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Effect of the Muscular Strength Exercise and Massage on Muscle Injury Marker and IGF-1

Kim Do-Jin[1] and Kim Jong-Hyuck[2]*

[1]Department of Community Sports and Recreation, Daelim University College, Anyang-si – 431 715, Gyeonggi-do, Republic of Korea
[2]Department of Beauty and Health, Jungwon University, Goesan-gun – 367 700, Chungbuk, Republic of Korea

Abstract

This experiment is to identify the effect of aid combined with strength exercise and massage affecting muscle injury marker and insulin-like growth factor: IGF-1. Therefore, there were Experimental Group (EG) and Control Group (CG) to identify the effect of the experimental aid. Each aided for 60 minutes, 40 minutes of strength exercise and 20 minutes of massage program, total 24 strength exercises, 3 times a week, for 8 weeks. Through this process we could see there is interactive effect on ammonia, phosphorus, creatine kinase, and lactate dehydrogenase, which are muscle injury markers. There is also interactive effect on IGF-1, which is insulin-like growth factor. As a result, aid combined with strength exercise and massage has a positive effect on muscle injury marker and IGF-1.

Keywords: IGF-1, Massage, Muscular Strength Exercise, Muscle Injury Marker

1. Introduction

It is an undeniable fact that the advance of science/industrial technology and economic development has brought the better and abundant life. However, regardless of its huge positive effect, still there are many side effects as well. Because of their convenient and simple lifestyle, people rarely do the physical activities, threaten their healthy life, and it finally contributes to the mortality rate to gradually increase[1].

According to the national health statistics, the ratio of people in their 20s who regularly exercise more than 3 times a week was 18.3%; male 24%, female 15.7% in detail. This statistics directly shows that young people seriously do not exercise[2].

Lack of physical activity and low exercise are the main reasons of adult diseases. Furthermore, it causes physical imbalance and makes people not to continue having healthy body condition s[3].

Nowadays, the whole world is concentrating on this issue, and people are putting their effort to develop the elements which disturb the physical activities and some strategies to enhance people to move[4].

Usually, professionals recommended aerobic exercises like jogging, cycling, swimming, etc., but recently they newly found that working out people's muscles is also very important. Muscle resistant work out was done in the past by a few people, but now it is known as an important exercise which not only decreases the symptoms of clinical diseases but also improves the quality of life. Now, American College of Sport Medicine (ASCM) and America Heart Association (AHA) recommends this for public health[5].

This workout is a representative anaerobic exercise which mainly requires various equipments including

*Author for correspondence

dumbbells and bar bells. By doing this, people can improve their muscle power as well as developing their health and stamina.

It positively influence the exercise performance ability by using fat loss, response from the nervous system, muscle power, muscle hypertrophy, etc[6]. In addition, muscle resistant workout stimulates the muscular skeletal parts which people wants to develop, and helps it to improve the muscle power, activate body parts, and expand the tissues by adapting to the muscular nervous parts[7]. Another point is the active recovery process. After exercising, people usually took a rest and went to sleep, which are so called passive recovery methods. However, nowadays, people recommend active recovery methods like sauna and massage.

These recovery methods are recognized as effective and active methods to swiftly reduce the fatigue materials[8], and especially massage enables the sensory receptors to be soothed and stimulated by promoting expansion and contraction of muscles; it stimulates the sensory receptors on the skin and help the blood vessels to easily expand and contract as well[9].

In this way, applying massage on the body parts can ease the heart and help blood circulation. It keeps reducing the fatigue materials, and supports the body parts with oxygen and nutrients. This increases the metabolism and finally helps people to reduce the pain, recover the muscle, and activate the nerves[10].

It is well known that massage positively influences from the nerve systems to the skeletal systems, and the professionals believe that the massage changes the penetrability of cell membranes, and help the metabolism by adapting the blood circulation[11].

In Cross-sectional study, muscle strength is inverse correlation metabolic syndrome[12] and also caused about death rate[13]. Long period of strength exercise is reported[14] responding to decrease cortisol and increase bone density, decrease arthritis symptom, decrease insulin to respond temporary stress. Massage, also, helps to physical development, and during getting massage, it feels free to work function of autonomic nerve[15]; therefore, massage is effect to nerve system and muscular system. In this aspect, treatment with strength exercise and massage combination has positive meaning to observe indices of muscle damage and growth hormone factor.

