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Analysis of Crypto Market Transaction Tracking

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Abstract

Despite being completely unknown for more than a decade, cryptocurrencies are now a trillion dollar worldwide industry with more than 4,000 different currencies available. Additionally, the decentralized nature of digital currencies has elevated the sector to a level where privacy and safe transactions are taken for granted. Market analysis, however, indicates that there are numerous security flaws that could jeopardize the genuine anonymity of the bitcoin transaction network. In this post, we examine a few network security flaws that affect cryptocurrency systems.

Keywords: digital currency, tracking, transactions

1. Introduction

The paper by Biryukov et al. [1] examines vulnerabilities in cryptocurrency traffic that enable the identification of these features and the ability to link transactions to particular nodes in the network. Although this research shows that vulnerabilities can be exploited as expected, it also shows that the strategy utilized in this paper is increasingly valid in light of network applications used in the real world [2-4].

Biryukov [1] took a more detailed look at the flaws that integrating Tor and Bitcoin showed. Due to greater privacy concerns while employing the latter, this is typically done. This study found that this hybrid use creates weaknesses that can be exploited to make Tor useless and anonymize Bitcoin transactions. Although the ethics of this study can be questioned, the research's findings are particularly valid because the methodology used genuine Bitcoin systems, the Tor network, and the involvement of the systems' creators.

The paper by Apostolaki et al. [5] investigates the middleware routing and attack vulnerabilities in the cryptocurrency network. These attacks can be used to fully split and disconnect nodes in the Bitcoin network, according to research. The researchers demonstrate how a user's mining activities may be compromised and seriously harm the Bitcoin industry in this manner. While this strategy is similar to that in the first article, it takes a closer look at the practical uses of the vulnerability and shows how it has already been used in the Bitcoin network [6,7].

2. Research statement

The security flaws of cryptocurrencies are examined at the network level in all of the evaluated articles, but they are all examined from different angles. The first and second articles primarily discuss user-level flaws, while the third article focuses on other flaws [8]. These articles analyze network data to test the proposed vulnerabilities and determine whether it would be feasible for adversaries in the actual world to employ the examined attack vectors and the necessary resources [9].

The study by Biryukov et al. [1] examines Bitcoin network traffic. A hypothesized and investigated Bitcoin network vulnerability enables a user to bind traffic via network analysis on network nodes. To give a comparative perspective of the vulnerabilities of various cryptocurrencies, this analysis initially examines Bitcoin traffic before applying it to other privacy-focused cryptocurrencies.

The article by Biryukov et al. deals with a more focused vulnerability discovered in bitcoin communications as a result of combining the Tor browser with Bitcoin infrastructure. This pairing is thought to be a result of both the inclination to increase user privacy through the use of an anonymous browser, such as Tor, and the rising perception of privacy problems connected with Bitcoin traffic [10-12]. As a result of widespread flaws in the Tor network system traffic and Bitcoin, it has been suggested that this combination will lessen network anonymity. This article investigates the implications of this proposition. The discovered vulnerability enables the development of new attack vectors that can anonymously transmit user traffic using these platforms [13,14].

According to Apostolaki et al., the Bitcoin routing system is vulnerable to medium-sized attack vectors. This article examines security flaws in the architecture of Bitcoin network traffic that could be used to impair Bitcoin mining operations and economic activity. This article examines the same vulnerabilities we previously mentioned, which allow transactions to be connected with particular users and nodes; however, this issue is now being explored from a business perspective. It also evaluates the consequences of routing attacks and network fragmentation. In addition to the user-level ramifications covered in the essay by Biryukov et al., there may also be implications for Bitcoin itself.

3. Research methodology

Prior to the research by Biryukov et al., the flaws had not been thoroughly tested. The majority of other studies concentrated on using data mining techniques to analyze data taken from the blockchain [15-17]. This investigation reveals a mostly unprotected attack vector for all the cryptocurrencies under examination, even though its primary goal is to assess privacy-focused security mechanisms and vulnerabilities for cryptocurrencies.

This article expands on pertinent earlier research on anonymous attacks, which often involve just the initial network node to take part in a transaction. In spite of the requested transaction addresses, this study shows how to employ weight functions to link transactions to nodes. This study demonstrates that the network has flaws that can be used to identify transactions anonymously and with high accuracy across all cryptocurrencies examined in the study. Even adversaries with relatively limited resources are practically able to exploit the revealed vulnerability in the Bitcoin mainnet [18-20].

In their study, Biryukov et al. combined the use of the Tor anonymous browser and the Bitcoin network to identify novel attack avenues. The study looks at the potential for cookie misuse, which would enable assaults to track user transactions invisibly, as well as people's innate capacity to detect attacks when the two systems are merged. "Cookies" can save user fingerprints, making it possible to identify users when they connect to the Bitcoin network using Tor [21-25]. They can even help attackers locate and identify an IP address. This article also offers defenses that can be employed to deal with current privacy weaknesses.

Prior to the research presented in this paper, the topic of Bitcoin security on peer-to-peer systems has already been thoroughly investigated; nevertheless, by concentrating on the particular combination of Tor [26-28] and Bitcoin [29,30] traffic, two of the most well-known, this research offers a fresh perspective. Systems of their own kind also offer a patch to the system that fixes vulnerabilities that have been discovered [31-33], in addition to validating attack pathways in actual Internet contexts. Additionally, they provide particular countermeasures that can be applied to lower the risks [34,35]. In a study, Biryukov et al. investigated ways to attack Bitcoin networks. This article investigates assaults against digital currencies using network routing infrastructure and the Internet itself, despite the fact that several attack vectors have been established in the field of digital currency security. The research covered routing attacks and their effects on Chinese blockchain mining activities and their financial ramifications.

The analysis in the article, which shows both the likelihood of attacks and the fact that vulnerabilities are now being routinely exploited, challenges this idea. It is a typical issue with traffic redirection on the Bitcoin network. The provided research study offers compelling proof for the proposed attack vector, an estimate of the attack occurrence on real networks, and an assessment of the possible harm to Bitcoin and its users. These data come from empirical analysis and real network situations. This research presents both short-term and long-term countermeasures that can be utilized to enhance security and address issues presented by the research in addition to conclusively demonstrating flaws. By disclosing the methods and potential effects of this vulnerability on Bitcoin systems, researchers have significantly benefited the sector. The discovery of these vulnerabilities, especially considering the countermeasures introduced, has a substantial influence on the security of cryptocurrencies. It is also causing an increase in adversaries exploiting consumers in the market.

4. Experiments

The three examined papers examine security flaws in network traffic, so the study and analysis of the articles is done by evaluating the veracity of the researcher's proposed flaws in network traffic and Bitcoin transactions. Researchers can verify their assertions and determine what resources an adversary would need to use to launch an attack by performing attacks on their network traffic.

Humans are introduced to many middleware attacks in the article "Shutdown and Binding of Cryptocurrency Transactions Based on Network Analysis" that are used to listen for and gather information about network traffic passed through test nodes. In order to aggregate cryptocurrency transactions together and connect messages to suggested source nodes, this analysis is then utilized to create transaction weights and heat maps. Researchers try to link nodes with particular IP addresses using this aggregate data in an effort to significantly lessen

the secrecy surrounding cryptocurrency transactions. The enemy can further define node data by combining this data with additional information obtained from passive attacks, just like in a real-world attack, even though, as the researchers admit, this does not always produce conclusive results. The viability of the attack is evaluated using scenarios.

The "Bitcoin over Tor Idea Not Good" study article evaluates the claims made using the actual Bitcoin and Tor networks, unlike the prior paper that conducted an experiment on smaller experimental networks. In order to plan and carry out the suggested assaults, researchers' users were introduced into the network during this study on peer-to-peer network designs. The validity of the results is far higher than other publications conducted in tiny experimental contexts, which frequently fail to match the complexity of real-world network environments, because claims are examined in real-time using the Tor and Bitcoin networks. However, the utilization of actual user network data to test for vulnerabilities and exploits raises ethical questions about the research. These ethical concerns are lessened as a result of the necessary article updates because experiments were carried out in collaboration with the creators of Bitcoin and Tour and the "cookie address" attacks were immediately patched to fix the vulnerability.

Similar to the research carried out in [36,37], the researchers designed and investigated systems attacks that are carried out on smaller networks, and the findings are generalized by researchers to account for bigger network sizes that potential adversaries may confront in the real world. While this method has inherent faults that affect the validity of the researchers' conclusions, these problems are minimized by the thorough analysis done in the study, which pays close attention to how the exploitation will actually be used in the real world. In addition to these points, the researchers also showed how the flaws are currently being actively exploited on the actual Bitcoin network, where traffic has been successfully redirected and nodes have been compromised, thereby demonstrating the flaws in question.

5. Discussion

Although the three articles each make a unique technical contribution, they all add to the conversation around the privacy and security of cryptocurrencies. The authors of [38-40] examined flaws that were mainly ignored in earlier studies on the security of the digital currency. Both articles examine the issue of analyzing network traffic, the first from a user standpoint and the second from a corporate perspective. A topic that has been thoroughly studied before, the study paper "Bitcoin over Tor isn't a Good Idea" tackles the problem of digital currency security through peer-to-peer networks. The research however adopts a novel strategy by delving further into one of the most well-liked amalgamations of digital currencies and peer-to-peer networks.

The findings of the studies "Democratization and Possibility of Cryptocurrency Transactions Based on Network Analysis" and "Bitcoin Hijack: Directing Attacks on Cryptocurrency" point to serious threats to the security of the crypto network in hitherto unreviewed areas. Fundamental problems with the research that can cast doubt on the validity of the analysis's findings. First off, test settings might not accurately reflect how an assault might happen with a real attacker, as was briefly addressed in both articles. The environments employed for both publications were modest experimental environments that tended to neglect parts of the network security protocols used in actual cryptocurrency transactions, like publishing and

tethering, to closely imitate the actual situation the attacker faced. Separately, the test analysis results support the researchers' hypotheses regarding the flaws, however for the purposes of a straightforward analysis, other network security methods are disregarded [41]. When this is considered, the veracity of claims about security risk might be seriously contested. The probability-based approach yields much fewer results because real-world network architectures are much broader and more complicated than those evaluated in experimental situations. Due to these and other security mechanisms being ignored, the search results are a fairly poor approximation of the capability of actual attackers. However, as was already said, the extensive recovery in the use and variety of cryptocurrencies has given adversaries more and more industrial weaknesses to target, thus any flaws found in cryptocurrency systems can result in widespread exploitation. The researchers' statements about potential consequences are highly dubious, nevertheless, until the application of such a vulnerability in the actual world is established [42,43].

