results of studies conducted by Athiainen et al., 2003 (4), Jacob et al. , 2010 (18), McCaulley et al., 2009 (23), Baker et al., 2006 (8) that the systemic construction of the training used can help increase the level of testosterone concentration in the blood, and strength training is one of the most relevant components of training The significant effect on raising the levels of testosterone in the blood, and this is consistent with the results of the current study. Significant differences in the level of testosterone concentration appeared after the strength program ($P<0.05$), followed by the speed program ($P<0.05$), while the increase in testosterone after the endurance training program did not appear significantly in the study sample of pre-school children. Puberty table (5).

In this, Athiainen et al., 2011 (3) indicates that the effect of strength training on changing levels of testosterone in the blood is mainly related to the process of controlling protein synthesis and muscle growth, in addition to the function of testosterone in achieving bone growth, and it is believed that the

primary mechanism of the effect of testosterone In stimulating protein synthesis in cells at the level of different tissues, it consists in increasing the production of RNA by increasing the effect that testosterone has on the level of DNA, which leads to an increase in muscle proteins, some researchers believe Majkic-Single 2006 (22), Guyton, Hall 2003 (16) The testosterone hormone stimulates the production of proteins and appears in general, in addition to the anabolic effects of testosterone, its anti-catabolic function

As Jakob et al. points out. 2010 (18) to the functional role that testosterone may play in blocking the glucocorticoid receptor, blocking the effect of cortisol. In contrast, Khozaymeh et al. 2012 (19) that exercise is one of the important activities that have a strong impact on raising the level of fitness, or in causing a group of side effects, which can change the state of the internal body environment and the level of hormonal secretion, especially with the high level of stress associated with exercise.

According to Lepin 2007 (20), physical exercise can become one of the factors of physical stress that cause an increase in the level of cortisol concentration, and one of the effects of exercise may appear as a stress factor that increases cortisol concentrations in the blood, especially when accompanied by weight loss.

Cortisol is secreted by the adrenal cortex, and it has many important metabolic functions such as its effect on the metabolism of glucose, proteins and fats. It raises blood glucose and increases the mobilization of fatty acids from the fatty reserve to active activities, which accelerates the mobilization and use of fats for energy production. On the other hand, cortisol has a catabolic effect, it inhibits protein synthesis, and stimulates the breakdown of protein into amino acid components in All cells of the body, and the amino acids that are released are transported to the liver to participate in the process of glucose synthesis by the process of gluconeogenesis, so that cortisol becomes an inhibitor of protein synthesis and muscle growth through its catabolic action (28). The functions of cortisol also include in helping the body adapt to stress, and in maintaining adequate levels of glucose even during fasting, in addition to its effect as an anti-inflammatory agent, and in reducing the immunological reaction to reduce the number of lymphocytes. Lymphocytes, increased epinephrine (10,13,33).

The results of the current study showed the significant change of the increase in the level of cortisol concentration after the endurance program ($P < 0.01$) Table (6) compared to the effect of the strength or speed program in not causing any significant increase in the level of cortisol concentration, despite the increase in the level of cortisol concentration after the speed program About the strength program of the study sample of pre-pubescent boys, but this rise was not significant, whether after the strength or speed program, table (6). The results of the current study agree with what was reported in Correl, P. et al. 1994. (11) In emphasizing the role that aerobic exercise can play in causing a significant increase in the level of cortisol.

On the other hand, Grandys, M. 2008 (15) studied the effect of moderate intensity aerobic training on muscle growth, and its relationship to hormonal changes in (15) healthy people, and after the specified training period, which amounted to (5) weeks, the results of the study showed the moral high level The maximum oxygen consumption, and the tendency of cortisol levels to rise, but this rise was not significant.

Canali, A. 2001 (10) indicates that the level of hormonal responses can change under the influence of the type and intensity of exercise used in relation to the level of the training condition. In one of the

studies conducted by Izquierdo 2004 (17) and with the aim of examining the chronic effects of endurance and strength training on hormonal concentrations during the period of application of the two study programs, which lasted for (4) months, the results of the study showed that there was no significant difference in cortisol levels between the study groups (strength, endurance, and the control group).