This experiment is to identify the effect of aid combined with strength exercise and massage affecting muscle injury marker and insulin-like growth factor: IGF-1.

2. Study Method

2.1 Subject of Study

The object of the study is a male college student living in Seoul, Republic of Korea who does not participate in regular physical activities. There were total 20 members, each 10 members of experimental group and 10 members of control group to identify the effect of the experimental aid. The final number of members is 16, excluding the 4 members who were absent or did not show active participation Table 1.

Table 1. Physical characteristic of subjects (M ± SD)

Group	N	Age (yr)	Height (cm)	Weight (kg)	Fat (%)
EG	8	22.50 ± 1.25	174.42 ± 3.11	70.42 ± 4.20	18.85 ± 2.50
CG	8	23.10 ± 1.42	174.55 ± 3.58	71.20 ± 3.85	17.58 ± 2.12

EG: Experimental Group
CG: Control Group

2.2 Muscular Strength and Massage Program

The aid program for this experiment had 40 minutes of strength exercise and 20 minutes of massage program, total 24 strength exercises, 3 times a week, for 8 weeks. The objects used free weight exercise using dumbbells and stationary equipment for strength exercise. The process of strength exercise included exercising dumbbell curl, dumbbell kick-back, dumbbell lateral raise, lat pull down, leg extension, and lying leg curl 3 sets each for the rate of 50-60 % according to bench press 1RM. There were one-minute breaks between sets. The process of massage started with cephalic, shoulder, abdomen, thigh to lower leg and the pressure strength was applied enough not to feel pain or discomfort. The massage started as low-pressure and gradually increased to fair pressure Table 2 .

2.3 Measurement Factor

In order to identify the effect of treatment; combined with strength exercise and massage related to factors which were measured through a blood test before and after with EG and CG. The factors were requested to a specialized organization of nuclear medicine after blood collection.

Table 2. Treatment program

Category	Type	Methods
Strength Exercise (40min)	Muscle strength	dumbbell curl, dumbbell kick-back, dumbbell lateral raise, lat pull down, leg extension, and lying leg curl (1RM 50-60%, 3set)
Massage (20min)	Manipulation	cephalic, shoulder, abdomen, thigh ,leg
Warm-up/ Cool-down (5min)	Stretching	Upper & Lower body stretching

2.4 Data Processing

In order to identify the effect of the experimental aid, PASW 18.0 statistics program was used. Descriptive statistics was proposed at each time interval for measurement, and 2-way RGRM ANOVA was applied to identify the effect of the experimental aid. The level of significance was verified at $p<.05$.

3. Results

3.1 Chang in Muscle Injury Marker

Ammonia, which is one of the related factors of muscle injury marker, has an interactive effect for $F(1, 14) = 22.959$, $p<.001$ in EG and CG Table 3. Phosphorus has an interactive effect for $F(1, 14) = 9.112$, $p<.01$ Table 4, Creatine Kinase (CK) for $F(1, 14) = 5.802$, $p<.05$ Table 5, and Lactate Dehydrogenase (LDH) for $F(1, 14) = 8.357$, $p<.05$ Table 6.

Table 3. Change of ammonia by the strength exercise and massage for 8 week

Source	SS	df	MS	F	p
group	3.464	1	3.464	.731	.407
error	66.372	14	4.741		
factor	4.241	1	4.241	18.185	.001
group*factor	5.354	1	5.354	22.959	.001
error	3.265	14	.233		

Table 4. Change of Phosphorus by the strength exercise and massage for 8 week

Source	SS	df	MS	F	p
group	.112	1	.112	.571	.462
error	2.738	14	.196		
factor	.153	1	.153	7.924	.014
group*factor	.176	1	.176	9.112	.009
error	.270	14	.019		

Table 5. Change of ck by the strength exercise and massage for 8 week

Source	SS	df	MS	F	p
group	4.514	1	4.514	.017	.899
error	3778.855	14	269.918		
factor	54.965	1	54.965	53.754	.001
group* factor	5.933	1	5.933	5.802	.030
error	14.315	14	1.023		