Along with the aforementioned, the research in [44,45] employs a technique similar to the first and actively investigates the drawbacks of utilizing such vulnerabilities in actual network environments. This study not only effectively supports their theory but also illustrates a potential method for combating abuse and the possibility of investigation supplying reciprocal actions. It also draws attention to the fact that the aforementioned vulnerabilities are already being used by adversaries in the Bitcoin network. Additionally, this article offers countermeasures that can be used in the short and long terms to address the vulnerabilities discovered through the study and analysis. The conclusions stated in [46,47] are substantially more credible as a result of a more thorough inspection and study of the proposed vulnerabilities and the identification of actual assaults on the Bitcoin network. Additionally, there are genuine vulnerabilities in the cryptocurrency network that not only need to be fixed right away but are actually costing Bitcoin and its miners money.

Using distinct beta environments, [48] carried out their investigation. While the authors themselves have evaluated and resolved the ethical issues raised by this vulnerability test, they have only done so in connection to the immediate effects of the experience on participants during study, taking no account of more general ethical standards. Tor's notoriety for enabling access to the dark web and the illegality of its use lead one to the conclusion that users who engage in illegal activity and commerce could dominate the combined use of Tor and Bitcoin. From this perspective, it can be inferred that finding and fixing vulnerabilities on these platforms is unethical, especially in light of the fact that law enforcement officials frequently use these attack vectors and vulnerabilities to look into and restrict illegal activities that rely on obscure platforms like the Tor browser [49]. Researchers, therefore, run the risk of undermining law enforcement attempts to stop unlawful and unethical activity on the Dark Web, like the sale of weapons, child pornography, and drug trafficking, by exposing these vulnerabilities and the solutions to fix them. However, the study methodology is thorough and rational, and real-world network settings used for research provide more valid results than the environment used for experiments, regardless of the ethical concerns of such research.

6. Conclusion

Over the past ten years, the cryptocurrency sector has grown rapidly, which has led to substantial advancements in systems and technology across the board. As a result of this

expansion, the security of these cryptocurrency systems has more flaws and weaknesses. The articles under examination examine some of the less well-known security flaws in cryptocurrency systems, with a special emphasis on Bitcoin and its network-wide flaws.

The analyzed articles give information about various cryptocurrency security flaws and potential attack routes. Although the articles mostly concentrate on Bitcoin, they also offer insights into other cryptocurrencies that prioritize privacy, like ZCash, Dash, and Monero. Given the current market domination of bitcoin, there is a lot of money at risk when evaluating the security of bitcoin systems, which has prompted the analysis of numerous attack avenues; nevertheless, some papers focus on some damage. They have less carefully considered flaws. They are most frequently seen at the network level in cryptocurrency systems. The articles "Bitcoin via Tor Is Not a Good Idea" and "Debugging and Correlation of Cryptocurrency Transactions Based on Network Analysis" discuss privacy concerns relating to Bitcoin network traffic vulnerabilities, especially at the user level. Bitcoin Hijacking: Routing attacks on cryptocurrencies continue to hunt for systemic flaws, however, these flaws are primarily commercial in nature and don't put much emphasis on user results.

Although the three articles focus on various facets of digital currency security, it is obvious that much work has to be done to protect cryptocurrencies, especially bitcoin, from possible attackers.

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The Effect of Physical Fitness Exercises on Dynamic Balance and Static Balance in Hearing Impaired Girls Aged 13 to 15 Years with Hypofunction of the Vestibular System in Mashhad

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***Abstract*— the purpose of this research was the effect of physical fitness exercises on dynamic balance and static balance in hearing impaired girls aged 13 to 15 years with vestibular system dysfunction in Mashhad. The research method was semi-experimental with a pre-test and post-test design with a control group. The statistical population of this research included all hearing-impaired girls with bilateral vestibular problems aged 13 to 15 in Mashhad. The statistical sample was selected in a targeted manner and randomly selected in two experimental and control groups (12 people in each group). The experimental group participated in a physical fitness program for 8 weeks, 3 sessions per week and 60 minutes per session. The control group only did daily and normal activities. Balance tests were taken from the participants before and after the training period. The statistical method of independent t-test was used using spss21 software to compare between two groups. The results showed that physical fitness exercises increased both static balance and dynamic balance in 13 to 15-year-old hearing-impaired girls with vestibular dysfunction (P<0.05). This indicates that hearing impaired children can improve their balance by participating in a physical fitness training program that includes 8 weeks and 3 sessions per week for 60 minutes.**

***Keywords*— Physical fitness exercises, dynamic balance, static balance, hearing impaired girls**

Introduction

Hearing is one of the most important factors in communicating with others, and any disorder in this system will cause the separation of the deaf and hard of hearing person from the society, and as a result, the lack of progress and development of his personality and other aspects of his development (1). Balance is a complex motor skill that describes the dynamics of body posture to prevent falls. The activities performed in the work environment and daily tasks such as walking and going up and down the stairs, all require balance and proper posture control. Also, balance is one of the important aspects of physical fitness that athletes benefit from to improve their sports performances; So that there are few sports in which balance does not play a role (2). It has been previously shown that infants and children with congenital hearing loss usually have vestibular deficits in both ears and impaired postural control (3). Several sources have considered the use of information from the vestibular system to be decisive for maintaining balance and posture, and have mentioned the information of vision and physical sense as useful in maintaining balance (4). Damage to the structure of the vestibular system, the cause of balance deficiency, is known to disrupt normal motor development. This injury is also considered the main cause of motor impairment (5).

The sensory systems that include the vestibular part of the inner ear, the sense of sight and bodily sensation play an important role in maintaining body stability and balance. Damage to parts of the cochlear-vestibular nerve not only causes sensorineural hearing loss, but may also be associated with balance problems due to damage to the vestibular branch of this nerve and this is the reason why about 40% of deaf people have difficulty maintaining balance (6). Deaf people have different movement and social behaviors, of course, some of them are quite obvious. These characteristics are mostly seen in maintaining body balance, coordination, strength and endurance (7). In fact, these different characteristics can be classified in the field of physical fitness indicators that deaf people are less prepared in these indicators compared to their normal counterparts.

Hearing impairment as a result of damage to the balance system of the body may affect the function of the higher centers of the brain (8). According to many researchers, reducing the endurance of these muscles causes their premature fatigue, damage to pain-sensitive tissues, and finally, spine injuries (9). People with hearing impairment have problems with balance, and balance is one of the essential prerequisites for daily activities (10). Maintaining or reaching a state of balance while a person is ready to move or is moving or ready to stand is a complex ability (11). Due to its effect on the growth of the vestibular system, exercise can be considered as a strong therapeutic intervention for people with functional disorders in the vestibular system, and sports activities are recommended for these people (12). Rine (2000) supports the idea that children with sensorineural hearing loss with vestibular dysfunction also have a disorder in neural organization (13). In the study of Livingstone and Mcphillips (2011) on children with profound hearing loss, due to the high probability of movement defects in these children, the priority of effective intervention programs was emphasized (14). There are very few studies that have investigated the effect of an intervention program on improving balance in hearing-impaired children with balance disorders. The research that was conducted for the first time in order to improve the balance of these children, included exercises that focused more on single-leg movements, were performed in a limited period of time, and did not produce significant improvement between the experimental and control groups (15). But a more comprehensive exercise program that included balance exercises and body awareness showed improvement in balance skills performance (16).

The purpose of this research was the effect of physical fitness exercises on dynamic balance and static balance in hearing impaired girls aged 13 to 15 years with vestibular system dysfunction in Mashhad.

Materials and methods

The research method was semi-experimental with a pre-test and post-test design with a control group. The statistical population of this research included all hearing-impaired girls with bilateral vestibular problems aged 13 to 15 in Mashhad. The statistical sample was selected in a targeted manner and randomly selected in two experimental and control groups (12 people in each group). The experimental group participated in a physical fitness program for 8 weeks, 3 sessions per week and 60 minutes per session. The control

group only did daily and normal activities. The basis of the exercises in this protocol are specific exercises for stabilizing the spine, retraining the proprioceptive sense of the lumbar-pelvic region, tucking in the abdomen with the contraction of the multifidus muscle, and then using the dynamic stability obtained in different positions (open arch, palmar and squat) by keeping the aforementioned stabilizing maneuver and adding dynamic components to it. 24 hours before and 48 hours after the training period, static and dynamic balance tests were taken from the subjects. Static balance was measured using balance error evaluation test and dynamic balance was measured using Y balance test.
Descriptive statistics and inferential statistics were used to analyze the data. In the descriptive statistics section, mean and standard deviation descriptive indices were used, and in the inferential statistics section, independent t-test was used using spss21 software.

Results

The results of the independent t-test to compare the balance changes of the two groups are reported in Table 1. The results showed that static balance increased significantly in the experimental group compared to the control group (P=0.001). Also, dynamic balance increased significantly in the experimental group compared to the control group (P=0.001).

Table1. The results of independent t-test to compare the balance changes of two groups

Variables	Groups	Before intervention	After intervention	t	df	p
Static balance	experimental	12.16 ± 1.94	16.83 ± 1.46	4.23	22	0.001 *
	control	13.50 ± 1.31	14.41 ± 2.57			
Dynamic balance	experimental	14.50 ± 2.90	22.33 ± 1.87	7.77	22	0.001 *
	control	13.25 ± 1.28	14.16 ± 0.93			

* Significant at the level of P≤0.05

Discussion

Based on the findings of the present study, physical fitness exercises increased both static and dynamic balance of 13 to 15-year-old hearing-impaired girls with vestibular system dysfunction. To control stability, both sense, which means collecting sensory information to understand the position and movement of the body in space, and movement, which means generating forces to control it, are needed and there must be a complex cooperation between the nervous system. The present findings are consistent with the research results of Matsuda et al. (2008) (17). However, the present findings were in conflict with the findings of Piegaro et al. (2014). Among the reasons for the difference in the results, we can mention the difference in the type of training program and subjects. In any case, the improvement of balance in this research was very evident. Perhaps the reason for this is the addition of strength training, especially strength training related to muscles that play a significant role in balance strategies. The most important muscles that are tonically activated while standing and their postural tone is very important in maintaining balance are: soleus and biceps muscles, tibialis anterior muscle, gluteus medius muscle, hamstring muscle, erector spinae muscles in the chest area and lumbar and abdominal muscles (18). Some studies also state that all body muscles are tonically active in a very small range to maintain vertical balance and body balance while standing (19). In this study, the emphasis of exercise on lower body muscles was mentioned. Therefore, using strength exercises along with balance exercises gives a special advantage to that exercise combination and doubles the effectiveness of the exercise. In addition, in the exercises, the strengthening of movement strategies of balance (movement strategy of the wrist, pelvis and taking steps) and the sensory mechanisms involved in the control of balance (sense of vision, sense of body and vestibular system) have been discussed. This can be one of the reasons for the significant improvement in balance in the present study. Such a sense of vision creates information about the position of the head and its movement in relation to the environment and other objects, and in fact creates a

standard for verticality, because many things that are around us, such as doors and windows, etc., are vertical. This information is an important source for balance control (18). The vestibular system complements the visual system in recognizing internal movements and relative movements. The delay of muscle responses to stimuli and visual impulses caused by the disturbance of balance is usually high and reaches about 200 milliseconds, which is much more than the delay of responses to the sensory system of the body which is about 80 to 100 milliseconds. For this reason, the researchers believe that the central nervous system first responds to the body inputs as a result of the motion of the surface.