On the other hand, Lucia, et al., 2001 (21) indicates that cortisol levels are not increased among international athletes, and athletes with high training experience compared to athletes with low levels of training or non-athletes, and the results were interpreted during the study conducted by Lucia, et al., 2001 (21) depending mainly on the low level of emotional stress, whether psychological or physiological, which international players face than non-international players or players with low levels, while the results of the same study (21) confirmed that severe emotional stress It is one of the immediate factors that have a strong influence on stimulating the secretion of cortisol, and in light of the results that came from previous studies and the results of the current study, Table (6), and with reference to specialized scientific references, it becomes clear to us that despite the change in the level of cortisol concentration after speed training, the increase The significance of the level of cortisol concentration appeared after endurance training ($P<0.01$) in the study sample of pre-pubertal boys compared to that with the effect of strength and speed training during the period of applying the training programs. For the three (8) weeks of training, and it may appear that the significant change in the increase in cortisol concentration after endurance training can be attributed to one of the two possibilities:

First: Depending on the role that cortisol plays in stimulating the recruitment of fats as a primary source of aerobic energy during the implementation of aerobic exercise activity (endurance program), or to

Second: The effect of the endurance program used on increasing the processes of demolition versus construction in pre-pubertal boys, and the evidence for this is the significant increase in the concentration of cortisol hormone after implementing the (endurance program) with no significant change appearing during the results of this current study to increase the level of growth hormone concentration. And testosterone after implementing the same program (endurance program) Table (7) compared to the significant increase that appeared in the level of testosterone concentration and growth after strength training Table (4) at the level ($P<0.05$) and the significant increase in testosterone concentration after the speed program Table (5)) at the level ($P<0.05$), which suggests the possibility of the role of cortisol as a primary stimulating hormone to increase the process of demolition versus building in a sample of pre-pubertal boys after implementing the endurance program, and by referring to the ratio of the hormone (testosterone / cortisol) after implementing the three training program (strength, It is clear to us that the highest relative value of the increase in the ratio of cortisol against the hormone testosterone appeared after endurance training (Table (7)), which confirms the possibility of an increase in catabolism that accompanied the endurance program about the strength and speed program, and in this, some information available in some research studies (28) indicates the catabolic effects of cortisol, as it works in the direction of anti-testosterone, insulin and growth hormone, cortisol helps to decompose muscle tissue, which leads to the occurrence of Sarcopenia.

Recommendations:

1. That the systematic construction of the content of the strength and speed training program for the research sample of pre-pubescent boys is part of the planning components of the long-term training program that aims to achieve multi-faceted development.
2. Interest in conducting research studies aimed at examining and evaluating the impact of the usual activities that children are exposed to within the training programs for the various activities,

especially in the field of endurance, strength, and speed on the secretions of the hormone testosterone, growth, cortisol, which is reflected in the judgment on what is valid for implementation of these activities and achieves the general fitness goals of pre-pubertal children.

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الملخص العربي

يهدف البحث إلى دراسة العلاقة بين تأثير استخدام ثلاثة أنواع من البرامج التدريبية المختلفة (القوة - السرعة - التحمل) على تغيير تركيز هرمون النمو ، التستوستيرون ، والكورتيزول وتقييم حالة التمثيل الغذائي الابتدائي مقابل التمثيل الغذائي الانتقاضي في الأطفال قبل سن البلوغ. 15 لاعباً نشطاً من فريق ألعاب القوى للناشئين تحت (15) سنة ، تم تقسيمهم عشوائياً إلى (3) مجموعات (ن = 5): واحدة للتدريب السريع ، والثانية لتدريب القوة ، والثالثة للتدريب على التحمل. تم جمع عينات الدم من مجموعة الدراسة مباشرة قبل وبعد تنفيذ البرامج التدريبية. تم تحديد تركيز الهرمونات باستخدام طريقة المقايضة المناعية الإشعاعية. ظهرت فروق ذات دلالة إحصائية في مستوى كل من تركيز TS و GH بعد برنامج القوة ($P < 0.05$) ، وفقط لتركيز TS بواسطة برنامج السرعة ($P < 0.05$) ، بينما لم تظهر الزيادة في هرمون التستوستيرون بعد برنامج تدريب التحمل بشكل ملحوظ. التغير المعنوي في زيادة مستوى تركيز الكورتيزول بعد برنامج التحمل ($P < 0.01$) ، مقارنة بتأثير برنامج القوة أو السرعة في عدم إحداث أي زيادات معنوية. بالرغم من ارتفاع مستوى تركيز الكورتيزول بعد برنامج السرعة عن برنامج القوة إلا أن هذا الارتفاع لم يكن معنوياً سواء بعد برنامج القوة أو السرعة ..

الخلاصة : الاهتمام بإجراء الدراسات البحثية الهادفة إلى فحص وتقييم أثر الأنشطة المعتادة التي يتعرض لها الأطفال ضمن البرامج التدريبية للأنشطة المختلفة وخاصة في مجال التحمل والقوة والسرعة على إفراز هرمون التستوستيرون والنمو. ، الكورتيزول ، والذي ينعكس في الحكم على ما يصلح لتنفيذ هذه الأنشطة ويحقق أهداف اللياقة العامة للأطفال قبل سن البلوغ.