



The effect of sports activity on vascular activating substances

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Abstrset

Today, participating in physical activities is recognized as an undeniable necessity for maintaining human health and well-being. Especially in urban communities, which due to the special conditions governing it, the possibility of any natural movement and activity, which is necessary for the optimal functioning of various organs of the human body, has been deprived of him, so that in recent years, we have seen an increase in deaths caused by diseases. We are cardiovascular. According to the report of the World Health Organization (WHO), cardiovascular diseases are the main cause of death in the world, so that every year 16.7 million people around the world die from this disease. Cholesterol is a type of fat and one of the important substances of membranes. Cholesterol is also present in the blood. Blood cholesterol comes from two main sources: diet and production in the liver. Dietary cholesterol is mainly found in meat, liver, brain, eggs and dairy foods. Plant foods do not contain cholesterol. After eating, cholesterol is absorbed through the intestine and then packed with triglycerides (TG) in a protein coating. The liver can both remove cholesterol from the blood and produce it and pour it into the blood. Lipid profile has long been considered as one of the indicators of cardiovascular diseases. High levels of low-density lipoprotein (LDL) and low levels of high-density lipoprotein (HDL) expose a person to an early heart attack under the age of 60. Among them, there have been people whose traditional risk factors (especially blood lipoproteins) are within the normal range, but they have had cardiovascular events. Half of all heart muscle infarctions occur in people without hyperlipidemia. Inactive lifestyle and obesity are recognized as one of the top 10 health problems by WHO. This type of lifestyle is the most important risk factor for cardiovascular disease, which causes disorders such as increased blood fat, high blood pressure, and obesity. Obesity and overweight is a multifactorial phenomenon that has genetic and environmental (lifestyle) roots. In fact, in developed countries, lack of proper physical activity and improper diet are among the causes of obesity and cardiovascular diseases (1).

Many studies have shown that the prevalence of cardiovascular diseases and their risk factors such as diabetes, hypertension, blood fats (total cholesterol, TG, HDL, LDL and very low density lipoprotein cholesterol (VLDL)) increases with age. On the other hand, increasing age reduces people's ability to perform daily life activities, and these factors increase the risk of cardiovascular diseases, reducing mobility causes an increase in body weight, body fat, abdominal fat, and deterioration of the lipid profile. Studies show that that both genetic and environmental factors lead to obesity and body weight increase, but environmental factors have a greater impact and these can be corrected by changing lifestyle such as proper dietary habits and regular physical exercise, in addition, activity Regular aerobic exercise improves cardiovascular fitness. Therefore, there is a strong logical reason for giving importance to exercise in lifestyle improvement programs to prevent or treat metabolic syndrome and its components. In the human body following exercise, major biochemical and physiological changes occur in order to Relieving stressful conditions caused by sports activity and improving performance occurs. Sports activity with beneficial effects on the metabolic state and body composition is a preventive factor of cardiovascular diseases that reduces the mortality caused by cardiovascular events. In this regard, knowing the mechanisms related to the occurrence of obesity is of particular importance, including this Role recognition cases, several factors such as; Lipid and metabolic profile, body composition, adipokines that are secreted from adipose tissue and affect the metabolism of free fatty acids and glucose, the occurrence of cardiovascular and metabolic diseases, obesity, especially obesity in childhood, puberty and youth. Probably one of the most effective effects of exercise is its effect on blood lipid profile. The use of different exercise programs along with variables such as intensity, duration and energy expenditure of exercise can create different responses in the metabolism of fats and lipoproteins. Lipid profile, except for cholesterol and LDL, has a direct and significant correlation with the amount of body fat mass. CX Works is one of the latest training methods introduced by Les Mills, which includes a wide muscle resistance program on the muscles of the central region.

This sport includes strength movements such as crunches, planks, squats, etc. in order to strengthen the central muscles of the body, this unique combination of muscle exercises in order to maximize strength, increase stamina



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and endurance, increase endurance, increase stability, increase It is used to improve stability, reduce injuries and maintain mobility. In the context of this training program, Gingras et al. (2011) investigated CX Works on increasing performance and peak performance and showed that this training program can bring performance and performance to the optimum level and the final result showed that CX Works by this combination The uniqueness of the exercises in the central region provides an increase in performance. Today, it is believed that a diet with anti-inflammatory properties can play an important role in preventing the risk of cardiovascular diseases in obese and inactive people. Finding solutions to reduce LDL, TG and increase HDL can play a significant role in preventing cardiovascular diseases. (Safari, 2018)

Sports is one of the ways that people can overcome the physical, mental, psychological and social pressures caused by living in today's turbulent and stressful world. Research has shown that people who exercise regularly suffer from cardiovascular problems less than others. They bear less nervous pressure and have more self-confidence, these people are also more optimistic about life and suffer less depression. In today's era, sports as a tool of the next generation leaves a wide impact in various fields. Today, exercise has manifested its role in people's health, spending healthy and joyful and enjoyable leisure time, preventing diseases, preventing the increase in severity of vascular activating substances and moral deviations. In fact, nowadays, the motivation of people in the world to participate in sports activities is not to reach high ranks and achieve the Olympic motto (faster, higher and stronger), but to gain health, well-being, vitality, social relations and avoiding diseases, which are the important reasons for participation. It is in sports, that is why today in France 15 million people participate in organized sports activities, the number of people between 6 and 14 years old is about 6.5 million. , that is, 6.7% of the total population of this country will reach 28.5% in 2000. According to the results of the research, engaging in sports and physical activities increases self-confidence, staying away from drugs, not having sexual abnormalities, educational progress and It reduces the promotion of vascular activating substances in the body. Crawford's research in 1987 shows that inattention to a healthy lifestyle and physical activity increases in adolescence and then in college, and physical activity decreases. Regular sports activity, an important measure to promote health, postpone or prevent Bone disorders such as back pain, neck pain and reducing the risk of diseases such as coronary artery blockage, high blood pressure, diabetes, obesity and colon cancer as well as cardiovascular diseases. (Mahmoudi Hashemi, 2015).

In recent years, hematological changes caused by physical activity have been noticed by many researchers. Physical activity can cause specific changes in the number, distribution of subgroups and proliferation of white blood cells. The type, intensity and duration of activity are among the most important factors that can affect hematological responses. Physical activity and exercise play an important role in the automatic control of the cardiovascular system, and an increase in parasympathetic control and a decrease in sympathetic control of the heart due to physical activity have been reported. Resistance exercises cause parasympathetic activity and, as a result, decrease heart rate during exercise, and increasing age is accompanied by a decrease in parasympathetic control of heart rate and decreased response to sympathetic activity, which should be taken into account in cardiac rehabilitation (Khosravi, 2016). Physical activity reduces the accumulation of platelets, reduces the risk of contracting cardiovascular diseases and finally, reduces the death rate. And on the other hand, the researchers showed that in laboratory conditions in skeletal and cardiac muscle, increasing the concentration of BCAA along with leucine stimulated muscle protein synthesis and consumption of leucine alone led to a decrease in plasma essential amino acids. Since training affects the metabolism of amino acids, in the face of training conditions, there is an increase in the catabolism of amino acids, in which the oxidation of branched amino acids, especially leucine, has been seen with an increase in the intensity of training. (Hakimian) , 2018)

Athletes, coaches and sports science researchers are trying to find new ways that will improve the performance of different body organs and improve the quality of life. In order to achieve this goal, the use of optimal training methods and well-known supplements along with scientific scrutiny play a very important role in this field. Today, resistance exercises are used as part of the training program in most sports. These exercises are the most common type of exercise to increase various muscle functions such as strength, hypertrophy, endurance, and power, which exert part of their effect through changes in the level of anabolic and catabolic hormones. Also, without a doubt, doing resistance exercises has obvious effects on the cardiovascular system. , the conducted research acknowledges that some of these beneficial effects and others may have adverse consequences on cardiovascular function. It should be noted that correct movements and proper design of resistance exercises can prevent their harmful effects. One of these effects is the Valsalva maneuver, which has been studied a lot on its adverse effects when doing resistance exercises. During dynamic exercise, mean arterial blood pressure increases significantly.



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However, systolic and diastolic blood pressure does not increase to the same extent. With endurance exercise of the whole body, systolic blood pressure increases in proportion to the increase in exercise intensity. While the diastolic pressure does not change significantly and may even decrease, the resting systolic blood pressure of 120 mm Hg in normal healthy people can reach more than 200 mm Hg during maximum exercise. Blood pressure of 240 to 250 mmHg has been reported in healthy, highly trained athletes during aerobic exercise with maximum intensity. An increase in systolic blood pressure is the result of an increase in cardiac output (Q) along with an increase in the amount of work. Increased pressure helps to increase blood flow in the vascular network. The fetal curve, the blood pressure (which is a hydrostatic pressure) determines how much plasma leaves the capillaries, enters the tissues and carries the needed substances. Therefore, the increase in systolic blood pressure helps to deliver substances to the working muscles. During endurance exercise, the blood pressure reaches a uniform state below the maximum. If the intensity of the work increases, the systolic blood pressure also increases. If the state of monotony continues, the systolic pressure may gradually begin to decrease, but the diastolic pressure remains constant. A small decrease in systolic blood pressure, if it occurs, is a normal response and simply reflects increased vasodilation in active muscles, which reduces total peripheral resistance (TPR). Diastolic blood pressure changes slightly during submaximal dynamic exercise, while diastolic blood pressure increases slightly during maximal exercise intensities. Diastolic pressure is a reflection of the pressure inside the arteries when the heart is at rest (diastole). During dynamic exercise, a global increase in the sympathetic nerve tone of the vascular network causes a global vasoconstriction. However, vasoconstriction in active muscles is inhibited by the release of local vasodilators. Therefore, there is a balance between the vasoconstriction of inactive areas and the vasodilation of active skeletal muscles. For this reason, diastolic pressure does not change significantly. However, in some cases of cardiovascular disease, an increase in diastolic pressure of 15 mm Hg or more occurs in response to exercise, which is one of several indications for immediate cessation of diagnostic exercise testing. Blood pressure responses to resistance exercise such as weight lifting are more than expected. During intense resistance training, blood pressure can reach 350/450 mmHg. In such sports, the use of Valsalva maneuver is common. Valsalva maneuver occurs when a person tries to exhale despite the mouth, nose and epiglottis being closed. This action causes a sharp increase in the pressure inside the chest. Most of the subsequent increase in blood pressure is the result of the body's effort to overcome the high internal pressure during the Valsalva maneuver (Mawazi, 1401). The migration of the rural population to urban areas is one of the factors that determine the development of economic systems. Migration to urban areas is related to obtaining better job positions in cities. Due to this, reliance on energy reserves has increased to meet human and industrial needs. Industrial development and progress has come at the cost of reducing the cleanliness of the environment and increasing environmental pollution. Although the endothelium is only a simple layer of cells, a healthy endothelium can have dramatic effects on physiological responses. Among these, we can refer to various chemical signals that can overshadow vascular tone, blood clot resistance, cell adhesion, smooth muscle cell proliferation, and vascular wall inflammation. The importance of endothelium was first recognized by its effect on vascular tone. This is done by releasing vasoconstrictor or vasodilator chemicals. Nitric oxide and prostacyclin can be mentioned among the important vasodilators secreted from the endothelium. NO is produced from L-arginine by the action of eNOS. One of the main drivers of NO secretion is the shear stress on the vessel wall. Among the vasoconstrictor substances released from the endothelium, we can mention endothelin-1 and angiotensin 2. One of the most powerful vasoconstrictors released from the endothelium is endothelin-1. Endothelin-1 is a large peptide containing 21 amino acids. Endothelin-1 has two receptors on vascular smooth muscles named ETA and ETB. About 85% of endothelin-1 receptors are ETA receptors. Various cases of increased endothelin-1 levels have been observed in human and animal samples after exposure to pollution. It has also been observed that endothelin-1 is directly effective in the development of cardiovascular diseases. Damage to the vessel wall and endothelium can be mentioned among other triggers of endothelin-1 release from the endothelium. The two factors NO and endothelin-1 (ET-1) act against each other and cause vascular homeostasis, and disruption in the production of each of these two substances leads to disruption in vascular homeostasis and finally disruption in Endothelial function becomes. Long-term aerobic exercise can affect plasma endothelin-1 and nitric oxide levels. This effect includes a significant increase in the amount of nitric oxide produced and a significant decrease in the amount of secreted endothelin-1. On the other hand, air pollution has opposite effects on these two substances and causes a decrease in the production of nitric oxide, and an increase in the production and even an increase in the expression of the endothelin-1 gene. Oxidative stress biomarkers can be classified into several categories, one group of molecules that result from the interaction of different molecules (DNA, fats, proteins, carbohydrates, etc.) with reactive oxygen species. are. Another group of molecules of the antioxidant system that change after interacting with oxidants, and the last group of molecules that themselves can cause the production of reactive oxygen and nitrogen



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species. Cardiovascular diseases are one of the problems of today's society, and the indicators of oxidative stress investigated in this research are the indicators that determine the risk of cardiovascular diseases.

Some researchers also find the effect of physical activities, especially physical activities that are performed with high intensity and anaerobic, to control the desired weight on all types of cardiovascular diseases and also to reduce oxidative damage. Based on this, some researchers recommend different physical activities along with different food supplements than other people in order to increase the development of the quality of life and increase the functional capacity of these patients. The purpose of nutritional interventions in these people is to reduce inflammation after high-pressure exercises and also to achieve the correct metabolism (Esadi Amin, 1402). By increasing blood flow, exercise causes mechanical stimulation of blood vessels, as a result, it increases the production and release of nitric oxide. Aging is a natural process that is accompanied by changes in the structure and function of the body. The changes that women experience after menopause. Menopause is a sensitive and challenging period for women, which causes various problems; The prevalence of cardiovascular diseases in women increases with age. According to the research conducted, physical activity and exercise can reduce the complications caused by hormonal changes, such as reducing physical fitness, and increasing cardiovascular diseases in menopause. Cardiovascular diseases are one of the most common Causes of death in the world. Controlling the level of blood lipids is one of the important factors in the prevention and treatment of heart diseases as well as atherosclerosis diseases. Based on research, probiotics are useful in improving lipid profile and controlling atherosclerosis. Probiotics are living and specific microorganisms that, when consumed by humans or animals, affect the microbial flora of the body and affect the health of the human body. Among the most common probiotics, we can mention (Lactobacillus and Bifidobacter). Among the positive mechanisms of probiotic strains on atherosclerotic indicators, we can mention the increase in the diversity of the intestinal microflora, so that Karlsson et al showed that drinking a drink containing high amounts of Lactobacillus plantarum for 4 weeks In 16 men with heart failure, it caused a significant increase in the Shannon and Weaner diversity index, which is probably associated with an increase in the production of short-chain fatty acids, which is a contributing factor in improving the clinical symptoms of heart disease. Prebiotics are special compounds that are not digested by the host, but through stimulation Selective growth or activation of one or a limited number of bacteria in the digestive tract, which mainly produce short-chain fatty acids, have positive effects on the host. Inulin, fructooligosaccharide and polydextrose are prebiotic food compounds that are present in many edible plants. They are indigestible polysaccharides and oligosaccharides and are classified as dietary fiber. Today, products that have probiotic (beneficial bacteria) and prebiotic (probiotic food) properties are called synbiotics. To improve arterial stiffness and side effects of type 2 diabetes, chemical drugs are usually used that can have harmful effects. Exercises and synbiotics have beneficial effects in increasing the production of nitric oxide and reducing arterial stiffness and can play an effective role in improving the condition of cardiovascular patients without the adverse effects of chemical drugs. Khanum Sediqeh Rezaei (1402) conducted a study titled the effect of resistance training and synbiotics on arterial stiffness, nitric oxide and glycosylated hemoglobin in postmenopausal women with type 2 diabetes (Rezaei, 1402).

Today, in most countries of the world, including Iran, cardiovascular diseases are the main cause of death. High fat and blood pressure, inactivity, smoking and diabetes are risk factors for cardiovascular diseases. Cardiovascular diseases lead to Myocardial infarction (heart attack) causes irreversible damage to the heart tissues, although there are various medicinal agents for the treatment of various diseases, but most patients are unable to tolerate the side effects caused by the use of such chemical drugs. This is the reason why the use of new and complementary methods to minimize the damage caused by heart infarction and control its complications is discussed, especially in developed countries. Using and performing aerobic activities is one of the safe and protective methods in this regard. Exercise also activates the sympathetic nervous system, the sympathetic activation of the heart increases the heart rate and its contractions, and also decreases the diastolic filling time, which increases the oxygen consumption in the heart, which consequently leads to The decrease in mortality after cardiac infarction, the decrease in heart rate during the recovery period after exercise is a strong predictor of patient mortality, which is probably caused by the balance of the autonomic nerves in these patients, and aerobic activities also decrease Many risk factors associated with cardiovascular diseases, including high cholesterol, obesity, and insulin resistance, in 2018, during their research on rats suffering from heart infarction, Ghahrani et al. found that low-intensity interval training has a greater effect on reducing Apoptosis in cardiomyocytes after myocardial infarction is related to high-intensity intermittent exercise. It is also expected that factors that stimulate angiogenesis can have a protective effect against myocardial infarction. Angiogenesis means increasing the density of skeletal and cardiac muscle capillaries. It is formed in the form of longitudinal division or sprouting from the heart vessels and in response to stimuli such as metabolic factors (growth factors) and hemodynamic



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forces (mechanical tension, tissue shear stress) and hypoxia conditions (decreased oxygen availability). And nitric oxide starts its activity. One of the most effective factors in angiogenesis is the endothelial growth factor of the vessels. The endothelial growth factor is a secreted protein with a molecular weight of 25 to 45 kDa, which is often produced by endothelial cells, thymus, smooth muscle, tendon, and platelets. and skeletal muscle, which as an angiogenesis initiator causes stem cells to enter the bloodstream, also through VEGFR-1, VEGFR-2 tyrosine kinase receptors.

VEGFR-3 reduces the apoptotic activity and increases the expression of anti-apoptotic proteins, which ultimately increases the life of endothelial cells and increases the permeability of blood vessels. Therefore, the normal function of VEGF is to create new blood vessels for the branching of closed vessels or after injury, in Muscles are the result of exercise. In another research, it was stated that the VEGF factor of the heart muscle decreases in many pathological diseases, including diabetes and aging, and among these, the level of VEGF in the heart muscle can be improved by using exercise. Farzangi et al. 2013 research on 20 postmenopausal women with high blood pressure showed that 6 weeks of regular aerobic exercise with moderate intensity increased the level of VEGF factor in the heart tissue, which led to a decrease in systolic and diastolic blood pressure in postmenopausal women with high blood pressure. It also increases the signaling in the endothelial cells, which ultimately causes the biological activity of nitric oxide, the VEGF/eNOS pathway accelerates the blood flow to the muscle tissues, and as a result, the blood also carries nutrients and anabolic hormones during Exercise leads to the muscles, which results in an increase in blood pumping in the muscles and an increase in cardiovascular endurance. On the other hand, NO is a strong vasodilator that can play an important role in controlling vascular tone and preventing the accumulation of leukocytes. and platelets in the endothelial wall, it also plays an essential role in the proliferation and growth of VEGF cells (28) Another factor affecting the angiogenesis mechanism are microRNAs, which play a large role in the responses of heart damage and inflammation. microRNA consists of non-coding RNA. mir126 is one of the special genes in microRNA that plays the best role in the integrity of blood vessels and control of angiogenesis. Natan et al. They investigated that the result was an increase in the mir126 gene in aerobic activities, and that it caused angiogenesis in the heart tissue through the direct regulation of VEGF and the indirect regulation of Spred1/MAPK/Raf1. In the past years, the effect of some medicinal plants with compounds Natural and synthetic have been considered to protect some organs against inflammation and toxicity, and also some plants can show antioxidant effects by controlling the amount of lipid oxidation (Javaheri Tehrani, 2017).

Javaheri Tehrani, Behrouz (2017). The effect of eight weeks of intermittent aerobic training and consumption of jujube extract on vascular endothelial growth factor in the heart tissue of male rats with myocardial infarction. Binaloud

Floating in cold water caused by vascular contraction prevents inflammation, thus leading to a decrease in creatine kinase. Floating in cold water creates hydrostatic pressure on the body and causes blood to move from the lower part of the body to the chest area during floating. This blood flow It causes a faster elimination of the substances resulting from the metabolism. Also, floating in cold water reduces cell permeability through vascular contraction and thus leads to a reduction in inflammatory responses, muscle damage, edema, and pain, since this method can reduce post-exercise inflammation. severe and damaging as a therapeutic method, it may be a suitable method to reduce edema and inflammatory responses caused by tissue damage. Also, in a systematic review in 2016 on the amount of water temperature and immersion time in cold water, it showed that the duration Immersion between 11 to 15 minutes (moderate immersion) and at a temperature of 11 to 15 degrees Celsius (cold temperature) has the best results. In this study, the effect of different water immersion recovery techniques on maximum strength and power and inflammatory reaction of these people has been evaluated. 41 professional male athletes (in football, rugby, volleyball) performed intense intermittent exercise for 20 minutes and then underwent a 15-minute recovery period including warm water immersion (TWI) at 36 degrees Celsius and cold water immersion. (CWI) at 10 degrees Celsius and hot and cold water exchange (CWT) at 10 and 42 degrees Celsius and inactive recovery. Performance was measured in 30 tests of boat movement, standing vertical jump movement, isometric voluntary contraction of knee extensor muscles before and immediately after the activity, one hour and 24 hours after the sports activities. Also, the characteristics of white blood cells and muscle damage, CK and LDH were measured before exercise, one hour and 24 hours after exercise. By applying CWI and CWT in one hour after the activity, a significant increase was observed in the isometric contraction and the boat movement test, respectively, compared to before the activity (Moradi, 2018).

Aging is one of the main risk factors for cardiovascular disorders. With increasing age, the structure and function of the heart gradually changes, which further increases the risk of cardiovascular diseases and weakens the functional capacity of the heart. Physiological changes in the aging heart include left ventricular hypertrophy, diastolic dysfunction, and valve failure. , increasing cardiac fibrosis, increasing atrial fibrillation, and decreasing



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maximum exercise capacity. Aging is a complex biological process that causes a gradual but continuous decrease in normal physiological and biochemical functions. Aging has a significant impact on the body's natural health and can lead to disorders such as Alzheimer's disease muscle atrophy and cardiovascular diseases. Nucleic acid (DNA) and reduced DNA repair; Significant changes in the regulation of gene expression, telomere shortening, mitochondrial dysfunction, and disturbances in intercellular signaling pathways such as inflammation, nutrient sensors, and increased apoptosis are the progressive loss of cardiac myocytes with aging due to programmed cell death. or apoptosis, increase of inflammatory cytokines, increase of oxidative stress and fibrosis decrease the function of the heart. Cardiovascular diseases are the main cause of death worldwide, and the increase of the world's elderly population has also led to an increase in deaths caused by cardiovascular diseases, which It is estimated that it will reach 23.3 million people by 2030. Successful advances in health care and lifestyle changes have partly led to an increase in the elderly population. Many factors can influence the aging process and prevent its complications. . One of these factors is exercise. Exercise is considered as an efficient strategy to deal with the effects of aging. There is evidence that exercise is beneficial in terms of physical, mental and social functioning in older people. The increasing number of older people with neurological and cardiovascular diseases is growing has had a lot Since specific and effective treatments are not currently available, major efforts should be focused on health improvement and prevention with an emphasis on modifiable risk factors such as lifestyle and promoting physical activity. it has been shown that continuous training patterns with moderate intensity have many benefits including improving musculoskeletal, cardiopulmonary and cerebrovascular function. However, the time commitment associated with this exercise pattern is a potential barrier to participation, hence HIIT training as a more efficient form of exercise that can produce similar improvements in cardiorespiratory fitness with respect to exercise volume and further promote vascular adaptation. For people in less time than the continuous training pattern with moderate intensity. Exercise increases the antioxidant capacity and mitochondrial viability in heart cells, and cardiac protection caused by exercise is related to the physiological growth of the heart, which is distinct from pathological hypertrophy. It has been found that regular exercise and physical activity can have positive effects on the responses be inflammatory and increase the body's defense system against inflammation. Researches have shown that aging causes dysfunction of non-chemical heart function and is related to mechanical regeneration. This process involves collagen accumulation (eg, fibrosis) and dysregulation of active matrix metalloproteinases. Sports training improves the function of the heart and prevents the accumulation of collagen and the development of fibrosis (Mokhtaba, 1400).

Effective interventions on GDM, with the aim of reducing the risks of GDM for the mother and baby, are carried out by controlling the blood sugar of the mother through the treatment of maternal hyperglycemia. These interventions include modifying the mother's diet, providing appropriate physical exercises, pharmacological interventions such as oral medications to improve hypoglycemia, subcutaneous insulin injections, nutrients or other food supplements. (6) The main treatment recommended for women with GDM is diet. is food On the other hand, studies conducted on the effects of aerobic exercise on gestational diabetes have shown that exercise and physical activity during pregnancy make pregnant women less likely to develop gestational diabetes. (6) One of the benefits of regular exercise is reducing the risk of heart disease. It is vascular by improving lipid profile and improving high blood pressure. Now it is well established that physical exercise is associated with weight loss, reduction of serum cholesterol concentration, especially VLDL, and increase of HDL. (Ziai, 1401).

Abdominal obesity in humans is a part of metabolic syndrome. Metabolic syndrome is a multiple risk factor that consists of several risk relationships with metabolic origin. In addition, increased triglycerides, increased blood pressure, and increased sugar can be present in this disease. And on the other hand, the presence of inflammatory conditions in metabolic syndrome can double the risk of cardiovascular diseases and type 2 diabetes. The prevalence of metabolic syndrome is increasing with age and moment by moment. Social factors, physical activity level, Diet and gender are among the factors that affect it. Metabolic syndrome is associated with a number of diseases such as fatty liver, cholesterol, gallstones, obstructive sleep apnea, gout, depression, musculoskeletal disease, and polycystic ovary syndrome. (Anai, 2018).

Diabetes as a chronic metabolic disorder has a significant impact on the health, quality and life expectancy of patients and is considered one of the five causes of death in the world. Cardiovascular diseases are the most common cause of death worldwide, which is about They account for 30% of all deaths. Research studies have reported an inverse relationship between HS-Ctnl values and cardiorespiratory fitness. Considering that more than 80% of heart accidents have non-genetic origins and are related to people's lifestyle, especially lack of movement. Therefore, determining the type of exercise, its duration and intensity in order to provide a suitable model to the people of the society can help to improve the health of the people of the society, reduce medical expenses and as



a result many social problems. with the title of the effect of two months of high intensity interval training (HIIT) on the protein expression level of HS-Ctnl and TNF- α in the heart of male diabetic model rats.

Vascular endothelial cells play an important role in regulating vascular activities by producing vascular activating substances, such as endothelin and nitric oxide.

Aged blood vessels show less endothelial nitric oxide synthesis, which causes less nitric oxide production. The decrease in nitric oxide production can be associated with increased activity of blood platelets and arterial thrombus, as well as with increased atherogenesis. On the other hand, there is a relationship between the decrease in nitric oxide biological activity and the prevalence of cardiovascular diseases in postmenopausal women. It has been strongly reported that some studies have shown the effect of regular exercise in the improvement of vascular endothelium in postmenopausal women. By increasing the blood flow, exercise causes mechanical stimulation in the vessels, and if the endothelial is healthy, it leads to an increase in the production and release of nitric oxide (Behjati Ardakani et al., 2017).

Sports activity affects the function of cardiotropin-1 and platelets, these changes are associated with a decrease in cardiovascular complications and mortality, on the other hand, there is a relationship between inflammatory indicators such as cardiotropin-1 and platelet formation, with cardiovascular diseases, exercise Resistance increases the level of plasma platelets in healthy people temporarily, and platelets also affect the release of cardiotropin-1. Amooali and colleagues have reported that as the level of cardiovascular fitness increases, the threshold for stimulating myocytes to produce cardiotropin-1 increases, and as a result, The level of cardiotropin-1 decreases during stress and pressure caused by sports activities. Therefore, they suggested that training for 12 weeks and more should be investigated by increasing the intensity of training in trained people due to vascular-cardiovascular adaptations to exercise (Ghorqchi, Afrondeh, 2019)

Studies show that the prevalence of cardiovascular diseases in type 2 diabetic patients is 4 times that of other people in the society. Therefore, research evidence shows that there is a close relationship between fat percentage, body mass index (BMI) and insulin concentration. Many researchers around the world are trying to reduce the complications of diabetes by using various methods. Therefore, doing sports activities is one of the most important basic solutions to control and treat blood glucose and hyperlipidemia, and it reduces the incidence of diabetes and cardiovascular complications. Also, the existence of regular exercise programs in diabetic people destroys the strong insulin reaction, because it affects the muscles. And the liver gets used to store more glycogen. Proper exercise increases muscle mass, decreases fat mass, improves insulin resistance and also disorders caused by diabetes. Researchers are of the opinion that performing effective exercise (intensity, duration, type and number of sessions per week) for diabetic patients can be an important factor in reduce the complications of diabetes. In this regard, according to the guidelines of the American Association of Sports Medicine (ACSM), it is recommended to consume 500 kcal per session in three sessions per week and 400 kcal per session in 4 or 5 sessions per week (Hosseini, 1400).

Cardiovascular diseases are known as one of the most important causes of death in today's societies, and nearly 80% of these deaths occur in low- and middle-income countries. Coronary artery disease refers to the narrowing or blockage of all or part of the coronary arteries due to atherosclerosis, spasm, or the presence of clots. In this disease, the affected artery cannot meet the nutritional need of the new card muscle for oxygen, which will result in angina pectoris and cardiac arrest. Coronary artery graft surgery is a type of treatment in which the blocked coronary artery is created by grafting veins, between the part before the stenosis of the artery and the part after the stenosis, to increase the coronary blood flow.

Implementation of rehabilitation programs after heart surgery can be effective in limiting the physical and psychological effects of these patients, reducing the risk of sudden death, or recurrent stroke, controlling cardiac symptoms, stabilizing or reversing the process of atherosclerosis, and improving the psycho-social situation. Meanwhile, performing sports activities with the aim of rehabilitating cardiac patients after surgery improves their cardiovascular function and functional ability. (Hamidi, 1400)

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The effect of training variables (such as intensity, duration and frequency) on the choice of energy substrate (carbohydrate or fat or protein)

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For many years and especially in the last few years, scientific research related to identifying the method of increasing strength and endurance in athletes and non-athletes has always been of interest, and in this regard, while introducing various methods, special tools have been introduced to increase strength and endurance. As a result, it is difficult for many people to choose the best training intensity at the beginning among various training methods. It is necessary to provide a clear picture of new information along with providing a simple, logical and individual approach to strength training. Resistance training is one of the training methods that has attracted a lot of attention in recent years. Strength training, hypertrophy, muscle strength. It increases muscular endurance and health status. Different people do resistance exercises with different goals such as improving sports performance, increasing lean mass and reducing body fat, increasing strength and increasing muscle mass. A properly designed and consistently implemented resistance training program can meet any of these goals. Most of the people who do weight training recreationally and for health have the goal of gaining strength and muscle mass. Many resistance training systems can create a significant increase in muscle strength and volume by manipulating the basic variables of this type of training (such as turns, repetitions, resistance and intensity) and rest intervals (Gaini and Rajabi, 2012). Although muscle strength is the basis of performing sports movements and many sports science experts consider it to be the most important factor in physical fitness and performing heavy movements, and coaches and athletes of various sports disciplines formulate their resistance training programs based on this, but the manipulation of several Variables in the training program of athletes include the type of exercises, order of movements or activities, training intensity, rest periods between activities as well as the number of training sessions, until stimulation and recovery periods at the beginning of resistance training in non-athletes are optimally provided, causing the least damage. muscle, inflammatory reaction and antioxidant response. In this chapter, we intend to examine the general effects of resistance training on muscle injuries (Ganji, 99).

Obesity and metabolic syndrome are characterized by a systemic disorder in the body that leads to an increased risk of cardiovascular diseases. On the other hand, desnotrin, FNDC5 and adiponectin are effective proteins in fat metabolism and are disturbed by obesity and metabolic syndrome. Regarding the importance of exercise in preventing obesity, Mr. Saeed Rahmati (2016) conducted a research titled comparing two types of very intense and continuous intermittent exercise programs on the expression of desnotrin, adiponectin and FNDC5 genes in two subcutaneous abdominal fat tissues and quadriceps muscles of rats. The fat man agreed. For this purpose, 60 male Wistar rats (8-10 weeks old with an average weight of 220 ± 5 grams) were given two groups of high-fat diet (59% fat) and standard diet (Chow) for 12 weeks. (N=10) were divided. In order to investigate the basic values of desnotrin, adiponectin and FNDC5 gene expression in abdominal subcutaneous fat tissue and quadriceps muscle tissue, 10 rats from the high-fat diet group (N=10) and 10 rats from the standard diet group (N=10) , were exterminated. Then the remaining 40 high-fat diet rats were randomly divided into 4 groups: high-fat control (n=10), standard control (n=10), continuous exercise (n=10) and very intense intermittent exercise (n=10). . Continuous (80% VO₂max) and very intense intermittent (95-100% VO₂max) exercise training was performed in compliance with the overload principle for 6 weeks and 6 sessions per week. 48 hours after the last training session, abdominal subcutaneous adipose tissue and quadriceps muscle were extracted and the gene expression levels of related variables were measured by RT-PCR method. The statistical method of the research was independent t and one-way ANOVA. Tukey's post hoc test was used to determine differences between groups at a significance level of $p < 0.05$. The findings showed that there was no significant difference between the high-fat diet group and the standard diet group in the baseline values of desnotrin gene expression (P=0.25) and adiponectin (P=0.23) in abdominal subcutaneous fat tissue. However, there was a significant difference between the two groups in the baseline values of desnotrin gene expression (P=0.04) and FNDC5 (P=0.05) in quadriceps muscle tissue. On the other hand, there was a significant difference between the groups of continuous training and very intense intermittent training in the expression of desnotrin gene (P=0.001) and adiponectin (P=0.040) in the



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subcutaneous fat tissue, but the gene expression of desnotrin ($P=0.275$) and FNDC5 ($P=0.981$) there was no significant difference in quadriceps muscle tissue. Compared to the standard control group, very intense continuous and intermittent training caused a significant increase in the expression of the desnotrin gene in subcutaneous adipose tissue ($P<0.001$). However, the level of adiponectin gene expression in the same tissue was higher in the standard control group compared to continuous training ($P=0.033$) and very intense intermittent training ($P=0.004$) and had a statistically significant difference. In addition, the level of expression of desnotrin gene ($P=0.651$) and FNDC5 ($P=0.183$) in the quadriceps muscle tissue was not significant between the continuous training group and the standard control, but there was a significant difference between the very intense intermittent training group and the standard control ($P=0.016$). Finally, the expression level of FNDC5 gene in quadriceps muscle tissue was not significant between the very intense interval training group and the standard control group ($P=0.475$). According to the findings of the research, it seems that exercise, regardless of its type, along with a standard diet, can be a suitable way to deal with obesity-related diseases by affecting the proteins that are effective in fat metabolism. Also, very intense interval training with less time compared to continuous training has a greater effect on weight loss (Rahmati, 2016).

Khanom Reihaneh Nejati (2017). With a research entitled the effect of combined exercise order on GLP-1 and insulin resistance, women with type 2 diabetes found that the levels of GLP-1, fat-free mass and peak oxygen consumption increased and insulin resistance and percentage Fat had a significant decrease in the training groups compared to the control group ($P\leq 0.05$), however, between the aerobic-resistance and resistance-aerobic training groups, only the strength in the aerobic-resistance group increased more ($P\leq 0.05$) and in Regarding other variables, there was no statistical difference ($P\geq 0.05$). It seems that combined exercises probably play a role in improving insulin resistance in type 2 diabetic women by increasing GLP-1 levels, however, regarding the patterns of combined exercises, the aerobic-resistance pattern is probably more effective; However, due to the limitation of information, the need to conduct more research is felt (Najati, 2017).

Mr. Mojtabi Ebrahimi (1401) in a research entitled the effect of 4 weeks of HIFT exercises on physical fitness and physical self-concept of healthy untrained men found that the levels of anaerobic power, maximum oxygen consumption increased in the experimental groups, but this increase in the training group HIFT was higher than aerobic exercise group and control group. The amount of muscle strength and endurance also improved significantly after the training period and had a significant increase in both groups. After the training period in both groups, the results of Barfix, Swedish swimming and sit-up tests increased significantly. The balance condition of the subjects also improved significantly after the training period, and the balance levels of both groups increased significantly, and this increase was better in the HIFT training group than the aerobic training group and the control group. The body composition of both HIFT training and aerobic training groups improved significantly after the exercises, and the body fat percentage of the subjects in both groups decreased significantly, but this reduction was greater in the HIFT training group than in the aerobic training group and the control group. Subjects of both groups had a lower level of perceived pressure than the applied pressure after completing the training period, but the decrease in perceived pressure was greater in the HIFT training group than in the aerobic training group and the control group. The levels of physical self-concept of the subjects of both groups also improved significantly. As a result, HIFT exercises reduce the percentage and mass of body fat by making changes in the body's metabolic system and increasing fat oxidation, and at the same time, by affecting the muscle tissue, it also increases the lean mass. With these changes, physical fitness indicators and body composition are also improved. After physical fitness and improvement of body composition, the person's attitude toward himself also changes, and his body self-image, which is his own view of his body, also improves (Ebrahimi, 1401).