The results of the present research were consistent with the results of Kaka and Zarrinkoub (2013) research (12). Also, the results of this research were consistent with the results of Majlesi et al. (2014) who investigated the effect of professional training interventions on static balance and walking of deaf children (21). They concluded that the walking quality of the subjects did not change after 12 training sessions, but the balance performance in the intervention group had a significant increase. The reason for the effectiveness of exercise programs on balance and height control can probably be attributed to the improvement of sensory organization and increased coordination, because exercise programs are balanced by increasing the organization of other senses that affect balance, such as the sense of body and vision, leading to improvement (22). On the other hand, the results of this research are not consistent with the findings of Piegaro et al.'s (2004) research (2). These researchers investigated the effect of 4 weeks of central stability and balance training on dynamic and static balance and did not observe a positive effect on balance performance as a result of these balance exercises (2). The reasons for this inconsistency include the different nature of the exercise program, the different balance evaluation tests, the number of sample sizes of children participating in the study, and the possible difference in the severity of children's deafness. According to the results of the present study, it seems that training in different sensory conditions with eyes open and closed and by manipulating different environmental components and tasks improves sensory integration and adaptation to different environmental conditions. Also, in hearing-impaired children, it makes better use of other senses involved in balance (vision and body sense) and subsequently improves balance performance in static and dynamic conditions.

Conclusion

As in many researches, the effectiveness of various exercises on the balance of hearing impaired people has been proven, in this study, the static balance and dynamic balance of the subjects improved significantly, and this indicates that hearing impaired children by participating in Physical fitness training program includes 8 weeks and 3 sessions per week for 60 minutes, they can improve their balance.

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Comparison of Personal, Social and Sports Identity in Deaf Women Athletes and Non-Athletes in Mashhad

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***Abstract*— the purpose of this research was to compare personal, social, and sports identity in deaf sportsmen and non-athletes in Mashhad. The research was done based on the analytical descriptive method. The statistical population included deaf women who were members of the Mashhad Center for the Deaf and were residents of Mashhad. Based on the simple random sampling method and using the Krejcie and Morgan table, 359 people (952 deaf athletes and 247 deaf non-athletes) were selected as a statistical sample. Standard questionnaires of sports identity (Borour, 1993), social identity (Safariniya, 2011) and personal identity (Adamz, 1986) were used to collect data. The reliability of the tool was calculated using Cronbach's alpha and was 0.83, 0.74 and 0.81 respectively. Independent t-tests and one-sample t-tests were used to analyze the data. There was a significant difference between deaf athletes and non-athletes based on individual identity, sports identity and social identity (P<0.05). Individual identity was at a suitable level in deaf female athletes, but not at a suitable level in deaf non-athlete women (P<0.05). Sports identity was at a suitable level in deaf sportswomen, but not at a suitable level in deaf non-athletes (P<0.05). Social identity was at an appropriate level in deaf sportswomen, but not at an appropriate level in deaf non-athletes (P<0.05). It seems that engaging in sports in deaf women improves their individual identity, social identity and sports identity.**

***Keywords*— Individual Identity, Social Identity, Sports Identity, Deaf Women Athletes**

Introduction

Sport is considered as one of the important methods of physical, mental and social development, participation in sports activities brings people together spatially and spatially. It provides many ways and

opportunities to become skilled and generally creates an educational flow in cultural and social dimensions for the individual. Research conducted between athletes and non-athletes in different environments shows that there is a difference between athletes and non-athletes in terms of identity issues, physical and mental health, social injuries, and emotional issues (1). In other words, people who exercise have less depression than those who do not exercise, and people who exercise have better individual and social adjustment than those who do not exercise (2). Research has shown that any body shape and defect in people causes them to have a negative perception of themselves. Disability is a crisis that everyone may face in their life path. Physical disability has physical and psychological dimensions, and just as it affects a person's physical health, it also affects her psychosocial adjustment and mental health. A person with some form of physical disability experiences a painful loss that has great physical and emotional significance. Therefore, the positive acceptance of the disabled person by herself and those around her is a basic condition for the positive social development of the person. The more a person has self-belief and a better understanding of her individual identity, the higher her position and efficiency, and she will be immune from psychosocial harms. Deaf people are among the people who need social acceptance as much as possible (3). Deaf people are among the people who can engage in sports activities and make the most of their free time in the favorable conditions of the society. Sports activities, while enriching part of the free time of the blind, can play an important role in the growth and development of their moral, psychological, and physical aspects or their identity in parallel with other activities. On the other hand, it increases his ability to deal with problems and adapt to the conditions, or even makes it possible to solve many problems. Today, the concept of identity is an interpretative issue, and recognizing its importance as the first intermediary between the organization and individuals is a necessity. Donken states that identity includes identifying the symbols of a service and its specific definition leads to the identification of the organization (4). Today, participation in sports activities leads to strengthening the process of sports socialization. The primary motive of people's participation in sports activities is to enjoy the pleasure of entertainment as well as to acquire skills in the field of interest. Sports identity is defined as a degree of power and exclusivity for a person who identifies his identity with the role of sports (5). Giving sports identity to the disabled causes the self-concept of these people and their ideal self-knowledge to be in line with some of the other aspects of their lives, because the impact of giving identity causes the person to participate in other social activities and even the emergence of their social identity will also be formed.

The purpose of this research was to compare personal, social, and sports identity in deaf sportsmen and non-athletes in Mashhad.

Materials and methods

The research was done based on the analytical descriptive method. The statistical population included deaf women who were members of the Mashhad Center for the Deaf and were residents of Mashhad. Based on the simple random sampling method and using the Krejcie and Morgan table, 359 people (952 deaf athletes and 247 deaf non-athletes) were selected as a statistical sample. In this research, three questionnaires were used to collect data.

Standard questionnaire of sports identity (Borour, 1993) is designed in the field of sports identity of athletes, which was previously used in the research of Heydari et al. (among disabled athletes and disabled non-athletes of Ahvaz Welfare Department). The percentage of Cronbach's alpha (reliability coefficient of the research tool) in this study was calculated as 83%, and the questionnaire has 10 questions and 7-choice Likert type.

Standard questionnaire of social identity (Safariniya, 2011) is designed in the field of social identity of athletes. Cronbach's alpha percentage (reliability coefficient of the research tool) in this questionnaire was calculated as 74% and the questionnaire has 20 questions and 5-choice Likert type.

Standard questionnaire of personal identity (Adamz, 1986) consists of 64 items and includes four subscales: disturbed, precocious, delayed, and advanced, each of which contains 16 questions. A score of 6 to 1 is awarded respectively. In this questionnaire, Cronbach's alpha coefficient is 81%. In the state of disturbed identity, a score of 53 and above indicates the existence of a disturbed identity in the person. In the state of early-formed identity, a score of 53 and above indicates the formation of an early-formed identity. In the state of deferred identity, a score of 63 and above indicates the existence of a delayed identity in a teenager, and in the state of advanced identity, a score of 73 and above indicates the formation of this type of identity in a person. Independent t-tests and one-sample t-tests were used to analyze the data.

Results

The results of the independent t-test to compare individual identity, sports identity and social identity between female athletes and non-athletes are summarized in Table 1. Also, the results of a sample T-Tech test to check the personal identity, sports identity and social identity of deaf sportswomen are presented in Table 2. In addition, the results of a sample T-Tech test to examine the personal identity, sports identity and social identity of non-athlete deaf women are presented in Table 3. There was a significant difference between individual identity, sports identity and social identity of deaf athletes and non-athletes, so that all three identities were better in athletes compared to non-athletes ($P<0.05$). The results showed that the personal identity, sports identity and social identity of the athletes were higher than the average level of the Likert scale and were significant. Because of this, it was significantly better than average ($P<0.05$). The results showed that individual identity, sports identity and social identity of non-athletes were lower than the average level of the Likert scale, but it was not significant. Therefore, it was not significantly better or worse than average ($P>0.05$).