Table 6. Change of ldh by the strength exercise and massage for 8 week

Source	SS	df	MS	F	p
group	6.015	1	6.015	.003	.955
error	25651.238	14	1832.231		
factor	37.570	1	37.570	5.730	.031
group* factor	54.793	1	54.793	8.357	.012
error	91.794	14	6.557		

3.2 Chang in IGF-1

IGF-1, which is one of the growth hormone factor, has an interactive effect for $F(1,14) = 15.363$, $p<.01$ in EG and CG Table 7.

Table 7. Change of IGF-1 by the strength exercise and massage for 8 week

Source	SS	df	MS	F	p
group	3797.919	1	3797.919	.495	.493
error	107417.321	14	7672.666		
factor	1265.755	1	1265.755	21.887	.001
group* factor	888.484	1	888.484	15.363	.002

Source	SS	df	MS	F	p
group	3797.919	1	3797.919	.495	.493
error	107417.321	14	7672.666		
error	809.622	14	57.830		

4. Discussion

This research was aimed to know how the 40 minutes muscle workout and 20 minutes massage program which was held for 8 weeks (3 times a week, 24 times total) influenced the muscle injury markers such as phosphorus, creatine kinase, LDH and insulin-like growth factor IGF-1. To estimate muscle injury markers, the activity of muscle enzyme in blood flow should be detected, and the muscle enzymes are crucial since they influence the metabolism process and supports support the muscle to build up the energy.

Creatin Kinase (CK) is an enzyme that prevent the body to lack of ATP when they are on the work out, and it tends to be increased when people exercise[16]. In [17] suggested that the increase of CK and LDH activity level in the blood is an indirect marker of muscle damage, and it can ultimately help to afford basic information of if the muscle was damaged due to the strong exercise intensity or not. The result showed that the group which exercised and had massage directly had the decrease of LDH, creatine kinase, and phosphorus, which means that muscle workout and massage can positively prevent the muscle from damage. Therefore, 8 weeks of muscle exercise and massage positively influence the muscle injury markers, and it seems that it is available to recover the muscle enzymes just like the enzymes before exercise. IGF-1 contributes to the whole process of nervous cells and responds to various forms of exercise[18]. It increases in the brain and peripheral nerves after long time of exercise, and neurotransmitters around brain vessel walls increase as well[19].

IGF-1 is also known as the material which influences the development and growth of tissues[20]. The main reasons why IGF-1 increases is the decrease of body fat, decrease of body mass, increase of insulin and growth hormones, etc[21]. When people exercise for a long time, growth hormones are secreted and it boosts the IGF-1s to compound, and muscle contraction and development of skeletal systems happen as well[22]. According to the preceding research[23], told that long muscle resistant workouts can boost the secretion of IGF-1. In[24] made 12 women over 65 years old to do regular aerobic and muscle exercises, and both of the exercises made the women to have better IGF-1 than before. Nishida et al. also carried a research by making healthy adults do the low-intensity cycle ergometer for 60 minutes a day, 5 times a week, for 6 weeks, and the adults all had better IGF-1 than before. Cassilhas et al. also had a research result which shows that the elders who did high-intensity workout had more concentrated IGF-1. In addition, Vega et al. made the research participants to do both low and high intensity workout, and the level of IGF-1 increased 28% when they did low intensity workout, and 16% when they did high intensity exercise.

In this research, the group which had muscle workout and massage had higher level of IGF-1, which is an element of growth hormone. Therefore, the muscle workout and massage method do positively influence the IGF-1.

Therefore, it is concerned that the muscular activities and massage are effective methods to induce the IGF-1 to be actively secreted.

5. Conclusion

Fatigue initiation mechanism of muscle is highly related with active capacity such as accumulation of metabolite and depletion of energy substrate. Furthermore, muscle injury marker that is shown after high-intensity exercise can be improved through aid program from this experiment. Strength exercise and massage are considered as a medium for positive improvement of IGF-1, which is used as a marker for myopachynsis and others.

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