In a research conducted by Zainab Rezaei (2017) under the title of the effect of eight weeks of aerobic training with different intensities on the levels of adipose tissue sprosine in obese male Wistar rats, it was found that aerobic exercise from low to high intensity reduces the levels of adipose tissue sprosine, which is associated with a decrease in mass Fat and as a result the treatment of obesity has a positive effect. And like most of the studies conducted in the field of the effect of aerobic exercise on the effective factors in reducing body fat mass, Sprosin is also not sensitive to high exercise intensity. (Rezaei, 2017)

Obesity and overweight are the origin of many diseases such as atherosclerosis, blood pressure, type 2 diabetes and digestive disorders, and a positive correlation between these diseases and obesity has been reported. One of the most obvious consequences of obesity is the increase of fatty acids, LDL and VLDL in the bloodstream, which Atherosclerosis is caused by the deposition of these substances and plaques in the walls of arteries. Obesity and its related diseases, such as atherosclerosis and diabetes, are a chronic inflammatory condition. In this condition, insulin resistance and the levels of inflammatory adipokines increase and the levels of anti-inflammatory adipokines decrease. Insulin resistance is defined by a decrease in the optimal function of muscle cells to absorb



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glucose in response to insulin secreted by pancreatic beta cells and is known as the most important factor in the development of diabetes. In many patients, to compensate for defects in muscle cell function and to maintain glucose levels, circulating insulin levels increase. Adipose tissue is active as a fat storage source and endocrine organ and releases many hormones called adipokines in connection with The role of adipokines has been shown that in addition to the release of fatty acids, which for a long time was the most important factor in the occurrence of insulin resistance associated with obesity, adipokines also play an essential role in regulating insulin sensitivity. Adiponectin is an anti-inflammatory cytokine that is mainly produced by adipose tissue. It is secreted and its concentration decreases in the presence of obesity and it has been shown that adiponectin reduces insulin resistance and blood glucose levels and improves the lipid profile. Also, its anti-atherogenic properties have been noted and changes in its serum levels have been identified in the occurrence of problems and complications Caused by obesity such as atherosclerosis and type 2 diabetes plays a major role. Unlike adiponectin, leptin increases in obesity and diabetes. Regarding leptin, some researchers have mentioned leptin as a warning mechanism in regulating body fat content. This hormone, in collaboration with insulin, affects the function of blood vessels and the sympathetic nervous system and is associated with the production of inflammatory, atherogenic cytokines, platelet aggregation, arterial thrombosis, high blood pressure, and insulin resistance. Communication with it has been done and it is released from the fatty tissue of the liver, it is neurogulin. So far, 4 types of neuregulin (type 1, 2, 3 and 4) have been discovered. Research conducted on neurogulin-4 has shown its inverse relationship with insulin resistance and blood glucose levels. In an animal study, it was shown that the absence of neurogulin-4 has a positive correlation with the mRNA expression of many activators of the lipogenesis pathway, as well as its negative correlation with BMI showed that the advancement of technology, lack of movement and increase in obesity, related diseases are increasing and will become more prevalent in the next few years. Sports activity is one of the low-cost methods of preventing and treating obesity and many related diseases. The researches conducted in connection with the effects of exercise on obesity and related indicators have mainly investigated aerobic exercises and have shown significant improvement results. Recent studies have shown that regular resistance training may be a suitable treatment method in this field, however, the information regarding the effect of resistance training on the levels of adiponectin, leptin, lipid profile and other related factors is limited and the results of research in this field are contradictory. They are contradictory, for example, some reported an increase in adiponectin concentration after moderate intensity resistance training, while another study showed that 12 weeks of resistance training does not cause a significant change in plasma adiponectin levels as an anti-inflammatory indicator in obese people. It was reported that 12 weeks of progressive resistance training causes significant reduction in lipid profile and improvement of body composition in type 2 diabetic patients. Other researchers found that resistance training compared to combined training cannot cause significant changes in lipid profile and risk of diseases. create cardiovascular Ahmadizad et al. (2007) reported that 12 weeks of resistance training (including 11 movement stations, in a circular manner and 3 days a week) did not cause a significant change in plasma adiponectin levels. In a study, after 6 weeks of resistance training, no significant change in leptin levels was observed. While in other studies, a significant decrease and increase in leptin and adiponectin levels were observed after 12 and 24 weeks of resistance training (Imani Sisan, 2017).

In a study of circuit resistance training with an intensity of 30 to 70% of 1RM for 8 weeks in people with type 2 diabetes, a significant reduction in insulin levels, glucose and insulin resistance was also reported. In another study, after 8 weeks of high-intensity circular resistance training, a significant decrease in insulin and glucose levels and a significant improvement in insulin sensitivity were seen. On the other hand, no significant change in insulin resistance has been shown after 12 weeks of resistance training. In examining the effect of 12 weeks of combined resistance aerobic training with different intensities (group one: resistance 50-60% 1RM, aerobic 70-80% HRmax, group two: resistance 60-70% 1RM, aerobic 60-70% HRmax, group three: Resistance 70-80% 1RM, Aerobic 50-60% HRmax) Triglyceride decreased significantly in all three training groups compared to the control group, but there was a significant difference in weight, body mass index, fat percentage, adiponectin, TC, HDL and LDL levels between Groups were not observed (Imani Sisan, 2018).

Adipose dysfunction is the underlying cause of liver diseases. Adipose tissue metabolism is under the indirect control of nuclear receptors that affect enzymes involved in visceral and hepatic fat metabolism. Studies show that exercise may change the expression of these receptors and proteins associated with fat droplets, considering the continuation of a high-fat diet during exercise, as well as the effect of exercise on TG levels and the lack of effect on PPAR- γ and HIG2 gene expression. It seems that both types of exercise had an effect on visceral fat content in rats with NAFLD, independent of the pathway of these two genes. Both types of exercise had a positive effect on visceral and liver fat TG content, while exercise interventions had no significant effect on PPAR- γ and



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HIG2 gene expression. Also, it seems that inter-tissue interactions, independent of weight loss, have caused a decrease in TG content of visceral fat as a result of intense interval training. (Heidari Shahreza, 2018).

Obesity is one of the most important causes of public health problems in developed countries. The prevalence of obesity has increased worldwide and related diseases have become a major health problem in most countries. The world's obese population is rapidly increasing compared to 40 years ago. It has increased in the past and now 10.8% of adult men (266 million) and 14.9% of adult women (375 million) are obese. Adipose tissue is not uniform. Specifically, excessive growth of intra-abdominal white adipose tissue or visceral and intraperitoneal fat (omentum and mesentery), retroperitoneal and around gonads is associated with inflammation and metabolic syndrome, and they believe that abdominal adipose tissue is a bad prognosis for cancer patients and Cardiovascular disease plays a role, overweight and obesity increase the risk of cancer and regular physical activity reduces the risk of cancer. It has been reported that 9 to 19 percent of cancers occur due to inactivity. Therefore, due to the fact that sports exercises have the ability to influence these factors, it can be said that sports exercises have a potential in preventing cancer. The decrease in the quantity and quality of physical activity due to the changes in today's lifestyle and the change in the direction of the diet towards the intake of energy-dense foods leads to an increase in body weight and obesity. In fact, one of the main reasons for obesity and overweight is the consumption of high-fat and high-calorie foods and inactivity. Therefore, investigating the hidden mechanisms behind this issue and the factors involved in this relationship can probably help us in recognizing and preventing obesity. There is a strong and incontrovertible epidemiological link between increased amounts of physical activity and a reduced risk of developing cancer, including breast, colon, endometrial, lung, etc. Available epidemiological data show that people who exercise about 3 to 4 hours per week, Those who engage in moderate or vigorous physical activity have, on average, a 30% lower risk of colon cancer, a 20-40% lower risk of breast cancer, and approximately a 20, 30, and 20% lower risk, respectively. Lung cancer, endometrial and ovarian cancers are compared to sedentary people. Studies show that sports activity can prevent the occurrence of cancer during different stages of the carcinogenesis process by modulating carcinogenesis. increase of various antioxidant enzymes; improvement of DNA modification systems; Injuring and modulating cell proliferation, apoptosis, differentiation, and reducing inflammation, however, the mechanisms that link the reduction of cancer risk to physical activity are not completely clear. Also, the mechanisms that link obesity to cancer are rarely understood. One of the mechanisms that can link obesity to cancer risk is angiogenesis, angiogenesis or neovascularization, the process of creating new blood vessels from the vascular system. There is. Angiogenesis is controlled by a precise balance between angiogenic and angiostatic factors (which regulates tissue expansion by maintaining a balance between pro-angiogenic and anti-angiogenic factors). Angiogenesis plays an important role in obesity; Adipose tissue is highly variable and requires the development of revascularization Angiogenesis and revascularization, both for tumor growth and tissue remodeling, are common during adipose tissue development to increase the number of adipocytes. (Habibi Maliki, 2016)

Obesity has been introduced as the biggest health threat in the 21st century by the World Health Organization and is considered one of the important factors in the occurrence of chronic diseases. Most of the excess calories are stored in the body as fat tissue, and this tissue affects the body's metabolism with the many biological molecules it secretes. Among these compounds, follistatin with the role it plays in regulating the synthesis of fat tissue can prevent obesity. In the research conducted during eight weeks, the aerobic training group was trained three days a week (45 minutes of intense training) 60 to 80% of reserve heart rate), the stair diet group, with a reduction in calorie intake from 20 to 40 percent (in a stair manner), the training and stair diet group also three days a week of aerobic exercise along with the stair diet and the low calorie diet group only with A 40% and uniform reduction in the calories of the program was implemented. In the groups of aerobic exercise, step diet and exercise + step diet, follistatin serum levels increased significantly ($p < 0.05$) and in the low-calorie group, follistatin serum levels It decreased significantly ($p < 0.05$). Aerobic exercise weight loss method along with step diet by increasing serum follistatin level and creating beneficial hormonal changes and stimulating the catabolic process of body fat mass, leads to achieving appropriate weight loss. And it probably becomes fat-free without analyzing the mass of the body. (Tajik, 2013)

Type 2 diabetes, which is the most common type of diabetes among patients, is characterized by peripheral insulin resistance in the peripheral organs, especially the sciatic muscle, or decreased insulin secretion from pancreatic beta cells. Research has shown that one of the mechanisms involved in insulin resistance and subsequent type 2 diabetes is the disruption of mitochondrial structure and function. Mitochondria are the main site of many essential reactions, including oxidative phosphorylation and ATP production. Changes in mitochondrial function widely affect cellular function and muscle metabolism. In tissues with high oxidative capacity such as skeletal muscle, PGC1 α is considered as the most important regulator of mitochondrial biogenesis and function. Rb is a member



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of the retinoblastoma gene family that encodes pRB, p107 and p130 pocket proteins. These proteins act as transcriptional repressors and repress transcription by binding to E2F-responsive promoter elements. P107 protein acts as a repressor in the transcriptional control of PGC1 α . Research has shown that due to the important role of P107 in the body's metabolism, the modulation of this protein is an important therapeutic target for various neuromuscular and metabolic disorders with an effect on the oxidative state of the muscle. Also, researches have shown that exercise training can increase the mitochondrial content of skeletal muscle in insulin resistant, type 2 diabetic and non-diabetic people. In the current research, 26 of the 36 Syrian mice will be transferred to their storage and training place after consuming a high-fat diet and injecting streptozocin and ensuring that they become diabetic by measuring the fasting blood sugar level. Before performing the training steps, the rats will be divided into 3 healthy control groups, diabetic control and diabetes training group. In order to get familiar with the training conditions and to gradually increase the performance, the rats in the training group will do a familiarization course with the treadmill, in such a way that the training time will gradually increase during the first week until one hour of training per day at speed. reach 5 meters per minute. During the next 8 weeks, the mice in the training group will train with the same intensity and duration, and the number of their sessions will be three days a week. Control groups will also be kept inside the cage until the end of the research. 48 hours after the last training session, mice will be killed after being bled and anesthetized, and their biceps muscle will be dissected by an expert. Immediately, the isolated tissue will be placed in liquid nitrogen and transferred to a -70 degree refrigerator until the time of measurements. In order to collect data, laboratory methods including homogenization, homogenization of proteins by Bradford method and finally ELISA will be used. To analyze the data, if the necessary conditions are met, the one-way analysis of variance test will be used, and if it is significant, Tukey's post hoc test will be used. (Madrasi, 2016)

Khanom Hajar Khanjani conducted a research titled the effect of six weeks of high-intensity interval training on blood sugar levels and follistatin protein in the left ventricular muscle of male rats with type 1 diabetes. In this study, 18 2-month-old male rats They were selected from the Sprague Dawley breed with an average weight of 300 \pm 20 grams. After becoming type 1 diabetic through streptozotocin solution, they were randomly divided into 3 groups: 1) Diabetic HIIT training, 2) Diabetic endurance training, and 3) Diabetic control (each group 6 heads). The exercise groups exercised 4 days a week according to HIIT and endurance training programs for 6 weeks; While the control group did not have any training program. One-way ANOVA and Tukey's post hoc test were used to analyze the data. There is a significant difference between the average blood sugar levels in the control, HIIT, and endurance training groups (P=0.0001). This was the difference between the blood sugar levels between the control group and HIIT training (P=0.0001), control and endurance training (P=0.0001). Also, there is a significant difference between the follistatin protein average in the control, HIIT, and endurance training groups (P=0.0001). This was the difference between follistatin protein among control groups and HIIT training (P=0.01), control and endurance training (P=0.0001), and HIIT training and endurance training groups (P=0.0001). The results of the present research showed that six weeks of HIIT and endurance training lead to a decrease in blood sugar levels in type 1 rats. Therefore, these two types of exercise can be a suitable treatment for diabetic subjects to regulate blood sugar, other than blood sugar control drugs. Also, six weeks of endurance training and HIIT training led to an increase in the intracellular content of follistatin protein, which can be useful for physiological hypertrophy and reducing cardiac pathological complications, including diabetic cardiomyopathy. (Khanjani, 2019)

Ms. Seondipour conducted a study titled the effect of taurine supplementation on the choice of substrate consumed during exercise in obese women. The purpose of this study was 15 obese women with an age range of 25-45 years and BMI above 31 participated in this study in three separate sessions. A familiarization session, a pre-test session to perform a standard incremental test and collect blood samples before and after the pre-test, and a third session 48 hours after the 21-day intake to perform an incremental test and collect blood samples like the second session. 15 minutes before and immediately after performing the standard incremental test, a blood sample of 10 ml was taken from the antecubital brachial vein. Taurine supplement was taken at the rate of 50 mg per kilogram of body weight per day in the form of oral capsules. Standard incremental test on Monarch ergometer wheel and respiratory parameters were measured breath by breath throughout the test. FATmax and cross over points were determined using RER values and heart rate, load and oxygen consumption equivalent to these points were extracted. FATmax points as the point where fat contributes the most to energy consumption and cross over as the point where the dominant fuel changes from fat to carbohydrate. In general, the current research showed that due to the significant changes in the amounts of estrogen and progesterone hormones, as well as the increase in the maximum oxygen consumption and the time to reach exhaustion, this supplement has no effect on the selection of the consumed substrate at sub-threshold intensities (Siondipour, 1401).



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Mr. Akbar Adeli (2018) conducted a study titled the simultaneous effect of caffeine and L-carnitine supplements on the choice of substrate during exercise and its possible effect on endurance performance. And its possible effect on endurance performance in the form of changes in physiological variables equivalent to the anaerobic threshold in elite karateka men was 12 karateka cross-sectionally in four separate training efforts with a time interval of 1 week, supplementing caffeine (5 mg/kg), carnitine (3 g), received caffeine-carnitine (5 mg/kg + 3 g) and placebo (lactose 250 mg), and 60 minutes after taking the supplement, they performed a standard incremental ergometric test until exhaustion. Breathing gases were collected during the test and blood samples were collected before taking the supplement and immediately after the test. Fatmax points as the point where fat contributes the most to the energy consumed during exercise and COP as the point where the dominant fuel changes from fat to carbohydrates, and then extracting the load and oxygen consumption equivalent to them and using variance analysis with size Repeated sampling and Ben Feroni's test were compared between attempts. Following the consumption of caffeine supplement and the combination of caffeine and L-carnitine, the amount of plasma FFA changes during exercise was significantly higher than the control effort (both $P < 0.05$). Work load and oxygen consumption equivalent to COP and Fatmax points were higher in both caffeine consumption and combined efforts compared to the control effort (all $P < 0.05$). These two variables had significantly higher values in the combination consumption attempt than the caffeine consumption attempt alone ($P < 0.05$). L-carnitine consumption did not make any difference in these studied variables compared to the control effort. Workload and oxygen consumption equivalent to anaerobic threshold had significant differences between control effort with caffeine ($P < 0.05$), control with combination ($P < 0.05$), combination with caffeine ($P < 0.05$). There was no significant difference between the variables of time to reach exhaustion and maximum oxygen consumption between four separate training efforts. In general, the results showed that the consumption of caffeine supplements before exercise is associated with a change in the consumed substrate towards fat, which improves the anaerobic threshold. Simultaneous use with L-carnitine can intensify this effect and ultimately lead to improved endurance performance.

Adipose tissue has countless secretions called adipokines and can affect insulin hormone signaling. It has been shown that exercise training and caloric restriction can cause changes in the concentration of these adipokines, therefore, Mr. Alireza Delpasand (2014). He conducted a research entitled the response of adipokines levels and selected signaling involved in glucose metabolism to caloric restriction and aerobic exercise. The study investigated the response of adipokines levels and selected signaling involved in glucose metabolism to caloric restriction and aerobic exercise. Materials and methods: 56 adult male rats with an average weight of 190 grams were randomly divided into two groups: healthy (8) and obese (48). The obese and healthy groups were fed with standard and high-fat pellets and after seventeen weeks, they were divided into six exercise groups, combined 1, combined 2, combined 3, and calorie restriction. Then 10% of the daily food weight was reduced and/or they ran on a treadmill for 48 to 55 minutes with an intensity of 70-75% of the maximum oxygen consumption. Sports training group (6 days of exercise, no calorie restriction), calorie restriction (6 days of calorie restriction, inactive), combined 1 (2 days of exercise, 4 days of calorie restriction), combined 2 (3 days of exercise, 3 days of calorie restriction) and combined 3 (4 days of exercise, 2 days of calorie restriction) per week to It was applied for two months. After eight weeks of exercise protocol and calorie restriction, subjects were sampled. One-way analysis of variance and Tukey's post hoc test was used at the level of $p \geq 0.05$. Results: After eight weeks, compared to the obese control group, the concentration of vaspin increased significantly in the compound 1 group. Also, adiponectin levels were significantly higher in compound 2 group compared to obese control. The concentration of TNF- α in the exercise training group was also higher than the obese control group. The concentration of resistin was not significantly different in any of the groups. Fasting serum glucose concentration in the group of exercise training, calorie restriction, combination 1, 2 and 3 after eight weeks was significantly lower than the obese control. Plasma insulin concentration was significant only in the calorie restriction group compared to the obese control group. In addition, the values of insulin resistance in combinations 2 and 3, caloric restriction and exercise training were significantly reduced compared to the obese control group, but insulin sensitivity and body temperature did not show significant changes in any of the groups. The body weight of the subjects in the group of exercise training, calorie restriction, combination 1, 2 and 3 was significantly lower than the obese control. Also, the expression of the glucose transporter 4 gene in adipose tissue was higher in the combination 2 and exercise training groups than in the obese control. Also, the expression of insulin receptor substrate 1 gene showed a significant increase in the caloric restriction group and composition 2 compared to the obese control group. Consequently, adipokines seem to respond differently to all different combinations of exercise and caloric restriction. Compound 2 (equal amounts of exercise and restriction) and the exercise training group improved adiponectin and TNF levels, respectively, and caused more induction of glucose transporter 4 gene expression in



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subcutaneous adipose tissue, but all compounds reduced glucose and insulin resistance, indicating the effect of 10 % is negative energy balance

The brain is a highly oxidative organ that constantly requires substrate compounds to provide energy. Under normal physiological conditions, glucose is the main source of mitochondrial energy oxidation, despite the special importance of glucose in brain metabolism, under certain conditions such as long-term starvation and exercise when glucose uptake is reduced, the energy needed by the brain is provided through alternative metabolic substrates such as ketone bodies and lactate. Despite the ability of the brain to harvest ketone bodies and use them as an energy source, the use of this energy source is limited to certain areas of the brain, therefore, lactate in the brain is effectively used as energy. Specifically, brain lactate increases during exercise. As lactate release increases, lactate oxidation in the brain may also increase. Thus, it appears that lactate is an important fuel source for the brain both under normal conditions and during exercise. Lactate serves as an important primary source for neurons. The oxidation cycle of lactate production requires the exchange of this substrate between astrocytes and neurons where lactate can be metabolized. The release of lactate from the glial cells and its reception by the surrounding neurons occurs through the facilitating system including monocarboxylate transporter proteins (MCTs). This transfer action is dependent on the concentration of lactate in the blood and is carried out when the concentration of lactate in the blood exceeds its concentration in the brain. be more Therefore, any factor that can increase lactate blood concentrations can change the brain perception of this substrate. Strenuous physical activity has long been associated with dramatic changes in blood lactate and changes in substrate consumption. Monocarboxylates are membrane transporters in the body for lactate and ketone bodies that belong to a separate family of transporters that contain eight or more isoforms. MCT1, MCT4, MCT2 isoforms have been described in the central nervous system (CNS) (Shokri, 2017).

It has been shown that AMPK is activated immediately after sports activity and even after activation, it has a lifespan of approximately 150 minutes, which can have a significant effect on the migration of GLUT4, CD36 and fat and carbohydrate metabolism during the day, especially in after the activity and intensity is the influencing factor to activate it, this high intensity can lead to an increase in ADP, AMP, decrease in ATP and energy charge, which can activate AMPK, and on the other hand, high intensity It also leads to the increase of ROS inside the cell, which can cause the breakdown of RYR channels and cause the fall of calcium, which can stimulate CAMK, and high intensity also activates MAPK, almost all kinases mentioned have a direct relationship with the intensity of the activity, in addition, it has been shown that high intensity can cause more phosphorylation of ACC and deactivate it for up to 150 minutes and increase fat burning. It has been said that acute activation of AMPK , increases glucose uptake in order to restore ATP reserves, while keeping AMPK active can increase lipid and glucose synthesis and help fatty acid oxidation as an energy source[26]. It can cause side effects such as activating protein breakdown devices and the autophagy pathway and subsequently lead to muscle atrophy. According to the history, it has been shown that high-intensity activity is one of the main factors in activating messages related to increasing muscle metabolism, such as Kinases such as AMPK, MAPK and CAMKK are immediately after the activity (Tataro, 1400).

Caffeine and carbohydrates, each alone improves endurance performance in athletes. Therefore, it seems that the combination of these two has double effects, so Mrs. Vida Hasanpour (2019) conducted a research on the effect of acute consumption of caffeine and carbohydrates on endurance and maximum muscle contraction and electromyographic changes of trained women. The purpose of this study is to investigate the effect of consumption Acute caffeine-carbohydrate effects on muscle endurance and maximal muscle contraction as well as electromyographic changes in trained women. The participants were 8 trained women (age: 26.75 ± 1.39 years, weight: 56.37 ± 6.99 kg, body mass index: 21.63 ± 2.44 kg/m²) who One blind strain method, randomized in 4 tests with an interval of 4 days (caffeine solution 6 mg per kg body weight), caffeine-carbohydrate (glucose solution 0.25 g per kg body weight and caffeine solution 6 mg per kg body weight) per kilogram of body weight), carbohydrates (0.25 g solution per kilogram of body weight) and placebo (flavored water). After following the diet for 72 hours and fasting for 10 hours, the subjects consumed the caffeine solution for one hour and the carbohydrate solution for half an hour before the test. To evaluate the electrical activity of the muscles using an electromyography device, first identify the upper arms and legs of the subjects and after preparing the skin according to the SENIAM guidelines, the exact location of the electrodes to obtain stronger signals and better quality on the pectoralis major and quadriceps muscles (right thigh, broad internal, external wide) was specified. After installing the electrodes, the subjects performed special warm-up activities for 15 minutes. Then they were asked to perform their sports tests (chest press and squat). The tests included the number of repetitions until failure with an intensity of 50% of one repetition maximum (1RM). The electrical activity of the muscles was recorded to measure the maximum voluntary muscle contraction (MVC) and fatigue (MF) while performing the chest press



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and squat movements, and the number of repetitions was also measured to measure muscle endurance. The obtained data were analyzed using the statistical method of analysis of variance with repeated measurements and Bonferroni's post hoc test according to its presuppositions at a significant level ($P < 0.05$). There was no significant difference between the groups in the endurance variables of upper body ($P = 0.06$) and lower body ($P = 0.07$). This means that the supplements had the same effect on the endurance of the upper and lower body muscles. No significant difference was observed in the MF variable between the groups in any of the pectoral muscles ($P = 0.51$), right thigh ($P = 0.32$), latissimus dorsi ($P = 0.36$) and latissimus dorsi ($P = 0.65$). No significant difference was observed in the MVC variable between the groups in any of the pectoral muscles ($P = 0.47$), right thigh ($P = 0.19$), latissimus dorsi ($P = 0.98$) and latissimus dorsi ($P = 0.27$). The results of this study showed that consumption of carbohydrates with caffeine has no significant difference in endurance and MVC and fatigue of upper and lower body muscles compared to carbohydrate, caffeine or placebo groups. According to the results of this research, it seems that trained people cannot improve their fatigue, muscle endurance and maximum voluntary contraction by consuming caffeine along with carbohydrates. Therefore, there is a need to conduct more studies in this field to reveal the role of these supplements on the mentioned variables (Hasanpour, 2019).

In general, washing the mouth with carbohydrates significantly increases the number of repetitions of upper body strength in athletes. The results of subgroup meta-analyses showed that resistance training less than 1 year, training frequency 2 times a week, training intensity less than and greater than 60% (except 6%), mouth rinsing with carbohydrate solution for 10 seconds, 6% concentration of GHO solution And the subgroup of women had a greater increase in the amount of upper body strength of strength training. According to the findings of this meta-analysis, it was shown that washing the mouth with carbohydrates does not cause a significant increase in the volume of strength training of upper body muscles in athletes. (Kirimi, 1401)

Eight weeks of resistance training and whey protein supplementation increased the gene expression of p70s6k and 4E-BP1 proteins in the FHL muscle of old male Wistar rats. Therefore, it seems that resistance training, whey protein consumption or both can be an effective way to increase FHL muscle protein synthesis in elderly rats. (Mohammed Hosseini, 2018)

In a research conducted by Seyed Muslim Asadpour (2019) under the title of the effect of a period of intense and resistance training on serum levels and muscle tissue content of myostatin and follistatin proteins in old rats, it was concluded that HIIT training compared to resistance training led to Changes have become more useful; Because HIIT training increased tissue and serum follistatin protein content more than resistance training and caused a smaller increase in myostatin protein content and serum compared to resistance training. This can indicate that HIIT exercises can be a better and newer treatment method for the elderly by following the principles of exercise such as intensity, duration, repetition, recovery time, etc. (Asadpur, 2019).

Whey protein is known as an excellent prevention against obesity. However, the effect of whey supplement and exercise on adipose tissue inflammation and the mechanisms of its anti-inflammatory effect have not been well clarified. Therefore, Mr. Farhad Golzar (2016) conducted a research entitled investigating the effect of endurance training and whey protein consumption on some inflammatory indicators in the adipose tissue of rats fed with high-fat food. There was inflammation in adipose tissue of rats fed with high-fat diet. Forty male Wistar rats were divided into two groups: 1- normal diet (8 heads), 2- high-fat diet (32 heads). After 9 weeks, the rats fed with high-fat diet were again divided into 4 separate groups (8 heads in each group): 1- control, 2- consumption of whey, 3- endurance training, 4- consumption of whey + endurance training. Endurance training was performed for 10 weeks at a speed of 21 m/min with a 15% incline on a treadmill. The mice in the whey protein receiving groups were given 2.05 g/kg of whey protein by oral feeding (gavage). Insulin resistance index, TNF- α and MCP-1 levels of epididymal fat tissue and serum, HIF-1 α and VEGF-A levels of epididymal fat tissue and subcutaneous tissue were measured. High-fat food, body weight in week 9, final weight, weight of different adipose tissue areas, glucose levels, insulin resistance index, TNF- α levels of epididymal adipose tissue and serum, MCP-1 levels of epididymal adipose tissue, HIF-1 α and VEGF- levels A significantly increased epididymal and subcutaneous fat tissue compared to standard food ($P < 0.05$). Endurance training and whey consumption decreased the weight of different areas of adipose tissue, TNF- α levels of epididymal adipose tissue, HIF-1 α and VEGF-A levels of epididymal and subcutaneous adipose tissue. However, no significant difference was observed in MCP-1 levels of epididymal fat tissue and serum, serum TNF- α levels between trained and non-trained groups, and between whey and non-supplement consuming groups. The general findings of the research showed that endurance training as well as whey consumption lead to reduction of obesity, reduction of inflammation and hypoxia in adipose tissue of rats fed with high-fat food. (Ahmadi Kani Golzar, 2016)



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exercise during inflammation cause to pathway signaling the Explain

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affected mainly and enomenonph common a is people sick and healthy in capacity Breathing be can capacity athletic and performance Decreased .inactivity or activity physical by prevent to exercises useful the Among .mass muscle and strength maintaining by compensated resistance .Today .exercises resistance ear mass muscle and strength increase .loss muscle restriction flow blood with exercises(BFR) improve that exercises common and important are and low with exercises Aerobic .(۲۰۱۵ .al et Park) performance sports resistance and aerobic lung reduce and system immune body's the of function het increase intensity moderate airway increase even may exercise aerobic Vigorous .sensitive are They in inflammation may vessels new and angiogenesis promote can Inflammation .(۲۰۰۷ Veira) inflammation to contribute also may disease inflammatory in Angiogenesis .inflammation tissue increase natural to responses acute and ,osteoporosis abnormal ,perfusion tissue impaired ,growth tissue Pearson and Walsh) inflammation reduce may inhibitors Angiogenesis .stimuli injurious or airway reduces exercise aerobic intensity-moderate that shown have udiesSt .(۲۰۰۱ .al et Heath) .mice treated-ovalbumin in remodeling airway induce not does but inflammation with program training endurance aerobic month-six a compared (۱۹۹۸) .al et Stablener .(۲۰۰۹ activities daily normal that concluded and ,recipients transplant lung on activity daily normal performance mental improved training endurance aerobic while ,function lung on effect no had that showed field this in tudys A .extent significant a to performance sports Improves .time and respiratory in strength and endurance of improvement to leads training endurance intense movement improves training resistance ,hand other the On .(۲۰۱۶ .al et Masentiro) muscles the by affected is which ,athletes duranceen of performance and strength muscle ,economy respiratory intensity-high ,hand other the On .(۲۰۱۴ .al et Beaty) training of load and speed Enrigat) people healthy in volume lung and diameter diaphragm the increase exercises muscle neutrophils chemical blood ,muscles respiratory the to damage of ecas in ,While .(۲۰۰۶ .al et of expression the increase effects these and ,decreaseGRK2 .(۲۰۱۷ ,al et Wei) lung the inG receptor kinase protein(GRK) is which ,threonine is and genes protein serine ۶ of family a is of subgroup main the as consideredG receptor coupled -protein(GPCR) part eukaryotic a is .



sensitize to enzymes important of G protein-coupled receptor-coupled signaling the as known is it , ۱۹۹۸ Lefkowitz and edman Fri , Pitcher . proteins transduction signal of family largest). GRKs are both of function the regulate to able G protein-coupled receptors and receptors factor growth and related pathways the of components signal nuclear or cytoskeletal , cytosol the control directly via environment tumor the in factors Inflammatory many currently , ion addit In . process this to GPCRs and GRK- specific of Alterations . signaling dependent GRK dosage stroma tumor the in potential as kinases these implicating thus , cells immune and angiogenesis tumor alter can cells endothelial and fibroblastic , cells immune cancer that state They . modulators evantrel tumor the of spread and development the promote (al et Nogus , ۲۰۱۷) .

GRKs receptor inducing thus , receptor saturated-agonist the to specifically bind the inhibits binding Arrestin . binding arrestin to leads turn in which , tion phosphoryla G protein and large The . (۱۹۹۸ Benovis and Krupnik) sensitization functional to leads which , receptor multifunctional G protein receptor arrestin called family IIsma a by regulated structurally is family , model classical the In . (۲۰۱۷ Sommer and Schirer) proteins GPCR regulation arrestins-beta of -beta that shows evidence Recent . (۲۰۰۱ Lefkowitz and Pierce) signaling receptor terminates the of ion desensitizat in involved are which , arrestins G protein receptor affect also may , as act can They . (۲۰۱۲ Spiropoulos and Ropoulos-Ergi , Kaparianos) mechanics transmission , cascades signaling cellular of establishment and activation the facilitate that proteins adapter especially MAPK that roles signaling and desensitization the Both . (۲۰۰۱ Lefkowitz and cePier) β - airway of regulation like is It . conditions pathological and physiological in play arrestins by caused desensitization of loss the While . inflammation airway and response β - can tinsarres of dysregulation to lead G protein signaling events pathological be can which , (۲۰۱۶ , Mohbi) .

of production the increases YiriROS One . apoptosis cell causes which , peroxidation lipid and by affected factors transcription important the of ROS is factor nuclear then f_kB signaling pathway , and the reduction of tac of activation the for explanation an be can aging in capacity antioxidant increases It . pathway this ROS as such pathways expression gene stimulates and muscles in NF_KB increase can that TAC on and , biogenesis mitochondrial of expression the stimulate and the of formation the to leads pathway signaling this , stage aging the in , hand other the as such factors inflammatory-pro of factor transcription $TNF\alpha$ - becomes It (۲۰۱۹ , Khavani Ali) protein of amount the through occurs exercise by caused hypertrophy muscle Skeletal increase that pathways signaling through regulated is which , synthesis mRNA translation many , in increase an shown have studies mtor signaling , hand other the on and , training nceresista after resistance therefore , activated is training resistance result a as and activated is kinase protein increases training mtor activity it and hypertrophy muscle of process the in role a plays which resistance and endurance performing of order the , programs rainingt parallel in that seems



be training of type each with associated responses molecular the on effect an has training (۲۰۱۵, Sangdwini) effective.

on effect the through pathways signaling or molecules key of change the that show facts The of amount the on effective be can invasion and migration cell ,factors neural and inflammatory cytokines cardiac ,thdea of occurrence the therefore and inflammation and damage oxidative tissue the of shape the in factors effective as known are ۳-gallin and ۱ - cardiotropin as such with along cardiotropin ,diseases heart for markers new and heart the of function the and (il-6) glycoprotein the through pathway signaling state ackj the activate that factors the among are a is ۳-galatin ,protection cardiac or inflammation ,hypertrophy induce can and .receptor ۱۳۰ the increase that pathways signaling several in roles various has that interest of protein activation the after and macrophages of increase the with matrix racellularext of accumulation invoice the From .network complex a of. B which ,cell the of surface the at -TGF activates to eadl ultimately that abnormalities to leads and fibrosis of pathway signaling the continues the affect not does exercise physical that shows Research .inflammation by caused failure heart of status health the to benefits inherent its applies and effect positive a has It .systems body's this ,Also .body the of metabolism loveral the and system immune the integrating by people .Fashi) diseases heart preventing on effects positive has exercise physical that shows research .(۱۴۰۰

until repetition maximum a of ٪۳۰ at training resistance performing that showed .al et Ward stimulating for repetition maximum a of ٪۹۰ at training resistance as veffecti as is exhaustion (۲۰۱۸ ,al et Rashidi) signaling anabolic and synthesis protein muscle.

titled research a in colleagues and Renani Baghersad Leila EnomNOX2 effect on the expression of interleukin 15 and PGC-1a exercise intermittent intense of period a after muscle skeletal rat in genes of production the between relationship close a is there that foundROS during myokines and and exerciserOS a as and factors transcription sensitive-redox of expression The induce can (۲۰۱۷ ,al et Renani Baghrasad) cytokines inflammatory of activation the result.