Table1. Independent t-test results to compare variables between two groups

variables	groups	mean ± standard deviation	t	p
personal identity	athletes	4.47 ± 0.73	0.528	0.007 *
	non-athletes	3.35 ± 1.27		
sports identity	athletes	4.28 ± 1.07	0.641	0.001 *
	non-athletes	3.02 ± 1.38		
social Identity	athletes	3.52 ± 1.21	0.368	0.001 *
	non-athletes	2.36 ± 1.27		

*significant at the level of $P\leq0.05$

Table2. The results of the T-Tech test, a sample for examining variables in athletes

variables	mean ± standard deviation	t	p
personal identity	4.47 ± 0.73	17.327	0.001 *
sports identity	4.28 ± 1.07	4.53	0.0012 *
social Identity	3.52 ± 1.21	3.87	0.001 *

*significant at the level of $P\leq0.05$

Table3. The results of the T-Tech test, a sample for examining variables in non-athletes

variables	mean ± standard deviation	t	p
personal identity	3.35 ± 1.27	- 4.28	0.062
sports identity	3.02 ± 1.38	- 5.61	0.055
social Identity	2.36 ± 1.27	- 4.89	0.06

Discussion

There is a significant difference between the individual identity of deaf sportswomen and non-athletes. On average, deferred identity is observed among deaf sportswomen, while deaf non-athletes typically do not have this type of identity, which means that sportswomen are more likely than non-athletes to make decisions. They act more carefully and show less haste. Also, on average, advanced identity is more common among deaf female athletes. While non-athlete deaf women usually do not have this type of identity, and this means that female athletes have more thoughtful decisions when faced with psychological problems and personality crises than non-athletes. Also, on average, advanced identity is more common among deaf female athletes. While non-athlete deaf women usually do not have this type of identity, and this means that female athletes have more thoughtful decisions when faced with psychological problems and personality crises than non-athletes. On average, disturbed identity is also less observed among deaf female athletes. While non-athlete deaf women usually have a higher level of this type of identity, and this means that female athletes feel less lost and empty compared to non-athletes. In addition, on average, early-formed identity is less observed among deaf sportswomen. While deaf non-athletes usually have a higher level of this type of identity, and this means that female athletes act more freely and have more decision-making power than non-athletes. Therefore, it can be concluded that one of the functions of individual identity is to stabilize one's personality. The meaning of personality is the same features and characteristics that a person believes to be unique to him. In this case, identity acts as a tool to strengthen and stabilize the person's concepts about himself. Individual identity in deaf female athletes is at a suitable level. The average obtained from the community of deaf sportswomen is higher than the average of the Likert spectrum and it can be said that in general, sportswomen are at a good level of individual identity. It can be concluded that female athletes better understand the individual identity that includes things like experiences, thoughts, dreams and aspirations. It seems that turning to sports has made the self-confidence of these people to be at a higher level, these people alone and away from others can create the necessary capacity for life within themselves. This capacity ultimately leads to the formation of a person's personality. The individual identity of non-athletes women is not at a suitable level. According to the results obtained, it can be concluded that exercise increases factors such as self-confidence in people, which results in an increase in self-awareness and the needs and ideals of a person, which is the result of personal identity. There are findings confirming the present findings (6, 7).

There is a significant difference between the sports identity of deaf women athletes and non-athletes. Considering that sports identity is a degree of importance, power and exclusivity that people receive and attribute to themselves from participating in sports, therefore, deaf and hardworking women give more importance to sports on average and It comes from more power and exclusivity in the society and their individual decisions and overcoming the disabled and accepting it. Therefore, by encouraging the disabled, including the deaf, to exercise, the level of strength in them increases and it leads to an increase in self-confidence, which results in the greater participation of the individual in the society and his greater activity in the social arenas. Sports identity in deaf female athletes is at a suitable level. According to the obtained results, it can be concluded that people who are engaged in a sport have reached a certain degree of exclusivity and feel more empowered in their daily activities and plans. Sports identity in deaf non-athlete women is not at a suitable level. It can be concluded that when disabled people, including the deaf, are less inclined to sports. Amount of power and exclusivity that comes from the presence of sports in people's daily activities will not be. On average, these people have lower self-confidence and self-confidence than athletes, and therefore their degree of participation in social activities is significantly lower. There are findings consistent with the present findings (6, 7).

There is a significant difference between the social identity of deaf sportswomen and non-athletes. The rate of social identity among non-athlete deaf women is less than 2.5, which indicates that the component of sports identity is low compared to the average. Therefore, comparing the two groups of female athletes and non-athletes, we come to the conclusion that the level of social identity of female athletes is relatively higher than that of non-athletic women. It can be concluded that in deaf sportswomen, due to participating in sports gatherings, it creates a feeling of belonging to the team. Therefore, a person has a greater desire

to participate in social activities and this causes a sense of belonging to the community. According to the obtained results, it can be concluded that by participating in sports activities, especially group sports, there is a sense of belonging to the group and activities to improve and advance the goals of the group, which is also manifested in the daily life of the individual. It finds and makes a person feel more commitment and belonging to the sports community and then the community and surrounding people seek participation. She has to answer the society's expectations and in critical situations the fate of the society and overcoming the crisis of the society becomes important for him and he tries to solve the problems of the society. The level of social identity among deaf non-athletic women is lower than the middle of the Likert scale. According to the obtained results, it can be concluded that not participating in sports activities has reduced self-confidence in social activities, one of the results of which is isolation and avoiding the community. Considering that sports activities, even if they are individual, it is necessary to participate in different sports communities, so the spirit of participation of people in collective activities increases and the individual feels more belonging to the society and the environment. Previous results confirm the present findings (6, 7).

Conclusion

It seems that engaging in sports in deaf women improves their individual identity, social identity and sports identity.

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The Effect of Simple Pyramid Resistance Training Session with Branched-Chain Amino Acid Supplementation on Insulin-Like Growth Hormone-1 Levels in Postmenopausal Women

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***Abstract*— the aim of the current research was the effect of a simple pyramid resistance training session with BCAA supplementation on IGF-1 levels during different periods of time in postmenopausal women. The current research was semi-experimental and applied. A total of 19 inactive postmenopausal women were selected. At first, the subjects were given the necessary information about the objectives and method of conducting the research, and each subject completed the consent form, physical activity and medical-sports readiness questionnaire. Then the subjects were randomly divided into two groups of simple + supplement pyramid resistance training (10 people) (age 52.20 ± 5.70 years, height 1.57 ± 0.01 cm and weight 88.76 ± 14.81 kg), Simple pyramid resistance training group + placebo (9 people) (age 50.89±4.25 years, height 1.60±0.01 cm and average weight 88.76±7.41 kg) were divided. The resistance training program was a pyramid with an intensity of 70-80% of one repetition maximum. The simple pyramid resistance training group + supplement consumed 0.1 gram per kilogram of body weight of BCAA powder in solution. Serum IGF-1 levels were measured before, 30 and 120 minutes after exercise. Two-way repeated measures statistical test was used to analyze the data. The findings showed that a simple pyramid resistance training session with BCAA supplementation has no effect on IGF-1 serum levels at different training times of postmenopausal women. Also, the difference between the groups in the level of IGF-1 after exercise was not significant. Probably, a simple pyramid resistance training session with and without BCAA**

supplementation at the rate of 0.1 gram per kilogram of body weight before and after training has no effect on the initial increase of IGF-1.
***Keywords*— Simple pyramid resistance training, branched chain amino acid supplementation, insulin-like growth factor-1, postmenopausal women**

Introduction

Menopause is a period of women's life that occurs on average after the age of 50 and is associated with a decrease in the secretion and production of estrogen. This period with increased immobility; Bone density, aerobic fitness, muscle strength and decreased balance are associated (1). In addition, menopause is associated with aging, followed by metabolic syndrome, obesity, high blood pressure, cardiovascular diseases, sarcopenia, and osteopenia. The phenomenon of sarcopenia is always associated with a decrease in muscle mass, the quality and function of skeletal muscles, which can lead to a decrease in the function of physical activity and sports activity in this society (2). During this period, the reduction in the ratio of anabolic to catabolic hormones plays an important role in reducing physical strength, muscle mass and aerobic capacity. With age, the amount of testosterone (the most important androgenic hormone) decreases after the age of 40, and the level of cortisol in the blood increases. to find Also, the amount of estrogen hormone decreases, which accelerates the loss of muscle mass and bone density in women. Insulin-like growth factor-1 (IGF-1) (polypeptide with a sequence of 77 amino acids) from the family of insulin-like growth factors; Together with its protein receptors, it is effective in regulating the mechanisms of production, differentiation and growth. Growth hormone acts as an inducer of the synthesis and release of IGF-1 from the liver, hence it is effective in controlling the growth and differentiation of most body tissues (3). IGF-1 is an important mediator for the growth of skeletal muscle and bone tissue, which is originally synthesized by the liver. Meanwhile, IGF-1 is also produced in several other extrahepatic tissues; and has local paracrine and autocrine effects (4). Normally, tissue reactivity to IGF-1 changes with age. The aging process is related to the reduction of its receptor content and IGF1R phosphorylation in muscle.

Physical activity and sports can help menopausal women to experience less physiological changes during this period. The results of studies show that performing regular sports activities leads to a reduction in the speed of physiological, anatomical, hormonal and metabolic changes and also leads to an improvement in the quality of life of postmenopausal women in society (5). The results of several studies have reported that a session or a period of resistance training with different intensities of a maximum repetition was associated with significant changes in IGF-1 levels in postmenopausal women. In general, the results of this research show that significant changes in the level of IGF-1 immediately after training and the following hours are influenced by several factors, including training program, food consumption, growth hormone changes and blood lactate levels (5-7). In addition to performing resistance exercises, athletes use supplements to maximize the effective factors of growth factors. Food supplements mainly include carbohydrate compounds, proteins, vitamins, minerals, etc. Branched-chain amino acid supplement contains leucine, isoleucine, and valine amino acid compounds, all of which are involved in the processes of the membrane transport system, transfer enzymes, growth hormone secretion and oxidative carboxylation (8). BCAA contains 35-40% of the essential amino acids of body protein and 14-18% of the total amino acids of skeletal muscle protein. Considering that 40% of the body weight is made up of skeletal muscle mass, therefore the muscle protein pool represents a significant reserve of BCAA in the body (0.6 to 1.2 mmol per kilogram of body weight). Most studies have shown that leucine plays an important role in protein metabolism and increases protein synthesis and inhibits protein degradation through the mTOR mechanism. BCAAs are involved in the oxidation process of skeletal muscle, although this process takes place directly in the liver. The body is not able to synthesize amino acids and must be included in the diet, and it is known that BCAAs play an important role in muscle oxidation during sports activities (9). On the other hand, leucine is a water-soluble amino acid that increases the amount of plasma insulin after eating, which plays an important role in increasing the activation of anabolic pathways leading to mTOR (7).

IGF-1 is a liver factor in muscle protein synthesis, and its production and release rate is different under the influence of resistance training programs. However, there are controversial results regarding the effect of resistance training program on IGF-1 levels during a training period. Also, there are limited studies on the effects of single-session simple pyramid resistance training programs on IGF-1 levels in AES women. The aim of the current research was the effect of a simple pyramid resistance training session with BCAA supplementation on IGF-1 levels during different periods of time in postmenopausal women.