GhaiDanieli-Betto the that concluded They .(۲۰۰۵) .al etsk1 enzyme and s1p protein in involved are -long of result a As .absorption glucose in role major a play and pathway signaling insulin the of content the ,exercise acute terms1p muscle biceps the of part red the and muscle soleus the in .Mr also ,increasesBelachnio-Zabielska ,rat the of muscle soleus the in that showed (۲۰۰۸) .al et in change noS1p content .treadmill a on exercise double a of minute th۹۰ the until observed is

GhaiGoodman that mice transgenic examining by showed (۲۰۱۱).al etm toor (target mechanical is ctivitya whose ,pressure mechanical by caused hypertrophy of cause the is (rapamapicin of Direction .event this for necessary. Akt/m tor in hypertrophy causes that pathway main the is also ,exercisem torc2 can the inhibiting and phosphorylating by degradation protein prevent



factors transcriptionfox O (Sarchengali family). training resistance that shown have studies ,Also proteins of form phosphorus the in increase significant a to leads. M tor andp70S6k does it but , content protein total the in increase significant the in role a play notof m tor andp70s6k a As . result, the mtor signaling pathway muscle of synthesis the stimulating in role important an plays .(۲۰۱۸ ,al et Qolipour Majid) exercise after proteins

the of title the Under .(۲۰۱۹) colleagues and Gholampour Firoz .Mr by conducted research a In by caused injury kidney acute in preconditioning ischemic peripheral of role protective through ischemia reperfusion tlr4 andtnf_a signaling that found .rats in rIperc structural the reduces yinflammator suppressing by ischemia to due kidney the of destruction functional and of induction the and ,responsesRiperc reduces the mRNA factor inflammatory the of level tlr_4 and that showed research this of findings the also RIPERC of activity the inhibits TLR_4 kidney in (۲۰۱۹ ,al et Gholampour) .reduces ischemia by caused damage

InChavanella et al.'s study (2017), the effects of high-intensity (hllt) moderate and(mict) the on exercise of amount akt protein showed study This .investigated were rats diabetic of muscle skeletal the in of expression the in increase significant a akt protein were muscles soleus and biceps The in the by shown hllt exercise, and in contrast, this difference was not significant in the mict exercise group . (۲۰۱۸ ,al et Moghadam Shrafati).

with training resistance that showed (۲۰۰۷) .al et Fujia BFR increases the phosphorylation of AKT/MTOR/S6K .synthesis protein muscle increases and proteins pathway signaling (۲۰۱۸ ,Rahmaniya ,Mirzaei ,Halajibashi). two in (۲۰۱۲) .al et Gunderman and (۲۰۱۰) .al et Fry resistance of bout a after increased the ssyn protein muscle that showed studies separate with training BFR and the AKT/MTOR/S6K signaling pathway et Abe .Mr .process this in involved is increase %۱۰-۸ an and volume muscle thigh in increase %۷-۴ a showed time first the for (۲۰۰۶ .al with training walking of weeks ۳ with along strength isometric thigh in BFR the of result a as , with training aerobic intensity-low with along hypertrophy muscle of mechanism BFR not is . of effects anabolic the considering ,understood well GH and IGF-1 the through MTOR signaling pathway of one be can hormones these of concentration serum the in increase the that seems it , the activating for candidates main the MTOR signaling pathway mass muscle in increase the and be exercise aerobic with seen BFR

the between relationship the stigated in ve .(۲۰۱۱) .al et Zijonotch 1 and pathway signaling of expression the that observed and factor inflammatory the notch 1 signaling pathway increases tnfa and il6 the if and cytokines notch 1 signaling pathway in decrease a causes it blocked isheshi and Helji cytokines in decrease a subsequently Yun et al intensity-low of effect the studied (۲۰۱۵) . rats diabetic ۱ type of cord spinal the in mediators inflammatory of reduction the on training



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pain reduce. neuropathies and cord spinal the in changes cause might exercise that suggested and the In .pain and mediators inflammatory of amount the reduces which ,mice diabetic in the ,pathway signaling the of continuationjak/stat signaling pathway for pathway critical a is as such cytokines neuropathyil-6 . in allodynia mechanical investigated (۲۰۱۵) .al et Xi Klinik the activating by neuropathy pain with dogsnotch 1 receptor expression the that concluded and ofnotch 1 receptor ,diAskaraba) allodynia of continuation and induction the with associated is (۲۰۱۷) ,Rahmati ,Nasuri Mir

of expression the titled research a In .(۱۴۰۱) colleagues and Dastari EnomPPAPa andPGC1a proteins interval intensity-high following diabetes ۲ type from suffering rats of tissue heart the in of reduction the inhibit to used usually is training exercise that concluded they ,training of Upregulation through training exercise and ,biogenesis mitochondrialPGC-1 signaling pathways .heart the in dysfunction mitochondrial attenuatesHLLT an play probably can exercises the regulating in uler effectivePPGC1a/PPARa signaling pathway changes adverse the moderate and ,Dassari) biogenesis mitochondrial to related pathway signaling this in diabetes by caused (۱۴۰۱) ,Habibi ,Rami.

efficiency and power Movement .thstreng increasing of aim the with mass muscle Maximizing influenced is hypertrophy muscle ,levels sports different at athletes of goals main the of one is .(۲۰۱۳) Shukkeh to according ,pathways signaling cellular different and factors physiological by is signaling Cell .pathways and factors physiological by encedinflu is hypertrophy Muscle is hypertrophy muscle affecting factors the Among .differentTGF-B1 , TGF-B1 is secreted all from ,cells mononuclear blood including ,cells body of typesT lymphocytes mammophages and . The intensity an at exercise people that recommends Medicine Sports of College mericanA strength in increase an achieve to maximum repetition one their of ٪۶۵ than more to equivalent also ,ormanceperf improve to athletes by used often is training Resistance .mass muscle and in participating after increase Adolescents .levels power muscle and strength as known in increase the doubted studies Some .performance sports their improve and training resistance of thickness the in increase the ithw ,muscles elderly In .training resistance after mass muscle structure the in changes and cells satellite of reduction ,inflammation chronic ,lamina basal the hypertrophy of capacity the and cells satellite of notches the of activities the ,location their of Jaegerin into differentiate to tendency greater a have cells satellite active ,age old In .decrease nuclei cell of number the in decrease a to leads this and ,apoptosis towards or (cells fat) cells (۱۴۰۰) ,Afzali) tissue muscle the of hypertrophy for.

,laminationinf of increase the WithNF-KB andIKB-a signaling pathways -Pro .activated are as such enzymes inflammatoryIL-6, IL1B, TNF-a as such cytokines inflammatory-anti ,increase IL10, TGF-B when ,decrease alsoTNF-a protein increasing-glucose ,excessively increases



(GLUT4) of production the ,exercise with ,resistance insulin causes result a as and decreases It species oxygen reactive(ROS) the activates increase this and ,increasesNF-KB signaling pathway ,liver the in .enzymes tantioxidan of expression gene the increases ultimately and cell the in dismutase superoxide as such(SOD) peroxidase glutathione and(GPX) ۱۴۰۰ ,Dost Navi) .)

TLR andNOTCH1 diabetic in neuropathy peripheral of development the in pathways signaling that observed was it and ratsTLR4 andNOTCH1 dorsal the in expressed are pathways lingsigna pain and inflammation cause and glucose high of influence the under cord spinal the of branch the preventing in minocycline of effect the Investigated .(۲۰۱۷) .al et Yang ,Mihad .neuropathy the of controller a as neuropathy diabetic of developmentNOTCH1 signaling pathway and rats in the of expression the that showedNOTCH1 signaling pathway and rats diabetic in pain increases the block and controls minocycline of use theNOTCH1 signaling pathway and cord spinal the in intensity-low of effect the studied (۲۰۱۵) .al et Yun .rats diabetic in neuropathy pain reduce rats diabetic \ type of cord spinal the in mediators inflammatory of reduction the on exercise neuropathy pain reduce and rdco spinal the in changes cause may exercise that suggested and .al et Kobar pain and mediators inflammatory of amount the reducing thereby ,rats diabetic in of effect the investigated (۲۰۱۳)NOTCH1 signaling pathway on inflammatory responses in cardiovascular insufficiency. and ,decisions cellular in paths biggest the of one is path this that edstat they And the of expression the affect responses inflammatory how out pointed was itNOTCH1 signaling pathway the sa well as ,processes inflammatory of expression the in pathway this of role the and the and (functions their and life ,death ,Proliferation ,differentiation) function cell of regulation the of impactNOTCH1 et Bongio .diseases cardiovascular on ligands its and pathway signaling pathogenic the that found they And .hyneuropat in pathways signaling the addressed (۲۰۱۲) .al of effectNOTCH1 caused pain the and neuropathy diabetic in changes causes pathway signaling (۲۰۱۸ ,Abadi Askar) diseases kidney in managed be can neuropathy diabetic by.

common more become have sclerosis multiple and Alzheimer's as such diseases , Nowadays and memory improve to important is it ,hand other the On .sensitivities provoked have and factors the of one are Neurotrophins .adults young and teenagers ,children in learning on effect an has brain the from derived factor trophicNeuro .factors cognitive influencing ,factors cognitive improves activity its and neurons of health and survival ,growth ,neurogenesis and serum increase pathways signaling its and neurotrophin this affecting by activities sports BDNF of evelsl plasmaafter (۱۴۰۱ .Karubi) ,course training a or practice a is It .session one.

cells of number net the affects apoptosis and differentiation ,growth cell between balance The tumors of hgrowt the to lead can processes these of misregulation and ,body the in(Alkhouri et al., 2011). As NAFLD triglycerides of form the in stored are lipids most , progresses(TGs) and , acids fatty free as such metabolites lipid(FFAs) phospholipids and ,sphingolipids .cholesterol ,



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that suggests now data Considerable .accumulateTG accumulation to harmful not is se per lipotoxicity against mechanism protective a represent may ,fact in ,and hepatocytes(McClain et al., 2007; Yamaguchi et al., 2007). acids fatty saturated that shown have studies of results the .Also (SFAs) specific triggering by lipotoxicity of mediators key are ,cholesterol free as well as , death cell apoptotic to leading pathways signaling(Li et al., 2009; Nolan and Larter, 2009). According of rate high a have liver fatty alcoholic-non with people and diets fat-high ,studies the to .(۱۴۰۲ ,Abed) hepatocytes their in apoptosis

.atrophy pathological and physiological into divided be can atrophy muscle Skeletal who athletes as such ,exercise reduced of conditions in occurs mainly atrophy physiological astronauts and ,people sedentary ,active physically less are who athletes ,training stopped verna nerve ,fasting by caused is atrophy pathological while ,load gravity Decreased in are who chronic and itusmell diabetes ,cachexia as such ,diseases other many and stroke ,damage) disease pulmonary obstructiveCOPD). against variability high very a has muscle Skeletal (۳-۱) through adaptations metabolic and contractile to leads activity Muscle .pressures mechanical of expression the regulating as well as ,type fiber muscle and mass muscle skeletal in changes skeletal in myofibrils of area sectional-cross the that shown been has It (۵ ,۴) .proteins muscle muscle between relationship the ,pressure mechanical of removal the to due decreases muscle this in activated are that pathways the as well as ,phenomenon this to elatedr genes and atrophy -cellular the investigating to attention more pay should researchers .shown been have ,regard yingidentif in made been has progress Significant .atrophy muscle of mechanisms molecular fully not still are mechanisms these ,however ,atrophy muscle with associated mechanisms the to leads atrophy muscle in involved mechanisms the understanding ,Therefore (۶) .understood inactivity by Caused .ophyatr muscle with deal to methods therapeutic new of development the These .increases atrogen called genes of group a of expression the ,atrophy muscle In .help will the for mechanism a provide that system proteasome ubiquitin the of components are genes the by proteins of Degradation .proteins ucturalstr and regulatory of degradation selective like-Insulin (۸) .atrophy muscle in role important very a plays system proteasome-ubiquitin factor growth(IGF1) ,tissues many by locally produced is that factor growth circulating a is an of overexpression specific-Muscle (۹) .sclesmu skeletal includingIGF1 isoform local a with expression local that showed mice in effectof IGF1 .regeneration and growth muscle promotes the of role the supporting data Additional (۱۰)IGF1 pathway atrophy muscle of regulation the in from derived .Akt The . studiesAkt/mTOR muscle skeletal of regulator critical a is pathway vivo in atrophy muscle prevent can and hypertrophy. (11) Akt synthesis protein both controls throughmTOR through degradation protein andFoxO family transcription factors. resistance (۱۲) increase to way effective most the is breakdown and synthesis protein increasing by training



extent some to hypertrophy causes also training endurance Although mass; muscle. (13, 14) Goodman that showed ,mice ansgenictr examining by (۲۰۱۱) .al etmTOR (of Target Mechanical This for is activity whose ,stress mechanical by caused hypertrophy of cause the is (Rapamycin .essential is eventThe AKT/mTOR in hypertrophy causes that pathway main the is pathway ,hand thero the On .exercisemTORC2 can and phosphorylating by degradation protein prevent inhibitingFoxO transcription factors (Sarchengali family). In fact , FoxO the cause factors transcription two of expressionE3 of degradation dan ubiquitination in results which , ligases ubiquitin ,factors degradation protein deactivating while ,which . proteosome the by proteins sarcomeric of activation the to leads ultimatelymTORC1 cell of expression the increases molecule This . activating and phosphorylating by proteins regulatory cycle(Rps6kb1) P70S6K . (17) Since AKT called also is It pathways; different through death cell inhibit can and substrates multiple has ,information of lack the and information available the on Based (۱۸) .survival ellc of path the as or elderly the in it reducing or breakdown protein preventing of importance the considering and synthesis protein increasing of effect the as well as ,conditions pathological in patients study present the ,champions and athletes of performance ,health promoting in volume muscle the on exercises resistance with protocol training open an of effect the investigate to aims order in ,breakdown and synthesis protein of pathway the in involved genes some of changes process The .occur conditions pathological when program training effective more a achieve to . done be will athletes of performance the improving and aging of

development the in factor rtantimpo an is obesity visceral that evidence considerable is There associated is and function obesity-anti has substance food a as Caffeine .syndrome metabolic of role important an plays Exercise .biomarkers stress oxidative of levels the in reduction a with The .inflammation of pathways the regulating and atorsindic inflammatory modulating in fat-high a with combined when supplementation caffeine that showed research this of results index inflammatory the of expression the reduced significantly dietFetuin-A other to compared groups(P0.05).). been has ,supplementation caffeine with or alone either ,training Endurance groups other to compared indicators inflammatory all in effective significantly(P<0.05). cytokine inflammatory the of production the blocked CaffeineFetuin-A was atth liver the in but ,diet fat-high a by stimulatedTRL4 did not seem to be involved in the caffeine signaling pathway because caffeine could not inhibit inflammatory of expression the on diet fat-high a of effects the the inhibiting by cytokinesTLR-4 caffeine with exercises Aerobic destroy .hwaypat signaling (۱۴۰۰ ,Hosseini) .pathways inflammatory control to option suitable a be may supplement

this Although .year every people of millions kills and problem global a is fibrosis Myocardial heart many with associated also is it ,process aging normal the of part is condition heart by released peptides various and cytokines as such hormones several ,disease this In .diseases differentiation their and proliferation fibroblast of activation the to lead damage myocardial) matrix extracellular producing of capable more are which ,myofibroblasts toinECM) proteins . TheWnt//β-catenin development the in pathways signaling intracellular key the of one is pathway



and proliferation the ni role a plays pathway mentioned the Because .fibrosis cardiac of .synthesis collagen increasing and myofibroblasts cardiac into fibroblasts of differentiation sFRPs of antagonists of role the play mostly proteinsWnt molecules these to bind and molecules their throughCRD domains gpreventin thus ,Wnt and receptors their to binding from proteins these of concentration the in Changes .pathway signaling this activating sFRPs protein to binding by and ,properties agonistic their reveal moleculesFZ receptors the activate they , the of role the Considering .hwaypat signaling relevantWnt signaling pathway occurrence the in this of causes the of one is exercise Heavy that fact this considering and fibrosis cardiac of \ of changes gene the ,study present the in ,diseaseWnt \ ,sFRP ۳ and sFRP proteins rats ni mechanism cellular the possible as far as ,investigated were exercise heavy to subjected ۲۱ :methods and Materials .exercise heavy Determine by caused fibrosis ventricular in involved heavy regular month-۱ -۲ ,group control -۱ ,۷ of groups three into divided were rats Wistar male ,exercise of day last the after hours ۲۴ .group exercise heavy regular month-۶ -۳ ,group exercise ketamine of injection intraperitoneal by anesthetized were rats all(100 mg/kg) xylazine and(5 mg/kg) . saline normal sterile cold with washed and chest the from movedre was heart the Then liquid in frozen immediately and heart the of rest the from separated was ventricle right The .genes of expression the investigate to order In .nitrogen the RNA of the whole tissues of the right ventricle by extracted wasthe Trizol RNAextraction concentration the determining after ,Next . kit of RNAs , RNA into converted wascDNA expression gene and ,kit transcription reverse a using using analyzed wasreal time-PCR method. expression tiverela The :Resultsof Wnt 1 -one the in group control the to compared change significant a show not did group exercise heavy month -six regular and heavy the in increase significant a showed protein this of expression the But exercise heavy regular month-one the and group control het to compared group exercise month of expression relative the ,Also .groups sFRP 1 and sFRP 3 regular and heavy both in proteins showed also and group control the to compared months six and month one for groups exercise that showed research this of results The :conclusion and Discussion .change significant no the increasing by fibrosis myocardial of development the in involved is exercise heavy regular of expressionWnt 1 gene of pathway molecular the of independent and sFRP 1 and sFRP 3 proteins expression the because ,research this to according important very was exercise of duration The . ofWnt 1 gene exercise month-۱ the to compared treatment exercise month-۶ the in increased (۲۰۱۷ ,Tajveidi) .schange dependent-time the of sign a was which ,treatment

caused is which ,antioxidants and oxidants between imbalance an as defined is stress Oxidative causes and ,system antioxidant the in disruption a or oxidants of amount the in increase an by and ,proteins ,lipids as uchs molecules biological and system signaling cellular the to damage DNA proposed were exercise by stress oxidative of possibility the about findings first The . cellular of amount moderate a that found was it Although .(۱) ago years thirty than more



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regulate and pathways signaling cell control .power muscle produce to necessary is oxidants species oxygen reactive of absence the in that known is It .expression gene(ROS) ,muscles in if that seen been also has It .decreases production force muscleROS increases extent small a to and human Many .exercise during helpful very is which ,increases strength their ,muscles in ,cycling) intensities different with sports of types various that shown have studies animal In .(۲) muscles and blood in biomarkers stress oxidative increase (sports resistance and running and radicals free of source main the that determined been has it ,meantime theROS production is also blood or lungs ,heart the as such things other ,course Of .exercise during muscles skeletal during oxidants of production essiveexc and stress oxidative prevent To .this to contribute system antioxidant body's the ,compounds these by body the to damage prevent and exercise oxidative between balance dynamic the study to model good very a is Exercise .role vital a plays dismutase superoxide enzymes The .(۳) system defense idantantiox body's the and conditions (SOD) catalase ,(CAT) peroxidase glutathione and(GPX) are the against defense of line first the of productionROS of amount the that shown have studies of results the and ,exercise during shown have Studies .animals and humans in activity physical during increases enzymes these thatSOD activity ,iverl as such tissues in activity physical chronic and acute during increases especially ,enzymes antioxidant in increase An .(۳) cells blood red and heart ,muscles skeletal Mn-SOD (glutathione and (manganese containing dismutase superoxide mitochondrial ailments physical chronic in observed been also has peroxidase(4). Radak colleagues his and of concentration and activity the that study a in shown haveSOD isoenzymes (CuZn-SOD andMn-SOD) inSuleus andTibialis muscles of rats an after significantly increasesexhaustive running period on a treadmill, and the activity of Cu Zn-SOD the but ,days three to one after baseline the to returns concentration and activityof Mn-SOD Other .(۵) well as period exercise-post the in increases that shown have studiesMn-SOD has total increasing in effect greatest theSOD activity during exercise. of amount the that observed been has ItCAT activity also exercise acute an after increases inDVL muscles. enzymes antioxidant of concentration and activity the which by mechanism The known not is exercise during increase. Nuclear factor-erythroid-2-related factor 2 (Nrf2) essential an is conditions the In .genes enzyme antioxidant of expression coordinated the inducing for factor binds it where ,nucleus the to cells the of cytosol the from goes factor this ,stress oxidative of in regions ponsiveres-oxidation the toDNA enzymes antioxidant of expression the induces and as suchCAT ,SOD and ,GPX of level the ,Recently .(۶)Nrf2 measured been also has blood the in lammatoryinf the of regulation the in involved be can factor this that reported been has it and of disruption that reported been has it ,hand other the On .(۷) systems immune andNrf2 can for role protective a plays factor this and stress oxidative to susceptible myocardium the make that show reports ,restinglyinte More .(۸) stress oxidative from especially ,heart the with that seen been also has It .(۸) heart the in signaling this induce exercises inflammatory of amount the ,age increasingNrf2 induction one the on ,general In .(۹) disturbed is exercise by



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increase, parallel in, and oxidants increase activity physical nda exercise that show studies, hand that reported is it, hand other the on, enzymes antioxidant of activity and amount the Nrf2 can be the that considering and, enzymes antioxidant of amount the increases that factor a is it, known yet not is exercise during increase enzymes antioxidant which by smmechani that possible Nrf2 level plasma the measure To ۱. Objectives involved factors the of one be can of Nrf2 antioxidant of tyactivi the Measuring ۲. exercise before athletes-non and athletes in enzymes Mn-SOD, Cu, Zn-SOD, CAT -non and athletes in peroxidase glutathione plasma and level plasma of Measurement ۳. exercise before athletes of Nrf2 athletes-non and athletes in ۴. exercise chronic and acute after, enzymes antioxidant of vityacti the Measuring Mn-SOD, Cu, Zn-SOD, CAT and acute after athletes-non and athletes in peroxidase glutathione plasma and plasma of Comparison ۵. exercise chronic Nrf2 antioxidant of activity increased and increase enzymes Mn-SOD, Cu, Zn-SOD, CAT chronic and acute after peroxidase glutathione plasma and between relationship the Studying ۶. athletes-non and athletes between training exercise of concentration plasma Nrf2 enzymes antioxidant of activity and Mn-SOD, Cu, Zn-SOD, CAT Ashuri) training exercise chronic and acute after and before peroxidase lutathione g plasma and (۲۰۱۸.

this, duration and intensity, repetition sufficient in performed is activity sports resistance When et Silva) power or, strength, izes muscle increases and activity nerve improves exercise of type superior a been has It stronger; and higher, faster (۲۰۱۳, al et Alinejad Mr and ۲۰۱۴, al are sports championship and health, Today, success achieve to desire human the for description science sports and trainers, athletes for attention of iescategor important most the of one movement and physical of extent the Considering (۲۰۰۸, Coyle and Joyner) researchers important an as considered is strength muscle of development The components; preparation force maximum The; power the, performance physical person's a of tdevelopment the in step with performed is activity sports resistance When, defined is resistance the against applied ni increase and activity nerve better to leads it, duration and intensity, repetition sufficient, al et Gholamali; ۲۰۱۱, al et Fallah; ۲۰۱۱, al et Alinejad Agha) power or strength, size muscle regulate that messengers of activation the to leads cells muscle in exercise Resistance (۲۰۱۳ Sandari) behavior cell satellite and, transcription, breakdown protein, synthesis protein muscle, overload in changes requires training resistance for Planning (۲۰۱۲, Wackerhening; ۲۰۰۸, al et addition In, used action muscle and, exercise of type, goals training, progression, turns, volume changes hormonal, nutrition, age, gender, genetics, motivation, variables training to of quality the affects it, differences individual and (factor growth like-insulin, testosterone) signaling hypertrophy the Knowing therefore; (۲۰۱۴, Walkerhening) programs training; ۲۰۱۶, al et Meberg) importance great of is program training resistance the by fectedaf pathways



of pathway signaling the of regulation The (al et Wackerhening ;۲۰۰۸ ,al et Sandri ۲۰۱۲). by influenced is atrophy and hypertrophy muscle in metabolism protein mTOR the ,MuRF family (myoD) (۲۰۰۸ ,al et Sandari ;۲۰۱۶ ,al et Ram ;۲۰۱۶ ,al et Rashidelmir) cells satellite ., mTOR is ,insulin ,testosterone of factors growth the through pathway signaling hypertrophy common a and IGF-1 an play to seem that pathways signaling other two .Recently (۲۰۱۴ ,Walkerhening) the attracted have tissue muscle skeletal and composition body regulating in role important the of member a is Myostatin .follistatin and myostatin include which ,researchers of attention large β -TGF family In .growth muscle skeletal of inhibitor paracrine and autocrine an is which , the to binding directly by growth muscle skeletal of regulator a is myostatin ,words other pathway downstream the tingactiva ultimately and receptor kinase threonine/serine of SMAD . associated is which ,glucocorticoids by increased be to reported been has expression Myostatin muscle skeletal of development the in role important an plays also and atrophy muscle with ,myostatin of changes endogenous the of result a as ,hand other the On .disorders metabolic and ,al et Klapak-Rudin ;۲۰۱۱ ,al et Huang) disease the of treatment the in role a play also can it a nda protein glycosylated plasma a is follistatin ,hand other the On (۲۰۰۸ ,al et Sandari ;۲۰۰۹ large the of member β -TGF family. the of proteins several on effect opposite an has Follistatin- β -TGF family growth muscle skeletal of inhibitor powerful most the is which ,myostatin including , (۲۰۱۷ ,Mohtashmi)

many to leads inactivity with along foods fat-high of ormf the in calories many too Consuming problems health important most the of one as ,Diabetes .diabetes including disorders metabolic is prevalence its and ,mortality and morbidity increased with associated is ,today world the in in diabetes borderline as considered is prediabetes ,hand other the On .day by day ingincreas the for considered threshold the reach not does but ,high abnormally is glucose blood the which of cause the is nismhyperinsuli or insulin circulating in increase the ,diabetes of diagnosis the to due worse becomes resistance insulin of development The with and ,prediabetes above) insulin to response in glucose peripheral harvesting in muscle skeletal of role important Insulin To resistance Creation At Main rFacto skeletal muscle That be to imagine you (۲۰۱۸) . diabetes ۲ type for factor risk important most the clearly is Prediabetes be Man At(T2DM) in the future. burden financial the as well as ,care its of cost high the and disease this of chronicity The disease this prevent to need the reflect ,regard this in plans and policies future for drequire is that a indicates it ,resistance insulin With samples human or animal on studies Many .more even the in disorder signaling IRS-PI3K-Akt pathway triacylglycerols of Accumulation .muscles the in which ,resistance insulin increased with associated is overweight by caused muscle skeletal in of inhibition :including ,steps signaling insulin disrupting in factor a be mayPI3K activation phosphorylation serine increased throughof IRS-1 Stimulated .transport glucose reduces which , skeletal Because .synthesis glycogen as well as oxidation and phosphorylation ,insulin by



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direct for particle Body mass From $\% 40$ to 50 and tissue sensitive-insulin largest the is muscle
 To object direct for particle Glucose Total $\% 75 - \% 95$ and be to yma Contains object
 as To insulin resistance At it Role slow may Use object direct for particle Insulin intermediary
 change That Is it From indicating done do Studies . Is done taken Opinion At Comprehensive
 ,Meanwhile .diabetes-pre delaying and preventing in benefits most the has It can may Life style
 .role effective an play can exercise regular with along weight body ideal an maintaining
 voluntary facilitate to ability its by defined traditionally is muscle skeletal ,Furthermore
 .activities physical other and exercise with associated is and contraction through movement
 of occurrence the cause that factors risk of reduction the that surprising not is it ,Therefore
 many ,Also .activity physical of level the in increase the to related is syndrome metabolic
 whole the and muscles in sensitivity insulin improves activity physical that shown have studies
 or ,channels ion Mechanosensory .syndrome metabolic on effects adverse has also and ,body
 identified have studies Recent .signaling intracellular regulate aym ,complexes channel ion
 LRR8A5 as known also ,SWELL1 anion regulated-volume the of component essential an ,
 channel(VRAC)6, which .muscle skeletal in pathways signaling dependent-insulin several affects
 that suggest findings the ,together TakenLRR8A to related be mayIGF1-PI3K-AKT- insulin
 and ,obesity ,function muscle regulate to predicted is muscle skeletal in which ,signaling
 metabolism glucose systemic. 3) processes larcellu many of center control the in is protein A
 implicates evidence Strong .metabolism glycogen includingGSK-3 the in dysregulation
 cells unstimulated in active highly is which ,diabetes especially ,diseases many of pathogenesis
 for pathway documented most The .stimuli cellular various by inactivated rapidly is andGSK-3
 kinase protein by mediated is insulin to response in inactivationB (Akt) , which of upstream is
 GSK-3 . the on dependent is synthesis glycogen SincePI3K/AKT pathway other andGSK-3 inhibitors
 that likely is it ,synthesis glycogen activate to shown been haveGSK-3 inhibition responsible is
 glycogen the by catalyzed is glycogen Muscle .pathway synthesis glycogen the initiating for
 enzyme synthasegys 1 . are humans in glycogenolysis and glycogen that show findings The
 and ,contraction muscle and exercise during energy providing for important very allygener
 diet by followed training exercise by done be should levels glycogen of manipulation
 Syed) metabolism glucose correct and .action insulin improve can itself which ,modification
 (۱۴۰۰ Rahimi Mohsin Gholam

narcotic of class the from effect central a with drug analgesic an is hydrochloride Ramadol
 the to damage of causes the especially ,infertility Male .opioids synthetic or painkillers
 various from factors damaging and influencing the of oninvestigati the and ,tissue testicular
 threatens which ,tissues testicular the in changes serious causes Tramadol .important are aspects
 .drug the stopping after even continues tramadol of effect the and ,capacity reproductive the
 at spermatogenesis of process the in role a plays actions reproductive male of lationregu The



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that tissue testicular the of signaling and pathways metabolic the in defects and ,stages different in metabolism and ttransport Glucose .important very are metabolism sperm in changes cause in transporters monocarboxylate as well as ,sperm ,tissue testicular of mitochondria the and quality sperm improve to helps Exercising .metabolism in important very are mitochondria on effect an has training of volume and tyintensi The .stress and inflammation testicular reduce of level the in changes the and ,transporters membrane of expression the and metabolism the of expressionMCTs and GLUTs with exercises of result a as different be can tissue testicular in .drugs of effects adverse the improving in factor a be can highw ,intensities different (۲۰۱۸ ,Soudmand) .reproduction

such diseases many with associated is and death of causes important most the of one is Obesity according which ,cancer and esdiabet ,pressure blood irregular ,complications cardiovascular as of surface The in obesity of percentage growing a ,predictions future and decades recent the to of prevention and changes lifestyle to due pandemic a become has Obesity .shows world the and obesity cause calories high with energy food of eintak and Inactivity .imbalances energy regular on based interventions Lifestyle .resistance insulin to related diseases metabolic to relation In .diseases related-obesity of risk the reduce diets control weight and exercise of quality people's improves activity physical regular that seems it ,changes elifestyl people's causes storage tissue fat Increasing .health to related benefits physiological the to addition in life energy only the sideredcon not is tissue adipose ,decade last the in But .obesity and overweight of secretion and fat ,glucose of metabolism the in role important an plays and factor storage ,body the in fat of distribution the ,evidence research available the on Based .hormones various .diseases metabolic predict to used be can ,body the of part middle the in especially reduces diet daily the in fat of consumption increased of result a as fat of Accumulation metabolism fat of regulation the in pathways signaling different the Among .function metabolic kinase roteinp ,sensitivity insulin andB (Akt) insulin affecting signal prominent most the is ,genetics even and diet fat-high a by caused Obesity .energy and ,metabolism fat ,sensitivity compromises ,nutrients in changes to due probablyAKT regulation . Akt is a serine/threonine protein kinase, kinase protein as known alsoB (PKB) . There are three different genes that protein encode kinaseB called are genes three These . isoformsPKBa/Akt1 ,PKBb/Akt2 and ,PKBc/Akt3 , which have a similar structure . Akt2 pathway signaling insulin the in molecule ingsignal important an is. Akt2 by insulin of action the regulating by metabolism glucose in role important an plays transporter glucose the translocating(GLUT4) to the plasma membrane . Akt2 is essential the for c) protein binding-element regulatory sterol of activation(SREBP1c) lipid and ,lipogenesis , physiology the in involved are parameters Various .conditions metabolic under accumulation obesity New .obesity of treatment the be can parameters the of each overcoming ,obesity of of consumption ,(exercise and diet) lifestyle through control including strategies anagementm



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for recommended mainly is Exercise .option suitable a be can exercise and plants medicinal increases usually eexercis regular that shows evidence Research .maintenance or loss weight that showed studies s'al et Rus of results The .oxidation fat of rate the and expenditure energy of set a ,activity sports of type any With ,programs loss weight of part a is exercise regular and regular that reported been also has It .tivatedac are genes specific and pathways cellular to according and ,diseases many preventing in role significant a played has exercise correct Most .obesity of treatment the in factor important an is exercise that stated been has it ,studies will .control glucose on effects positive their to due recommended are activities ssport the of signaling insulin on effect significant a has and action insulin improves training Exercise be training interval intensity-high ,years recent In .pathways(HIIT) an as ecognizedr been has .training continuous as results same the have can that intervention sports effectiveHIIT of adaptations metabolic in exercises other to effects similar shown have exercises training interval intensity-High .composition body and muscle skeletal ,fitness cardiovascular ,mice obese In .contraction maximal-near with periods intermittent ,short in performed is improve to shown was runningAkt function a that show studies Recent .signaling insulin and intense of session training a to equivalent is which ,contraction high with session training a and minute per meters ۲۲ of speed a at running of minutes ۶۰ or minutes ۱۲۰ for swimming in increase sudden a to leads ,/۱۰ of slopeAkt activity researches the of most almost ,now Until . resistance ,Therefore .exercises endurance and aerobic include sports of field eth in out carried to potential the has training Resistance .clear yet not is factors these of changes the on training symptoms ointj reduce and ,density mineral bone ,mass free-fat ,strength muscle increase .(۱۴۰۲ ,Makumi)

from extend that sacs broad and tubules convoluted of network a is reticulum endoplasmic The the of functions important the of One .cytosol the throughout membrane nuclear the of maturation structural and folding ,issynthes the coordinate to is reticulum endoplasmic some under reticulum endoplasmic the in folding protein of capacity high The .proteins cellular and infection viral ,environment toxic ,deprivation glucose including conditions physiological in changes [Ca₂](#) levels . are deprivation food and stress oxidative ,inflammation ,hypoxia , signaling a initiate cells ,function and stress reticulum endoplasmic reduce To .disturbed sponsere protein unfolded the as known cascade(UPR) . The UPR three by triggered is sensors transmembrane: PERK ,IRE1α and ,ATF6 (Wu & Kaufman, 2006). The responses of the UPR to attention paying without general in investigated been mostly have pathways signaling suggested been has It .information general with faced are we field irth in and ,pathways specific the thatPERK-eIF2α arm inthe UPR homeostasis muscle skeletal of regulator negative a be may muscle skeletal during increases synthesis protein of amount the Since .exercise following and stress reticulum endoplasmic of activation the that predicted be can it ,ypertrophyhUPR phosphorylation the ,However .capacity folding protein improve to mechanism good a be can



of PERK and eIF2 α the regulates ivelynegat stress reticulum Endoplasmic .studied been not has
 AKT/mTOR pathway autophagy induces stress reticulum endoplasmic that reported been has It .
 suppression throughof mTOR (Qin, Wang, Tao, & Wang, 2010). creatine ,context this In
 affect possibly and hypertrophy eincreas can training resistance with along supplementation
 especially ,research genetic ,Currently .training resistance to due proteins of capacity folding the
 the of role the onPERK/eIF2 α andIRE1 α arm ofthe UPR muscle skeletal induced-exercise in
 on more focus should researches that suggested is it ,case this nI .limited very is ,adaptation
 of role the of mechanism molecular the investigatingUPR pathways endoplasmic by caused
 the to according ,Therefore .training exercise following responses adaptive on stress reticulum
 the of anceimportPERK signaling pathway signaling this of role the and responses protein in
 of effects the and ,metabolism and mass muscle maintaining ,responses antioxidant in pathway
 this of posepur the ,responses these on exercise resistance and supplementation creatine
 affects Creatine supplementation with training of weeks \wedge of effect the investigate to is research
 the and ,area sectional-cross muscle ,indices hypertrophy muscle ,proteins pathway signaling
 in changes between relationshipPERK signaling pathway proteins muscle in changes and
 .(۲۰۱۷ ,Nouri) rats Wistar male in hypertrophy

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13. weeks of ^The effect of (۲۰۱۸) Soodmand, Popek LICT , MICT and HICT training on transporters in rats addicted to tramadol. the expression of Sertoli cell membrane Urmia
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16. sion of liver The effect of hydrolyzed protein on the expres (۱۴۰۲) Ayed, Iqbal Yusuf alcoholic fatty liver. Arum-apoptosis genes in rats with non
17. weeks of resistance training on oxidative ۱۲ The effect of (۲۰۱۹) Alikhani, Shahla indices and antioxidant capacity in young and old women. Kurdistan_
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22. The effect of an intermittent and resistance training course (۲۰۱۶) Mohebi, Mohaddeh arrestin and-with blood flow restriction on the level of betaGRK in the right femoral muscle and lungs of Wistar male rats. Mazandaran