Materials and methods

The current research was applied and semi-experimental, which was conducted as a pre-test-post-test with two groups. The statistical population of the research was made up of postmenopausal women of Mashhad city, based on the criteria for entering the research (one year has passed since the last menstrual period, no use of hormone therapy, having a body mass index between 25 and 30 kg/m2, no history of cardiovascular disease, liver, kidney, lung and diabetes and no regular sports activity in the last 6 months) and after initial screening by the researcher, 19 people were selected to participate in this study. Subjects were randomly divided into two groups: simple pyramid resistance training + branched amino acid supplement (10 people) and simple pyramid resistance training + placebo group (9 people).

In order to comply with the ethical charter, before taking samples, all people were familiarized orally with the nature and manner of doing the work and its possible risks, and they were reminded of important and necessary points about nutrition, physical activity, illness and drug consumption in order to comply with it. Exercise the necessary care then all the people completed the written consent form to cooperate in the research work and declared their readiness to participate in the research. It should be mentioned that all the people were free to withdraw from the research work at any time without any conditions. First, the standing height was measured in centimeters using a caliper (Seca; Germany), then the body mass index and fat percentage were measured using a body composition analyzer model 720 made in South Korea in two stages: pre-test and post-test.

In order to prepare blood samples, in coordination with the medical diagnosis center, an experienced expert in experimental sciences was asked to take blood from the subjects. Blood samples were taken in three stages before, 30 minutes and 120 minutes after training. The amount of blood taken was 5 cc from the antecubital vein of the arm, which was then poured into anti-coagulant glasses and transferred to the laboratory for analysis after the end of blood collection. The values of IGF-1 were reported by the ELISA method and its kit with Mediagonest brand, made in Germany, with a sensitivity of 0.09ng/ml and a variability of less than 6.8 and 6.7%.

The simple pyramid resistance training program (light to heavy) was as follows, the first set is 70% of one repetition of sitting with 12 repetitions, the second set is 75% of one repetition of maximum with 10 repetitions and the third set is 80% of one repetition of maximum with 8 repetitions, rest There was 1 to 2 minutes between each set and 2 to 3 minutes rest between each movement. (To estimate the maximum muscle strength, the subject first warmed up by choosing light weights for 5 minutes, and after a two-minute rest, according to the subject's estimation, they chose weights that they could lift at least once and at most 10 times completely. and do it correctly. By placing the amount of weight and the number of repetitions in the following formula, the maximum strength of the subjects in the movements of the simple pyramid resistance training program was calculated. To measure the maximum strength, the formula of Berzyski (1999) was used (repetitions * 2.78 - 78/102) / load* 100 = one maximum repetition). The exercises included Chest Press, Horizontal Leg Press, Seated Row, Seated Calf Raise, Triceps Pushdown, Leg Curl, Knee Extension and Preacher Curl (23).

The groups were randomly divided into two groups: supplement + simple pyramid resistance training and placebo + simple pyramid resistance training. For the supplement group, the branched-chain amino acid supplement made by the Universal company of America with the brand BCAA Stack was used, and the amount of 0.1 gram per kilogram of body weight of BCAA powder was mixed in 400 ml of solution, and the subjects took 200 ml before training and after They used the remaining 200 ml of exercise (9). For the placebo group, a supplement with the minimum amount of energy made in the country and with the brand

Slim last 1 was used. The placebo group, like the supplement group, consumed 200 ml before and after training. It should be noted that the solutions were used in a blinded manner.
To analyze the data, descriptive statistical tests (mean and standard deviation), Shapiro-Wilk statistical tests used to determine the normality of the data, and Levene's test was used to determine the homogeneity of variances. Two-way analysis of variance with repeated measures used to examine the changes in the research variables. All statistical calculations were done using SPSS statistical program. Also, a significance level of $p<0.05$ was considered.

Results

Based on research, the average age, weight and body mass index of the subjects were respectively in the resistance training group with supplement (52.20±5.70), (76.88±14.81), (29.80±5.72) and in resistance training and placebo group were (53.89±2.25), (69.30±7.41), (27.00±2.52). All variables had a normal distribution. According to the results obtained from this research (Table 1) in both exercise groups with supplements and exercise, there is no significant difference in the amount of IGF-1 between the time periods before, 30 and 120 minutes after exercise (650/ $F=0.2$; $p>0.098$), ($F=0.766$; $p=0.481$). Also, the results of the two-way ANOVA statistical test with repeated measurements showed that there is no significant difference in IGF-1 levels between the time periods before, 30 and 120 minutes after exercise ($F=0.904$; $p<0.414$). (Table2). In other words, there was no significant difference between the groups before, immediately and 120 minutes after training. On the other hand, the results of the interaction effect of time repetitions of IGF-1 of the groups showed that there is no significant difference ($F = 2.431$; $p = 0.103$) (Table3).

Table1. Information on changes in IGF-1 before, 30 and 120 minutes after exercise in the subjects of exercise + supplement, exercise (19 people)

groups	Before exercise	30 minutes after exercise	120 minutes after exercise
exercise + supplement	70.40 ± 25.13	74.40 ± 35.73	93 ± 46.40
exercise	63.77 ± 22.40	51.33 ± 26.69	53 ± 10.34

Table2. The results of the analysis of variance statistical test with repeated measurements between the exercise + supplement group and the exercise group

groups	df	F	P
exercise + supplement	2	2.650	0.098
exercise	2	0.766	0.481

Table3. The results of the statistical test of two-way analysis of variance with repeated measurements between the levels and the exercise + supplement and exercise group

groups	Df	F	P
Levels of measurement	2	0.904	0.414
Interactive effect	2	2.431	0.103

Discussion

The present findings showed that a simple pyramid resistance training session and BCAA supplement consumption have no effect on IGF-1 serum levels before, 30 minutes and 120 minutes after exercise in postmenopausal women. One of the main objectives of the present study was to determine the effects of BCAA consumption along with a simple pyramid resistance training session on changes in serum IGF-1 levels. In general, the results of the present study showed that performing a simple pyramid resistance training session with BCAA supplementation before and after training has no effect on IGF-1. So far, no study has been conducted on postmenopausal women with BCAA supplementation with resistance training. However, several other studies have investigated the effect of resistance training and BCAA supplementation on physiological variables. In line with the results of the current research, Spillane et al. (2013) reported that eight weeks of heavy resistance training and BCAA supplementation had no effect

on body composition and skeletal muscle performance (10). These researchers attributed the lack of effect of BCAA supplementation to the low sample size, lack of direct monitoring of supplement consumption and resistance training by the researcher, lack of diet control and low dose of BCAA supplementation (9 grams). Also, Foster et al. (2011) investigated the effect of eight weeks of heavy resistance training and BCAA + carbohydrate supplementation on physical performance and body composition. The results of this study showed that the consumption of BCAA supplements along with carbohydrates during resistance training is required (12). kerksick et al. (2006) also investigated the effect of ten weeks of resistance training and protein and amino acid supplementation on skeletal muscle performance and muscle metabolism index. The results indicated an increase in total body mass, lean mass, muscle strength and serum IGF-1, mRNA expression of IGF-1, MHCI-II and myofibrillar protein (13). IGF-1 is an anabolic hormone that increases in response to mechanical activity. It is thought that IGF-1 participates in skeletal muscle cell hypertrophy processes by activating satellite cells. It has been found that IGF-1 levels in skeletal muscle tissue exert their myogenic effects up to 72 hours after exercise (14, 15). It has been reported that a session of resistance training leads to the positive regulation of mRNA expression of growth factors, including IGF-1, and continues for several hours after exercise (16). In relation to food consumption and resistance training, studies have shown that taking amino acid supplements immediately after resistance training leads to the activation of anabolic factors for several hours after training. Showed consumption of 10 grams of BCAA is effective in increasing some skeletal muscle anabolic factors up to three hours after consumption. Reported carrying out a resistance training session with BCAA and carbohydrate consumption has an effect on IGF-1. Researchers attributed their possible causes to the amount of leucine in BCAA, which leads to an increase in IGF-1, which was confirmed by Church et al. (2016). It seems that the dose of BCAA supplement (120 mg per kilogram of body weight) and resistance training were effective in increasing IGF-1. In the present study, there was no change in the amount of IGF-1. The possible causes can be due to the dosage that was 0.1 gram per kilogram of body weight (17). Willoughby et al. (2006) subjects consumed 20 grams of amino acid before and after training, it was more than the amount prescribed in the present study (18).

The results of this research showed that simple pyramid resistance training had no effect on IGF-1 profile. It seems that it was caused by the lack of increase in growth hormone after training. Of course, it can be said that the amount of blood lactate has not increased significantly. It has been reported that lactate and blood acidity play an important role in growth hormone secretion (19). However; Growth hormone and blood lactate changes were not measured in the present study; Therefore, caution should be used in interpreting the results. Another aim of the current research was to investigate the effect of simple pyramid resistance training on IGF-1 changes in postmenopausal women. The obtained results showed that resistance training has no effect on blood serum IGF-1 levels. As we mentioned earlier, limited studies have investigated the acute effect of resistance training on postmenopausal women. However; in the study by Ribeiro et al. (2016), the effect of simple versus traditional pyramid resistance training on IGF-1 responses in elderly women was investigated. The results of this study showed that hormonal responses increased in both groups during the first 12 hours. These researchers attributed this increase to the characteristics of simple pyramid resistance training and the increase of hormone receptors (20). The results of the present study did not confirm that high intensity can affect IGF-1 changes. Probably, this lack of alignment can be attributed to the sample size, the type of training protocol. Other studies conducted in line with the present study show that resistance training has no effect on IGF-1 levels. In this regard, Razmjoo et al. (2009) examined the acute and chronic effects of resistance training on IGF-1 changes in non-athlete girls. These researchers reported that there was no significant change in the amount of IGF-1, but an increase in muscle strength was achieved. They attributed the lack of increase in the amount of IGF-1 to the increase in the half-life of IGFBP-3, the increase of inflammatory factors (21). This was while the researcher was not able to measure these influential variables. Therefore caution should be used in interpreting the results. Sadeghi et al. (2008) attributed the increase in IGF-1 in connection with resistance training to the amount of rest between each set and pointed out that short-term rest leads to a greater increase in anabolic hormones. These researchers stated possible reasons for changes in acidity caused by muscle activity, increased growth hormone secretion, sympathetic nervous

system activity (noradrenaline) and low rest between sets (22). Also, Hoshyar et al. (2015) reported that strength training with two fertility patterns has a positive effect on some physiological and hormonal factors, especially IGF-1, in active young women. They reported that the increase in the amount of IGF-1 is related to the increase in growth hormone and lactic changes (23).

Conclusion

The purpose of this study was the effect of a simple pyramid resistance training session with and without BCAA supplementation on postmenopausal women. The results of this present study showed that a simple pyramid resistance training session with BCAA supplementation at the rate of 0.1 gram per kilogram of body weight before and after training has no effect on the initial increase of IGF-1. Also, other results showed that a simple pyramid resistance training session without BCAA supplementation has no effect on IGF-1.

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The Effect of Two Types of Recovery Activities in Cold Water and Massage on Creatine Kinase (CK) and C-Reactive Protein (CRP) in Football Players

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***Abstract*— the purpose of this study was to compare the effect of two types of recovery (massage and running in cold water) on creatine kinase (CK) and C-reactive protein (CRP) of soccer players following a simulated soccer activity. 14 youth male soccer players were purposefully selected and randomly placed in two groups of recovery of massage and recovery of running in cold water (7 people in each group). On the day of the sports test, at 10:00 AM, all the subjects participated in a simulated soccer physical activity session with the difference that the massage group recovered by massage after the activity; And the cold water running group recovered after the activity by running in cold water. Immediately after the activity, after recovery, 24 hours later and 48 hours after the activity, blood samples were taken from all subjects. The serum levels of CK and CRP first increased and then began to decrease, and these changes were significant (P<0.05), but the difference between the two groups was not significant (P>0.05). Probably, recovery in water or in the form of massage leads to the reduction of inflammation in young football players after a simulated football activity, but there is no difference between the two types of recovery.**

***Keywords*— Recovery in water, delayed onset muscle soreness, massage, soccer, inflammation**

Introduction

The recovery process plays an important role in maintaining sports performance and preventing fatigue for players (1). Athletes are under a lot of pressure, which includes repetition, duration of training and intensity of training, and returning to the initial inappropriate state in intermittent training can cause negative effects on the physical performance of players (2). The pressure of training and competition causes a drop in the athlete's physical performance (3). In addition, it causes continuous and unusual pressures on the athletes' muscles (4, 5). Delayed onset muscle soreness is a reflection of muscle damage in the process of physiological adaptation of muscle to intense training. Among the biochemical signs of delayed muscle contusion is the increase in the level of creatine kinase (CK) in the blood, which increases

when sarcomeres are torn (6). The pain caused by delayed onset muscle soreness usually appears 12 to 24 hours after the activity and may continue for 2 to 5 days (7). Therefore delayed onset muscle soreness can cause the process of returning to the initial state to be slow, and it is even possible that the athlete misses the next training session or sessions. This loss of training sessions can have a negative impact on the football player's preparation process. Also, inflammation plays a role after intense training and delayed onset muscle soreness. Inflammatory factors increase with the start of exercise and gradually accumulate and cause pain in the muscles involved in exercise. One of these factors is C-reactive protein, which starts to increase as soon as the activity is done (8). After intense physical activity, the production of inflammatory cytokines such as TNF-α, interleukin-6 and C-reactive protein increases (9). Coaches and athletes are trying to use appropriate methods to resolve these events, so that recovery is accelerated.

Passive recovery increases cardiac output to a lesser extent compared to active recovery, and less muscle involvement reduces the message received from mechanical receptors and central command (10). Active recovery with low intensity after intense exercise can maintain adrenergic activation and catecholamine concentration (11). Also, during active recovery, muscle glycogen content remains almost constant, but a certain increase is seen in response to passive recovery (12). Consecutive training sessions in a training period cause cumulative adaptive responses. Improper recovery can cause fatigue, reduced adaptation, reduced performance as a result of overexertion or overtraining (13). In this regard, one of the most popular ways to return to the original state is training in water. Changes in water temperature and examination of physiological responses to exercise in hot water, cold water, body temperature water and alternating exercise in hot/cold water can determine the best water temperature limit for returning to the initial state. The difference between these methods is due to the difference in water temperature and different results are obtained at different temperatures (14). Also, nowadays, massage has attracted many customers in the world and is considered as a therapeutic method, and it facilitates recovery after intense training and can be used to increase physical performance. Massage, as a therapeutic and relaxing method, is widely used in sports competitions for the purpose of preparing before the competition, between two competitions and returning to the original state after the competition (15). One of the best benefits of sports massage is its positive effect on sports performance, reducing the time to return to the initial state after activity, reducing muscle tension, reducing lactate, restoring energy reserves through increasing blood flow, nervous excitability, increasing properties muscle elasticity, reduction of delayed onset muscle soreness and finally improved sports performance in the next competition (15, 16). However, there are conflicting results regarding the effectiveness of massage on returning to the desired initial state, in such a way that some studies show that the massage process has no effect on muscle strength and power, heart rate, blood flow, lactate clearance and its excretion, and finally sports performance is (17-21). The results of studies indicate that performing active recovery through keeping muscles active with low intensity reduces blood lactate concentration (15,22), increases or maintains peak and average power (23), facilitates sports performance (24) and reduces heart rate (25). On the other hand, some studies have pointed out the effectiveness of passive recovery on increasing the duration of activity until reaching fatigue (26, 27) and reducing the accumulation of metabolic substances (27) compared to active recovery.

The purpose of this study was to compare the effect of two types of recovery (massage and running in cold water) on creatine kinase (CK) and C-reactive protein (CRP) of soccer players following a simulated soccer activity.

Methodology

This semi-experimental research was conducted with a pre-test and post-test design in two groups including massage recovery and water exercise recovery. The statistical population of the research includes all male football players in the youth age group of Shiraz city. Among them, 14 volunteers were purposefully selected and randomly placed in two recovery groups (massage and running in cold water) (7 people in each group). After the subjects were selected, they appeared in a briefing session a week

before the start of the research, and the purpose of the research and how to implement it were explained to them, and written consent was obtained from them voluntarily. On the day of the sports test, at 10:00 AM, all the subjects participated in a simulated soccer physical activity session with the difference that the massage group recovered by massage after the activity; And the cold water running group recovered after the activity by running in cold water. Immediately after the exercise, after recovery, 24 hours later and 48 hours after the activity, blood samples were taken from all subjects. CK and CRP levels were measured for each sample. This exercise consisted of six 15-minute rounds of special exercises, including walking, dribbling the ball through obstacles, running backwards, running at speed on four straight lines for a distance of 50 meters and back and forth, which was performed on the grass field. Subjects were allowed to drink water after every 15 minutes during a 1.5 minute break. The subjects' heart rate was recorded in the 10th, 20th, 30th and 40th minutes of each half of the exercise. Bishap and colleagues implemented this exercise protocol in 1999. The choice of this protocol is due to the similarity of its stages with the usual techniques of football sports, and the researcher used it with the aim of transferring the real pressure of football training to the subjects (28). Water recovery consisted of walking or running in water with a temperature of 26 to 28 degrees Celsius with a tube for 10 to 15 minutes. The massage protocol also included simple and general massage of large muscles for 30 to 45 minutes. In order to compare and examine the changes of the variables, the statistical test of mixed analysis of variance was used. A significance level of $P \leq 0.05$ was considered. All statistical calculations were done using SPSS version 16 statistical software.

Results

The results of descriptive statistics of the variables are presented in Table 1. The results of the mixed variance analysis test to check and compare the changes of the variables are reported in Table 2. Serum CK levels increased after exercise and then started to decrease, which changes were significant (P=0.001), but the difference between the two groups was not significant (P=0.23). Serum CRP levels increased after exercise and then started to decrease, which changes were significant (P=0.001), but the difference between the two groups was not significant (P=0.15).

Table1. The results related to the mean and standard deviation of the variables

Variables	Groups	After the exercise	After recovery	24 hours later	48 hours later
CK (U/L)	Running in cold water	218.83 ± 27.15	214.91 ± 28.43	206.25 ± 41.17	191.57 ± 37.41
	massage	225.49 ± 29.96	217.64 ± 28.55	198.16 ± 34.38	177.70 ± 26.01
CRP (ng/ml)	Running in cold water	1859.68 ± 290.97	1581.20 ± 276.80	609.92 ± 241.18	340.04 ± 192.73
	massage	1717.74 ± 462.70	1648.23 ± 277.50	541.70 ± 202.22	476.15 ± 211.74

Table2. The results of mixed variance analysis to compare and check the changes of variables

Variables	Factors	F	P	Effect size
CK	Time	24.40	0.001 *	0.88
	group	0.036	0.85	0.003
	Time* group	1.66	0.23	0.33
CRP	Time	44.50	0.001 *	0.93
	group	0.001	0.98	0.001
	Time* group	2.15	0.15	0.39

*significant at the level of $P \leq 0.05$

Discussion

According to the findings of the present study, as a result of recovery in water and massage, the serum levels of CRP and CK decreased significantly after the activity, but there was no significant difference between the two groups. Lira et al. (2015) reported an increase in inflammatory factors after intense upper and lower body intermittent exercise (29). Also, Żebrowska et al. (2015) measured the serum concentration of IL-1β, IL-6 and TNF-α in female athletes, before exercise, immediately after exercise, and 15 minutes after exercise and observed that in 15 minutes After exercise, a significant increase in IL-1β and TNF-α was observed (30). In another research, Donges et al. (2014) investigated the effects of simultaneous resistance and endurance exercises on inflammatory factors. They took blood samples from 8 middle-aged men 1 hour and 4 hours after exercise. IL-1β and TNF-α were significantly increased at 1 h post-exercise, although they returned to resting levels by 4 h post-exercise (31). According to the available scientific findings, it seems that after eccentric activities that are associated with muscle contusion, the increase of inflammatory factors is also higher. In this regard, Yamanishi et al. (2014) investigated the effect of concentric and eccentric resistance training on inflammatory factors. 20 healthy adults did both exercise sessions. 24 hours after exercise, the variables were evaluated. The results showed that TNF-α levels increased significantly after eccentric exercise compared to concentric exercise. Therefore, they concluded that due to more metabolic stress, inflammatory factors increase after eccentric exercise more than concentric exercise (32).