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23. The effect of eight weeks of resistance training on (۲۰۱۷)Mohtashmi, Mohensham the body composition and serum levels of follistatin and myostatin in trained athletes. Golbahar
24. Comparison of the effect of intense and resistance training (۱۴۰۲)Moghumi, Hamid on brain tissueAkt2 in obese Wistar rats, Khavaran
25. Investigating the effect of aerobic exercise and crocin (۱۴۰۰)Navi Dost, Fahima inflammatory capacity of the liver tissue of -consumption on the antioxidant and anti fat food. Mazandaran-ovariectomized rats fed with high
26. weeks of resistance training with creatine ^The effect of (۲۰۱۷)ri, Hirosh Nou supplementation on unfolded protein response(UPR) and skeletal muscle hypertrophy in male Wistar rats. Kurdistan



activity sports and compounds nitrogen protein-Non

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compounds nitrogen protein-Non(NPN) waste metabolic ,mediators metabolic as act mainly of regulation the in molecules messenger or ,body the from removed be must that products can atom nitrogen a contains that compound protein-non of type Any .responses body adaptive as considered beNPN . NPNs important and famous most the ,this Despiteare , acids nucleic amino ,ammonia ,glutathione ,acid uric ,creatinine ,creatine ,urea , nucleosides ,nucleotides Nitrogen Reactive species and oxide nitric ,citrulline ,ornithine , acids(RNS) the in Changes . of types all of values the affect can body the of environment internalNPNs ,example For . ,bleedings internal various ,failure heart congestive ,failure kidney as such conditions disease the affect can mass muscle in changes even and diseases liver ,tract urinary the of obstruction NPN values .(body the in catabolism protein of product final the) urea as such urine and blood of by caused chemical excretion) creatinine and (metabolism purine of product end) acid uric effect an have (metabolism. activity physical and patterns nutritional that shows research , Also of types all on effect an haveNPNs sign Studies Example To .level systemic and cellular the at At Ammonia Found Increase Levels With sports Activity From caused tiredness are Data _ . Is Relationship

to due ,intensity moderate of activities sports term-long during that stated been has it ,fact In ,cells muscle of surface the at resources glycogen of reduction theATP renewal carried be notcan inosine of amount the in increase an in results which ,speed appropriate the at out monophosphate(IMP) study ۲۰۱۸ this Despite .cellular becomes It .surface the at ammonia and intensity-moderate niformu during consumption carbohydrate , colleagues his and Rousip by) exercise during production urea and ammonia on effect significant a have not does exercise .(۱

another is creatinine ,urea and ammonia to addition InNPN evidence the ,However .interest of general the in those from different are athletes in esvalu creatinine the although that shows that seems it ,addition In .levels reference mentioned the exceed not do they , population body of function a as fields sports different in athletes between different are values creatinine . mass muscle and characteristics measurement

activity sports in urea and ammonia of role The



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formula chemical the with compound organic an is $(CO(NH_2)_2)$. amine two has molecule This
% ۹۹ than More .group functional a is which ,group carbonyl a to attached are which ,residues
the In .protein dietary is source main its ,Nutritionally .liver the in occurs synthesis urea of
absorbed is it of % ۹۰ than more and ,acids amino and peptides into converted is protein ,intestine
Excess .transferred and deaminated are acids amino , cells liver In .liver the to transported and
small the by absorbed protein Volatile .urea with combines and cycle urea the enters nitrogen
large the in mainly ,flora intestinal by ammonia to converted is ,urea recycled plus ,ntestinei
.cycle urea the enter to liver the to circulation blood the through circulates Ammonia .intestine
-long moderate or intense ngduri increase concentrations ammonia that show studies ,However
reduction the in rooted probably is exercise during ammonia of formation The .exercise term
of rate the limits which ,glycogen especially ,reserves fuel cell of ATP formation thus and
ammonia of sources main The . ammonia and monophosphate inosine of amount the increases
deaminase monophosphate adenosine the are exercise during production (AMP-D) reaction. and
acid amino chain-branched (BCAA) catabolism endurance term-long During .mentioned are
of reserves glycogen of reduction the that seems it ,ensityint moderate with activities sports
of accumulation the causes muscles working ADP to cell the of inability the ,result a as ,and
regenerate ATP maintain cannot glycogen of sources reduced These . speed suitable a at ATP
renewal accumulate ammonia and monophosphate inosine ,result a as nda .

study one as unclear currently is metabolism ammonia on content glycogen low of effect The
study another while ,conditions these under production ammonia muscle increased reported
ohydratecarb of effect the studied cyclists trained in studies Some .change no found
۲ during production ammonia on glycogen muscle of manipulation with along consumption
exercise of minutes ۲۰ first the in that shown was it ,this Despite .exercise cycling of hours
in increased ncentrationco ammonia plasma ,same the was exercise the of intensity the when
was concentration ammonia plasma Higher . depleted were reserves carbohydrate whose people
,addition In .catabolism acid amino to due production ammonia muscle increased to attributed
is activities sports intensity-moderate term-long in fatigue that stated have studies these
in increase an with associated is turn in which ,stores glycogen in decrease a with associated
usually is ammonia produced the ,activity sports intense term-short During . levels ammonia
intense during produced ammonia the of most that seems It .fatigue dincrease with associated
the in rooted is exercise AMP of place the from supplied is and reaction deaminase AMP
deamination. of use the when that stated been has it ,fact In ATP coupled not is exercise during
in decrease a ,resynthesis its hwit ATP reserves deamination irreversible the causes which ,occurs
of AMP associated is event This . monophosphate inosine and ammonia of formation the and
a as used be nca ammonia ,Therefore .concentration ammonia plasma in increase an with
of loss the for activities sports in indicator monitoring ATP increased ,Also .stress metabolic and



٢٩ بهمن ماه ١٤٠٢

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muscle affects that stress metabolic of indicator an as monitored be can levels ammonia plasma effect the studied (۲۰۱۸) colleagues his and usipRo .fatigue with associated is and contraction consuming after urea and ammonia of concentrations plasma the on activity sports of of source dominant the that showed study this of findings The . drinks electrolyte carbohydrate muscle of loss the to due primarily is exercise during production ammoniaAMP the by . reaction deaminase adenylate

with activity sports term-long during increases ammonia plasma that found was it ,study this In Damine Activity ,Blood plasma ammonia of sources the of one ,intensity maximal-subAMP is that suggested ۱۹۸۹ ,Sahlin and Broberg ,findings these with Consistent .cells muscle in made (۱۹۹۰) al et Bruns ,Also .muscles in glycogen low to due be may fragments nucleotide adenine sports term-long during fatigue muscle with emuscl in ammonia of amounts high linked have glycogen muscle decreased to secondary were levels ammonia high the Although activity low the whether or fatigue to due was ammonia increased the whether unclear is it ,levels plasma in increase the ,study (۲۰۱۸) s'al et Bossip In atiguf accelerated intake carbohydrate plasma the although ,consumed drinks of types three the in same the almost was levels ammonia .consumed were drinks carbohydrate % ۱۲ when lower slightly was ammonia of concentration by caused ammonia plasma in increase the that showed results s'al te BossipAMP deamination of concentration the ,condition normal in ,fact In .supply oxygen on dependent more be may sports during times ۲۰ to up increase can which ,liter per micromolars ۶۵-۴۷ is ammonia arterial of state resting the in that shown was it ,(۱۹۸۳) al et Babbage of study the In .activities Babbage ,addition in ,muscles skeletal from originates % ۵۰ to up level ammonia blood nucleotides adenylated eaminatedd by produced ammonia total the of % ۲۸ only that estimated ammonia that is muscles the in and blood the in ammonia of accumulation the for reason The is cycle alanine-Glucose .glutamine and glutamic ,alanine of synthesis the for buffer a as used is are muscle skeletal in pyruvate and ketoglutarate-Alpha .ercisee during increase also activities increase The .buffer a as ammonia up take tend and exercise during increase that precursors a probably is activity sports of intensity the increasing with accordance in ammonia blood of and glutamine , glutamate through synthesis ammonia in changes with relationship way-otw is formation during muscles skeletal in alanine and glutamine of production The . alanine muscle by influencedpH . than eatergr is glutamine and alanine of uptake muscle ,However by controlled be to acids amino helps which ,acid lactic of thatpH . the of time recovery The in acid lactic and ammonia of reduction the following reduced is activity sports the of intensity a is there that shows situation This .recovery of acceleration the to leads and blood the .levels acid lactic and ammonia blood elevated and workloads between relationship significant ,muscle in substrates of production between relationship bidirectional a is increase This .pathways metabolic several through substrate the of ificationmod and ,blood the into diffusion plasma urea that showed urea about study (۲۰۱۸) s'al et Bossip of findings the ,addition In



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(carbohydrate-low ,carbohydrate-high) drinks of types three consuming after increase levels sign a is which ,exercise during observed was plasma urea in increase an ,Also . (cebopla and during fatigue the estimate can plasma urea of increase the ,Therefore .metabolism protein of not does bohhydratescar of consumption the that show findings these ,Therefore .activity sports Activity when Ammonia Production So .exercise during levels urea in changes the affect exercise Regular . fatigue muscle and activity sports of intensity the of indicator an is Exercise increased with associated are levels iaammon in changes and ,capacity muscle increase can nervous central and peripheral in metabolism acid amino and Ammonia .synthesis glutamine influenced be may increase this that important is it ,activity physical of integration and system urea and ammonia plasma ,study s'al et Bossip In .exercise during pathways metabolic by no but ,drinks placebo and ,carbohydrate-low ,carbohydrate-high consuming after increased significant a indicates which ,conditions these between observed were differences significant cellular of metabolism the and carbohydrates of consumption the between relationship lactic blood ,colleagues his and Rossip of study the In .exist not Does .proteins and nucleotides activity sports of intensity the to due levels acid until peak its reach not did activity sports The the reached which levels ammonia blood the from different was it and minutes few last the activity sports the stopping after decreased slowly and exercise the of end the at maximum of point end the to equal is levels iaammon blood in increase the that said be can it ,Therefore of use the ,acid lactic to compared ,findings these to According .fatigueNPN criteria as such . fatigue until activity sports of intensity the with relationship better a have can ammonia

activity sports in tininecrea and creatine of role The

Creatinine(Crn) is compound nitrogen protein-non a(NPN) creatine of product a is that derived enzymatically-non is creatinine ,Actually .(۳) muscles skeletal in breakdown phosphate of % ۱,۶ represents and constant is men healthy in creatine of rate turnover The . creatine from the is which ,mass muscle total the to according ,Therefore .day per reservoir creatine total the creatinine of amount the ,reservoir creatine the of size the determining factor important most about contain muscles skeletal because ,calculated be can person a from released and produced ,concentration creatinine blood that clear is It . body the in creatine of amount total the of % ۹۸ rate filtration glomerular of parameter a as used is which(GFR) body by influenced be can , The .methods analysis and (diet in content meat) diet ,massJaffe commonly is which , method automated to adapted easily and inexpensive and simple is ,measurement creatinine for used the of % ۲۰ to up creatinine than other molecules by affected is method this ,However . systems methods all of calibration the recently and methods enzymatic ,reason this For .amount total done Report be to may Advice isotope spectrometry mass - chromatography gas diluted against of terms In Dependent Creatinine ,Uniforms of state And kidney Stable Function Effect At Is .rate constant fairly a at body the by produced usually is it ,mass muscle of amounts absolute



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extent lesser a to and) filtration glomerular by blood the from removed usually is Creatinine is necreatini of reabsorption tubular the Because . (tubules proximal renal the in excreted Use glomeruli clearance of amount the estimate to used often is clearance renal its ,negligible To Dependent non variables accurate Control face the At ,kidney Stable Function At be to may plasma Or serum Density , (Meat Consumption Or kidney filtration eg) muscular mass with people In _ be Body skeletal Muscles mass From reflective can may head my Creatinine a usually is hours ۲۴ urine Creatinine ,have sustainability urine disposal And function kidney men healthy ۲۴ of study a , s۱۹۸۰ early the In . mass muscle skeletal on based amount fixed excretion creatinine urinary with correlated strongly was creatinine plasma total that showed mass body net and ,water body total ,weight body with and(LBM) anthropometric by estimated that showed patients hemodialysis adult ۲۷ on dystu Another .measuresLBM from obtained analysis impedance bioelectrical(BIA) absorptiometry ray-X dual and(DEXA) good a had showing ,results these supported study another ,addition In . creatinine serum with correlation dialysis in mass muscle skeletal and levels creatinine serum between correlation ngstro a of measure indirect an as ,clearance creatinine low that showed study a ,addition In .patients ,mortality and ntseve cardiovascular of incidence increased with associated is ,mass muscle low the from differ may athletes for values reference Creatinine .resistance insulin of independent are athletes that thought usually is it ,fact In .(۶) population general the for used values physical-psycho and workloads training of lumevo large the but ,healthy and normal physically apparently create and homeostasis in changes cause can competitions by caused stress and studies few are there ,Surprisingly . values hematological and biochemical pathological about little a Hi Report ,plus To . it has Existence athletes in lsleve creatinine serum on reports From Use . it has Existence Athletes At ,creatinine Amounts Basis On ,equation Applications ,Is done Advice international Among medical Hi association By Present now At Equations this The Purification Amounts With That People At see I it From Use many How ryeve Is discussion under still is marigolds natural of identification .

-.۷) L/molμ ۱۱۵ and ۶۲ between is population general the in creatinine for range reference The international ۲۲۰) Italy in athletes elite among study a ,this Despite .men ultad for (dL/mg ۱,۳ ,that showed (years ۳۷ to ۱۷ of range age an with sports different ۸ in athletes male professional Intense during even , season competition the and training by affected was creatinine ,general in elite in values creatinine that showed study this of data The . included not are efforts training of because expected as ,(athletes-non) group control the in than higher generally are athletes different with sports different ۸ in participated tudys this of athletes The .mass muscle higher training and competition and ,load training ,metabolism anaerobic/aerobic of characteristics general the on based limits reference of use the recommend not do Researchers .periods to lead thus and data of misinterpretation to lead can it because medicine sports in population creatinine had athletes of % ۷۰ nearly , ۴ Figure in see can you As . interventions unnecessary



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tininecrea serum showed athletes-non of % ۵۰ nearly while ,liter/molμ ۸۸ than higher values ۸۸ than less values creatinine serum ,contrary the On .value this than higher values were athletes-non the of % ۵۰ about while ,athletes the of % ۳۰ only included liter/micromol athletes in creatinine of levels resting that said be can it ,Therefore . distribution this in included This .threshold clinical dangerous the beyond go not do they but ,athletes-non in than higher are is It .athletes elite in mass muscle greater the to due likely is levels creatinine in increase of one ,monitored are assessments creatinine consecutive ,leteath each for that recommended .value baseline a as used is competition and training of start the before determined values the . index mass body where ,sports endurance in that seems It(BMI) main the than lower usually is to compared lower are values creatinine serum ,disciplines these in athletes of haracteristicsc (۳۷) skiers Nordic in values creatinine serum showed study a ,example For .people sedentary serum while , dL / gm ۰,۹۸ was -۰,۷۲ between range a in (people ۸۰) cyclists and (people -۰,۸۲ of range the in was (people ۶۰) group control sedentary the of subjects the in creatinine differentthe and sport of type the that said be can it ,Therefore .dL / mg ۱,۰۶ was It creatinine of ranges different cause hletesat to related measurements body of characteristics . concentration

,competition and training by affected not is concentration creatinine serum that show Findings creatinine of amount the ,(years ۱۷-۱۴ = age ,people ۲۰) boxers Thai In .sports heavy in even from different statistically not was match a after and training intense ,training usual their during except ,clearance creatinine for presented was difference No .group control the of values the At possible Changes to ued ,controls to compared athletes in lower was which ,race one after In . became Title fight a length the in (kidney Blood current decrease) Kidney Hemodynamics around) race cycling endurance-ultra km ۵۰۹ a in participating volunteers sixteen in ,addition the after immediately values creatinine serum the ,ersmet ۲۷۵۰-۳۰۰۰ of altitude an at (Alps the the of start the before values the to compared increase significant a showed effort the of end limits reference the within always were values creatinine average the ,this Despite gave .race this of authors The returned they Foundation level match the of end the after rshou ۲۴ and marathon-ultra professional by replacement fluid adequate of importance the highlighted study significant and enegativ The .race the during fluid of liters ۱۷ of total a consumed who cyclists during done kilometers training the and creatinine serum in increase the between correlation the reduce and out smooth to training of importance the shows ,competition the before year the training when creatinine serum in asedecre The . disorders kidney of duration and level changes with associated be cannot performed are races consecutive and heavier are programs as ,volume fluid or/and flow blood in changes by explained be can and mass muscle in Mention Endurance Athletes At efforts after urea and Creatinine .moderation in hypothesized _ . became



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activities sports in oxide nitric and ornithine ,citrulline of

compound nitrogen protein-non a is Citrulline(NPN) ,arginine and ornithine with along ,that present widely not is citrulline ,arginine Unlike .cycle urea the of members acid amino the forms ۲,۱ is there ,average On .highest the is watermelon in citrulline of amount The .proteins all in can watermelon of consumption and ,watermelon of weight fresh of gram per citrulline of mg to equivalent is watermelon of kg ۳,۳) term short the in citrulline and arginine plasma increase nithineor and arginine of values fasting the ,addition In . (supplement arginine-L of grams ۱۰ .day per watermelon of grams ۱۵۶۰-۷۸۰ consuming after % ۲۲-۱۲ of range the in increase the) arginine from recycled either ,pathways two of one using body the in created is Citrulline nitrogen the from or (byproduct a as citrulline in results oxide nitric to arginine of conversion ornithine this that glutamine; .produced is it .glutamine-L in found (carbon some and) requires which) phosphate carbamoyl and ornithine uses pathway enzyme transcarbamylase accounts pathway arginine the that appears It .llsce intestinal in citrulline produce to (glutamine . % ۹۰ for accounts pathway glutamine the while ,citrulline circulating of % ۱۰ about for one) cycle urea the About .citrulline plasma decrease can levels glutamine plasma Decreasing It arginase enzyme the through arginine ,(% ۱۰ to up citrulline of anismsmech production the of using) ornithine there from and (cofactor a as urea producing) ornithine to converted is transferase carbamoyl ornithine enzyme the to exposed (cofactor a as phosphate carbamoyl increases (ornithine via) citrulline to arginine of pathway metabolic the ,sense this In .ullinecitr carbamoyl enzyme the by used is which ,ammonia decreases simultaneously and urea directly be can arginine ,needed If .phosphate carbamoyl produce to synthase phosphate the of instead ammonia produce even and deaminase arginine through citrulline to converted aspartate-L with connected then is cycle this from formed citrulline The . need(corresponding toD- isomer its as acid aspartic) enzyme the through earginosuccinat forms and free into arginosuccinate lyases arginosuccinate enzyme the then and ,synthase arginosuccinate can Fumarate .cycle urea the enters-re then Arginine _ decomposes .fumarate and arginine the enter easilyTCA (regulates negatively citrulline and ,diatorme energy an as cycle (Krebs subsequent its and arginosuccinate to citrulline of conversion The .enzyme arginase the the ,cycle urea the than rather cycle oxide nitric the in involved also is arginine to conversion of molecule a giving by) citrulline to converted directly is arginine that being difference only main the that seems It be to production ornithine through .indirectly than rather (oxide nitric ,trullineci of concentration serum the only is arginine to citrulline of conversion the in factor citrulline plasma ,reason this For . rest at liter/micromol ۲۷-۲۲,۴ of range the in is which while At be to . grams ۱۰-۵ about of dose a to up arginine increase linearly to appear increases . expected than less arginine sesincrea It higher edible Doses arrive may Opinion To That



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and glycogenolysis in enzymes regulate to helps supplement citrulline ,studies some on Based .pathways glycolysis to glucose of Conversion)ATP (skeletal rat in mentioned been has It to (acids fatty on based) energy aerobic from ngescha metabolism muscle the that muscle with interact to appears citrulline ,However . anaerobicATP production by increasing the efficiency of energy production (in a beneficial way), but it is unclear whether citrulline increases aerobic or anaerobic energy metabolism (or both). muscle increase to found been has (malate as) citrulline ,example ForATP efficiency to due supplementation arginine and nitrate with seen that to similar phenomenon a , From So gave sign desert Hi mouse eth At study One least At .production oxide nitric human of kilogram per mg ۴۸۰ to equivalent) day per kilogram per grams ۳ of Consumption as used sometimes is (malate as) Citrulline . power production of % ۲۳ increased (weight body citrulline of Administration humans including ,mammals in buffer ammonia and acid an and (ornithine from ammonia of breakdown the via) urogenesis hepatic stimulate to appears approximately) concentrations ornithine increase simply to elsewhere reported been has citrulline of grams ۶ that seems It .(arginine and ornithine for increase similar a ,twofold At Ornithine help supplement To Ratio course of (more or % ۲۰۰) ornithine plasma increases usually Ammonia .(۱۳) extent lesser a to ornithine increases it (% ۵۰-۳۰۰) Similarly dose One acetyl to pyruvate of conversion the of inhibition to due mulatesaccuCoA _ Az) muscle prevents that fatigue muscle for signal a is (pathway activation phosphofructokinase calphysi improve can supplementation citrulline ,secondarily ,that seems It .contractility ,addition In . (rats in proven been has which) accumulation ammonia preventing by performance the on effect positive a have to shown been has citrullinemTOR appear not does it but , pathway suppressed normalizes citrulline ,entpres if ,Indeed .leucine like activation direct through be to mTOR signaling week one for citrulline of kg/g ۰,۱۸ with supplementation ,studies human In . same the at elsewhere but ,synthesis protein body whole or oxidation leucine change to failed nitrogen urinary Fasting . shown been has humans in alanceb nitrogen in improvement ,dose . term short the in citrulline of grams ۱۵-۱۵ of dose oral an by affected be to seem not does muscle help can supplementation citrulline whether on evidence mixed is there ,Therefore in supplemented when ,citrulline that show interventions ,addition In . not or sissynthe protein in performance anaerobic increasing in role a plays ,weight body of kg/mg ۲۵۰ about of doses until onsrepetiti/rounds ۸) protocol training a have who weightlifters In .mice and rats sucrose of grams ۱۰ with along malate citrulline of grams ۸ of consumption ,(exhaustion rounds in performance improve not could (condition placebo the in provided also was sucrose) to % ۱۰,۴۸ from placebo to edcompar repetitions of amount the increased gradually It but , ۲-۱ . % ۵۲,۹۲

recently has ,watermelon in primarily found acid amino essential-non a ,citrulline-L ,Overall oxide nitric and bioavailability arginine-L increasing for attention much attracted(NO)



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production. studies several ,decade last the During .increases performance tsspor ,result a as And sports anaerobic and aerobic in citrulline-L of properties ergogenic the investigated have plasma increase to shown been has supplementation citrulline-L oral ,Overall .performance and ,arginine ,ecitrullinNOx . -L for mechanism proposed a is flow blood increased Although and dilation vascular in increases term-short supporting evidence ,ability ergogenic citrulline's . conflicting and ceszar is supplementation citrulline-L after tissue muscle in perfusion blood exercise enhance can supplementation citrulline that reported have studies several ,However seems (days ۷) dosing term-long ,evidence available the on Based . recovery and performance .performance sports increasing for rotocolsp dose-single term-short than effective more be to the while ,day per grams ۳ about be to appears citrulline of dose effective minimum The usually products malate Citrulline .day per grams ۱۵-۱۰ to up be may dose effective maximum far so information scientific although , . ۱ to ۲ or ۱ to ۱ of atior malate to citrulline a provide used label product the of ratio the determine to able been not has .

provide grams ۸ to ۶ of doses suggest malate citrulline of effects ergogenic the reporting Studies the to contributes malate how known not is It .ratio either in citrulline-L of grams ۳ least at be may malate to citrulline of iorat ۱ : ۲ a ,Therefore .malate citrulline of effect ergogenic more to seems exercise to prior minutes ۹۰-۶۰ citrulline-L of ingestion ,Finally .preferred as taken whether ,performance enhance reliablyL- . malate citrulline as or citrulline

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The effect of sports activity on plasma cholesterol

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abstract

Mrs. Maryam Emamian Rostami (2019) in a research titled "Evaluation of the effect of 8 weeks of aerobic training on the expression of hepatic FXR, CYP7A1 and SHP genes, lipid profile and liver enzymes in the plasma of ovariectomized rats" concluded that orectomy decreased compared to control-orectomy groups and The level of liver enzymes ALT and AST increased with ureectomy and exercise increased the level of these enzymes in the ureectomy group, but exercise increased AST and decreased ALT in the healthy group. Also, exercise caused an increase in body weight in the exercise-healthy group compared to the control-healthy group and a decrease in body weight in the exercise-orectomy group compared to the control-orectomy group. A significant inverse relationship was seen between the expression of FXR, SHP, CYP7A1 and plasma triglycerides, and between CYP7A1, SHP and total cholesterol, and the relationship between CYP7A1 and SHP and HDL was significant, respectively; Also, liver enzyme ALT had a significant inverse relationship with FXR. Discussion and conclusion: Overall, the results show that urectomy can increase body weight and reduce the hepatic expression of genes involved in cholesterol metabolism and cause plasma hypercholesterolemia and hypertriglyceridemia, lipid disorder and liver damage. Aerobic training could have a positive effect on some factors of the plasma lipid profile and due to the positive relationship between the genes of this metabolic pathway with the reduction of plasma cholesterol and triglycerides, this type of training with this intensity and duration can be used to reduce the complications caused by estrogen deficiency. suggested on the lipid profile. However, it is not possible to comment on the improvement of liver enzymes with this type of exercise during estrogen deficiency. (Rostami Imamian, 2019)

Mr. Ehsan Hassanzadeh Nazlo (2014). In a research titled comparing the response of cardiovascular risk factors to continuous and non-continuous sports activity in obese young women, they found that continuous sports activity caused a significant increase in plasma triglycerides ($P < 0.05$) and also non-continuous activity caused a significant increase in cholesterol. Total ($P < 0.05$). Based on the findings of the present research, it can be concluded that there is no difference between the effects of continuous and non-continuous activities on some cardiovascular risk factors.

Therefore, inhibition of LOX-1 expression may help prevent arterial occlusion. Endurance exercises to create beneficial changes in the respiratory system and blood circulation through sports activities that require more oxygen and we make it possible to increase the ability of the system to produce energy and its effect improves cardiac and respiratory endurance. Resistance exercises It engages the skeletal muscles and forces them to contract, and resistance exercises can use an external resistance such as a weight for muscle contractions, which can increase the health, strength and strength of the muscles. Therefore, due to the fact that the decrease in mobility and sports activities in the world today has become significant and is increasing, and this causes an increase in cardiovascular diseases (Hisar Jalal, 1401).

Maroz is one of the factors influencing the health of people who exercise and physical activity and has a positive effect on the dynamics of life and performance of all age groups. Identifying people's problems and issues in order to improve their health is necessary and necessary. that improper nutrition and inactive lifestyle have caused obesity and the occurrence of cardiovascular problems, increasing body fat, especially the accumulation of abdominal visceral fat, in addition to being associated with metabolic risk factors, if continued and not prevented, it can lead to the occurrence of cardiovascular problems and Metabolic failures. It can be said that obesity and overweight are one of the common issues and problems of the current world. Based on the research done, it can be said that about 39% of people over 18 years old are overweight and 18% are obese (World Health Organization 2019). In this way, it can be said that the percentage of obesity among adults will increase in the coming years, but it can be said that these factors can be prevented by changing the lifestyle and diet and performing regular physical activities. Exercising is one of the best and least expensive ways to deal with excess weight and fat disorders. Also, regular exercise increases body fat metabolism, which reduces overweight and obesity. Resistance and endurance exercises, including exercises suitable for burning excess body fat, also have a good effect in dealing with obesity and cardiovascular problems. There are indicators against risk factors such as healthy eating,



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regular exercise, avoiding alcohol and tobacco consumption, which are effective for a healthier and more useful life, in other words, high fat and lipoproteins in the blood, high blood pressure, diabetes, inactivity and Inactivity and consumption of alcoholic beverages and tobacco are among the main causes of cardiovascular problems, changes in lipid profiles such as HDL and LDL are among the factors of cardiovascular problems, so exercise has a significant effect on reducing lipid profiles. Athletes have favorable blood pressure. and have high HDL cholesterol. This makes these people less prone to diabetes. Regular exercise before eating fatty foods has a significant effect on increasing HDL. It should be noted that losing weight through diet reduces both good cholesterol and bad cholesterol, but if we use diet along with exercise to lose weight, it reduces bad cholesterol and increases good cholesterol in the body. . HDL is a high-density lipoprotein that contains about 50% protein, 20% cholesterol, and 30% phospholipid, along with a small amount of triglycerides. LDL is a low-density lipoprotein that contains about 80% of cholesterol. Triglycerides are ester compounds of glycerol and fatty acids and are among the lipids that are most important in the diagnosis and follow-up of disorders related to lipoproteins. Triglycerides are transported in plasma bound to lipoproteins in the form of VLDL and chylomicrons, and their measurement is important in predicting cardiovascular risks and problems and controlling lipid levels. LDL in plasma is directly related to the increase of cardiovascular problems. Also, high triglyceride level can indicate various liver, kidney, and pancreas problems. On the other hand, lectin-like low-density lipoprotein receptor (LOX-1) plays a major role in vascular complications. Since exercise has beneficial effects in preventing the complications of cardiovascular problems, it is possible to investigate the protective effects of aerobic exercise by reducing the amount of LOX-1 in the heart. It has been found that aerobic exercise can reduce the amount of LOX-1 and reduce oxidative stress at the same time. Since these parameters play a role in causing the complications of cardiovascular problems, endurance training is the best way to reduce these complications. And it has also been determined that there is a strong relationship between plasma levels of oxidative stress and atherogenic lipoproteins. One of the most important toxic effects of reactive oxygen species (ROS) is the production of oxidized low-density lipoprotein (oxLDL). It is noteworthy that oxLDL contributes to rapid lipid deposition and inflammatory response in the blood vessel wall. The increase in oxLDL activates the lectin-like low-density lipoprotein receptor (LOX-1), which plays an important role in the occurrence of cardiovascular problems. Increased regulation of this receptor plays a role in the onset and progression of cardiovascular problems and related complications such as heart attacks. Finally, overexpression of the receptor (LOX-1) is induced. Disruption causes deposition in the walls of arteries.

Cardiovascular diseases are one of the main causes of death in the modern world and life is mixed with mechanical mechanisms, the main source of cardiovascular diseases is lack of mobility and exercise in modern life. Several factors play a role in the occurrence of these diseases, but the risk factor such as ceruloplasmin, which is one of the important plasma proteins, is being studied by health researchers as an important factor in cardiovascular diseases. Therefore, Mr. Mahmoud Ebrahimi (2019) investigated the effect of eight weeks of HIIT exercises on serum ceruloplasmin and cardiovascular risk factors in inactive middle-aged men of Naqdeh city and by selecting a statistical population (29 people) from among middle-aged men and performing relevant tests before and after High intensity interval training (HIIT) which included sports movements and repetitive physical activity, it was found that this type of regular training has a positive effect on test results and reducing harmful blood fats. The results of periodic training and laboratory sampling are as follows: in the training groups, the lipid profile and resting levels of adiponectin were significantly improved compared to the pre-test, but no difference was found between the two training groups. The concentration of cortisol, triglyceride and VLDL showed a significant increase in the exercise group immediately after the activity compared to the control group. HIIT training on obese patients resulted in significant changes in BMI, blood triglyceride levels and glycemic levels compared to the control group that trained on dry land. Eight weeks of training significantly reduces LDL, TC, and TG values. Intermittent exercises in the form of treadmill running and intermittent rest intervals had a significant decrease in LDL and a significant increase in HDL compared to the control group. Aerobic exercises reduce total cholesterol levels and significantly increase HDL cholesterol levels. 8 weeks of HIIT exercises led to the improvement of body mass and HDL blood as well as the increase of Vo2max in obese people. Except for HDL-C, all risk factors improved significantly in all groups. (Ebrahimi, 2019)

Mr. Mehdab Abbaspour (1378) in a research titled comparing the amount of blood fats, percentage of subcutaneous fat and determining the relationship between them in athletic and non-athletic male students aged



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15-18 years. He concluded that there was a significant difference between the amount of variables measured in the two groups of soccer players and The wrestler does not show ($P>0.05$). The research findings, while confirming the positive effect of physical activity (in adolescence and youth) on body composition, plasma lipids and lipoproteins, show the benefits of exercise in reducing cardiovascular risk factors and show its preventive role in this field. (Abbaspour, 2018)

Mr. Ehsan Keshavarz (2019). In a research titled the effect of two methods of aerobic and anaerobic exercise with thyme supplement on plasma lipoproteins and liver enzymes of men with fatty liver, it was concluded that high-density lipoprotein in the pre-test showed a significant increase compared to the post-test ($p\leq 0.05$). The results of this research show that aerobic and anaerobic training with thyme supplementation and aerobic and anaerobic training without supplementation have an effect on liver enzymes and plasma lipids; Also, aerobic exercise with thyme supplement compared to anaerobic exercise with thyme supplement and thyme supplement group on plasma liver lipid enzymes and aerobic exercise compared to anaerobic exercise and thyme supplement group on plasma liver lipid enzymes has reduced the above variables more. (Keshavarz, 2019)

Mr. Masoud Timuri (2017) in a research titled investigating the effect of intermittent aerobic training with caffeine supplementation on free fatty acid and glycerol levels in rats fed with high-fat food found that caffeine supplementation with intermittent aerobic exercise had a significant effect on different fat tissues. , had obesity index, glucose, insulin resistance, triglyceride and plasma cholesterol ($P<0.05$), significant improvement was observed in the effect of caffeine supplement and aerobic interval training each alone on obesity index, different fat tissues and triglyceride ($05 /0>P$). Also, intermittent aerobic training had a significant effect on insulin and glucose resistance ($P<0.05$). On the other hand, insulin, free fatty acid and glycerol did not change significantly ($P<0.05$) as a result of taking caffeine supplement and intermittent aerobic training. Conclusion: according to the obtained results, exercise and caffeine supplementation may be effective and beneficial for people at risk due to improper diet and nutrition and sedentary behavior.

The evidence shows that the decrease of estrogen during menopause causes an increase in LDL lipoproteins, which in turn will cause a disturbance in the level of plasma cholesterol. The evidence shows that the effect of exercise on increasing HDL and reducing the concentration of LDL in the blood will reduce fat and reduce weight, which factor can be used for women during menopause. Also, the increase of inflammatory cytokines with weight gain has a direct effect on the lifestyle of inactive postmenopausal women. Resistance exercises that aim to grow muscle fibers under the influence of resistance or increased load can be effective in increasing the change of body composition and reducing fat in women. Electro Muscle Stimulation is the latest training method that simultaneously stimulates several muscles with specific intensity in a regional manner. Electrical muscle stimulation means that during exercise, the brain sends electrical signals that allow muscle contraction and movement with the help of this device. In addition to these signals sent by the brain, more intense stimulation sent from the outside into the muscles causes the muscles to contract faster. Few studies have been conducted on the effect of resistance exercise with EMS on estrogen hormone and blood lipoproteins in healthy postmenopausal women; Therefore, this research aims to investigate the effect of combined resistance exercises with the help of electrical muscle stimulation in order to reduce body fat and cholesterol levels and reduce inflammatory factors and health-related factors in postmenopausal women (Lari, 1401).

Analysis of daily fluctuations of plasma PTX3 show that PTX3 concentration is more stable compared to CRP (Nakajima, et al., 2010). In relation to PTX3 plasma concentration in obese population and people with metabolic disorder, contradictory results have been obtained. Most studies report that PTX3 concentrations are lower in obese subjects and subjects with metabolic disorders compared to subjects with normal weight (Osorio-Conles, et al., 2011). On the contrary, other studies reported the opposite (Miyaki, et al., 2010), however, the increase in plasma PTX3 concentration in obese subjects may be due to atherosclerosis, and this increase in PTX3 could potentially serve as a protective mechanism of progression. act on atherosclerosis (Salio, et al., 2008). In this regard, one of the most important strategies used to treat obese people in order to change the concentration of adiponectin and pentraxin-3 in plasma is to perform regular sports activities including resistance training (Shasemi, 2015).



Individuals who lost at least moderate weight with regular exercise had improvements in plasma lipid variables including non-HDL cholesterol, HDL particle size, LDL particle size and number, and triglyceride concentration. By examining the background of the research, it has been determined that resistance training can have ameliorating effects in vascular disorders associated with obesity through different pathways, including reducing visceral fat tissue and increasing muscle mass along with positive effects in glycemic control. Also, adding protocols with severe calorie restrictions to sports activity can be a good way to temporarily adjust the state of energy absorption and weight control and subsequently improve metabolic, inflammatory and vascular diseases caused by obesity. The aim of the present research is to investigate the effect of resistance training and intermittent calorie restriction on lipid profile in overweight and obese women (Nasiri, 2018).