One of the main reasons for using active recovery compared to passive recovery after intense training is that active recovery increases lactate removal compared to passive recovery (33,34). According to Declan et al. (2003), although serum lactate concentrations are similar during active and passive recovery, increased blood flow during active recovery may decrease intracellular lactate without affecting serum lactate (35). Higgins et al. (2013) investigated the effect of three methods of floating in cold water, contrasting water shower and passive recovery on the perception of contusion. The results indicate that the contrasting water shower method, compared to the other two recovery methods, caused a significant increase in the perception of muscle stiffness one hour after training (36). Sayers et al. (2011) investigated the effect of three methods of passive recovery, active and floating in opposite water on the delayed onset muscle soreness of 16 hockey players after the Wingate test (37). The results showed that the degree of soreness was significantly reduced after the method of floating in contrasting water and active recovery compared to passive recovery, but no significant difference was observed between the two methods of floating and active recovery. Based on the previous results, the use of different periods of floating in hot and cold water gives different results. The best effect of buoyancy in contrasting water is seen in times longer than 12 minutes (38). Pournot et al. (2011) investigated the effect of recovery methods of buoyancy in hot water, cold water, contrasting water and returning to the initial passive state after an intermittent and tiring exercise on the perception of muscle soreness. The findings of this research stated that the two methods of floating in cold water and opposite to the other two methods, returning to the initial state, lead to a reduction in the perception of muscle stiffness after the exercise (39). Elias et al. (2013) compared three methods of returning to the initial state on the soreness levels of futsal players after training. The results showed that two methods of floating in water cause a significant reduction in the perception of muscle soreness compared to passive recovery (40). In addition, Ingram et al. (2009) reported that floating in contrasting water leads to a lower perception of muscle soreness than passive recovery (41). Rezaei et al. (2012) compared the effect of different temperatures of floating in water on the physical performance of swimmers. The results showed a significant difference between the methods of floating in opposite water and cold water and the passive method (42). On the other hand, the research results of Crowe et al. (2007) show the drop in the second performance of the Wingate test after 15 minutes of floating in cold water. They have suggested that floating in warm water with an hour between speed trainings has a better effect on the next performance due to the increase in the range of motion of the muscles (43). Although many studies have shown that different methods of returning to the initial state are effective in lactate excretion, but in relation to the subsequent performance, the results are contradictory and show that factors such as creatine kinase levels, C-reactive protein, heart rate and Temperature etc. have an effect on anaerobic functions (44, 45). During intense activity, due to the increase in peripheral blood pressure, blood fluids leave the capillaries and enter the active muscles.

Accelerating the return of fluids to the blood stream, in addition to increasing movement and elimination of metabolic waste products, reduces muscle pain and stiffness and improves performance (44, 45).
Professional football players do intense training during the week to prepare for the competition and hold an official competition on the weekend. These trainings and competitions continue during the season. Also, players may play two or three games a week in Asian and world tournaments. All these factors lead to high physical pressure on the players and lower performance of the athletes. The results of Hemmings et al.'s (2000) research on the effects of massage on some physiological, psychological and performance indices of boxers showed that the psychological aspect of massage effects is more obvious than its physiological and performance aspects (46). This inconsistency in the findings is probably due to the difference in the protocols. According to research reports, it is believed that one of the most important advantages of sports massage, especially during sports competitions, and as a result of improving performance in the next competition, is overcoming fatigue and reducing recovery time. Although many elite athletes believe that massage is an important part of their success, the effects of massage itself remain in question. Massage can improve some physiological symptoms, but some studies have not shown any effect on recovery parameters (47-49). According to research findings, massage has many physiological and psychological benefits that may play a significant role in pain relief and tissue regeneration by increasing blood circulation and coagulation flow (50). Due to its unique applications, this intervention is a method that is used in many fields such as therapy, rehabilitation, and recovery from injuries or sports (50).

Conclusion

Probably, recovery in water or in the form of massage leads to the reduction of inflammation in young football players after a simulated football activity, but there is no difference between the two types of recovery.

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The effect of nonlinear resistance training with dill extract on serum adropin levels and its relationship with insulin resistance in type 2 diabetic patients

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***Abstract*— the aim of this study was to investigate the effect of nonlinear resistance training with dill extract on adropine and its relationship with insulin resistance in type 2 diabetic patients. 32 patients with type 2 diabetes were divided into four groups: resistance training, supplementation, resistance training + supplementation, and placebo. Interventions were performed for 12 weeks. Consumption of dill included 300 mg / kg body weight per day. Nonlinear resistance training, consumption and their combination significantly reduced blood sugar and insulin resistance and significantly increased adropine levels (P <0.05). These changes were significantly greater in the exercise and dill combination groups. The relationship between adropine changes and insulin resistance was also significant and negative (P <0.05). Adropine may play a role in reducing insulin resistance following nonlinear resistance training. Consumption can increase the effects of exercise.**

Keywords*— *Diabetes, Dill, Resistance training, Adropine, Insulin resistance

Introduction

Diabetes is one of the most common metabolic disorders of the present century, which is becoming epidemic (1). Prolonged exposure to high glucose levels is known to be one of the major causes of diabetes (2). Environmental factors such as lack of exercise along with obesity, stress and genetic factors are other causes of diabetes (3). Increased insulin resistance can lead to type 2 diabetes and increase the risk of atherosclerosis, high blood pressure and cardiovascular disease (4). Adropine, on the other hand, is a hormonal peptide discovered in 2008 by Kumar et al. This protein consists of 76 amino acids and is originally considered a secretory peptide. Its amino acid sequence is the same in humans, mice and rats. Although current knowledge about the exact physiological role of this peptide is weak and needs further studies, recent data show an important role for it in energy homeostasis and control of glucose and fatty acid metabolism (5). This protein is encoded by the Enho gene, which is mainly expressed in the liver and central nervous system. Adropine is a membrane-bound protein that mediates cell-cell communication. In addition, adropine has been identified in various tissues and body fluids, such as the brain, cerebellum, liver, kidney, heart, pancreas, small intestine, endothelial cells, and so on. Previous studies have shown that the level of this protein varies under different physiological and pathological conditions. Adropine is

involved in fat and carbohydrate metabolism, metabolic diseases, central nervous system function, endothelial function, and cardiovascular disease. Information on the exact role and mechanism of action of this interesting protein is not yet complete (5). Recently, adropine has been shown to be important in the choice of skeletal muscle fuel (6). Adropine has been shown to increase pyruvate dehydrogenase activity to increase glucose oxidation (7). Therefore, it is possible that increasing adropine by increasing glucose metabolism leads to a decrease in blood sugar and thus a decrease in insulin resistance. This effect can prevent diabetes in the elderly and also reduce the risk of heart disease. Adropin also reduces the oxidation of muscle fatty acids in parallel by inhibiting carnitine, a key enzyme that transports fatty acids to mitochondria (6). In addition, adropine can reduce exercise-induced vascular stiffness by increasing nitric oxide (NO) (8). However, not much research has been done on the effect of exercise on adropine, and it seems that studies on the effect of exercise on this peptide, which was discovered in 2008 and its discovery life is not yet 10 years. Fuji et al. (2015) reported that 8 weeks of aerobic exercise significantly increased serum adropin levels in middle-aged and elderly adults (8).

On the other hand, physical activity is not only useful for treating various diseases such as obesity, diabetes and hyperlipidemia, but also for maintaining good health (9). Although different types of aerobic activity are considered a good treatment for patients, especially diabetics, because diabetics are usually obese and have a sedentary lifestyle, these exercises are not possible for all patients. Such people do not have enough motivation and strength for aerobic physical activity. Physical activity in diabetics and obese people requires a certain amount of muscle strength and endurance that can be achieved through resistance training (10). Resistance training is a growing treatment tool that has the potential to increase muscle strength, endurance, flexibility, body composition and reduce risk factors for cardiovascular disease (11). Also, resistance training with sufficient intensity and duration can reduce glucose and glycosylated hemoglobin (HbA1c) alone (12). Resistance training can improve muscle mass, strength and power and can be considered a healthy treatment tool. Resistance training can also increase insulin sensitivity and daily energy expenditure and improve quality of life (13, 14). Resistance training is associated with increased force production, muscular hypertrophy, especially in fast-twitch fibers, recall of large number of motor units, and nerve impulses (15). On the other hand, resistance training preferentially improves glucose uptake by increasing the size of each muscle fiber, all of which together have a greater effect on the amplitude of the action potential (16). In a review study of 30 selected studies, it was reported that HbA1c, fat mass and systolic blood pressure were significantly reduced due to resistance training programs (17). However, there are many types of resistance training that require further study. Nonlinear resistance training, meanwhile, can be a viable option because it has a similar metabolism to aerobic exercise but also develops resistance training adaptations. In any case, more studies are needed in this area. On the other hand, the role of nutritional interventions along with exercise programs is very important. If exercise programs are combined with nutritional interventions, they will have a more positive effect. In this regard, recently, a lot of attention has been paid to medicinal plants due to their naturalness and lack of side effects. Among them, dill (Anethum graveoleus) is a plant of the umbrella family and contains dilatosides, coumartin, camphorol and other flavonoids and phenolic acids. The hydroalcoholic extract of this plant can be effective in lowering blood sugar. The antioxidant compounds in dill are effective in glucose uptake and can also be involved in repairing and regenerating damaged beta cells (18).

The aim of this study was to investigate the effect of nonlinear resistance training with dill extract on adropine and its relationship with insulin resistance in type 2 diabetic patients.

Methodology

This research is a quasi-experimental study with pre-test and post-test design with placebo group which was performed in two groups of blinds. 32 women with type 2 diabetes with a body mass index (BMI) of 30 and above were randomly assigned to four groups of nonlinear resistance training, supplemental nonlinear resistance training + supplementation and placebo (10 people in each group). Before starting the research, the nature, goals and risks of this study were explained to the subjects in a face-to-face meeting

and written consent was obtained from them to participate in this study. He was present at the sampling session 24 hours before the start of training and blood samples were taken from four groups in the 12-hour fasting position. After that, the interventions were performed for 12 weeks. The resistance training + supplement group received both nonlinear resistance training and dill supplementation interventions. During this period, the placebo and supplement groups performed daily activities and normal life without participating in regular exercise. The supplement group took 300 mg / kg body weight daily as capsules. The placebo group also took 300 mg / kg body weight per day in capsule form. Capsules of both supplement and placebo groups were used in the same shape and size. The nonlinear resistance training program includes weight training at different intensities with an emphasis on muscle endurance and a flexible timing pattern. This exercise program has been presented in advance by Nikseresht and his colleagues and its full description is given in Tables 1 and 2 (19).

48 hours after the end of training, the subjects were present in the second sampling and blood samples were taken from all four groups in a 12-hour fasting state. For each sample, levels of insulin and adropine were measured and insulin resistance was calculated. In addition, weight and body mass index were measured and calculated. Glucose was obtained by turbidimetric colorimetric method using an elitech kit made in Italy. Insulin was obtained by ELISA method using a microcalorimetry kit from Monobind, USA. Insulin resistance calculated using glucose and insulin concentrations and Homeostasis Model Assessment formula. Insulin (HOMA-IR) was calculated as follows:

$$\text{HOMA-IR} = (\text{glucose concentration} \times \text{insulin concentration}) \div 22.5$$

Adropine was measured using an ELISA kit made in the USA by ELISA method and spectrophotometer. Height was measured with a German-made Seca height gauge on which a person stands barefoot. Weight was measured with a digital scale made in Germany, without ordinary shoes and clothes. Body mass index was also calculated by dividing weight in kilograms by height squared in meters. In order to compare and evaluate the changes of variables in four research groups and in two blood sampling times, the statistical test of mixed-variance analysis of intra-subjects in a 4×2 design (4 groups and 2 times) was used. If a significant difference was observed, Tukey post hoc test was used. A significance level of $P \leq 0.05$ was considered.

Results

The results of mixed analysis of variance are reported in Table 1. The results of Tukey's post hoc test are also summarized in Table 2. The results of the Pearson correlation coefficient test are also presented in Table 3.

Table1. Results of mixed variance analysis

Variables	Groups	Before	After	F	P	Effect size
Glucose ()	training	124.62 ± 10.80	106.25 ± 10.00	16.86	0.001 *	0.64
	dill	119.12 ± 5.11	106 ± 10.00			
	training + dill	126.37 ± 10.05	89.50 ± 9.00			
	placebo	106.87 ± 6.08	113.87 ± 6.00			
Insulin ()	training	17.17 ± 2.17	14.70 ± 2.52	15.12	0.001 *	0.61
	dill	16.15 ± 3.05	13.70 ± 3.30			
	training + dill	16.36 ± 2.70	10.80 ± 2.34			
	placebo	14.70 ± 2.02	14.70 ± 1.78			
Insulin resistance	training	5.28 ± 0.85	3.94 ± 0.88	22.91	0.001 *	0.71
	dill	4.69 ± 0.98	3.70 ± 1.02			
	training + dill	5.06 ± 1.07	1.89 ± 0.68			
	placebo	3.86 ± 0.52	4.12 ± 0.55			
Adropine ()	training	2.26 ± 0.30	3.84 ± 0.57	23.21	0.001 *	0.71
	dill	2.59 ± 0.43	3.81 ± 0.99			
	training + dill	2.36 ± 0.35	4.79 ± 0.55			
	placebo	2.41 ± 0.25	2.38 ± 0.32			

*significant at the level of P≤0.05

Table2. Tukey's post hoc test results

Pairwise comparison	Glucose	Insulin	Insulin resistance	Adropine
Training / dill	0.83	1	0.82	0.65
Training / training + dill	0.02 *	0.005 *	0.001 *	0.035 *
Training / placebo	0.002 *	0.028 *	0.003 *	0.001 *
Dill / training + dill	0.004 *	0.004 *	0.001 *	0.002 *
Dill / placebo	0.015 *	0.030 *	0.028 *	0.002 *
Training + dill / placebo	0.001 *	0.001 *	0.001 *	0.001 *

*significant at the level of P≤0.05

Table3. Pearson correlation coefficient test results

Correlation matrix	Glucose	Insulin	Insulin resistance	Adropine
Glucose	-	r= 0.83 p= 0.001 *	r= 0.93 p= 0.001 *	r= - 0.73 p= 0.001 *
Insulin	r= 0.83 p= 0.001 *	-	r= 0.94 p= 0.001 *	r= - 0.67 p= 0.001 *
Insulin resistance	r= 0.93 p= 0.001 *	r= 0.94 p= 0.001 *	-	r= - 0.72 p= 0.001 *
Adropine	r= - 0.72 p= 0.001 *	r= - 0.68 p= 0.001 *	r= - 0.73 p= 0.001 *	-

*significant at the level of P≤0.05

Nonlinear resistance training, consumption and their combination significantly reduced serum glucose (P = 0.001). Glucose reduction was significantly higher in the exercise and dill combination group (P <0.05). The relationship between changes in adropin and serum glucose was also significant and negative (P = 0.001, r = - 0.73). Nonlinear resistance training, consumption and their combination significantly reduced serum insulin (P = 0.001). Insulin reduction was significantly greater in the exercise and dill combination groups (P <0.05). The relationship between changes in serum adropine and insulin was also significant and negative (P = 0.001, r = - 0.67). Nonlinear resistance training, consumption and their combination significantly reduced insulin resistance (P = 0.001). The decrease in insulin resistance was significantly greater in the exercise and dill combination groups (P <0.05). The relationship between changes in serum adropine and insulin was also significant and negative (P = 0.001, r = - 0.72). Also, nonlinear resistance training was consumed and their combination significantly increased serum adropine (P = 0.001). The increase in adropine was significantly higher in the exercise and dill combination groups (P <0.05).

Discussion

According to the findings of the present study, 12 weeks of nonlinear resistance training, consumption and their combination significantly reduced blood sugar and insulin resistance in type 2 diabetic patients and significantly increased their adropin levels. However, these changes were significantly greater in the combination of exercise and dill groups than in the exercise group alone and dill alone. Among them, the relationship between changes in adropin and insulin resistance was also significant, so that with increasing adropin, insulin resistance decreased. Significant reductions in blood sugar (20) and significant reductions in insulin resistance (21) have been reported in various studies. In line with the present results, a decrease in insulin resistance has been reported along with a decrease in BMI (22). One of the most important reasons for hypoglycemia following exercise is an increase in glucose transporter called GLUT-4 through the mechanism of cellular calcium increase due to muscle contractions, which leads to more blood glucose transfer into the cell, resulting in lower blood sugar and insulin resistance. (23). Mechanisms such as increasing insulin signal inhibitors such as Insulin receptor substrate-1, increasing mRNA, glucose transporter proteins GLUT-4, increasing the activity of glycogen synthetase and hexokinase enzymes in skeletal muscle, reducing release and increasing the uptake of free fatty acids

Plasma and increased glucose uptake and changes in muscle composition are involved in this adaptation (23).

So far, various studies have examined the effect of physical exercise on insulin resistance and lipid profiles, but a number of studies have examined the possible mechanisms involved (the effect of exercise on insulin resistance and profile). Lipids) are not high. In this study, in addition to insulin resistance and lipid profile, we studied adropine, a new peptide of hepatic origin that affects lipid and carbohydrate metabolism, and the results showed a significant increase in this peptide with 12 weeks of nonlinear resistance training Patients had type tow diabetes. But the previous findings in this regard are not many. However, consistent with the present findings, Fuji et al. (2015) reported that 8 weeks of aerobic exercise significantly increased serum adropin levels in middle-aged and elderly adults (8). Adropine, on the other hand, is a regulator of endothelial nitric oxide synthetase and NO release, which decreases with age. However, the effect of aerobic exercise on circulating adropin levels in middle-aged and elderly adults remains unclear. Fuji et al. (2015) concluded that adropine may be involved in reducing stiff exercise due to arterial stiffness (8). Although few studies have shown that serum adropine levels increase with aerobic exercise (8) the source of exercise-induced increase in adropine is still not well understood. Adropine is produced in vascular endothelial cells, brain, heart, kidney, liver, pancreas, skeletal muscle, and small intestine (24, 25). An in vitro study showed that adropine increased NO production in venous endothelial cells by increasing the phosphorylation of the eNOS protein (26). In this regard, in connection with water training for the elderly, Tanabe et al showed that aerobic swimming training increases the expression of aortic mRNA and eNOS protein in older mice (27). Therefore, since exercise-induced increase in adropine may help regulate arterial eNOS levels through the effect of autocrine or paracrine in endothelial cells, adropine expression in endothelial cells may lead to increased circulating adropine following exercise. Be (8). However, we do not yet know what happens to the expression of the adropin gene following physical exercise, and future research should be conducted on the effect of nonlinear resistance training on the expression of adropin mRNA in older men. Recent clinical studies have shown a decrease in adropine in cardiovascular patients such as coronary artery disease, cardiac X syndrome and angina pectoris (28, 29, 30). Also, in patients with type tow diabetes, low adropine levels have been reported with endothelial dysfunction (31). Therefore, adropine can be a new biomarker for endothelial function associated with diabetes and heart disease (31). In this connection, adropine has been reported to regulate lipid and carbohydrate metabolism (32) and its secretion is regulated by dietary sugar and fat intake (33). Adropine leads to weight loss and improved glucose tolerance and hepatic lipid metabolism (32, 33, 34). As in the present study, weight and body mass index also decreased significantly in the nonlinear resistance training group. The effect of adropine on carbohydrate metabolism probably depends on the activation of pyruvate dehydrogenase, which increases the use of sugar as a fuel in skeletal muscle, which increases glucose oxidation and insulin signaling activity (35). Previous studies have shown that adropine is needed to prevent obesity-induced insulin resistance (32, 33). If the concentration of adropine decreased in insulin resistance, impaired glucose metabolism and obesity were reported (34, 36).

The findings of this study also showed that consumption of dill extract at a rate of 300 mg / kg body weight per day has similar effects to the effect of exercise and its addition to exercise, leads to a further increase in adropine and a further decrease in resistance to It becomes insulin. The hypoglycemic effect of dill extract is probably related to its flavonoid composition (quercetin). One of the possible mechanisms of action of this plant in lowering blood sugar is the effect on glucose uptake. Plant antioxidant compounds reduce glucose uptake in the intestine. This effect is achieved by inhibiting digestive enzymes such as alpha amylase and alpha glucosidase, which are involved in the hydrolysis of carbohydrates, inhibiting the transfer of glucose from the folded membrane of the small intestine, and delaying the emptying of gastric contents into the small intestine. On the other hand, plant antioxidants also have an insulin-like effect and increase glucose uptake into peripheral tissues. Another possible mechanism of action of this plant is its effect on beta cells and repair and regeneration of damaged cells and stimulation of these cells to insulin secretion.

Conclusion

It is concluded that nonlinear resistance training improves diabetes and prevents its complications by reducing insulin resistance in type 2 diabetic patients. Adropine also appears to play a role in these exercise-induced changes. Consumption of 300 mg / kg body weight of dill extract may also have similar effects to exercise due to its flavonoid compounds, including quercetin. Extract this dose of dill and exercise will probably increase the effect of exercise.

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