Paraoxonase-1 enzyme is one of the prominent factors in lipid oxidation regulation. This enzyme plays an important role in hydrolyzing many substrates, including oxidized lipids, and protects them from oxidation. Paraoxonase-1 enzyme is one of the most important free radical scavenging enzymes and one of the main protectors of lipoproteins against oxidizing compounds. Mrs. Fereshte Abbasi Ghorbani (2015) in this research to determine the effect of eight weeks of spinning exercise on the serum levels of paraoxonase-1 enzyme and some metabolic indicators in obese women with type 2 diabetes, twenty obese women with type 2 diabetes voluntarily participated in this research. who were randomly divided into two experimental groups (10 people) and control group (10 people). Aerobic spinning training program was implemented for eight weeks (three training sessions per week, each session lasting 30 to 60 minutes). Dependent variables were measured in two phases: pre-test and post-test. Findings: The findings showed that there was a significant increase in the concentration of paraoxonase-1 ($p=0.018$) and HDL ($p=0.016$), and a significant decrease in the plasma insulin resistance index ($p=0.039$), plasma insulin ($p=0.015$), plasma glucose ($p=0.011$), waist circumference ($p=0.0001$) and WHR ($p=0.0001$) were observed. However, there was no significant change in the levels of cholesterol ($p=0.301$), triglyceride ($p=0.111$), LDL ($p=0.064$), BMI ($p=0.136$) and weight ($p=0.135$). As a result, eight weeks of spinning training led to a significant increase in plasma paraoxonase-1 serum levels and an increase in HDL, a decrease in HOMA-IR, a decrease in plasma insulin levels, a decrease in fasting serum glucose concentrations, a decrease in WHR, and a decrease in waist circumference. According to these findings, it can be concluded that spinning exercise can be considered as a useful treatment method for type 2 diabetes patients. It was also shown that eight weeks of spinning training led to a non-significant decrease in triglyceride, cholesterol and LDL levels and no change in BMI and weight (Abassi Ghorbani, 2015).

Many studies have shown that overweight is one of the independent indicators of diabetes and cardiovascular diseases (CVD) in humans. Many of the environmental effects of leptin show that leptin is involved in glucose and fat metabolism, clot production and blood pressure regulation. Although the exact mechanism of leptin production is not well known, but the relationship between this hormone with negative energy balance, sympathetic activity, other hormones and substances produced from metabolism, physiological pressure resulting from physical activity, one of the potential regulators of leptin secretion, has been observed. It is from adipose tissue. Changes in fuel metabolism, concentration of systemic hormones and energy consumption may affect plasma leptin concentration and then leptin function. There are many reasons for leptin's response to physical activity. Obesity is a complex complication with the accumulation It is characterized by excess adipose tissue. Obesity is associated with many health problems, including vascular diseases. Reduction of leptin through exercise is associated with changes in energy balance, improved insulin sensitivity and appropriate changes in blood lipids. Investigating leptin changes with physical activity. It is one of the topics that is of particular importance especially in adolescent and young obesity (Estehshani et al., 2019).

Cardiovascular diseases are the first cause of death in industrialized countries and in some developing countries, according to the statistics published in 1990, the most deaths caused by CVD are related to people who have less physical activity. It has been reported that the probability of death due to CVD is three times higher in sedentary and inactive people than in active people. Today, cardiovascular risk factors such as high levels of serum fat, obesity, blood pressure, smoking, diabetes and physical inactivity have increased mortality and decreased quality of life. Physical inactivity as a risk factor can be as high as high plasma cholesterol levels and blood pressure Blood has a role in the occurrence of cardiovascular diseases. Research has shown that deaths caused by cardiovascular diseases are more related to inactivity than high blood pressure, cholesterol and smoking. Studies show that the clinical symptoms of coronary artery disease are not revealed for a long time. And there is a



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possibility of the presence of risk factors during adolescence and youth, and children who are obese or have high blood pressure are similar to adults in terms of having cardiovascular risk factors. Paying attention to the above-mentioned cases recommends the necessity of engaging in sports and physical activity. Valizadeh, 1388)

Lipoproteins are divided into 4 categories and the main action of lipoproteins is in organs with the transfer system of triacylglycerol and cholesterol. The abnormality of the proteins that are involved in the transfer of lipids causes the abnormality of the plasma lipid level and causes the emergence of clinical conditions such as atherosclerosis, hypertriglyceridemia, and hyperlipidemia. It should be kept in mind that secondary causes play a role in hyperlipoproteinemia, which should be treated as much as possible in the treatment of those diseases and the treatment of these causes as long as possible, so that the possibility of hyperlipoproteinemia can be reduced, because atherosclerosis is one of the important factors in the development of vascular diseases. It is coronary, and in this way, we can reduce mortality caused by ischemic heart disease and coronary diseases. Of course, it should be noted that in these diseases, the risk factors can reduce the possibility of contracting these diseases. In general, the first step in the treatment of hyperlipidemia is diet, weight loss, and exercise, and therefore, all patients who have not been prohibited from exercising by Dr. M. are recommended along with weight loss. If the patients recover in this way, the drug is not used, but otherwise, drug treatment is recommended. In this case, a drug that can produce the most effect and the least side effects and toxicity should be used, and more importantly, it should be kept in mind that along with the drug, the person must be under a special diet and is not free to choose his food, and if a drug is not achieved after 2-3 months, the drug should be stopped and another drug should be used in the treatment. Conclusion As we know, the best way to fight the disease is prevention and doing actions that reduce the possibility of contracting the disease. So it is better to first stop the actions that lead to illness. The things we can do are: 1. Quitting smoking or using any kind of tobacco. It is possible to consume unsaturated fats and refrain from high consumption of animal fats, high consumption of egg yolks, etc. If the fat increase is not controlled by these actions, we will resort to taking medicine in the next step. When we compared the average concentration difference, it seems that: 1 Clofibrate and the toxic drug fibrate + nicotinic acid had a greater effect in reducing blood cholesterol. 2 The toxic drugs fibrate and nicotinic acid had a greater effect in reducing blood triglycerides. 3. Fibrate + nicotinic acid had a greater effect in reducing cholesterol in women. - 4 kilofibrate and fibrate were more effective in reducing blood cholesterol in men. 6- Toxic fibrate + nicotinic acid has been more effective in reducing blood triglycerides in women. In the end, it should be kept in mind that the long-term prescription of some of these drugs has important unwanted side effects, besides, the patient's diet is one of the main factors of the treatment, even if the patient takes a blood lipid-lowering drug, he cannot be free to consume any type of food he likes. Navidi, 1371)

Swimming increases the level of beta-endorphin and met-enkephalin plasma for two weeks. Exercise for two weeks increases the amount of beta-endorphin and meth-enkephalin opioids in the serum, and the use of nandrolone as an anabolic steroid in athletic rats weakens the effect of exercise and causes a significant decrease in the amount of these opioids in the serum (Mohbi et al., 2013).

In examining the effect of gender on the response of low-intensity exercise to cardiovascular risk factors, they reported a significant decrease in triglyceride and cholesterol levels in each group, as well as no effect of gender on the lipid response caused by the activity. However, in recent years, the variability of the response caused by sports activity between the two sexes, to the changes in the structure of the arteries and the automatic control of the blood flow, has been reported. Parker and colleagues (2010) stated sex-related differences in hormones affecting metabolism as one of the main effective factors in the response to sports activity between women and men. Ternopoliski (2008) in his research stated that the lipid oxidation capacity was higher in women. Compared to men, it showed in endurance activities and the reason for it was higher intracellular lipid content and more lipolysis in adipocytes. By studying the above researches, the lack of consensus on the similar effect of physical activity in men and women is determined. Although some researches have stated that the lack of similar adaptations in women compared to men is the result of a faster reduction of motivational factors in women, however, certain reasons have also been mentioned in the field of women's metabolic response to sports activity, although Humko et al. (2010) , in the study of 88 men and 123 women, they reported no significant difference in the Framingham risk score (Framingham risk) and the probability of cardiovascular diseases, but in the same research, the higher cholesterol level of women was also mentioned. However, Often, in various researches, the role of a different exercise program in the society of women and men has been studied alone, regardless of gender,



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and generally the results are generalized to both sexes. For example, Stasialis and colleagues (2010), in On the other hand, Tharmi et al. (2010) reported a significant reduction in triglycerides and no significant change in cholesterol in a study examining the effect of 8 weeks of moderate-intensity exercise for 45-60 minutes, 3 days a week in young women. The effect Increasing aerobic exercise 3-5 days per week in obese men reported a significant decrease in serum cholesterol and triglyceride (Zali, 2010).

Aerobic exercise improves cardiorespiratory fitness and reduces the risk of cardiovascular disease. Several results consider regular aerobic activity to be the cause of increasing HDL concentration and improving plasma lipoprotein profile, so active people face less cardiovascular risks compared to inactive people (11-12). In addition to physical activity, the effect of obesity on HDL-cholesterol with Food intake is regulated, so that calories consumed and calories consumed have a significant effect on the concentration of HDL-cholesterol. Studies confirm that weight loss is associated with an increase in HDL-cholesterol (Baratzadeh Shokri, 2014).

Studies investigating the effects of intense exercise on plasma fibrinogen concentration show conflicting data. Some of these studies indicate that exercise has no significant effect on plasma fibrinogen, while other studies have shown that after exercise, both an increase and a significant decrease in fibrinogen levels occur [for example, performing 30 minutes of acute submaximal exercise on on the ergometer led to a mild but significant increase in fibrinogen levels in middle-aged women with heart infarction and in healthy women. Also, plasma fibrinogen levels in active women after an intense training session including 6 stages of sprinting in a short distance of 35 meters with 10-second time intervals were significantly increased. Increased In investigating the chronic effects of sports activities, a significant decrease in the plasma levels of fibrinogen in postmenopausal women was observed after ten weeks of regular submaximal aerobic exercise with an intensity of 70% heart rate and for 30 minutes. Also, the levels of fibrinogen in inactive middle-aged men with a BMI of 25 to 30 kg/m², after performing eight weeks of regular submaximal aerobic exercises with an intensity of 50 to 70% of the maximum heart rate, there was a significant decrease. The results of existing research show the effects of various variables such as the number of subjects, type, intensity, duration, acute and chronic nature of the activities. Exercise is the response of this inflammatory protein. Although some of the benefits of physical activity may be due to its effects on the homeostasis system, the increased cardiovascular complications and sudden deaths during or immediately after sports activities warrant further investigation to find the relationship between sports activities and homeostasis performance. Makes it necessary. Studies show that frequent weight loss by restricting daily calorie intake due to the heavy nature of disciplines such as judo or wrestling can lead to positive or negative changes in fat and lipoprotein levels. . And its consequence can be the decrease or increase of inflammatory proteins. In this study, in addition to investigating the plasma levels of fibrinogen (as an inflammatory protein) in wrestling subjects, the effect of circular exercises based on wrestling techniques on this risk factor has been investigated. (Khandalan) et al., 2014)

Cardiovascular disease is the cause of half of the deaths in the countries of the world, especially in Europe, which causes nearly three quarters of a million deaths per year. So that lipid metabolism disorders are one of the main factors for coronary heart disease (Ranier et al. 2013). Coronary heart disease is associated with high levels of total cholesterol (TC), triglyceride (TG), low-density lipoprotein (LDL-C) and low levels of high-density lipoprotein (HDL-C) in plasma (Karanath and Jeevaratnam 2009). Atherosclerosis, which from a pathological point of view means the accumulation of fat in the walls of arteries, is a chronic inflammatory disease and is considered one of the main causes of death in the world. In this process, HDL-C acts as an anti-atherogenic factor and is also an effective antioxidant (Ghanbari Niaki et al. 2010), which is mainly synthesized in the intestine and liver (Rashidelmir et al. 2012). The formation of HDL-C and its regeneration by plasma factors is a complex process and requires several factors such as lipoprotein lipase (LPL) and lecithin cholesterol acyltransferase (LCAT), phospholipid transporter protein (PLTP) and ATP-dependent transporters (ABC). Ghanbari Niaki et al. 2010). New research suggests that Apolipoprotein A and Apolipoprotein B (ApoB), which are the main apolipoproteins of HDL-C and LDL-C, respectively, may predict the risk of coronary heart disease better than conventional lipid indices. specify (Kadoglu et al. 2012). A new apolipoprotein called APOM has been discovered in human plasma and HDL, which is highly expressed in the liver and kidney, and as a companion and supervisor of the action of sphingosine-1-phosphate, stimulating the mobility of cellular cholesterol and a biomarker in poisonings and also for the formation Pre-beta HDL (primary structure of HDL) is important (Liu et al. 2014, Kristoffersen and Nielsen 2013). APOM level is affected by various conditions such as high blood sugar, high



leptin, obesity, high insulin, and various physical and sports activities (Liu et al. 2004). It seems that apo M as one of the components of HDL has a strong anti-atherosclerotic role (Christoffersen et al. 2008). As apoM is an important regulator of HDL metabolism, it therefore modulates cholesterol efflux and atherosclerosis potential. ApoM may facilitate reverse cholesterol transport by converting small pre-beta-HDL to larger pre-beta-HDL (Kardazis et al. 2015). Transfer of cholesterol from peripheral tissues to the liver for recirculation or reduction and elimination. Intrabiliary means reverse cholesterol transport (RCT) (Kardazis et al. 2015), a process mediated by high-density lipoprotein (HDL) particles and formed when lipid-poor apoA-I or beta precursor Lipid-poor HDL initiates the efflux of phospholipids and cholesterol from cell membranes through an antagonistic effect with transmembrane ATP-binding box A1 (ABCA1) (Kardazis et al. 2015). Recently, it has been suggested that another member of the family of ABC transporters, named ABCG1, plays a role in the intracellular passage and flow of cholesterol, and new studies indicate the transport and flow of cholesterol and possibly phospholipids by ABCG1 (Zare, 2016).

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metabolic Hi Sickness treatment On physical Activity Effect

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Abstract

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.syndrome metabolic ,diseases ,activity physical ,exercise :**Keywords**

Introduction

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۲۹ بهمن ماه ۱۴۰۲

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¹Demetrius
²Gidding



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³Zoeller



method

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Discussion

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۲۹ بهمن ماه ۱۴۰۲

المشاهد محقق اردبیلی، برگزار کردند
اولین همایش بین المللی
فیزیولوژی ورزشی
First International Exercise Physiology Conference



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Decrease Stress hormones And be discharge happiness hormones ,sports Activities do With ,oS be will it Persons anxiety Decrease And spirit improvement Cause Issue this find they To ,it has anxiety And Stress reason a every To That days At Man every That be will Advice down slow Feeling self Condition At recovery can the until pay to sports Activities)(Pour ۲۰۰۴ ,al et Ranjbar)

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۲۹ بهمن ماه ۱۴۰۲

انستیتاد معلقل اردبیل، برقرار هر کاند
First International Exercise Physiology Conference
اولین همایش بین المللی فیزیولوژی ورزشی



Press University Shiraz .. ۱۴۰۲ .M ,Yusefian ,Z ,race Muslim .A ,Salehi ,F ,jurist

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۲۹ بهمن ماه ۱۴۰۲

المشاهد معقل اردبیلی، مرکز ورزش
اولین همایش بین المللی
فیزیولوژی ورزشی
First International Exercise Physiology Conference

A comparative study of the hormone levels of athletes and non-athletes

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Summary:

This study aims to explore the role of hormones in regulating energy during physical activities. Proper energy balance and regulation are crucial for athletes' performance and success in the sports field. Recent research has shown that hormones play a significant role in regulating the metabolic and performance-related processes associated with exercise.

Hormones respond to exercise in various ways. For example, there is an increase in stress hormones such as cortisol and adrenaline, which help stimulate the release of glucose and fatty acids to increase fuel supply to the muscles. Additionally, growth hormone and testosterone are released during post-exercise periods to enhance muscle repair and tissue building.

Hormone levels also influence fuel utilization during physical activity. For instance, insulin increases blood glucose levels and promotes its uptake and utilization as an energy source. On the other hand, testosterone enhances the use of fatty acids as a fuel for the muscles, contributing to the body's ability to utilize fats as a primary energy source.

Furthermore, there is research interest in manipulating hormone levels to improve athletic performance. Researchers believe that modifying hormone levels can positively affect athletic performance, including increasing strength, endurance, and enhancing recovery processes.

Keywords: surface levels, athletes, non-athletes, sports activities

This study faces some challenges. For example, the complex nature of hormonal interactions and individual hormone responses pose challenges in understanding the role of hormones in energy regulation in sports. This requires further research and completion of studies to elucidate these relationships and identify the precise mechanisms linking hormones to athletic performance.

In general, this study highlights the importance of hormones in regulating energy during physical activities. Understanding the impact of hormones on fuel utilization and athletic performance can help improve athletic performance and achieve desired outcomes. By leveraging this knowledge, evidence-based strategies can be developed for exercise regulation, nutrition, and manipulation of hormone levels to maximize the benefits of physical activity.

While research in this field is still ongoing and requires further studies, understanding the relationship between hormones and energy regulation in sports is an important step towards enhancing athletes' performance and advancing scientific understanding of the physiological processes occurring during physical activity.

There is still much research work required to reach definitive and conclusive results in this field, but future studies and advancements in technology will contribute to expanding our knowledge and understanding of the role of hormones in energy regulation during physical activities.

the introduction

Energy and its regulation are crucial aspects of physical activity. The performance of athletes relies on the provision of the necessary energy for intense physical exertion. Hormonal regulation plays a vital role in organizing and distributing energy in the body during exercise.

Hormones are secreted by endocrine glands and circulate throughout the body via the bloodstream, influencing metabolism, recovery processes, and physiological adaptations. The hormonal system interacts with other metabolic systems in the body to ensure the supply of energy required for athletic performance and stimulate post-exercise recovery processes.

Understanding the role of hormones in energy regulation during physical activity is of paramount importance. The regulation of energy in the body during exercise involves complex interactions between hormones and other metabolic systems. Comprehending the role of hormones in this process requires a detailed analysis of the various



effects of hormones and how they interact with each other and with other factors such as exercise, nutrition, and rest.

This study aims to achieve several objectives. Firstly, understanding the role of hormones in regulating energy utilization and distribution in muscles and tissues during physical activity. The potential effects of different hormones on energy utilization processes in the body and their conversion into physical performance will be analyzed. Secondly, identifying the factors that influence hormone secretion during exercise and how they impact athletic performance. Lastly, this study will provide a comprehensive insight into how this knowledge can be utilized to enhance athletes' performance and develop appropriate training and nutrition programs.

There are several hormones that play a crucial role in regulating energy during physical activity. Here are some examples:

1. **Adrenaline (Epinephrine):** Adrenaline is released by the adrenal glands in response to exercise or stress. It increases heart rate, blood pressure, and the breakdown of glycogen (stored glucose) in the liver and muscles, providing a quick source of energy.
2. **Insulin:** Insulin is produced by the pancreas and helps regulate blood sugar levels. During exercise, insulin levels may decrease, allowing for the release of stored glucose and promoting the uptake of glucose by muscles for energy.
3. **Glucagon:** Glucagon is also produced by the pancreas and has the opposite effect of insulin. It stimulates the breakdown of glycogen in the liver, releasing glucose into the bloodstream to maintain blood sugar levels during exercise.
4. **Cortisol:** Cortisol is a stress hormone released by the adrenal glands. During exercise, cortisol levels increase, mobilizing stored energy sources such as fats and proteins to provide fuel for the body.
5. **Growth Hormone:** Growth hormone is released by the pituitary gland and plays a role in muscle growth and repair. It helps to mobilize fatty acids from fat stores, which can be used as an energy source during exercise.
6. **Thyroid Hormones (T3 and T4):** Thyroid hormones regulate metabolism and energy expenditure. They play a role in maintaining a steady supply of energy for physical activity by influencing the breakdown of carbohydrates, fats, and proteins.
7. **Testosterone:** Testosterone is an androgen hormone that is primarily associated with male characteristics. It also plays a role in energy metabolism and muscle protein synthesis, contributing to athletic performance and recovery.

These hormones, along with others, work in coordination to regulate energy utilization, storage, and distribution in the body during physical activity. The levels and interactions of these hormones can vary depending on the intensity and duration of exercise, individual factors, and overall hormonal balance.

Research Objectives:

۱- Knowing the difference in hormone levels between people who practice sports and those who do not practice sports

۲- Knowing the effect of exercise on the level of hormones between the group that exercises and those that do not exercise

Research Hypotheses:

- The researcher assumes that there is a difference between the hormone levels between athletes and non-athletes

The research problem

addressed in this study is to investigate the variations in hormone levels between athletes and non-athletes. By examining the differences, the study aims to determine the impact of sports participation on hormone regulation and how it contributes to athletic performance. Additionally, it seeks to identify any potential advantages or disadvantages that athletes may have due to their unique hormonal profiles.



Research Scope:

- Spatial scope: Al-Kadhimiya Bodybuilding Club - Baghdad – Iraq
- Time scope: 21/4/1401
- Human scope: Bodybuilders at Al-Kadhimiya Club

Research Methodology:

This study will employ a descriptive research design. Hormone levels will be measured through blood samples collected from both athletes and non-athletes. The samples will undergo analysis using appropriate laboratory techniques, such as immunoassays or chromatography. Statistical analysis will be conducted to compare hormone levels between the two groups and explore potential relationships between hormone profiles and athletic performance.

Tables

Variables	The arithmetic mean is normal	Arithmetic mean for mathematicians	Standard deviation of normals	Standard deviation of athletes
Testosterone Hormone	٣٢٠	٥٤٥	15.275	44.4
Growth Hormone	6.6	1.52	11.3	2.08
Cortisol Hormone:	١.8	0.9	2.1	1.1

Discuss the results

The research results indicate that there is a difference in hormone levels between athletes and non-athletes. This means that the hormone levels for athletes significantly differ from those of non-athletes. These findings suggest that physical activity and sports training have an impact on hormone secretion in the body.

To discuss these results in detail, we can focus on the following factors:

Testosterone Hormone:

Research suggests that testosterone levels are higher in athletes compared to non-athletes. This enhances athletes' ability to build muscles and increase muscle strength. Testosterone hormone is also responsible for improving athletic performance by enhancing strength and endurance.

Growth Hormone:

The level of growth hormone may be higher in athletes due to intense physical training and endurance. Growth hormone plays a crucial role in increasing muscle size, tissue formation, and body recovery after intense workouts.

Cortisol Hormone:

Intensive exercise may have an impact on cortisol hormone, which is a stress and stress response hormone. The cortisol hormone levels may be elevated in athletes as a result of physical stress and fatigue from intense training.



However, proper training management and rest are required to maintain a balance of cortisol hormone and avoid excessive increases that may negatively affect athletic performance.

Influence of Diet and Lifestyle:

The impact of physical activity and sports training on hormones may be associated with other factors such as diet and lifestyle. For example, a balanced diet rich in protein can contribute to the secretion of growth and testosterone hormones. Additionally, the overall lifestyle of athletes, including good sleep and stress reduction, can affect hormonal balance in the body.

It is worth noting that these results are not absolute and can be influenced by multiple factors, including the type of sport, fitness level, and genetic factors. Results may vary from one study to another, so it is important to approach the current findings with caution and consider them as contributions to understanding the relationship between physical activity and hormones.

Furthermore, it is important to consider that hormones are not the sole factor influencing athletic performance and physical adaptation. Other important factors such as technical and tactical training, mental capacity, and mental resilience also play crucial roles.

Conclusions

- Regular and moderate physical activity can have a positive effect on hormone balance in the body.
- Intense exercise and rigorous training can temporarily increase the secretion of certain hormones, such as human growth hormone and testosterone.
- Proper nutritional balance and good sleep also play a role in improving hormone balance.

Recommendations

1. Engage in regular moderate-intensity aerobic exercises, such as brisk walking, cycling, or swimming, for at least 150 minutes per week. This can help improve hormone balance and overall health.
2. Include strength training exercises at least two days a week. Resistance training, using weights or bodyweight exercises, can help increase muscle mass and promote the release of hormones like testosterone and growth hormone.
3. Incorporate high-intensity interval training (HIIT) into your exercise routine. HIIT involves short bursts of intense exercise followed by periods of rest or lower intensity. This type of training has been shown to have positive effects on hormone levels.
4. Prioritize regular sleep and aim for 7-9 hours of quality sleep per night. Sufficient sleep is essential for hormone regulation and overall well-being.
5. Maintain a balanced diet that includes a variety of nutrient-dense foods. Ensure you're consuming adequate protein, healthy fats, and complex carbohydrates to support hormone production and overall health.
6. Manage stress levels through relaxation techniques such as meditation, deep breathing exercises, or engaging in activities you enjoy. Chronic stress can disrupt hormone balance, so finding effective stress management strategies is important.

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۲۹ بهمن ماه ۱۴۰۲



The effect of healing exercises using aids and tools on some functional variables and soccer scoring skill

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Abstract

Athletes at the level of the Iraqi league face more and more escalating physical loads related to the goals pursued by the athlete, which require discovering and developing training methods and directing them towards increasing the efficiency and ability of athletes to achieve the best results. There is no doubt that physiological changes affect and are affected by human physical and skill capabilities in all sports activities. Fatigue is the main reason for limiting the player's continuity in performance, as he interpreted many of the phenomenon of fatigue as a physiological phenomenon that leads to a decrease in the athlete's efficiency. For the player and how to design a recovery program for football players and the role of the various healing means that will provide important scientific information that leads coaches and those in charge of football teams to pay attention to the phenomenon of low physical fitness and try to plan to avoid it or reduce its effects through the preparation of healing exercises applied to a sample of football players and adults Their number is (24) players. The study aimed to identify its impact on some functional variables and the scoring skill of young football players, and the researcher assumed that there were statistically significant differences between the tribal and remote tests in the functional abilities of young football players. The second hypothesis was that there are statistically significant differences between the tribal and remote tests. In scoring skill for young football players.

Keywords: **football, recovery, performance, energy**

1-1 Introduction and importance of the research:

Practicing sports and sports activities place a great burden on the various organs and organs of the body, as athletes face more and more escalating physical loads associated with the goals pursued by the athlete, which require the discovery and development of training methods and directing them towards increasing the efficiency and ability of athletes to achieve the best results. There is no doubt that physiological changes affect and are affected Human physical and skill capabilities in all sports activities.

It was found that fatigue is the main reason for limiting the player's continuity in performance, as many scientists have interpreted the phenomenon of fatigue as a physiological phenomenon that leads to a decrease in the athlete's efficiency and can be identified through several internal and external manifestations.

Therefore, the problem of not continuing the physical performance resulting from the appearance of fatigue makes us need to research in a way that can contribute to overcoming the outcomes and causes of this problem so that the player can resume his activity quickly again. Therefore, the high training loads in terms of sizes and weights necessarily included planning Training is not only the training programmes, but these programs themselves have come to include, in addition to the training doses, the planning of means for resting or restoring recovery.

In order to reach a high athletic level, the relationship between the exerted effort and the recovery period of hospitalization must be properly controlled, and the effort exerted and the recovery period of hospitalization should be considered as one unit.

The rapid development in the reluctance and intensity of training loads has led to an interest in the athlete's recovery processes and the speed of his disposal from the effects of fatigue resulting from the previous training dose or from competition. He faces this challenge that imposes on him the use of heavy loads and at the same time does not cause any health, physical or technical harm to the athlete.

The lesson here is not just using large training loads as much as the accuracy and correctness of building and planning these loads when applying them. The effect of training loads is not considered to merely bring about physiological changes during work (the recovery period), and that the body is not exposed to two cases only: rest and work, but rather to the preparation of hospitalization.

The functional processes of the body are linked to each other, and the body's work to restore recovery begins immediately after the completion of the physical work and the functional state that the individual goes through



after physical work and until returning to the normal state is called the recovery recovery period, after which the body returns to its normal state.

Therefore, the importance of the research is to address an important aspect of the training process, which is to identify the role of hospitalization in raising the physical, physiological and skill level of the player, how to design a recovery program for football players, and the role of the various healing means that will provide important scientific information that leads to a better understanding of the impact of the hospital program that helps Coaches and those in charge of football teams pay attention to the phenomenon of low physical fitness and try to plan to avoid it or reduce its effects.

1-2 research problem:

By following up on the Iraqi football league matches and the field practice of the researcher, being a former player and current football coach, he noticed a decrease and weakness in the skill performance in the match, as well as an increase in fatigue for most of the players of the Iraqi football league teams despite conducting a training unit. Healing exercises that can return players to their normal position before high physical performance as soon as possible to restore their energy stores and get rid of fatigue residues in order to avoid injuries that may occur as a result of increasing the training load, which thus leads to a decrease in the levels and skill performance of sports teams.

1-3 Research Objectives:

- 1- Preparing recovery exercises for football players.
- 2- Identifying the effect of recovery exercises on some functional variables among young football players.
- 3- Recognizing the effect of recovery exercises on the scoring skill of young football players.

1-4 Research Hypotheses:

- 1- There are statistically significant differences between the tribal and remote tests in the functional abilities of young football players.
- 2- There are statistically significant differences between the tribal and remote tests in the scoring skill of young football players.

1-5 Research areas:

- 1-5-1 The human field: the youth football players of the Al-Shoula Sports Club.
- 1-5-2 Time range: from 9/9/2023 to 16/11/2023.
- 1-5-3 Spatial domain: Al-Shoula Sports Club stadium.

Research methodology and field procedures:

2-1 Research Methodology:

The nature of the problem is what determines the method used, so the problem imposed on the researcher to use the experimental method, and the experimental method is known as “Experimental (Research)” as “a deliberate and controlled change of the specific conditions of an accident and the observation and interpretation of the resulting changes in the event itself” (Wajih Mahjoub, 2005, p. 269).) .

2-2 The research community and its sample:

The selection of the sample is related to its representation of the research community, and the research community is represented by the players of Al-Shula Sports Club for the youth group for the 2022 training season, which are (26) players, and (2) players were excluded from them due to injury, and the researcher chose the research sample in a deliberate way, as he chose (6) players from them. An exploratory sample so that the total number of the two groups (24) players represented the main sample, and it was divided into two groups randomly by lottery, each group of (12) players to be the experimental group and the other to be the control group.

2-3: Research tools, means and devices used in the experiment:

2-3-1: Research Tools:

The research tools adopted in this study are the method used by the researcher
By collecting the required data, the research tools used by the researcher are:

1. Personal interviews with experienced and specialized people.
2. Observation and experimentation.
3. Physiological tests and soccer scoring test.
4. Auxiliary work team.
5. Expert evaluation forms.
6. Hospital approach.
7. Arab and foreign sources.
8. The International Information Network (Internet).

2-3-2: Equipment and means used in the research experiment:



1. Medicine ball (4).
2. A Chinese-made digital electronic stopwatch (LCD) waterproof digital stopwatch (Aliexpress) type.
3. Rubber bands (mini bands) (12) of a German-made type (Adidas).
4. Elastic rubber bands (4) (magilo) Bands Resistanc, Italian made.
5. German-made Riester Diplomat-Presameter, number (1).
6. An American-made OX meter, number (1).
7. Small Japanese-made casio electronic arithmetic calculator, number (1).
8. Weighing scale with hour indicator type (HHHO) made in China.
9. Length measuring tape.
10. Foam Roller (4) of a German-made type (Adidas).
11. Box number (1)
12. Plastic cones (15).
13. Scout ropes (4).
14. Footballs (10).
15. Football pitch, whistle, tape measure, stopwatch.

2-4: Field Research Procedures:

2-4-1: Determine the search variables:

The researcher conducted personal interviews with some of the experts and specialists in order to control The tight scientific experimental design that addresses all research variables and completes the requirements The study in a way that ensures the identification and inventory of the variables as shown in Table (1).

Table (1) Determine the study variables

dependent variables		independent variable
its type	Variable name	
- \Scoring.	skill	hospitalization program
- \vo2 max.	physiological	
- \Heart rate before exercise.		
- \Blood pressure of both types before exertion.		

2-5 Application of the hospital program:

The nature of the training units that the players received by the mobile researcher was at the rate of three units per week for a period of two months, and the hospital program was applied at the end of the training units for a period of (16-17 d). Where the hospital unit was completed in the form of (stations), where the experimental group, which numbered (12) players, was divided into two stations, each station (6) players, and each player performs a specific exercise for a period of (30 seconds) and then switches to the other exercise until the end of the station and then starts from It is new to repeat the first exercise in the same station until the exercises are completed at the station and then move to the other station where he begins with other different exercises. The second station consists of (6) exercises performed by the player while repeating them again, where the total exercises that the player performs entirely in the hospital unit (24) Healing exercises, and the program began on 9/9/2023and ended on 16/11/2023.

2-6: Statistical means:

- 1- The statistical bag system (SPSS) was used to extract percentage values
- 2- Arithmetic mean



- 3- standard deviation
- 4- The mediator
- 5- skew modulus
- 6- Simple Correlation Coefficient (Person)
- 7- t-test of correlated samples

Presentation, analysis and discussion of results.

3-1 Presenting, analyzing and discussing the results of the functional abilities between the pre- and post-test of the experimental group.

Table (2)

Arithmetic means, standard deviations, mean difference, standard deviation, calculated (T) values and the significance of differences between the results of the pre and post tests in the functional abilities tests of the experimental group

The significance of the differences	value(t) calculated	p	q q	Posttest		pretest		measruing unit	Variables
				p	s	p	s		
moral	۵,۰۲	۲,۷۱	۵,۱۳	۲,۲۴	۶۲,۷۷	۲,۱۲	۶۷,۸۴	against	Pulse before voltage
moral	۴,۹۸	۱,۳۵	۵,۴۳	۴,۲۳	۱۲۵,۲۲	۲,۷۸	۱۳۰,۰۸)mm/Hg (systolic pressure
moral	۷,۶۸	۱,۹۸	۴,۳۸	۳,۷۶	۷۲,۶۲	۲,۱۵	۷۷)mm/Hg (diastolic pressure
moral	۵,۹۰	۶,۷۶	۱۱,۵۲	۱,۵۵	۵۳,۳۵	۱,۷۲	41.83	mL/kg/sec	Vo2 max

The tabular value of (T) is (2,201) at a degree of freedom (11) and at a significance level (0.05).

Table (3) Variables Unit of Measurement Pretest Post Test SQF QV Value (T) Calculated significance of differences

The significance of the differences	value(t) calculated	p	q q	Posttest		pretest		measruing unit	Variables
				p	s	p	s		
moral	۶,۶۱	۲,۱	۳,۹۷	۱,۹۸	۶,۷۷	۰,۹۴	۲,۸	Degree	Scoring test

Table (T) value (2,201) at a degree of freedom (11) and at a significance level (0.05)

After looking at the results shown in Tables (2), (3), which shows the results of the experimental group in the pre and post measurements of the functional tests, it becomes clear to us that the experimental group has improved its level.

The researcher attributes the reason for these differences to the hospitalization exercises prepared by the researcher, which had an effective effect in finding the differences between the pre-test and the post-test and in favor of the post-test.

As well as the nature of the exercises that were applied to the experimental sample, which made these differences between the results of the pre and post tests.



The use of recovery and calming exercises, where he took into account from the beginning the use of the principle of regulating recovery in line with the training intensity in the program applied to the experimental sample, which works on the rapid drop in the pulse and return to the natural state of the player.

And the use of some calming and healing exercises of various kinds helped positively to develop functional and skill capabilities.

The researcher believes that the training method used for recovery exercises according to the pulse index, which included all parts of the body, achieved its goal, as the members of the experimental group were able to a high degree without a drop in their level. From physical adaptation to the effectiveness and impact of recovery exercises, and (Fadil Kamel and Amer Fakher) points out that "healing exercises are physical exercises that gradually reduce body temperature and pulse rate and speed up the recovery process" (Fadil Kamel mentioned, 2008, p. 186).

Shapiro smith asserts that "coordinating the use of calming exercises with increasing training intensity may show a high degree of adaptation" (Shapiro smith, 1983, p82).

With regard to blood pressure, the researcher believes that the decrease in blood pressure occurred (Systolic and diastolic) Its cause is due to the correct and legalized scientific training that the researcher followed, as well as recovery after physical exertion. As (Devrise) points out, "regular training adapts the heart to the effort, and leads to a lower heart rate during rest or when giving different training loads, compared to people who do not exercise regularly, and the reason for this is due to the amount of blood paid in one stroke." Increasing the rest period between one stroke and another." (Derrise, 1980, p125)

The regular practice of sports activity leads to the development of some functional capabilities, and this change is due to the nature of the muscle groups that are most used in this." (Youssef Lazem and Saleh Bashir, 2006, pg. 64)

Where the researcher attributes the exercises used were effective in developing (Vo2 max) in the tribal and post tests and for the experimental group, where it was better than the control group. This is due to the role of the healing exercises used by the experimental group. "The minimum effort increases the body's need for oxygen for the muscle cell, and in response to this, the demand for oxygen will increase and the respiratory effort will speed up its work, and the increase in respiratory functions depends on the intensity and duration of performance." (Marshall, R.j and wphero).

Also, (Vo2 max) under the influence of controlled and organized sports training, the strength of the breathing muscles (diaphragm muscles and intercostal muscles) improves. As a result, the process of pulmonary ventilation improves during the performance of physical exertion, that is, the volume of breathing air increases, as the volume reflects the ability of the lungs to Air absorption, and therefore the vital capacity is an important indicator for knowing the maximum volume of breathing air when performing a physical load. This will be at the expense of the oxygen consumed by the rest of the body. (Abu El-Ala Ahmed Abdel-Fattah and Mohamed Sobhi Hassanein, 1997, p. 277)

As for the soccer scoring skill, the researcher attributes this development and the preference that occurred to the experimental group, which was better than the control group, whose development was limited, to a number of things and factors, namely.... that the researcher before preparing for the recovery exercises through which he aimed to develop scoring from the movement He was fully convinced that recovery exercises are one of the important characteristics of a football player, and in order for the player to perform this skill perfectly, the coach must carefully choose the training sizes and intensity, the appropriate rest periods, as well as knowing the general physiological condition of the athlete because scientific sports training must be linked with physiology. The player's body, and with the help of the recovery exercises, these positive results were obtained for the experimental group, and about this (Hanafi Mahmoud Mokhtar) indicates that "the speed of skill performance is one of the important characteristics of the football player, and in order for the player to perform skills during matches at the ideal speed, the coach must mean the selection of exercises Which is completely similar to what happens during the matches and he trains the players on them with the gradual performance until the player gets used to it Boone for her performance with the same force and speed that she should perform during the match. (Hanafi Mahmoud Mukhtar, 1989, p. 93)

The researcher attributes the superiority and development of the experimental group that applied soccer recovery exercises to the control group that did not apply these exercises and relied on the coach's approach in developing the skill under study, to the fact that the special exercises were effective to a large extent in eliminating fatigue faster than the control group, so the positive rest It has a great role in getting rid of fatigue.

4- Conclusions and Recommendations:

4.1 Conclusions:



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In light of the findings, the researcher reached the following conclusions:

- 1- There is a close correlation between the level of cardio fitness, the oxygen capacity and the skill performance of young football players
- 2- The exercises of Restoration of hospitalization will have a positive effect on functional capabilities, delay the onset of fatigue, and develop an increase in oxygen capacity.
- 3- The hospital program prepared by the researcher contributed to improving the scoring skill of football players.
- 4- The use of aids had a greater impact on improving functional and skill capabilities.

4-2 Recommendations and Suggestions:

According to the conclusions reached, the researcher recommends the following:

- 1- The hospitalization methods under study can be used to return the athletes to a normal state.
- 2- The necessity of paying attention to physiological variables when preparing a training curriculum.
- 3- Conducting a periodic medical examination to assess the players and their readiness to bear the burden of training.
- 4- Conducting complementary research and studies for players of different categories and adding other indicators

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Explain the effect of exercise on chronic constipation.

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abstract

Constipation is a common disease that is widely seen in clinical visits and has important effects on the family and society. Constipation is a condition that is usually accompanied by a decrease in the number and volume of stools and can cause dissatisfaction and discomfort for the affected person. The causes of constipation can include physical factors, psychological factors, nutritional abnormalities, and medication use. Treatment for constipation depends on the underlying cause, but usually, diet modification, lifestyle changes, and over-the-counter medications can provide relief. Finally, to maintain health and prevent constipation, it is recommended to follow a healthy diet, consume high fiber and consult with a specialist doctor. This disorder is affected by functional factors in many cases. However, in severe and refractory cases, the evaluation of secondary causes is very important in order to properly diagnose constipation and provide appropriate treatment. Exercise is also an important factor in managing constipation. Regular exercise and physical activity can help improve and increase bowel function. Endurance exercises such as running, walking, swimming, and abdominal rotations can help with normal bowel function and improve constipation. Also, exercise can reduce stress and regulate the nervous system, which may be effective in improving symptoms of constipation. In describing and examining the concept of constipation from the patient's point of view, attention should be paid to the signs and symptoms that may indicate the presence of secondary causes (such as weight loss, gastrointestinal bleeding, anemia, etc.

Keywords: Physical activity, exercise, constipation, prevention, disease

In the absence of warning signs and symptoms, it can be treated by following recommendations on fiber intake, diet, fluid intake, increased physical activity, and not taking drugs that cause constipation. The incidence of chronic constipation in society is always an important challenge among people. According to statistics, 50 cases of constipation occur every year for every 1000 people. These statistics show that this problem is widely present in the society and most likely needs appropriate solutions to manage and reduce this problem. The results of this research showed that one hour of walking with 60% of the maximum heart rate per day can provide a very good recovery for people who have no physical activity and no history of illness, but suffer from chronic constipation. In justifying the improvement achieved by walking, it can be mentioned that the activity increases the tone of the digestive organs such as the intestine, and the movements of the intestines may become more normal and the problem of constipation will be reduced to the minimum possible. In the body's digestive system, increasing bowel movements prevents chronic constipation. For this reason, patients who have undergone surgery are encouraged to walk as soon as possible after surgery, so that digestive movements can return faster and prevent constipation. Also, the patient is able to tolerate oral nutrition. (Talley et al., 1992)

The problem of chronic constipation is relatively high among the Asian elderly population. According to the research, 10.8% of this age group reported symptoms related to chronic constipation. More surprisingly, it is more common in women than men, in non-whites than whites, and even in children than adults. Chronic constipation, which is considered as one of the most common digestive problems, can be very bothersome for the sufferer. This problem usually occurs with insufficient stimulation of the stomach and intestines, as well as irregular bowel



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function. On the other hand, improper lifestyle, unbalanced nutrition and lack of fiber in the diet can contribute to the emergence of chronic constipation. (Heaton et al, 1992), (Johanson et al, 1989), (Nyam et al, 1997) Severe constipation, for example, we see two or fewer bowel movements per month in women. This problem occurs more in female patients with irritable bowel syndrome (IBS). Some studies have even shown that the frequency of constipation is higher in these patients. (Ebrahimi et al., 2006) Chronic constipation can interfere with daily activities. Chronic constipation may cause people to strain too much to have a bowel movement. Treatment of chronic constipation depends in part on the underlying cause. However, in some cases, the cause is never found. Sports is a competitive activity based on physical skills and plays an important role in the prevention and treatment of various diseases along with physical health. Some of these diseases include kidney, lung, orthopedic, infectious, neurological, heart pain, stroke, and fatty stroke. Also, exercise can help treat chronic diseases such as constipation and arthritis. By strengthening the cardiovascular system, exercise can effectively strengthen the heart and lungs and give hope for their optimal performance. For this reason, the risk of cardiovascular disease is greatly reduced. Scientific observations show that people who are engaged in a profession that involves daily physical activity are less likely to suffer from heart attacks. Exercise plays an important role in the prevention and treatment of cancer and physical and mental health. Exercise is useful for increasing physical strength and maintaining a healthy mind. People with weak physical strength can have negative emotions and psychological problems. Athletes have excellent behavioral traits such as leadership, personal and social values, self-confidence and more social growth. Research shows that exercise contributes to mental health and prevention of mental disorders. Also, exercise reduces anxiety and depression and releases energy. Sports in childhood and adolescence are very enjoyable and relaxing. Exercise has a significant effect on the vitality of people and makes them better and more successful. Athletes learn qualities from their coaches that are less visible in the behavior and actions of others, and this increases their personality. Sports has an undeniable role in all stages of life and should be given more importance. (Ismail Vand, 1401)

Proper exercise can greatly help prevent constipation. Physical activity is one of the basic factors for bowel movement and food decomposition. For this reason, people who are more active have less constipation problems. Among the useful exercises for constipation are: yoga-squat-lounge-cycling-walking-plank-pelvic floor exercises. The effect of exercise on the digestive system:

Exercise and physical activity have a significant positive effect on the functioning of the human digestive system. In such a way that many internal specialists believe that most human diseases occur due to disorders in the digestive system. Exercise and physical activity can help improve the functioning of the digestive system and increase the level of health and general improvement of the body.

Studies have shown that regular and continuous physical activity can improve the functioning of the digestive system. These activities increase the movement of the muscles of the stomach and intestines, which in turn facilitate better digestive function and improved digestion of food. Also, exercise leads to an increase in the production of beneficial chemicals such as digestive hormones that help the digestive system function properly. Regular physical activity also reduces the symptoms of some gastrointestinal diseases such as constipation, irritable bowel syndrome and inflammatory bowel diseases. Exercising and intermittent exercises included in the daily routine can help to regulate the food intake and better movement of food in the digestive system, thus improving its performance.

Therefore, it is very important to plan to do regular physical activity and various and appropriate sports as a method of prevention and improvement of the digestive system. Finally, regular exercise and physical activity promote general health and well-being and help achieve a better level of health and wellness.

The positive effects of exercise on the digestive system include:

1. Physical exercises stimulate appetite and desire for food. Especially in people who suffer from anorexia nervosa, this effect is very evident.
2. Exercise prevents constipation by stimulating the digestive system.

As the research has shown, one of the factors of constipation is the weakness of the pelvic floor muscles, which considering that the subjects had an inactive lifestyle, one of the improvement factors can also be found in strengthening the relevant muscles due to regular activity and He knew how to walk. One of the other factors is psychosomatic constipation, which is rooted in anxiety and lack of familiarity with the environment. Since most of the students are away from their families and suffer from various problems, it is possible that this factor has also had an effect on causing constipation in them, and physical activity and group walking have been able to cheer them up and have an effect on Anxiety and tensions are also indirectly effective in recovery.



In Iran, no comprehensive epidemiological studies have been conducted to evaluate the prevalence and incidence of constipation. However, some limited studies have been published in this area. For example, in a study at Yazd University, it was found that 55% of patients had normal colonic transit, 17% of them had slow transit, and 7.5% of them had minute disorder. In addition, 20% of the study subjects had a combination of slow colonic transit and impaired excretion.

Constipation can be a complication with systemic or neurological disorders. On the other hand, constipation is a side effect of many common medicines. To facilitate the diagnosis of constipation, it is divided into three groups: normal transit, slow transit, and defecation disorders with rectal emptying:

Constipation with natural transit: The largest number of cases of constipation (59%) belong to the category known as functional constipation. This category of patients usually complains of difficulty in defecating and defecating hard stools. In some cases, patients' symptoms are aggravated by mental stress and may be accompanied by bloating, pain and abdominal discomfort. Most patients in this category respond favorably to receiving fiber alone or with an osmotic laxative.

Excretory disorders In 25 cases, excretory disorders are the cause of constipation, which are often caused by disturbances in the structure of the pelvic floor or the anal sphincter. Structural disorders such as rectocele or excessive perineal descent syndrome are less frequent causes of defecation disorder. Some patients may have a history of physical sexual abuse and eating disorder, to diagnose pelvic floor coordination disorder, Rome working group criteria can be used.

Constipation with transit: slow is the cause of 13% of the attached cases, which is mostly seen in young women and with a decrease in the frequency of bowel movements. Once a week or less, the onset of symptoms is usually around puberty. Mild cases respond to dietary fiber. But severe cases will not respond favorably due to the severe delay in emptying the ascending colon and the reduction of high-amplitude peristaltic contractions after meals. (Amirbaigy et al., 2006)

In a study conducted by Nakaji et al. in 2002, the relationship between lifestyle factors and bowel movements in the Japanese community was investigated. This research was conducted by distributing a questionnaire among 1699 people in Japan and the results showed that there is a positive and significant relationship between age and constipation in men, but this relationship was not observed in women. It was also found that fiber consumption is related to constipation in both sexes and this relationship is observed only in men. The latest research shows that exercise can also improve the problem of constipation in Japanese society. (Nakaji et al., 2002)

Simren (2002) in his research entitled the relationship between sports activity and gastrointestinal disorders concluded that the existence of inactivity has a role in the elimination of gastrointestinal problems. However, based on strong evidence, it cannot be claimed that sports activity is effective in treating these problems. Exercise is one of the ways that can help improve the entry and exit of food from the digestive system. For example, one of the common problems in this area is constipation. Constipation, as one of the stomach and intestinal discomforts, may disturb many people. But based on research, exercise can act as an effective solution to improve this problem. Studies have shown that physical activity can stimulate excretion and help regulate digestive muscle activity. Constipation can be improved by doing proper exercises and exercises that strengthen the abdominal and intestinal muscles. (Simrén et al., 2002)

In a study conducted by Robertson et al. in 1993, the effect of exercise training on total and partial colonic transit in constipated patients was investigated. The results of this research showed that there was no effect of one hour of daily walking on colon transit in constipated patients. This finding shows that exercise alone is not enough to accelerate colon transit in constipated patients. To improve the condition of constipation, other measures and treatments are needed. Therefore, it is recommended for constipated patients to consider other measures in addition to exercise to experience improvement in their condition. (Robertson et al., 1993)

In 2005, a study titled the effect of regular physical activity on the pattern of abdominal emptying in middle-aged patients with chronic constipation was conducted by Skriver et al. In this research, 45 subjects under the age of 40 were divided into two experimental and control groups. The control group continued their normal lifestyle, while the experimental group exercised for 12 weeks with 30-minute sessions of brisk walking. At the end of the research, using radiography, intestinal transit was tested and the results showed that regular physical activity has a positive effect on the excretion pattern and intestinal transit. In other words, regular physical activity led to a reduction in bowel movement time and frequency. Overall, this research shows that exercise improves the pattern of abdominal emptying in middle-aged patients with chronic constipation. These results indicate the importance



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of physical activity in improving gut health. For this reason, it is recommended that people with chronic constipation include regular and suitable exercise programs in their daily life to experience an improvement in their bowel emptying pattern. (De Schryver et al., 2005)

In a study conducted by Brown et al. in 2000, the effect of physical activity on constipation in Australian women was investigated. The results of this research showed that exercise can significantly improve the symptoms of constipation. Constipation is a common problem that many people face and it can have a devastating effect on their quality of life. In this research, a sample of Australian women was investigated and the effect of physical activity on constipation symptoms was investigated. The results showed that physical activity can significantly improve the symptoms of constipation. Therefore, exercise as a natural and simple method can be considered as an effective solution to deal with constipation. Constipation is one of the issues that can negatively affect people's quality of life. (Brown et al., 2000)

Masson and colleagues in 2000 investigated the possibility of stress and depression in women with constipation. The results of this study showed that this probability is higher than the normal population. Constipation is a common disease known as functional constipation and is often caused by dysfunction of the pelvic floor muscles. The treatment of this chronic disease is usually done through physiotherapy (Mason et al, 2000).

According to the research in the field of traditional medicine of Iran and China about constipation, it has been shown that in Chinese culture, the stomach and large intestine directly accept each other's influence and cause constipation. As a result, the simultaneous use of Iranian and Chinese traditional medicine treatments as complementary treatment methods, along with exercise, is the best way to manage and treat constipation. In traditional Iranian medicine, some factors such as nutritional deficiency, lack of fiber, lack of water, and mental-spiritual problems are known as the main causes of constipation. For this reason, it is recommended to consider a diet rich in fiber and healthy foods. Also, consuming herbal teas such as onion, garlic, cardamom, dill, rosemary and thyme can help. On the other hand, in traditional Chinese medicine, energy and Qi flow in the stomach and large intestine are very important. For this reason, using techniques such as abdominal massage, deep breathing and fitness exercises can help improve digestive function. (Maciocia et al, 2004)

In 2020, Abdullahi et al. investigated the effect of combined exercises for six weeks on improving the quality of life and physical performance after chemotherapy in patients with colon cancer. Colon cancer is a disease that is associated with abnormal growth of cells and has the ability to attack and spread to other parts of the body. The treatment of this disease is accompanied by many physical and psychological side effects. One of the common side effects of chemotherapy in colon cancer patients is constipation. Constipation means a significant decrease in the number of stools or difficulty in emptying them. This problem can affect the quality of life and physical performance of patients. Combined exercises include a combination of endurance, strength and flexibility exercises that aim to improve physical performance and reduce side effects associated with chemotherapy. Based on the results of Abdullahi et al.'s research, these exercises can facilitate the improvement of the quality of life of colon cancer patients and increase their physical performance. Considering the importance of this research, it is recommended to treat colon cancer with combined exercises to reduce the side effects of chemotherapy and improve the quality of life of patients. As a result, combined exercises can play an important role in the management of colon cancer. Colon cancer is a serious disease that is related to the development of cancer in the colon. But exercise can be used as a promising strategy to treat some of the psychological and physical complications that occur during and after colon cancer. Performing combined exercises seems to improve the quality of life and physical performance of patients with colon cancer. Specialists are advised to consider exercise training to facilitate improvement in patients' quality of life and physical performance.

The results of this research show that the training protocol (including aerobic and relaxation exercises) significantly accelerates the improvement of the quality of life in all dimensions (psychological, social, physical and environmental) and improves the physical performance of the training group compared to the control group. forgives. In this research, especially against the problem of constipation, aerobic exercises and relaxation have had a significant effect. Patients who suffer from constipation can experience a significant improvement in the symptoms and indicators of their disease by performing the mentioned exercises. Finally, the results of the current research confirm that aerobic exercises and relaxation play an effective role in improving the quality of life and physical performance of people suffering from various diseases, including constipation. Therefore, it is recommended for people suffering from these diseases to experience a significant improvement in their quality of life and physical performance by following the advice of specialist doctors and starting to do aerobic and relaxation exercises.



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These findings prove that sports exercises under direct supervision are very important for cancer patients. Therefore, due to the use of sports expertise, access to better equipment and proper exercise prescription, it is recommended that patients with active cancer keep themselves active after physical therapy. The positive effects of exercise on patients are clear, but due to the lack of sample numbers, these findings cannot be generalized to a larger group. In addition, cancer patients may struggle with problems such as constipation and related ailments. Therefore, in sports training for this group, things like proper nutrition and respect for one's abilities should be considered. As a result, sports guidance under direct supervision is very important for cancer patients and allows patients to experience physical improvement after treatment.

Improving the quality of life of cancer patients is a major concern that requires proper care and development. Constipation is one of the effective factors in increasing anxiety and reducing the quality of life of cancer patients. The improvement and proper management of this disease can have a significant effect on improving the lives of patients. Constipation, as one of the common symptoms in cancer patients, can negatively affect their daily activities. Therefore, the correct management and treatment of constipation, in addition to reducing pain, can significantly improve the quality of life of cancer patients. Considering the importance of improving the life of cancer patients, it is suggested that more efforts be made to improve the management and treatment of constipation in these patients.

The findings of the present research may lead to the development of intervention programs to help rehabilitation professionals and other health care professionals in improving the quality of life in elderly patients with colon cancer. Such interventions should focus on helping patients, increasing their sense of self-sufficiency, and improving body image, and therapists should try to reduce fatigue and its consequences and increase physical performance by performing appropriate exercises and with supervision, in addition to helping to strengthen the body's immune system.

The ability of some personal variables to explain the quality of life of elderly patients with colon cancer helps to deeply understand the factors related to the quality of life of these people. Therefore, future research should focus on investigating these variables such as self-efficacy, body image perception, gender and other personal variables such as patients' sense of control and optimism. These reviews are essential to help improve performance and increase people's motivation to deal with various problems and challenges, including constipation.

One of the factors that should be investigated in future research is the ability of colon cancer patients to communicate with others and express their feelings and fears related to the disease in a positive way with mental health measures. This issue is very important because colon cancer patients may face problems such as constipation and illness that can have negative effects on their mental health. Examining the ability of these patients to deal with these problems and positively relate to others will help us find ways to improve their quality of life.

It is important to examine all variables associated with constipation and disease in the context of longitudinal studies, which use larger samples. This method allows us to observe the changes that occur over time and draw conclusions about it. With this method, we can address the issue of constipation and disease in a more professional and complete way and obtain accurate and reliable results. (Abdullahi et al., 2018)

According to the research conducted in London, New Zealand, Los Angeles and Norway, Sahar Qara has concluded in 1378 that continuous physical activity can significantly reduce the risk of diseases. These researches show that regular physical activity can improve a person's health and prevent the occurrence of chronic diseases such as heart disease, diabetes and obesity. In this research, people who did regular physical activity showed that their immune system improved and the body's resistance to diseases increased. Also, regular physical activity can improve a person's mental and psychological performance and help reduce stress and increase energy.

In a Sarvistan survey on 2779 policemen and firemen in 2013, the issue of sports and social cohesion was investigated. The results of the survey showed that there is a correlation between the physical health of these people and their daily activities. This finding shows that people who are physically active and exercise regularly have better physical health and are more connected to society. As a result, encouraging and promoting physical activities and sports for policemen and firefighters can facilitate the improvement of their health and increase their social cohesion.

In 2002, Gosselin and colleagues conducted a study at Duke University to examine how exercise and physical activity affected a group of middle-aged men and women. In this study, 32 people participated in the survey. Of these 32 people, a group of 16 people underwent a 10-week program that included walking and jogging for 45



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minutes per session, three sessions per week. But another group of 16 people (control group) did not have any sports activities.

The results of this study showed that the test group who did sports had less anxiety, depression, fatigue and distress than the control group. Also, their physical strength also improved.

As a result, the study indicates the importance of exercise and physical activity in the mental and physical recovery of middle-aged people. By confirming the positive effects of exercise on mental and physical health, this study recommends that middle-aged people also pay attention to regular and appropriate exercise. (Goslin et al., 2002) In 1380, Alijani conducted a research on 36 non-athlete women. These women mostly worked as mothers and were involved in child rearing issues. He divided them into two groups: the group that exercised, known as the walking athlete group, and the group that did not exercise, known as the sedentary non-athletic group. In this research, Alijani's goal was to investigate the effect of sports and physical activity on the lives of these women. The results of the research showed that female athletes had better energy and health levels than non-athletic women. Also, exercise and physical activity can improve women's childbearing and family life issues. Therefore, this research shows that exercise and physical activity improves the quality of life of women. Therefore, it is recommended that women engage in daily sports activities to maintain their health and improve their lives.

In this research, the first group was required to participate in a 45-minute brisk walking program five days a week. But the second group had no sports activities. During this research, the mental health of both groups was measured three times using the general health scale. Physical activity and sports have always been recognized as an important factor in maintaining physical and mental health. Performing sports activities improves the functioning of the heart and blood vessels, the respiratory system and the immune system of the body. Also, physical activity and exercise can help improve mood, reduce stress and increase energy. In this research, the first group that participated in the brisk walking program had better results in mental health than the second group. These results show that regular physical activity can help improve mental health. Therefore, based on the results of this research, it is recommended that every person engage in regular physical activity and sports activities in order to maintain and improve their mental health. Of course, before starting any sports activity, it is recommended to consult a specialist doctor to determine the best exercise program for each person. Research shows that physical activity and exercise are very important for improving women's mental health. A group of women who participated in exercise and sports activities saw their stress scores increase from 71 to 81 after 6 weeks, indicating a positive mood. However, physical activity exercises in the group that were not active did not make a significant change in their mental health. Therefore, based on the research results, it can be concluded that sports training and physical activity are very effective for improving women's mental health.

By spending more time exercising and being physically active, the women in the first group showed higher energy levels and a sense of calmness and relaxation compared to the non-exercising group. Also, they experience less tension and anxiety, and in general, they have more satisfaction and interest in their lives. It seems that exercise and physical activity can have a significant effect on the psychological improvement of women. As a result, we recommend that women of all ages engage in sports and physical activity to reap the psychological benefits and improve their quality of life. (Alijani, 1380)

The findings of a long-term study by Karimian in 2002, which was conducted on 64 non-working men and women in the age range of 25 to 45 years, showed that the level of anxiety of the test group that was involved in physical activities such as aerobic and low-intensity sports for 3 months And the time-consuming ones such as light stretching and softening and recreational swimming, volleyball and badminton regularly played 2 hours a week, had decreased significantly. In this study, the effect of exercise and physical activity on relieving anxiety has been investigated. The results showed that participation in physical activities, especially aerobic and low-intensity sports such as stretching and light stretching and recreational swimming, volleyball and badminton, had the ability to reduce anxiety in non-working people in the age range of 25 to 45 years.

These results show that exercise and physical activity can be used as a strategy to reduce anxiety and increase mental health in people. This study emphasizes that performing physical activities regularly and in a suitable period of time can significantly improve the mental state of different people. According to this study, it is recommended that people of any age and occupation, including the unemployed, consider physical activities and sports in their plans. These activities can not only improve physical health, but also improve mental health and reduce anxiety. (Karimian, 1382)



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Harris (1381) stated in his research that almost all those who exercise say that they are refreshed and feel good and pleasant after doing sports; Their morale improves and they gain more self-confidence, and this feeling increases their efficiency and ability. Today, many scientific researches have shown that exercise, in addition to being a valuable tool for physical health, has a close relationship with mental health and especially the prevention of mental disorders. Exercisers tend to feel less anxious and depressed than sedentary people, and also examined the effect of eliminating exercise on ten volunteers who exercised 45 minutes a day, 6 to 7 days a week. In this way, after one day of training, they rested for three days and resumed training on the fifth day. Decreasing and eliminating exercise was associated with complications such as increased self-esteem disorder, anxiety, tension, depression, confusion, and decreased ability of people. These effects were reversed when exercise was resumed. Exercise, especially in childhood and adolescence, is a healthy escape to release their stored energy, and this itself is very enjoyable and relaxing. (Thomas Harris, 1381)

In 1998, Meshkinpour et al. conducted their research on a sample of 8 (7 women and one man) patients with chronic constipation in their research entitled "Effect of regular sports activity on the management of chronic constipation". These patients did regular training (one hour per day and five sessions per week) for 6 weeks and 4 weeks, and then rested for two weeks. In this research, the effect of regular exercise on the management of chronic constipation was investigated. The results showed that regular exercise can significantly improve the management of chronic constipation. This research was considered as a professional study in this field. They concluded that physical activity to the extent that people consider it as regular exercise, such as walking three kilometers daily without rest, cannot effectively control chronic constipation. The treatment of chronic constipation does not depend on exercise and physical exercise, but we should focus on diet and other factors.

Some effective methods to control chronic constipation are:

- Increasing the consumption of fiber in the diet
- Drink enough water and fluids
- Using foods containing probiotics
- Change in the type and composition of foods
- prescribing drugs for chronic constipation (Meshkinpour et al, 1998)

In 2007, Waldan et al. found a significant difference between factors related to well-being and quality of life in people with and without constipation. Also, a significant correlation was observed between quality of life and constipation. Exercise, as a health-related factor, can affect the quality of life of people with chronic constipation. Research shows that regular and continuous sports activities can help improve the symptoms of constipation and increase the quality of life of these people. Exercise that is intense and focuses on physical endurance, such as running, swimming, brisk walking, and other aerobic exercise, can help you stay fit and improve bowel movements. In general, exercises that include strengthening movements of the abdominal muscles and problems such as twists and bends are effective for improving chronic constipation. Exercises such as yoga and breathing exercises can also help regulate pressure in the abdomen and reduce the effects of chronic constipation. These exercises are often based on deep breathing and focusing on abdominal muscle tension. Also, during exercise, blood flow to the intestines increases, which can cause more bowel movements and reduce constipation. For this reason, regular and continuous sports activities accelerate the improvement of chronic constipation symptoms. Chronic constipation requires special care and proper techniques. In order to improve the symptoms of constipation and reduce its impact on the quality of life, basic medical advice is very important. For this reason, regular exercise can also bring effective improvement in controlling chronic constipation. Exercise can act as one of the appropriate solutions to reduce chronic constipation. By performing sports activities, intestinal muscles are stimulated and natural contractions are intensified and intestinal function is improved. As a result, intestinal motility increases and the removal of food from the body is improved. To achieve better results in controlling chronic constipation, it is better to engage in regular and continuous sports activities. But in choosing the type of exercise to control chronic constipation, you must act carefully. Exercises that include stretching and exercises to strengthen the abdominal and pelvic muscles can be very helpful. For example, yoga, walking, swimming and cycling are some of the sports that can bring significant improvement in the control of chronic constipation. Along with medical advice and regular exercise, proper and balanced nutrition should also be considered as a basic solution in controlling chronic constipation. (Wald et al., 2007)

In a research titled the relationship between physical activity, fiber consumption and other lifestyle variables with constipation in women, Laurent Doukas and his colleagues examined 62,036 women aged 61-36. They collected information through a postal questionnaire for two years. They collected in 1982-1980. In this research, an attempt



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was made to investigate the relationship between physical activity, fiber consumption and other factors that have an effect on chronic constipation. The research results showed that exercise and physical activity are very effective in reducing the risk of chronic constipation in women. Also, fiber consumption as an important factor in improved lifestyle plays an effective role in reducing this problem. Therefore, this research shows that doing regular physical activity and consuming high fiber in the diet can significantly improve chronic constipation in women. These results can help to improve the quality of life of women and reduce the problems that arise after chronic constipation. According to the study, the results show that daily physical activity and fiber consumption can help reduce the prevalence of chronic constipation in women. According to the observations, a decrease in the prevalence of constipation was observed in women who had bowel movements twice or less per week. Also, women who had regular physical activity had a much lower incidence of constipation. Also, fiber intake was associated with a lower incidence of constipation, especially in women who had a high-fiber diet. As a result, it is recommended that women pay attention to the two factors of daily physical activity and fiber consumption in their diet to reduce the risk of chronic constipation. (Dukas et al., 2003)

In 1999, Wang et al., in a study titled the relationship between individual social characteristics and lifestyle with constipation among Asian adults, used interview subjects in their research to improve and expand this content. The results of this research showed that the rate of constipation does not depend on gender and cultural factors, but it increases with the age of people and also the diet has an effect on constipation. In order to complete the content, we can mention the importance of exercise in reducing chronic constipation. Research has shown that sports activities, especially fitness training and cardio exercises, as well as changes in the way you eat, can make a significant improvement in reducing chronic constipation. Therefore, for people who are facing the problem of chronic constipation, it is recommended to follow regular and suitable exercise programs and follow a healthy diet containing fiber. In general, to fight chronic constipation, it is necessary to pay special attention to social factors and people's lifestyle. Also, promoting the culture of exercise and healthy eating can be effective in reducing this problem. (Wang et al., 1999)

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The effect of eight weeks of Taekwondo training on the endurance of the core muscles in girls with clubfoot

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Abstract

Background and purpose: Dynamic cross-leggedness of the knee is a common risk factor for acute injuries and overuse injuries of the lower limbs. The central region of the body can be considered as a muscle belt in the center of the movement chain, which is a stabilizing unit for the spine and trunk. The muscle strength and endurance of this area allows the system to perform the distribution, delivery and transmission of the desired force by mechanically stabilizing the spine. Many experts consider the central stability area as a key component in improving sports performance. Therefore, the purpose of this study was to consider the effect of eight weeks of Taekwondo training on the endurance of the core muscles in adolescent girls with clubfoot.

Methodology: The statistical sample of the research consisted of 30 girls aged 14-18. After the test, the samples were randomly divided into an experimental group (n=15) and a control group (n=15). To compare the average of the research variables before and after the exercise protocol in each group, the correlated t-test was used, and for the inter-group comparison of the variables, the analysis of covariance test was used at the significance level of $P \geq 0.05$.

Results: The results of the correlated t-test showed that there was a significant difference ($P \geq 0.05$) in the scores of Chorus muscle endurance (Sorenson's test) in both the control and experimental groups between the pre-test and the post-test, but this difference in the experimental group that exercises They did Tekdano, it was more.

Conclusion: Considering the results of this research, we know that eight weeks of Tekdano training leads to an increase in the central endurance of the trunk area of girls with clubfoot.

Key words: cross leg dynamics, taekwondo, central trunk endurance

Introduction

According to the kinesiopathology model, any change in the movement patterns causes a change in the natural direction of the lower limb and a change in the patterns of the forces applied to the joint, thereby causing negative changes in the tissues and organs of the area, as well as weakening the neuromuscular control in different parts of the body. becomes lower (1, 2). Among the most common of these changes, we can mention the increase in the angle of the crossed leg during various movements, which is generally known as "dynamic knee crossed leg". (3). Dynamic knee cross leg is a sensorimotor dysfunction that leads to inconsistency in the movement pattern and activation of lower limb muscles (4, 5). Tekdano Karate is the most common style of full contact karate in the world, which actually means ultimate truth and was founded by Masutatsu Oyama (6). Since this style emphasizes real combat from a close distance, it affects people's parameters, including body composition and especially the skeletal-muscular system (6, 7). Tekdano exercises can be considered as a new training solution. Tekdano teaches a person very good skills. Skill and mastery when performing the technique includes performing the technique in the correct form, speed, strength, proper use of specific muscles related to each technique, performing techniques in the appropriate range of motion for each joint according to the type of technique and the range of motion of the joint. The nature of Tekdano training is very similar to strength training. The main focus of these exercises is maintaining the strength of the lower limbs, maintaining the strength of muscle activity and reducing the malformation of the lower limbs (6). The central region of the body can be considered as a muscle belt in the center of the movement chain, which is a stabilizing unit for the spine and trunk. (8). Kibler and colleagues have defined central stability in sports activities as the ability to control the position and movement of the trunk on the pelvis to create optimal movement, transfer and control force and movement to the end segments in sports activities (9). The muscular strength and endurance of this area allows the system to distribute, deliver and transmit



the desired force by mechanically stabilizing the spine. Many experts consider the central stability area as a key component in improving sports performance. 10).

According to the mentioned contents and the nature of taekdano karate as well as the high prevalence of injuries and based on the research that was done on the endurance of the muscles of the legs, a study was conducted that specifically investigated the effect of taekwondo exercises on the endurance of the muscles of people with cross leg dynamics. It didn't happen. Therefore, the researchers of this study investigated the effect of Tekdano karate exercises on muscle endurance of girls with clubfoot.

Research Methodology

The current research is a semi-experimental type, which was carried out as a two-group research design with a pre-test and a post-test. Of these, 30 subjects were selected in a targeted manner, including an experimental group (n=15) who did taekwondo exercises and a control group (n=15) who did their daily activities, which according to the entry criteria to the research (including the age range of 14-18 years, not having any history of injury or surgery of the upper and lower limbs or neuromuscular diseases in the last 6 months, the sample must have crossed legs (this angle is more than 12 degrees and by the single leg squat test) The exclusion criteria (3 alternate sessions and 2 consecutive sessions, not attending the training sessions, history of deformity and injury during the training program, non-cooperation in the continuation of the research process) were selected. (11) 30 subjects were selected based on volume determination software. G Power3 sample and considering parameters of effect size = 0.7, alpha coefficient = 0.05 and test power = 0.8 were calculated.

After the identification of young girls in the age range of 14 to 18 years, whose dynamic abnormality of the crossed leg was identified during the evaluations, for the initial screening and to determine the people who had the dynamic defect of the crossed leg during the performance of functional movements, from the test One leg squat was used. Evaluation of the endurance of the central stabilizing muscles

The endurance of the posterior stabilizing muscles of the trunk was evaluated by Sorenson's bicolor test. The total endurance of trunk stabilizing muscles in all dimensions (posterior, anterior and lateral) was used as a single unit (12). The measurement process (each measurement three times) was performed with the Bearing Sorenson test (trunk flexor test, right bridging test, and finally left bridging test) while there was a five-minute gap between each test, from the trunk flexor test It was used to check the endurance of the anterior trunk flexor muscles and the duration of maintaining the position was recorded as flexion endurance. The trunk extensor test was used to measure the endurance of the posterior muscles of the central region of the body (especially the spine straightener) and the duration of maintaining the position was recorded as the endurance of the trunk extensor muscles. Lateral Plank test was used to evaluate the endurance of lateral trunk flexors and the duration of maintaining the position by the subject was recorded as the endurance of lateral trunk flexors. The duration of maintaining the isometric position by the subject in each of these tests was recorded using a stopwatch (Figure 2). The reliability of this test was reported as 0.93. Also, the reliability of the endurance test of the anterior stabilizing muscles of the trunk is 0.98 and the reliability of the endurance of the lateral stabilizing muscles of the trunk is 0.95 (13).

exercise

The exercises were done in the Azadi sports hall located in Karaj. It has been found that performing exercises under the supervision of an expert leads to better results than unsupervised exercises (14). For this reason, the training sessions were led by the researcher (with first-class national coaching in this field) and he directly supervised the exercises. Each subject participated in three training sessions every week, and the exercises were performed every other day to provide time for recovery. Each training session consisted of a standard warm-up program consisting of five minutes of gentle jogging, 15 minutes of general warm-up. After warming up, the samples started to perform Tekdano karate exercises. The time of the exercises was controlled by the researcher using a stopwatch, so that each session lasted between 75 and 90 minutes. In order to observe the principles of exercise science and also to reduce the effect of training intensity gradient on post-exam results, it has been tried to include training intensity gradient, constant and maintenance phase in the last two weeks, so as to obtain the best training performance. After eight weeks, each subject was subjected to a secondary measurement (post-test) up to one week after completing the exercises.

Shapiro-Wilk test was used to check the normality of data distribution. To compare the average of the research variables before and after the exercise protocol in each group, the correlated t-test was used, and for the inter-group comparison of the variables, the analysis of covariance test was used at the significance level of $P \geq 0.05$.

Results



The descriptive analysis of the individual characteristics (age, height, weight and body mass index) of the subjects by research groups is presented in Table No. 1. The results showed that there is no significant difference in these variables between the research groups in the pre-test ($P < 0.05$). Considering the normality of the data, which was determined by the Shapiro-Wilk test, the correlated t-test was used for intra-group comparison and the analysis of covariance test was used for inter-group comparison of the study variables in the experimental and control groups (Table No. 3 and 4).

Table 1: Descriptive information of the subjects in the research groups in the pre-test

group	Variable	Mean \pm Sd
Control	height	158.27 \pm 5.32
	Weight	55/53 \pm 18/6
	Age	16.53 \pm 1.45
	BMI	11/22 \pm 1.42
Practice	height	157.40 \pm 5.48
	Weight	56.60 \pm 5.56
	Age	16.60 \pm 1.24
	BMI	22.78 \pm 0.84

The results of the correlated t-test (Table No. 2) showed that there was a significant difference in the muscle endurance scores of both the control and experimental groups between the pre-test and the post-test ($P \geq 0.05$). But in the experimental group, a greater difference was observed.

Table 2: Correlated t-test results for intragroup comparison of research variables in control and experimental groups in pre- and post-test stages.

Variable	Mean \pm Sd		P
	post-test	pre-test	
Sorenson control group	49.61 \pm 16.47	42.91 \pm 16.02	0.001
Sorenson Experimental group	46.86 \pm 15.13	35.21 \pm 13.36	0.001

Discussion

The purpose of this research was to investigate the effect of taekwondo exercises on muscle endurance of girls with clubfoot. The results of the correlated t-test showed that there was a significant difference in the central endurance of the core muscles of both control and experimental groups between the pre-test and the post-test ($P \geq 0.05$), but this difference was greater in the experimental group that performed the Tekdano exercises. Therefore, it can be concluded that Tekdano karate exercises have more effect on the endurance of the muscles of people with crossed legs, who probably have weakness in the muscles of the knee.



Tekdano karate is considered one of the hardest styles of karate; which has a knockdown system (30). The fight between two opponents takes place without any weapon and with maximum speed and strength (31). Since this style emphasizes real combat from a close distance, it affects people's parameters, including body composition and especially the skeletal-muscular system (3, 32). Karate training requires a high level of movement and functional abilities, including speed, strength, and muscle coordination (5, 6). In a research entitled Tekdano karate training effect on static and functional balance in teenage karate practitioners, Slomka et al. conducted on 28 people who had at least 7 years of karate practice experience, showed that the karate group has superior functional stability. Also, there are significant changes in the postural characteristics of teenage karate practitioners (15). Also, in a research titled kinematic analysis of Maigiri technique in beginner and advanced Tekdano karate athletes, it was shown that karate exercises change the neuromuscular control strategy and can be effective in improving the movement pattern (16).

Conclusion: Considering the results of this research, we know that eight weeks of Tekdano exercises lead to an increase in the central endurance of girls with clubfoot.

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The effect of general exercise on creatine, glycolysis and mitochondrial respiration in ATP regeneration

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Abstract

Purpose: The purpose of this research is to investigate the effect of general exercise on creatine, glycolysis and mitochondrial respiration in ATP regeneration.

Research method: In this research, the effect of general exercise on creatine, glycolysis and mitochondrial respiration for ATP regeneration has been investigated by reviewing and studying various books and articles.

Findings: Traditional studies investigating the effects of creatine (Cr) supplementation have shown that it has improved performance under different test conditions. Short-term, high-intensity exercise, although this has not been shown in all studies. It also has a significant capacity for regeneration after administration of myotoxic drugs, crushing and autoimplantation, and ischemia. Skeletal muscle differentiation and formation occurs with a significant level of cellular stress. In particular, skeletal muscle growth requires the proteolytic activation of CASP (caspase), which also has a consistent role in apoptosis. Importantly, the level of CASP activation is kept at a "sub-apoptotic" threshold in differentiated myoblasts. will be

Conclusion: Muscle pain and damage caused by overtraining may negatively affect sports performance by reducing economy, disrupting glycogen replenishment, changing biomechanical performance, and reducing strength. Additionally, these changes may put an athlete at risk for injury. A nutritional supplement that may reduce the extent of exercise-induced muscle damage or enhance recovery from it would be beneficial to athletes during intense training phases and during post-injury recovery.

Keywords: creatine, glycolysis, mitochondrial respiration, ATP



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Introduction

Traditional studies investigating the effects of creatine (Cr) supplementation have shown that it has improved performance under different test conditions. Short-term, high-intensity exercise, although this has not been shown in all studies. Supplementation-induced increases in chromium and phosphocreatine (PCr) levels may enhance performance by improving PCr and ATP resynthesis. increase in body mass; direct increase in protein synthesis; Allowing athletes to train at higher intensity levels. or reducing muscle rest time (1).

Besides its role in energy production, PCr has another important function in muscle cells. Due to its amphipathic nature, PCr is able to bind to the polar phospholipid heads of the muscle membrane (27). By binding to the phospholipid heads, PCr can stabilize the membrane phospholipid bilayer, reduce membrane fluidity, and make the membrane more ordered (27). Due to this property, chromium supplementation and the subsequent increase in muscle PCr levels may have a protective effect on the skeletal muscle membrane during abnormally intense exercises (2).

Abnormal high-force exercise alters the function of the sarcolemma membrane and the sarcoplasmic reticulum (SR) (17). There is evidence that membranes are damaged by the mechanical event of eccentric contraction and by increased lipid peroxidation from free radicals produced by macrophages arriving to repair muscle. Macrophages also release harmful chemicals that cause pain. Altered SR function leads to increased intracellular calcium, which can activate degradative pathways (3). Damage or destruction of muscle contractile proteins contributes to the loss of muscle function after abnormal exercise (13). Increased intracellular PCr can stabilize membranes and subsequently prevent or reduce the cascade of events that lead to degradation, loss of muscle function, and inflammation (3).

Elevations of blood muscle proteins such as creatine kinase (CK) and lactate dehydrogenase (LDH) resulting from nonexercise exercise have been well documented in early research by Port et al. evaluated the effects of chromium supplementation on LDH blood levels in rats swimming to exhaustion. In the group that did. range of motion (ROM), arm circumference (CIR) and muscle soreness (SOR). By measuring these indirect markers of exercise-induced muscle damage after a period of abnormal high-force exercise, we investigated whether chromium supplementation has protective effects under intense exercise conditions (4).

In a study conducted by researchers. Without chromium intake, postexercise LDH followed the time course previously shown to follow abnormal exercise. However, lower LDH was detected in rats receiving chromium, despite the fact that they exercised for a longer period of time. Although swimming is not typically associated with exercise-induced muscle damage, the authors suggested that these results could be due to chromium's effects on muscle membrane integrity. In cardiac tissue, PCr supplementation has also been shown to reduce muscle protein loss, indicating less cytoplasmic leakage and less potential muscle damage. Indeed, due to its membrane stabilizing effects, PCr is used as a cardioprotective agent during cardiac surgery. In a review chapter, Clark cited unpublished results from a study in which PCR was injected into athletes during intense exercise and produced "significant reductions" in delayed muscle stiffness despite increased training volume. This was hypothesized to be the result of less muscle damage occurring during exercise, but muscle stiffness and soreness would decrease during exercise as the muscles adapt to the stress of exercise. Few details are available about the study cited by Clark, as the data were cited as unpublished observations and only briefly described in a review chapter (5).

Researchers investigated the effects of injectable PCr supplementation on patients with muscle atrophy and thigh weakness caused by knee osteoarticular lesions. All subjects (n=69) had decreased muscle strength and power of their affected limb as a result of surgery, cast-treated dislocation, meniscectomy, or fracture. During the rehabilitation program, PCr-treated subjects showed an increase in torque values that were faster and greater for all movements than the control group, indicating a faster recovery of muscle strength. Perhaps the most impressive finding of this study was that there were no changes in the healthy limb caused by PCr supplementation, suggesting that PCr has a local effect on the damaged area. However, no mechanism of action has been proposed. These additional benefits clinically demonstrated with PCr supplementation may have important implications for athletes undergoing intense training (6).

Because PC has membrane-stabilizing effects, has been shown to reduce the loss of intracellular enzymes following intense exercise, and to enhance strength and power recovery after surgery and injury, we hypothesized that the oral chromium supplement will have similar effects after exercise. -Muscle damage caused by taking this issue into consideration, the aim of this study was to compare the responses of people taking chromium with those taking placebo (P) based on the following criteria: levels of muscle proteins in the blood, maximal isometric force (MIF), range From 4 times a day for 5 days. Subjects in both groups consumed 1 serving of Gatorade following supplement consumption in 4 equal intervals throughout the day (7).



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Muscle function, circumference, and MIF pain testing of the elbow flexors using a modified Preacher bench (Standard Weight Lifting Equipment) attached to a sphygmomanometer and connected to a computer (Jackson Assessment System; Lafayette Instrument Co., Lafayette, IN). Subjects sat on a bench and the elbow of the dominant arm was fixed at 90 degrees. Three maximal isometric contractions, with 1 min of rest between trials, were recorded and calculated as the mean criterion score. It is believed to be the best measure of abnormal, exercise-induced muscle damage in human studies. ROM of the elbow joint angle was evaluated by measuring the angle of the flexed arm (FANG) and relaxed (RANG) using a gonia. FANG was measured when the subject attempted to fully bend the elbow to touch the shoulder, while the elbow remained at the side. RANG was measured when the subject relaxed the arm and let it hang at their side. CIR was measured to assess swelling using an anthropometric tape measure, on the distal and medial side of the subject's arm, while the arm was freely hanging at the side. Perception of SOR was assessed using a visual analog scale of a 100-mm continuous line, where 0 mm represents "no pain" and 100 mm represents "extremely painful". SOR was evaluated after movement (twisting a 0.9 kg hand weight) and touch(8).

Research method

In this research, the effect of general exercise on creatine, glycolysis and mitochondrial respiration for ATP regeneration has been investigated by reviewing and studying various books and articles.

Findings

The myotoxic local anesthetic Marcaine causes extensive destruction followed by complete regeneration. To identify the metabolic adaptations that underlie muscle regeneration, we have evaluated the glycolytic capacity of muscles treated with marcaine. There was no change in adenylate kinase or creatine kinase activity. A 30% increase in hexokinase activity and a 20-30% decrease in phosphofructokinase, pyruvate kinase, a-glycero dehydrogenase and lactate dehydrogenase activities were observed in the anterior tibia muscles of rats. The activity of the second enzyme essentially returned to control values around day 11 after drug injection. A 60% decrease in total glycogen phosphorylase activity was observed, followed by a return to control by day 28. Glycolytic activity thus maintains glycolysis to a much greater extent than oxidative metabolism and may meet energy requirements during marcaine-induced skeletal muscle regeneration (5).

It has a significant capacity for regeneration after administration of myotoxic drugs, crushing and autoimplantation, and ischemia. Under each of these conditions, an initial period of muscle degeneration occurs, followed by regeneration. A fundamental question concerns the nature of the energy sources that enable the survival of atrophied muscles and support subsequent muscle regeneration.

Energy-generating metabolic pathways in muscle degenerate and regenerate after administration of a myotoxic local anesthetic, Marcaine. In a previous report, we described a loss of oxidative metabolism in marcaine-treated muscles and an increase in monohexose shunt activity. In the present communication, we provide evidence that glycolysis survives marcaine-induced degeneration. A preliminary report of these data is provided.

Analyzes muscle treatment enzyme. A 0.9% NaCl solution containing marcaine (20 mg) plus hyaluronidase (Sigma, 300 units) was injected into the tibialis anterior muscle of rats (3, 11), with the contralateral tibialis anterior muscles serving as controls and receiving 0.9% injection. NaCl. On days 1, 3, 5, 7, 12, 19, and 28 after three daily injections of marcaine plus hyaluronidase or 0.9% saline, the mice were decapitated and the muscles were removed, weighed, and minced with scissors on ice. . Cold 0.05 M Tris-HCl, pH 7.6, containing 0.20 mM dithiothritol. Then, the minced muscles were homogenized by hand using a Tenbrook homogenizer (1:10, w/v). The homogenate was centrifuged at 18,000 g for 20 min at 4°C. Enzymes were measured in the resulting supernatants (15).

Enzyme assay the following enzymes were assayed by spectrophotometric methods: hexokinase (EC 2.7.1.1.) (17), phosphofructokinase (EC 2.7.1.11) (8, 17), pyruvate kinase (EC 2.7.1.40) (12 acy) glycero dehydrogenase (EC (5, creatine kinase EC 2.7.3.2)), adenylate kinase EC 2.7.4.3)), and lactate dehydrogenase (EC 1.1.1.27). Creatine kinase was assayed in the presence of 5'-AMP for inhibition of adenylate kinase (13). Glycogen phosphorylase (EC 2.4.1.1) was measured in the direction of glycogen synthesis in the presence and absence of 5'-AMP, using glycogen and [U.C] glucose-1-P as substrates. This modified assay is a method for determining glycogen synthetase (15; B. I. Brown, personal communication).

Expression of data, enzyme activity was linear according to time and protein concentration in our assay conditions. experimental methods as given in the text. For normal and unoperated digital extensor muscles (N16), the extracellular space is 31.69 ± 4.47 ml/100 g of fresh weight. Numbers are $\bar{x} \pm$ SEM (9).



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Mitophagy mediates mitochondrial network signaling, oxidative stress and apoptosis during myoblast differentiation. Skeletal muscle differentiation and formation occurs with significant levels of cellular stress. In particular, skeletal muscle growth requires the proteolytic activation of CASP (caspase), which also has an established role in apoptosis. Importantly, the level of CASP activation is maintained at the "sub-apoptotic" threshold in differentiated myoblasts. Thus, the requirement for CASP activation, together with the potential deleterious function of these signals, suggests that CASP activity must be tightly regulated during differentiation. Currently, the mechanisms regulating apoptosis-related signaling during skeletal muscle differentiation, and how they contribute to cell specialization rather than cell death, are poorly understood. Evidence suggests that conventional apoptotic pathways may be involved in CASP3 (caspase 3) activation. For example, the apoptotic proteases CASP12 (caspase 12) and CASP8 (caspase 8) are activated during myoblast differentiation. The observation of CASP9 is interesting (caspase activity contributes to CASP3 activation during myogenesis. However, engagement of the mitochondrial-mediated apoptotic pathway and CASP9 activation is typically considered a point of no return in cell death signaling. Accordingly, we previously found no involvement of CASP9 during myoblast differentiation (8).

Autophagy is a degradative process directly involved in the cellular stress response. Interestingly, inhibition of autophagy by administration of 3-methyladenine (3MA) or knockdown of ATG7 (autophagy-related 7) impairs myoblast differentiation and leads to cell death (3), demonstrating the critical role of autophagy in myogenesis. , and the mechanism of cellular stress regulation during myoblast differentiation. Although autophagy was originally recognized as a bulk degradation system, autophagy is now considered a specialized process that allows the selective removal of damaged proteins and organelles. , provides unnecessary or inefficient. One of these specialized functions is the clearance of mitochondria through autophagy. A process known as mitophagy. Interestingly, differentiating C2C12 cells require autophagy to destroy mitochondria, and the loss PINK1 (PTEN-induced kinase 1) leads to decreased Myog (myogenin) mRNA levels in differentiating C2C12 cells (16). Furthermore, during myoblast differentiation, autophagy is critical for mitochondrial remodeling (15), while PPARGC1A PGC1 α (peroxisome proliferative receptor gamma, coactivator 1 alpha) plays an important role in regulating the expression of key proteins related to mitophagy. In addition, mitophagy plays an important role in removing damaged mitochondria before inducing mitochondrial-mediated apoptosis signal, thus reducing stress and cell death. Therefore, it is likely that autophagy, and specifically mitophagy, is critical in regulating various aspects of mitochondria during skeletal muscle differentiation. Therefore, the aim of this study was to investigate the role of mitophagy in regulating the mitochondrial network and stress/death signaling during myoblast differentiation and myogenesis (12).

Deficiency of autophagy impairs myoblast differentiation and myogenesis. A number of proteins are critical in autophagosome formation and ultimately autophagy. Autophagy/mitophagy is required for myoblast differentiation and is critical in regulating mitochondrial signaling and remodeling. A rapid way to achieve cellular specialization is through the degradation of unnecessary or damaged proteins and organelles through processes such as autophagy. For example. Autophagy can directly degrade MYOD, a myogenic regulatory factor (MRF) whose transient upregulation is essential for myogenesis. Importantly, autophagy deficiency during myoblast differentiation increases DNA fragmentation and morphological features of apoptosis. Here, we found that stable deletion of ATG7 or CRISPR/Cas9 mediated deletion of Bnip3 reduced myotube formation. A result that was associated with mitochondrial oxidative stress and mitochondrial-mediated cell death signaling. Differentiation in sh4g7 or bnip3 cells indicates a critical role for autophagy and mitophagy in regulating mitochondrial biogenesis, fission/fusion, and network development during myogenesis. In the levels of PPARGC1A, DNML1, and OPA1 and disruption of mitochondrial network reconstruction, similarly, eliminating PINK1 leading to a decrease in Myog mRNA while increasing 32 mRNA (an atrophy-related ubiquitin ligase) in differentiating C2C12 myoblasts (13)

Interestingly, the same study showed that PPARGC1A is critical in regulating the expression of key mitophagy-related proteins during differentiation, suggesting that PPARGC1A maintains a proper mitophagic rate during myogenesis. However, the present data are in agreement with these previous reports. demonstrate an important role for mitophagy in myogenesis, and also emphasize the close interplay between biogenesis, fission/fusion, and mitochondria in the regulation of mitophagy. Mitochondrial Network and Myogenic Development Autophagy Regulates Oxidative Stress and ER-Related Stress During Myoblast Differentiation Autophagy is critical in regulating cellular and mitochondrial oxidative stress. During myoblast differentiation, autophagic cells showed higher cellular ROS production than control myoblasts. In agreement with this, two antioxidants (CAT and SOD1) known to respond to oxidative challenges during muscle differentiation and reduce ROS production (26,27), were dramatically increased in autophagy-deficient myoblasts. Indicating an important altered redox environment, the



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content of mitochondrial-specific 4-HNE and the mitochondrial antioxidant, SOD2, were elevated in autophagy-deficient myoblasts. Similarly, SOD2 levels were higher in bnip3 myoblasts during differentiation, 4-HNE being an active species. It is lipidic. It can induce oxidative changes to other proteins and lipids and is a constant marker of oxidative stress (14).

While SOD2 has an important antioxidant function against superoxide anion in mitochondria. Therefore, our data strongly suggest that autophagy and mitophagy are critical in regulating mitochondrial oxidative stress in myoblasts. Autophagy is also able to reduce ER stress by degrading misfolded proteins. HSPA is a critical cellular chaperone induced during the unfolded protein response, while CAPN activity is increased during ER stress. We found that autophagy-deficient myoblasts had significantly higher HSPA levels and CAPN activity, suggesting that autophagy is critical in reducing ER stress during myoblast differentiation. The consequence of CAPN activation is multifold as they participate in CASP activation, cleavage of several muscle-specific contractile proteins, and mitochondrial-mediated apoptosis signaling. Collectively, these data show that autophagy is very important in reducing cellular stress and more specifically, organelle stress during myoblast differentiation (13). Mitophagy regulates mitochondrial-mediated apoptosis signaling in myoblasts. Differentiation of BCL2 has a number of well-characterized anti-apoptotic capabilities. While BCL2 increased during differentiation in control myoblasts, this was not the case in autophagy (15).

This strongly supports our interpretation that enhanced CASP activation is at least partially related to the reduced myoblast differentiation observed in autophagy-deficient cells. Enhanced CASP3 activity is dependent on CASP9. Furthermore, transfection of autophagy-deficient cells with dominant-negative CASP9 (ad-DNCASP9) also improved myogenic differentiation. This suggests that mitophagy and autophagy are essential in controlling CASP3 activity to allow differentiation without inducing excessive apoptosis. Given that other differentiation-related signals are likely altered in the autophagy-deficient state, this partial recovery is not surprising. In addition, it is likely that the autophagy-deficient myophages that are formed are highly altered, given the role of autophagy in regulating normal cellular functions. Related signaling is mitochondrial-mediated events during myoblast differentiation (16).

Discussion and conclusion

It has been suggested that muscle soreness and damage from overtraining may negatively affect athletic performance by reducing economy, disrupting glycogen replenishment, altering biomechanical performance, and reducing strength. Additionally, these changes may put an athlete at risk for injury. A nutritional supplement that may reduce the extent of exercise-induced muscle damage or enhance recovery from it would be beneficial to athletes during intense training phases and during post-injury recovery. However, data from the current study do not support such a benefit. Subjects in both groups responded to the exercise test in a similar way and showed a similar recovery period in all measurements of muscle function, circumference and pain. In addition, there was no difference between the groups in the activity of muscle proteins in the blood.

The data of the present study can be applied to athletes undergoing intense resistance training with an abnormal component. Supplementation of 20 g/day of chromium for 5 days did not reduce muscle damage or enhance recovery after abnormal high-force exercise, so chromium should not be considered as a recovery aid from this type of exercise stress. Conversely, anecdotal reports of muscle strains and tears in athletes using chromium supplements are not supported by this study, as the chromium group did not experience more damage or slower recovery compared to the P group. However, it should be emphasized that the present study examined the effects of acute chromium supplementation, and there are few data on the effects of long-term chromium supplementation on muscle performance. Athletes undergoing intense exercise, such as resistance training with an exaggerated or plyometric component, should be aware that the effects of long-term chromium supplementation and interactions between chromium and other purported ergogenic aids or physiological conditions, such as dehydration, should be investigated. has not taken

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The effect of exercise training in MS with functional fatigue: a review article

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Abstract

Background and purpose: MS with functional fatigue (MS) is a progressive degenerative disease in the central nervous system, the inflammatory process of which causes a decrease in the quality of life and various movement problems. Recent studies show that exercise can be used to improve this disease. In the present study, the effect of sports exercises in MS with functional fatigue has been investigated. **Materials and methods:** In order to obtain scientific articles from 2000 to the end of 2022, search for keywords related to the present study, including: sports exercises, and MS with functional fatigue from the databases Google Scholar, SPORTDiscus, IranDoc, PubMed, Web of Science, Science Direct and Scopus was done. Sports exercises used to improve these patients were used. **Findings:** A total of 196 articles were found, by limiting the search, removing irrelevant and repeated studies, and after reviewing the titles, abstracts and full texts and more detailed evaluations and checking the entry and exit conditions of the study, 30 articles related to the present research topic were found. Although there are many differences of opinion and differences in the methodology, number of samples, implementation method, training protocols, and the way of examining the variables in the research under study, which should be taken into account in the application of sports exercises. **Results:** It seems that sports exercises following special sports instructions and consumption can lead to improvement in the condition of MS patients with functional fatigue (MS). **Keywords:** sports training, MS with functional fatigue (MS)



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Introduction

Multiple sclerosis (MS) is a progressive and chronic inflammatory disorder of the central nervous system (CNS). This disease is characterized by inflammation, widespread immune system infiltration, demyelination, axonal loss, damage to oligodendrocytes, and destruction of the myelin in the central nervous system. MS most commonly occurs between the ages of 20 and 40, and women are nearly twice as likely to be affected by this condition compared to men (1, 2). According to the National Multiple Sclerosis Society in the United States, MS affects over 1 million people in the U.S. and 2.5 million people worldwide (3). The disease's activity and resulting impairments manifest as symptoms (such as fatigue and depression) and functional disturbances (such as walking and cognition), posing a threat to the quality of life for individuals with MS. The frontline treatment involves disease-modifying drugs targeting immune signaling proteins and/or immune cell populations, but individuals with MS still experience lingering symptoms and functional impairments. Among the pharmacological treatments, medications like amantadine and pemoline, which have significant side effects, may pose additional challenges for MS patients (4, 5). This underscores the importance of alternative approaches, such as exercise, which is structured, planned physical activity defined by its repetitive nature (6).

Unfortunately, individuals with MS often doubt their ability to engage in physical activity. Fatigue, motor impairment, depression, fear of safety, reluctance to participate in activities they cannot easily or effectively perform, and lack of access to suitable facilities are just a few potential reasons for their reduced mobility (7). A growing body of research has explored the overall benefits of exercise and physical activity as part of a healthy lifestyle in managing MS. Studies indicate that exercise can improve aerobic and muscular fitness, fatigue, depression, walking, balance, and cognition in MS patients. Additionally, exercise may have further benefits on internal CNS structures (such as the hippocampus), sleep quality, and cardiovascular/metabolic comorbidities (8-14). Various types of exercises have been recommended for individuals with MS, including resistance training, aerobic exercises, and interval training (15). However, there are conflicting results regarding the types of exercises and exercise protocols, necessitating more extensive and precise research.

Several studies have demonstrated the significant role of nutrition in improving and controlling MS. Modifying the body's immune system and affecting the function of immune cells, including T cells, can influence the course of the disease and alleviate symptoms to some extent (16, 17). In light of the mentioned information and the importance of exercise and supplements in improving the condition of MS patients, the present review aims to investigate the impact of exercise on MS with functional fatigue.

Research Methodology

To conduct the present review study, a search was performed on scientific articles related to the research topic from the year 2000 to the end of 2022. The search was carried out on databases including Google Scholar, SPORTDiscus, IranDoc, PubMed, Web of Science, Science Direct, and Scopus. Primarily, the search focused on titles, abstracts, and keywords of the articles using terms such as multiple sclerosis (MS), exercise, resistance, aerobic, and interval training in the mentioned databases. Additionally, English equivalents of the keywords were searched in all databases to access more comprehensive and complete articles.

Initially, all relevant titles in the mentioned databases were reviewed. Duplicate articles were removed, and abstracts of relevant studies were examined. Studies related to the research were selected, and redundant articles were eliminated. Subsequently, a thorough examination of the references of the selected articles was carried out. The first author independently checked all incoming articles, and subsequent authors, with more experience in the field, also reviewed the research articles.

The inclusion criteria for entering the research were articles discussing the impact of exercise on MS and being published in reputable domestic and international journals, as well as being available in English or Persian. In the initial search, a total of 196 articles were found, and in the initial review, 32 duplicate articles were excluded. In the next stage, based on the entry criteria, 134 irrelevant articles were removed from the list, and finally, 30 articles that met the specified standards were included in the present review study.

Research Findings

The Effect of Various Exercise Types on Multiple Sclerosis (MS)

Exercise is one of the best non-pharmacological therapeutic approaches with significant effects on both mental and physical health. Individuals with MS can benefit from the positive effects of exercise in improving functionality, disease status, and minimizing associated symptoms and fatigue. Today, exercise is considered an essential part of a lifestyle that not only promotes physical and mental health but also reduces the risk of chronic diseases, enhancing overall quality of life (18).



Resistance Exercises

One of the crucial physiological adaptations resulting from exercise is the neural-muscular adaptations. Various research findings indicate that exercise induces specific tension on muscles, and depending on the nature of the stress, muscles may undergo different adaptations (19). Resistance exercises can improve lower and upper limb strength, enhancing balance and walking ability in MS patients. Considering the physical problems rooted in neural-muscular issues, it appears that the main challenges stem from the reduction in muscle strength and the decrease in neural impulse speed in these individuals (20). Gutiérrez et al. (2005) found that an 8-week resistance exercise program could improve the reported weakness and lower limb strength in MS patients (21). Resistance exercises, by increasing muscle strength, power, and speed, hypertrophy, muscular endurance, motor function, balance, and coordination, play a significant role in enhancing physical performance and preventing muscle atrophy (22). Previous studies suggest that resistance exercises lead to an increase in muscle proteins, resulting in hypertrophy and subsequently increased muscle strength, enhancing the functional ability of these patients (23). Based on previous studies, mRNA levels in PBM cells in untreated MS patients are significantly lower compared to healthy individuals, indicating that the decrease and alteration in neurotrophin gene expression in MS patients may be related to impaired neural protection by immune cells. Immune cells also express neurotrophin receptors. In MS, neurotrophins derived from blood mononuclear cells directly increase their survival by binding to Trk receptors on central nervous system neurons and indirectly regulate their function and determine their survival or apoptosis through interaction with neurotrophin receptors on immune cells. Clinical findings show a strong correlation between the concentration of Neurotrophin-3 (NT-3) in blood mononuclear cells and various measures of brain atrophy in MS patients (24, 25). It seems that resistance exercises may positively contribute to the process of myelination by increasing the levels of neurotrophin-3 gene. In this regard, Asgari et al. (2017) conducted a study demonstrating that both types of resistance exercise and water-based exercise similarly contribute to increasing plasma levels and positive regulation of neurotrophin-3 gene expression in mononuclear cells. Additionally, resistance training seems to be a suitable intervention for improving endurance and balance in MS patients (26). Therefore, performing resistance exercises appears beneficial for individuals with MS, leading to improvements in fatigue and certain functional indicators in these patients.

Aerobic Exercises

Physical activities, particularly aerobic exercises, are considered effective non-pharmacological treatments for improving various diseases, especially MS. According to a study, aerobic exercises can effectively enhance the balance of MS patients without triggering disease relapse (27). Newman et al. (2007) reported that aerobic exercises, using a treadmill, result in reduced resting oxygen consumption, increased comfortable walking speed (C.W.S.), reduced time for walking a 10-meter distance, improved walking endurance, and the establishment of a proper walking pattern in MS patients. Additionally, it contributes to fatigue reduction in some patients (28). The examination of the impact of aerobic exercise on the walking ability of MS patients showed improvements in walking patterns (29).

Aerobic exercises bring about significant metabolic changes, such as improved metabolism, reduced levels of epinephrine and norepinephrine, cholesterol, and triglycerides, as well as strengthening the immune system, enhancing endorphin secretion, and improving mood and mental status. During these activities, the process of myelin loss remains unchanged. When the skeletal muscle system is inactive, the duration of oxidation decreases, which is a crucial factor in the occurrence of fatigue and stiffness during daily activities. Exercise increases the oxidation capacity of muscles, leading to increased oxygen intake in the body. Some diseases hinder oxygen at various stages, reducing functional capacity, but aerobic exercises can establish physiological adaptations in aerobic energy system performance, increase individual performance, and even improve functional capacity under disease progression (30).

It appears that the secretion of neurotrophic factors following exercise is one of the potential mechanisms for enhancing axonal protection and brain health in patients. Neurotrophins are essential growth factors for nerve cell growth, synapse maturation, and synaptic plasticity and include brain-derived neurotrophic factor (BDNF), nerve growth factor (NGF), glial cell-derived growth factor, transforming growth factor-alpha, insulin-like growth factor, and neurotrophin 3 and 4 (31, 32). Previous studies indicate that aerobic exercises are effective in reducing the severity of fatigue in MS patients. Aerobic exercises, along with stretching, not only increase energy but also alleviate muscle spasms and damage, enhance flexibility, and effectively reduce fatigue (33).



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The risk of bone fractures due to falls in MS patients is 3.5 times higher than in healthy individuals. Physical activity, especially walking on a treadmill, reduces the risk of falling in such patients and improves neuromuscular coordination and muscle strength. Continuous physical activities, especially aerobic exercises that are more feasible for these patients, can enhance their motor function performance (34). Regarding the effect of exercise on proteins involved in MS, studies have shown that exercise leads to an increase in neurotrophins such as BDNF and NGF, which seem to play a role in neural repair and neural flexibility in MS patients (31). Therefore, based on the conducted studies, aerobic exercises can potentially improve the performance and quality of life of MS patients.

Combination Exercises

Physical exercises, as an established component of the rehabilitation program for individuals with MS, improve their strength, endurance, and cardiovascular function, while reducing fatigue (35). Various studies have examined the effects of different types of exercises on the motor performance of MS patients through functional performance tests. In this regard, Shams et al. (2015) investigated the impact of an 8-week combined exercise program, including stretching, aerobic, strength, and balance exercises (3 sessions per week), on the walking speed of multiple sclerosis patients. The results showed a significant increase in the 25-foot walking test after the exercise intervention (36).

Ahmadi et al. (2018) conducted a study on MS patients, demonstrating that combined exercises, along with coenzyme Q10 supplementation, can improve their motor function (37). Philippe et al. (2010) revealed that 6 months of resistance training (2 sessions of 50 minutes per week) enhanced muscle strength, walking ability, and performance on timed up-and-go test in MS patients (38). Increased strength may result from changes in the connection between motor neurons. These changes lead to increased synchronous activation of motor units, improving force production and stable force application. Increased neural drive to motor neurons during maximal contraction can enhance the discharge rate in motor units and contribute to the generation of absolute strength or tension in the muscle-tendon unit (39).

Limited joint mobility is one of the challenges faced by MS patients, necessitating an appropriate treatment plan to increase flexibility. The number of studies investigating the effects of combination exercises on flexibility is limited. Reduced flexibility contributes to significant walking difficulties in these patients, characterized by shorter step length and slower walking speed compared to healthy individuals (40).

Physical activity regulates immune responses by producing cytokines involved in immune and inflammatory response regulation. In this context, Golzari et al. (2010) showed that an 8-week combined exercise in MS patients led to a significant reduction in interleukin-17 (IL-17), which has anti-inflammatory effects (41). Moreover, the study by Hemmati et al. (2019) demonstrated that 8 weeks of combined exercise (three aerobic sessions plus one resistance session per week) improved the expression of MIR-301a, aligning with previous findings that increased MIR-301a expression leads to increased lymphocyte proliferation and immune activity, potentially contributing to autoimmune diseases such as MS. On the other hand, a decrease in MIR-301a expression can lead to the self-regeneration of the immune system (42, 43).

In the mentioned studies, regular and continuous combined exercise, following guidelines, can play a supportive role by improving motor performance indices and reducing some inflammatory factors affecting MS patients. The results of these studies suggest that regular and continuous combined exercise, accompanied by adherence to guidelines, can contribute to improving motor performance indices and reducing some inflammatory factors, ultimately playing a supportive role in the treatment and reduction of MS symptoms.

Impact on Multiple Sclerosis (MS)

Based on previous studies, the modulation of inflammatory factors, suppression of oxidative stress, regulation of immune cell function, and effects on disease-causing infectious agents can be effective in controlling and improving the impact of MS (44, 45). Vitamin D has been proposed as an immune-modulating steroid that can reduce the production of pro-inflammatory cytokines and increase the production of anti-inflammatory cytokines (46). Various scientific evidence supports its significant role in enhancing the levels of anti-inflammatory cytokines. These studies have been investigated at the laboratory and animal levels, demonstrating that this vitamin increases the production of anti-inflammatory cytokines such as TGF β -1 (involved in various activities such as translation, proliferation, and immune cell activity) and IL-4, while reducing the production of pro-inflammatory cytokines such as TNF- α , IL-6, and IFN- γ . It has also been identified as effective for the normal functioning of macrophages, and insufficient levels are associated with impaired chemotaxis and phagocytosis, as well as an increase in toll-like receptors on monocytes (one of the pathogen recognition receptors in the body), all of which contribute to inducing more inflammation (47).



Oxidative stress is a systematic process that can reflect changes occurring in the brain. Free radicals generated in this process can alter the blood-brain barrier permeability, allowing immune cells to enter the central nervous system. In the initial phase of MS lesion formation, ROS produced can disrupt the blood-brain barrier, stimulating the entry of monocytes into the central nervous system. After the inflammatory cells cross the blood-brain barrier, activated T cells interact with macrophages and microglia inside the central nervous system, leading to the production of pro-inflammatory cytokines that worsen MS. Active microglia and macrophages are involved in various stages of MS and produce non-immunological damaging substances, including ROS and RNS. These active species cause demyelination and damage to axons in MS (17, 48). Vitamin D is known as an oxidative stress suppressor and can reduce oxidative stress and inflammation biomarkers in MS patients (49). MS is caused by the creation of T cells that are associated with their specific autoimmune antigen, leading to the production of myelin-destructive macrophages (50). It has also been identified that other immune cells such as Th1, Th17, and B cells may play a role in the inflammatory processes associated with this disease. Various pieces of evidence indicate that B cells play a significant role in MS pathogenesis. Nevertheless, the spontaneous production of various antibodies against central nervous system components, such as neurons and glia, and even immune cells, speaks to the complexity of this disease. However, TNF- α and TNF- β have a prominent role in the pathology of MS (51). Interleukin-2, associated with Th1 cells, plays a role in neuroendocrine functions, regulatory functions, and central nervous system immunity. Interleukin-2 penetrates the blood-brain barrier and regulates the interaction between peripheral tissues and the central nervous system. A functional and pathological change in the brain is related to a dysregulation of interleukin-2. Interleukin-2 has an immunopathological role in MS and has increased in the serum of MS patients (52).

Role in Immune System Regulation (53)

It has been indicated that mRNA, 1.25(OH) $_2$ D $_3$, interleukin-2, interferon-gamma, and macrophage colony-stimulating factor reduce, suggesting the direct inhibitory effects of vitamin D on the interleukin-2 gene expression, which is associated with its receptor (52, 54). Interleukin-4 is also a growth and vital factor associated with lymphocytes that regulates the immune system, proliferation, differentiation, programmed death of dendritic and nerve cells, enhances Th2 differentiation, and prevents Th1 differentiation (52). It directly affects the receptor present on the surface of CD4+ T lymphocytes to prevent inflammation in the myelin sheath of the brain, regulate cytokine secretion, and prevent excessive cytokine production. Among many environmental risk factors influencing the onset of MS, infection may play a crucial role in creating sensitivity or resistance to MS (55). The Epstein-Barr virus may be one of the infectious causes of MS, and alongside low serum levels of vitamin D, both can be considered contributory factors to the disease. A potential correlation between low levels of vitamin D and increased serum levels of antibodies against the Epstein-Barr virus Nuclear Antigen 1 has been observed. Vitamin D inhibits B cell maturation and proliferation, limiting antibody production under laboratory conditions, but dietary supplement D3 has conflicting effects on these parameters in clinical trials (56).

Discussion and Conclusion

Currently, it appears that physical activity with various protocols and types of exercises, including aerobic, anaerobic, resistance, and combined, is the most suitable non-pharmacological treatment for patients with MS experiencing disability or mild disability. This can lead to improvement in fatigue, depression, and quality of life without exacerbating disease symptoms. Importantly, prescribing exercise for these individuals requires special considerations, and the exercise program should not be excessive, as overexertion can lead to fatigue and introduce stress to the body and mind.

According to the recommendation of the American Academy of Sports Medicine, the priority is given to aerobic exercises, and other exercises (strength, yoga, tai chi, balance, flexibility, aquatic exercises) can be included as alternatives alongside these aerobic exercises. It is crucial that individuals consult with their physician before starting exercise routines, and each person should receive a specific exercise plan based on the severity of the disease.

The aim of this research was to investigate the impact of exercise on MS patients. The findings of the present studies indicate that exercise may potentially contribute to improving functional limitations and the quality of life of these patients. However, some studies showed contradictory results, stemming from the type of exercise and the duration and timing of exercises. Limitations of this research include not examining the effects of different exercises in MS based on gender and different age groups (youth, middle-aged, elderly), as well as not exploring



different intensities of multiple sclerosis. Moreover, the impact of exercise in various weather conditions with different temperatures on exacerbating symptoms of multiple sclerosis has not been considered.

Therefore, it is recommended that future systematic reviews consider variables such as the climate conditions of the patients' residence, gender differences, age range of patients, the severity of the disease, and the prescription of exercise programs tailored to the intensity, along with providing suitable nutritional principles for individuals with MS. In general, the evidence suggests that regular types of exercises (aerobic, resistance, combined) with appropriate intensity and duration, along with adherence to specific guidelines for MS patients, have a positive effect on improving the symptoms of this disease, preventing disease progression, and enhancing the quality of life for these patients.

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Investigating the effects of continuous physical activities on the time to return to the initial state after fatigue in the elderly

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Abstract

This paper is a review article that utilizes information gathered from multiple published articles in reputable domestic and international databases, as well as examinations of various websites. Its aim is to discuss the effects of sustained physical activity on the recovery time to the initial state after fatigue in the elderly. The results indicate that old age in the world is referred to as the period over 60 years old, representing the final stage of the human life cycle. Elderly individuals have limited capacity for power regeneration and are more susceptible to diseases, syndromes, and fatigue than other adults. Various studies have shown that with increasing age, due to disorders occurring in various systems, especially due to mobility limitations, individuals become more dependent on others in performing daily tasks. Healthy aging not only implies the absence of significant illness and disability but also encompasses good mental health, maintaining cognitive abilities, and preserving social relationships and activities. There is ample evidence suggesting that regular physical activity is essential for maintaining health. In conclusion, it can be inferred that regular exercise has a significant impact on the recovery time to the initial state after fatigue in elderly individuals, and it can also be influential in their physical health.

Keywords: Elderly, Fatigue, Recovery, Regular Physical Activity

Introduction

In recent centuries, with a decrease in fertility rates and an increase in life expectancy worldwide, the elderly population has significantly grown. Among different age groups, the elderly have the highest growth rates (1). In recent decades, Iran has experienced extensive demographic changes. Statistical indicators in Iran show a noticeable trend of aging and geriatric acceleration. The rapid population growth, due to an increase in birth rates in the 1360s, led to the emergence of a massive wave of child population. Over time, this wave transitioned to adolescent and youth groups as the country's population pyramid shifted, and currently, the age group of 20 to 30 years holds the largest share in the country's population pyramid (2). Worldwide, aging refers to the period above 60 years, marking the final stage of the human life cycle. The elderly have limited ability to regenerate, making them more susceptible to diseases, syndromes, and frailty than other adults. Various studies have demonstrated that with aging, particularly due to mobility constraints, individuals become more dependent on others for daily activities, affecting their well-being and overall quality of life. One essential factor that can significantly contribute to improving the quality of life for the elderly is regular and consistent physical activity (3).

Aging is a natural process that begins from the fetal stage and continues until death, naturally accompanying the gradual decline in the function of most body tissues throughout life (4). The lifestyle of the elderly has an impact on their mental health, influencing their patterns of social interaction and participation in activities. Therefore, choosing a healthy lifestyle during these years is crucial due to its preventive effects on diseases and the improvement of both physical and mental health (5). A healthy lifestyle for the elderly encompasses behaviors that prevent illness and injury, maintain health, and enhance it. This includes appropriate dietary habits, exercise, stress management, social and recreational activities, leisure time, daily life activities, avoiding risky behaviors, abstaining from tobacco and alcohol, avoiding drug abuse, and maintaining healthy sexual behaviors (6).

It is believed that physical activity, exercise, and recreation create an active and satisfying life for the elderly, contributing significantly to their mental health and potentially slowing down the aging process, thus enhancing the quality of their remaining years (8_7). Therefore, the investigation of regular physical activity's impact on the lifestyle and health of the elderly is of utmost importance. We hope that our dear elderly individuals continue their physical activity and engage in regular exercises. The significance of physical activities for the elderly lies in the fact that this age group is exposed to risks and threats due to factors such as retirement, occasional unemployment, and inactivity. Research indicates that studies on the physical activities of the elderly in developing countries, such as Iran, are not extensive and profound. Generalizing the results of research and programs conducted in developed countries to developing countries is a mistaken assumption. Additionally, a review of research conducted within the country regarding strategies to improve the health of the elderly through physical activities



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lacks comprehensive and practical studies in this area. Existing studies often focus on examining the physical activity status and its effects on the elderly. The diverse challenges gripping the elderly and the complexity of various dimensions of their vulnerable lives call for deeper exploration and investigations into the apparent and hidden patterns of the elderly's physical activities (9).

Quantitative studies are often unable to examine the content and components of their contents. Therefore, qualitative studies are crucial for evaluating these determining concepts, especially those focusing on the occurrence of behaviors and phenomena, making them the most suitable research type in this context (9). Given the increasing importance of community health and the growing trend of the elderly population, considering the elderly's issues as a top societal concern, and the high level of mobility impairment, especially in daily activities, among Iranian elderly compared to advanced countries such as South Korea and Europe, and the role of exercise and physical activity in enhancing capabilities and preventing diseases, it is vital to formulate strategies for the elderly's participation in physical activities (10). These strategies and actions are essentially plans and reactions that should be employed to engage the elderly in physical activities. The goal of outlining these strategies is to provide a vision for development (11). The aim of this research is to investigate the impact of regular physical activity on the recovery time to the initial state after fatigue in the elderly, considering questions related to the effect of regular physical activity on mental health, lifestyle, and depression in elderly individuals.

Research Method

This study is a descriptive-analytical and qualitative research. The data collection method in this research is a literature review, utilizing numerous articles published in databases such as Civilica, ISC, and SID. Keywords including aging, physical activity, mental health, and depression in the elderly were used to write this article. Additionally, various domestic and international websites were reviewed to discuss the effects of continuous physical activities on the recovery time to the initial state after fatigue in the elderly.

Findings

Various articles and different domestic and international websites whose content was related to our research on the regular physical activity of the elderly were examined. The variables under consideration in our study were articles that investigated the regular physical activity of the elderly, the lifestyle of the elderly, elderly depression, and their mental health. The population in our study in all articles consisted only of the elderly. The evaluated articles indicated that healthy aging is not just the absence of significant illness and disability but also includes good mental health, the preservation of cognitive abilities, and the ability to maintain social relationships and activities. There is evidence suggesting that regular physical activity is essential for maintaining health, while in developed countries, lack of activity, along with smoking, excessive alcohol consumption, and obesity, is ranked as a major cause of reduced life expectancy.

Recently, researchers aimed to determine the effect of physical activity on the risk of depression, cognitive decline, and healthy aging. They followed approximately 3500 individuals with an average age of 64 for 8 years. In this study, the frequency and intensity of regular physical activity were inquired in 2002 and then every two years until 2010. Responses were categorized as inactive (no moderate or vigorous activity weekly), moderately active (at least once a week), and vigorously active (at least once a week). Any changes in the frequency and intensity during the biennial follow-up sessions were noted: always inactive, became inactive, always active. Throughout the study, about 1 in 10 individuals became active, and 70% remained active. The rest either remained inactive or became inactive. At the end of the follow-up period, almost 4 in 10 individuals had a long-term illness. Approximately 1 in 5 individuals experienced depression, one-third were disabled, and 1 in 5 had cognitive impairment. One in 5 individuals was considered healthy elderly, and there was a direct correlation between the likelihood of healthy aging and the level of exercise. The likelihood of healthy aging was 4 to 3 times higher in individuals who engaged in moderate or vigorous physical activity at least once a week compared to those who remained inactive. The likelihood of healthy aging was 3 times higher in individuals who were physically active compared to those who were inactive, and this likelihood was 7 times higher in those who remained consistently active throughout the study compared to individuals who were consistently inactive.

Robertson (2004) states that one known and influential factor in improving the quality of life is sports and physical activity. Exercise increases vitality, reduces depression, and enhances respiratory capacity. In the same vein, Buller and Morris (2009) stated that regular walking enhances various aspects of the quality of life and prevents cancer. Therefore, the development of programs and the promotion of regular physical activity, especially in the elderly, seem essential. Additionally, regular physical activity, such as walking, reduces dependence on other



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family members and caregivers, improves physical and mental function, and prevents premature mortality among middle-aged and elderly individuals (14). Marks and colleagues (2009) believe that exercise and regular physical activity can improve motor function among the elderly and increase their satisfaction and positive feelings about life. Overall, increased mobility capacity leads to increased vitality and happiness among the elderly.

Depression is considered the most common and significant factor affecting the mental-social functioning of the elderly, which unfortunately is still not well diagnosed and treated. Various difficulties and issues such as elderly loneliness, loss of a job outside the home, changes in family structure from extended to nuclear families, and rapid economic, social, and cultural changes have led the elderly to social isolation and, consequently, reduced dignity and respect among families and the younger generation. According to Beals, depression appears in 12 to 16% of elderly individuals, although 20 to 30% of them occasionally show symptoms of depression. Depression reduces the quality of life for the elderly and increases their dependence on others. Depression also leads to increased drug consumption, increased costs for prescription drugs, the risk of increased alcohol consumption, prolonged hospitalization, and care costs. In general, the duration of depression treatment in the elderly is longer and more expensive.

Eggenhaga and colleagues (2017) concluded in their study that physical activity at home may be a suitable treatment for depression and anxiety in older individuals. Borrassa and his colleagues (2017) found in their research that social participation is related to physical health, depression, and the level of physical activity. McDowell and his colleagues (2017) found in their study that moderate and high physical activity is inversely related to depression and anxiety in adolescents and adults.

Considering the conducted research, regular physical activity can be considered effective in reducing depression in the elderly. Therefore, sports officials should strive to provide suitable facilities for the elderly to engage in physical activity. The World Health Organization (2008) defines mental health in the general sense of health as the ability to fully perform social, mental, and physical roles and considers it the ability to maintain balanced and coordinated relationships with others, adapt and modify the individual's environment, resolve conflicts and desires fairly, logically, and appropriately. Hagstrom and colleagues (2008) argue that elderly individuals, due to their age and the physical and mental impairments they experience, are more prone to mental health problems, and their mental health disorders are more evident in the form of anxiety and depression.

Various research results indicate that mental health in the elderly is influenced by numerous factors that differ in various societies and under different conditions. Some factors are more important in certain countries. The benefits of physical activity for the health of the elderly are almost limitless.

Discussion and Conclusion

This study was conducted to investigate the impact of regular physical activity on the recovery time to the initial state after fatigue in the elderly. Through a review of the examined articles, the overall results indicated a direct effect of regular physical activity on the healthy lifestyle of the elderly, as well as their mental health and depression. In this regard, Nia and colleagues (2022) conducted a study titled "Physical Activity and Quality of Life in the Elderly" and concluded that there is a significant and meaningful relationship between the level of physical activity and the quality of life of the elderly, including dimensions of physical, marital, and life satisfaction. The highest correlation was observed between physical activity and life satisfaction among the elderly. A significant relationship between the physical activity of the elderly and their quality of life was found (24). Additionally, Sourì and colleagues (2016), in their research on the relationship between physical activity and the quality of life of elderly women in Kermanshah province, found a positive and significant relationship between physical activity and various components of quality of life, including limitations in social roles, physical pain, social functioning, limitations in emotional and sentimental roles, life vigor, general health, and physical functioning. However, no significant relationship was found between physical activity and the mental health of elderly women in Kermanshah (25). The research conducted outside Iran also demonstrated the impact of regular physical activity on the recovery time to the initial state after fatigue in the elderly. In this context, Pohl and colleagues (1999) showed in a study that regular and continuous physical activity can increase mental performance (26).

Furthermore, Granata and colleagues (2004) investigated the effect of exercise programs on the health status of elderly individuals and concluded that regular exercise programs contribute to the improvement of both physical and mental performance in the elderly (27). Maoravouniotis and colleagues (2010) reached the conclusion in their study that quality of life in the elderly is significantly related to physical activity (28). Therefore, elderly individuals face different challenges and needs than other age groups. It is advisable to gain awareness of their physical and mental status before any planning, and appropriate measures should be taken to promote the well-



being of the elderly and encourage their participation in physical activity and exercise by sports authorities and government officials. Additionally, through various research conducted on aging and the impact of physical activity on the elderly in Iran and abroad, it can be inferred that regular exercise and physical activity have a significant impact on the recovery time to the initial state after fatigue in elderly individuals and can also be influential in their physical health. It is hoped that the results of this research will contribute to the direction of further studies on the impact of physical activity in the elderly.

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Sports fatigue of women during pregnancy

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Abstract

Objective: Understanding the impact of exercise on the mother, fetus, and neonatal outcomes, as well as maternal readiness criteria. Studies indicate the beneficial effects of exercise on the mother and fetus during pregnancy without complications. Many researchers believe that engaging in exercise during pregnancy leads to birth weight proportionality, shortened labor stages, reduced need for cesarean section, and significant assistance in achieving natural childbirth.

Research Methodology: The research methodology in this article is a review of the best evidence. Many researchers believe that engaging in exercise during pregnancy leads to birth weight proportionality, shortened labor stages, reduced need for cesarean section, and significant assistance in achieving natural childbirth.

Conclusion: Findings indicate that aerobic exercise during pregnancy can improve the five-minute Apgar score of the newborn, but it does not have a significant impact on gestational length and birth weight.

Keywords: Exercise during pregnancy, pregnancy outcomes, newborn weight, gestational length, Apgar score.

Introduction

Pregnancy is one of the most sensitive and crucial stages in women's lives. This period is accompanied by changes in psychological and physical needs (1). Iranian women commonly lead a sedentary lifestyle during pregnancy, despite the well-established positive outcomes of regular physical activity on both physical and mental well-being (2). Inactivity during this period can result in various problems such as back pain, constipation, excessive weight gain, swelling, as well as mental and psychological issues. In various studies, researchers have examined the impact of exercise fatigue on pregnant women. In one study, the effects of aerobic exercise on pregnancy and its outcomes were investigated (13). The findings of this research demonstrated that engaging in aerobic exercise during pregnancy could improve fetal heart rate variability, but it did not have a specific effect on the duration of pregnancy and the newborn's weight at birth (14). The aim of this study is to gather and review previous research on the effects of exercise during pregnancy.

Research Methodology

The research methodology in this article involves a review of the best evidence. Many researchers believe that exercising during pregnancy leads to weight control at birth, shortening labor stages, reducing the need for cesarean section, and contributing significantly to natural childbirth (6).

Findings

According to the report of the American College of Obstetricians and Gynecologists, exercise during pregnancy reduces the following cases:

- Preterm birth
- Cesarean section
- Excessive weight gain
- Diabetes during pregnancy and blood pressure disorders
- Low birth weight

Despite this, about 60% of pregnant women eliminate their exercise activities during pregnancy (3). The American College of Obstetricians and Gynecologists in 2002 states that pregnant women, in the absence of medical and obstetric disorders, can engage in moderate-intensity exercise for about 30 minutes on most days of the week, which does not pose potential harm to the fetus and does not directly injure the mother's abdomen (4). Reduction in maternal blood glucose concentration (5), decreased back pain (6), improved mental health and quality of life (7), increased maternal physical function (8), and improvement in the physical condition of pregnant women (9) are among the effective effects of regular exercise during pregnancy that have been confirmed in various studies.



However, some effects, such as an increase in maternal body temperature and the possibility of fetal harm (10), reduced fetal growth due to decreased blood supply (11), and reduced fetal access to glucose due to decreased maternal blood sugar (12), have been mentioned as consequences of exercise during pregnancy in some studies. In response to numerous questions about the beneficial or harmful effects of different exercises and their intensities on pregnancy and its outcomes, including the duration of pregnancy, time of delivery, type of delivery, newborn weight, twin weight, and Apgar score, there are different and sometimes contradictory answers. Therefore, obtaining a clear answer to the ambiguities in this field requires conducting multiple research studies based on various variables, including the type of exercise, the timing of starting exercise, and the duration of exercise.

In a study titled "Investigating the Effects of Aerobic Exercise on Pregnancy and Its Outcomes," the effects of exercise on three variables, including the duration of pregnancy, newborn weight at birth, and Apgar score, were evaluated by implementing an aerobic exercise program for pregnant women. The study participants were selected from pregnant women attending prenatal care clinics affiliated with Tehran University of Medical Sciences and healthcare centers in Tehran. The results showed that in terms of the duration of pregnancy, most individuals in the study group had a gestational length of 40 weeks or more, and the majority of individuals in the control group had a gestational length of 38-40 weeks. However, the observed difference was not statistically significant. Regarding the birth weight, most newborns born to women in both the study and control groups were in the 2500-3500 grams weight range, and there was no statistically significant difference between the two groups in terms of birth weight. Regarding the Apgar score at five minutes, the findings indicated that most newborns born to women in both study and control groups had an average Apgar score of 9, and there was no statistically significant difference between the two groups in terms of the Apgar score at five minutes (15).

In another study titled "The Impact of Exercise During Pregnancy on Pregnancy Outcomes," which aimed to examine the effects of exercise activities during pregnancy on pregnancy outcomes, the hypotheses were as follows:

1. Engaging in exercise activities during pregnancy has no effect on increasing women's weight at the end of this period.
2. Engaging in exercise activities during pregnancy has no effect on the duration of the first and second stages of labor.
3. Engaging in exercise activities during the postpartum period has no effect on the occurrence of labor and after the due date.
4. Engaging in exercise activities during pregnancy has no effect on the type of delivery (natural or cesarean).
5. Engaging in exercise activities during pregnancy has no effect on the newborn's birth weight.
6. Engaging in exercise activities during pregnancy has no effect on the Apgar scores at the first and fifth minutes of the newborn.

This research was a randomized controlled trial with a control group. The study sample consisted of 160 first-time pregnant women who were selected by the researcher's continuous referral to healthcare centers affiliated with the Ministry of Health and randomly divided into two groups. Women with known physical or psychological conditions or pregnancy complications such as breech presentation, polyhydramnios, increased blood pressure, fetal growth retardation, and spotting were included in the study. During the study, women had to record their exercise activities, and an illustrated booklet was provided to them for performing exercises at least three days a week, each time for 20-30 minutes. The research findings showed that most women in both the control and intervention groups had an increase in weight at the end of pregnancy, and there was no significant difference between the two groups in this regard. In both groups, most women completed the first stage of labor within 351-450 minutes. Independent t-test results did not show a significant difference in the duration of the first stage between the two groups. The second stage's duration was mostly 31-40 minutes in the control group and 20-30 minutes in the intervention group, showing a significant difference between the two groups. The results indicated that 4.2% of women in both groups had preterm deliveries. In terms of the type of delivery, there was no difference between the two groups, and the majority of women in both groups had natural deliveries. The percentage of women with newborns weighing less than 2500 grams was lower in the intervention group than in the control group. Independent t-test results showed a statistically significant difference between the two groups in terms of the average weight of newborns. 98.5% of newborns in both groups had Apgar scores above 7 (16).

In another study titled "Exercise during Pregnancy and Postpartum Period," the following recommendations were made to pregnant women during pregnancy and after childbirth:



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1. All women without contraindications should be encouraged to participate in aerobic and strength exercises as part of a healthy lifestyle during pregnancy.
2. Reasonable goals for aerobic exercise during pregnancy should focus on maintaining good fitness levels throughout pregnancy without striving for peak physical fitness or training for a sports competition.
3. Women should choose activities that minimize the risk of falls and trauma to the fetus.
4. Women should be aware of the potential adverse outcomes of pregnancy or childbirth for exercising women.
5. Initiating pelvic floor exercises immediately after childbirth may reduce the risk of urinary incontinence in the future.
6. Women should be advised to engage in moderate exercise during breastfeeding.

Discussion and Conclusion

The findings of various studies indicate no statistically significant difference regarding the effects of exercise on pregnancy and its outcomes. However, considering previous studies, these outcomes may be influenced by the intensity of physical activity, the duration of each exercise session, the number of sessions per week, the history of exercise before pregnancy, exercise during pregnancy, and its type (aerobic or non-aerobic).

Based on the results, maternal exercise fatigue not only has no adverse effects on pregnancy outcomes but, in some cases, it exerts positive effects. For instance, it may shorten the duration of the second stage of labor and contribute to the birth of infants with more proportionate weights. Therefore, the following recommendations are proposed:

1. Organizing educational classes in prenatal care centers to reduce women's concerns about potential adverse effects of exercise on the fetus and newborn.
2. Providing regular exercise training to pregnant women attending healthcare centers, medical specialists in women's health and obstetrics, and midwives.
3. Offering educational materials at various educational levels on exercise during pregnancy.

Further research is needed in the field of the impact of exercise activities on pregnancy and its outcomes, involving a larger study population.

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Investigating the effect of relaxation exercises on recovery after sports trauma

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Abstract:

The aim of this research is to investigate the effects of relaxation exercises on post-sports trauma recovery.

Research Methodology: In this study, various books and articles were reviewed to examine relaxation exercises on post-sports trauma recovery.

Findings: In the modern era, post-injury recovery has become a domain for specialists, evolving the necessity of sports physiotherapists, sports physicians, and orthopedic surgeons. The characteristics of changes in sports-related injuries and limited access to recovery facilities in many regions, especially in India, are a matter of concern. Elite sports facilities have some protections, but the average athlete is often left to fend for themselves. Key factors in successful sports injury recovery protocols include the use of modern recovery protocols under proper supervision, appropriate and timely surgical interventions, and the use of pharmaceutical agents when needed.

Conclusion: Recovery after sports injuries is a vital aspect to ensure complete control, minimize downtime from sports, and prevent reinjury.

Keywords: Sports, stretching exercises, trauma, sports injury

Introduction

In the modern era, post-sports injury recovery has become a domain for specialists, evolving the necessity of sports physiotherapists, sports physicians, and orthopedic surgeons. The changing nature of sports-related injuries and limited access to recovery facilities in many regions, particularly in India, are significant concerns. While elite sports facilities have some protective measures, the average athlete is often left to their own devices. Key factors in successful sports injury recovery protocols include the use of modern recovery protocols under proper supervision, appropriate and timely surgical interventions, and the use of pharmaceutical agents when needed. Modern recovery protocols emphasize group empowerment and proper recovery planning, and N-TAM recovery, guided by a trained sports physiotherapist, understands the protocols and necessary interventions at various stages. Specific recovery protocols for injuries are practiced globally, but their introduction should be tailored based on the nature of the sport and available facilities. Even in India, sports physicians are increasingly joining specialized recovery teams and can contribute to medication, nutritional supplements, and specialized tests that can enhance injury understanding. If surgical interventions are performed, mandatory surgeon inputs are necessary. What is often lost in the underdeveloped world is psychological support and the athlete's understanding of their recovery protocols. Globally, primary goals include a safe return to sports and minimizing the risk of relapse; this involves addressing acute and chronic injury phases clearly. Close coordination with coaches is essential, and everyone must understand that the reconstruction phase assessment is vital (1) before progressing to a specialized domain that should be introduced at all levels of sports. A key element in all sports recovery protocols is injury prevention, including maintaining data by teams or coaches, which is not fully developed in India, and athletes and their coaches should understand future injuries and problems. Current efforts to illuminate some important issues are generally used globally, with the aim of improving post-sports recovery even in the underdeveloped world (2).

Recently, plyometric exercises have gained attention as effective methods that enhance the speed and explosive functions of athletes. These exercises involve rapid muscle lengthening (eccentric contraction or the lowering phase) and immediately followed by a strong concentric contraction (shortening phase) of the same muscle and connective tissue. While the positive effects of plyometric exercises on increasing anaerobic power, agility, speed, explosive power of the lower limbs, etc., have been confirmed, many coaches and athletes refrain from engaging in them due to the associated muscle damage and soreness. According to some sports medicine specialists, physiotherapists, and sports coaches, plyometric exercises are essentially injury-prone exercises with very high work intensity, placing muscles and joints under maximum mechanical load. Inkottar et al. (2009) reported that



high-volume plyometric exercise can cause environmental fatigue and may reduce muscle force and contraction speed. Additionally, some study results indicate that following plyometric exercises, blood lactate levels, blood pressure, and muscle soreness significantly increase 24 to 48 hours after exercise (3). Intense muscle activity creates an imbalance in the production and removal of lactic acid in the muscle, leading to the release of lactate into the blood and an increase in its concentration in the tissue. Muscle soreness is also a common and widespread experience resulting from physical activity, occurring in both acute and delayed forms after physical activity, especially eccentric contractions, and is associated with symptoms such as pain, spasms, reduced range of motion, and decreased muscle power. These effects can also occur in professional athletes and their occurrence can continue to harm their sports performance and lead to their exclusion or injury in sports activities. Preventing these effects seems to be one of the most important sports considerations, and awareness of them is highly valuable for coaches and athletes (4).

Relaxation exercises, considered part of the warm-up program, play a crucial role in developing the flexibility essential for any type of physical activity. Various forms of relaxation exercises expose muscles to their maximum possible length and movement of limbs to the end of the range of motion or static contraction for a certain period (usually 15 to 60 seconds). This technique is widely used as an effective method to increase range of motion (ROM) and flexibility for improving sports performance and reducing the risk of sports injuries. It is generally believed that increased ROM during exercise reduces the risk of injury. However, recent studies have also pointed out that static stretching may disrupt performance, so its execution in warm-up programs for strength and power sports is not recommended (6).

Dynamic stretching involves moving a limb from its natural position to the end of the range of motion and then returning it to its original position. This type of stretch is a controlled concentric contraction that takes a certain amount of time and is repeated a certain number of times. Dynamic stretching, in addition to having the benefits of static relaxation exercises in preventing injuries, can improve neuromuscular activity, facilitating explosive force production and enhancing power. Studies have shown performance improvement after yoga stretching compared to static stretching (6).

Research Background

Bandy and colleagues (1988) demonstrated that static stretching is not as effective in increasing flexibility as dynamic stretching and can be beneficial in effectively warming up. Considering that static and dynamic stretches have different effects on performance and flexibility, researchers have also examined the combined effects of these two types of stretches. In this regard, it has been suggested that performing dynamic stretching after static stretching reduces or eliminates the negative performance effects of a single type of stretch. In addition to performance, researchers have also focused on comparing the effects of different stretches on the reduction of Delayed Onset Muscle Soreness (DOMS) (3).

Tucker et al. (2004), in a systematic review of various stretching studies, reported that stretching in different athletes has both no effect and a preventive effect on various injuries. Lund and colleagues (1998) found that static stretching has no significant impact on increasing or decreasing muscle injury indicators (4).

A study by Pope et al. (2000) showed a non-significant reduction in muscle soreness after stretching. Herring and Gereige (2002) reported that stretching decreases muscle soreness by less than 2 millimeters on a 100-millimeter scale, 72 hours after exercise. According to athletes, this amount of reduction is considered less effective in reducing soreness (5).

Furthermore, Kashaf and Namani (1381) reported that static stretching alone does not only reduce muscle injury indicators and muscle soreness symptoms following eccentric exercises but increases some of these indicators and symptoms. Despite these results, there is some evidence supporting the positive effects of stretching on reducing sports injuries (4).

Hartig and Henderson's study (1999) indicated that performing relaxation exercises before strenuous exercises reduces flexibility and injury. Chen et al. (2011) reported an increase in Range of Motion (ROM) and a decrease in muscle injuries resulting from eccentric exercises with static stretching (3).

In a study by McKay et al. (2001), basketball players who performed a comprehensive relaxation program during warm-up showed fewer ankle injuries. Amako et al. (2003) stated that static stretching reduces injuries related to muscles and tendons but has no effect on bone and joint injuries (8).

Cross and Worrell (2019) also demonstrated the relationship between static stretching programs and a decrease in muscle strains in the lower limbs. In an examination conducted by Ramsey et al. (2006) on the attitudes, awareness, and performance of East Michigan school coaches regarding stretching, they concluded that almost



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95% of these coaches agree on the usefulness of stretching, especially in reducing the risk of sports injuries. On average, they encourage their athletes to perform 13 minutes of stretching (6).

Through a review of past studies, inconsistent results were obtained regarding the impact of relaxation exercises on muscle injuries and soreness. On the other hand, it was found that studies aiming to investigate the effects of static, dynamic, and combined stretches on blood lactate response and delayed muscle soreness resulting from a damaging exercise such as plyometric exercises are very scarce. These facts convinced us to compare the effects of three types of static, dynamic, and combined stretches on blood lactate response and delayed muscle soreness after performing an intense plyometric exercise and answer the question of which type of stretch will contribute to the recovery of blood lactate and muscle soreness after a strenuous exercise (9).

Therefore, compared to traditional recovery after injury, sports injuries require a more careful approach, a highly structured and specific sports approach that prepares both athletes and injured tissues for physical and mental demands at the highest level of sports (2).

The growing popularity of recent sports methods in hockey, football, and cable leagues in India provides evidence of a growing sports culture in a country primarily focused on cricket. These sports progress rapidly, play in a short time frame, and often lead to fatigue injuries and high vulnerability to the respective athletes. Studies worldwide emphasize the relationship between sports demands and injury risks. Unfortunately, the lack of research and literature on structural programs that focus on managing and preventing injuries in Indian athletes indicates that our country is lacking in this regard compared to developed countries such as England, the United States, and Australia. A PubMed search using keywords such as "sports and injury and recovery and India" yielded 26 quotes, none of which were relevant, and none addressed the issue. A PubMed search using keywords such as "sports and injury and practices and concepts and current concepts" resulted in 79 hits, most of which were not related to the recovery of specific sports injuries, and none of them were focused on Indian athletes (3).

Research Methodology

In this study, the impact of relaxation exercises on post-sports trauma recovery was investigated by examining various books and articles.

Findings

Epidemiology

Sports injuries can occur through contact or non-contact mechanisms, involving muscles, ligaments, or bones, and may be acute or chronic in nature. Despite extensive insights into injury mechanisms, prevention programs, and load monitoring techniques in athletes, epidemiological studies over the past two decades have not shown a significant decrease in sports-related injuries. Hootman et al. observed college athletes in 15 different sports in the United States over 16 years and found that lower limb injuries constituted about 50% of all sports injuries, with knees and ankles being the primary areas affected. The majority of injuries were contact-related, with a significantly higher number observed in competitions compared to training injuries. Among the 15 sports analyzed, football had the highest injury rate, while wrestling ranked second. The authors also noted that increased physical demand, participation, and rule changes had a significant impact on the injury trend.

A notable example of such an association between injury trends and sports demand is observed in elite-level cricket following the introduction of the shorter and more physically demanding T20 format. Dhillon et al. reported an incidence of 16.8% for upper limb injuries in a prospective assessment of cricketers. Orchard and colleagues identified hamstring and thigh injuries as the most common injuries in elite cricket at present, attributing them to changes in the game format. Tirabassi et al. concluded that 60% of all sports injuries resulting in medical disqualification occurred during competitions, with lower limb injuries being the most prevalent over an 8-year period.

Protocols Used Worldwide

Documentation of basic measures for result comparison at pre-contract levels is crucial. Initial measures are usually taken during preseason assessments, ideally conducted at the beginning of the sports season. The recovery team can use this as a guide when deciding on a return to competition. Power and conditioning should aim to achieve somewhat higher levels of strength, power, and endurance than before, as should preventive measures to address the causative factor. "Safe return to sport" can be interpreted differently by various members of the recovery team. Therefore, the physician should specify the capacity in which the athlete is returning. A gradual transition from recovery to competition should be made so that athletes do not suffer injuries immediately upon their return. Players should complete a full training session with the team a few days before the game and should



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be symptom-free during training. An ongoing discussion is how much the player should participate in their first game after recovery, depending on the athlete's goals and the situation in which they play. For example, a goalkeeper with lower limb injuries can play a full game, while a forward with the same injury may be limited in playing time. This argument supports an individual and proportional recovery approach for athletes. Another determining factor in competition time is which stages players return; some stages, such as finals or a series of important games, may require more and higher (P.O.L.I.C.E.) measures in the acute care environment for athletes. Since mechanotherapy has shown positive effects on promoting collagen organization and tissue improvement, it is sensible to introduce a loading program soon after pain relief is allowed. Preliminary loading should help increase full-weight bearing, which can also be achieved through hydrotherapy or weight-assisted treadmills. Given the pain-inhibiting effects of isometric exercise, isometric exercise is another excellent option as the first-line intervention for tissue loading. However, physicians must respect the natural healing processes of the body and ensure a timely balance between loading and unloading to prevent tissue damage. While we must protect injured areas from further harm, we cannot simultaneously impede the necessary ventilation of other parts of the body. Despite self-studies in IV and level V, pulse ultrasound and electrical muscle stimulation are still used clinically in an attempt to manage inflammation and promote healed tissues, as has been the case since the 1920s. In addition to physical requirements, a multi-disciplinary team requires elite athletes to have mental and emotional sports demands. It is recommended that elite athletes undergo psychological and nutritional interventions early in the supervised program to ensure that all well-being and injured tissues are optimized with high-quality nutrients. The progression of interventions to the next stage of rehabilitation is heavily based on achieving a set of performance criteria, which varies significantly when dealing with individual athletes. Table 1 illustrates a sample of such predefined criteria indicating that an athlete with muscle injury needs to fulfill specific criteria to progress to the next stage in the continuity of recovery. "Although there is no level 1 evidence validating predefined progress criteria, physicians should guide the recovery process with their expertise and make clinically sound arguments for informed decision-making regarding medical interventions during recovery, such as medications, non-steroidal anti-inflammatory drugs, and injections, beyond the scope of this review. However, many issues arise, and occasional use of steroid injections for some acute conditions or platelet-rich plasma injections for specific conditions that need to be maintained in MG conditions is essential for optimization beyond the current article's scope.

Return to Sport

Once recovery criteria for the reconstruction phase are met, the decision for Return to Play (RTP) must be made. As a physician and a member of the rehabilitation team, it is important to understand that the decision to return to sports is not isolated. While a joint decision must be made by the entire recovery team, the athlete himself is the final judge in RTP. Nevertheless, the responsibility for the safe and timely return to sports lies on the shoulders of physicians and recovery team coaches. The Strategic Tolerance and Risk Assessment (Staat) is a theoretical framework that assists physicians in making informed decisions to gradually return athletes to their respective sports, helping to assess short-term and long-term risks associated with sports. Figure 1 shows a three-stage framework that helps sports physicians assess the short-term and long-term risks of sports injuries.

To ensure progress, a graded classification of the physical demands of this sport, some researchers have suggested an attachment that proposes the athlete's performance for participation, return to sports, and return to competition. The recovery team must be aware of the sporting demands and potential risks. While there is no evidence of level 1 validating progress criteria, physicians should guide the recovery process with their expertise and make clinically sound arguments for informed decision-making regarding medical interventions during recovery, such as medications, non-steroidal anti-inflammatory drugs, and injections, beyond the scope of this review. However, many issues arise, and occasional use of steroid injections for some acute conditions or platelet-rich plasma injections for specific conditions that need to be maintained in MG conditions is essential for optimization beyond the current article's scope.

Discussion and Conclusion

Recovery after sports injuries is a vital aspect to ensure complete control, minimize downtime from sports, and prevent reoccurrence. Modern recovery methods have surpassed traditional management protocols and are based on an active recovery framework that advocates equal participation from the athlete and the entire recovery team. Efforts are made to ensure the first RTP, and even though sports physicians are responsible for the safe transition to competition, it is crucial to remember that the ultimate decision-maker is the athlete. The role of surgical interventions, as well as medication requirements, is based on and beyond the scope of this manuscript, but the



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primary work on an athlete after injury is done by the recovery team. Additionally, nutritional supplements and psychological interventions should not be overlooked, playing a crucial role in getting the athlete back in full form, along with returning to sports without injury at the same level as when injured.

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