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## Effect of 5 km running velocity on hormone ghrelin level in untrained obese men

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### ABSTRACT

*The purpose of this study was to examine the effect of 5 km running on hormone ghrelin levels in non-athletes obese men. 20 healthy, overweight non-athlete university students participated voluntarily in this study. The subjects performed twice on a treadmill with speed of 5 km per hour with the 400 energy cost calories. Blood samples were collected for determination of ghrelin in the same conditions and controlling affecting environmental factors on rest and immediately after two sessions running on a treadmill with a one-week interval. The results showed that blood ghrelin increased significantly. According to the research findings, blood ghrelin levels increased in a running with speed of 5 km per hour on a treadmill with 400 energy cost calories.*

**Key words:** hormone ghrelin, caloric intake, BMI.

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### INTRODUCTION

Communities develop and expand with changes in technology, life styles, feeding types and limited physical activities, separately or together have caused obesity and obesity-related diseases which is one of the main concerns of human society. Obesity and its related diseases have caused the deaths of millions throughout the world every year. Although heredity causes obesity, but environmental factors are more common than inheritance in obesity, and many different methods have been used to control and prevent obesity, such as, methods using a variety of medications, surgery, diets and other dietary supplements. Given these methods are costly and often with irreversible side effects, are not recommended for public use. Exercise as an easy and low cost method is recommended to combat obesity and its complications [10]. Because exercise training improves the health status of obese individuals and is associated with reduction of body weight, there is interest in the effects of exercise on ghrelin and adiponectin and whether these peptides may provide better understanding of how exercise improves health. Exercise is considered as a potent facilitator for the maintenance of healthy levels of body fat and the secretion of various hormones in the body, so we decided to evaluate the ghrelin, a newly discovered endogenous hormone and an important factor in obesity [8]. Ghrelin was introduced to the world by Kojima and his colleagues for the first time in 1999. Ghrelin consists of two words, ghre means growth and relin means release has been observed for the first time in the rat stomach [16].

Ghrelin is mainly produced by the stomach, and synthetic peptides have been identified recently as potent growth-hormone secretagogues. Excessive secretion was considered in the intestine and as a ligand for an endogenous growth hormone (CHS-R). Eating or waiting to start eating, increases ghrelin secretion and drug consumption of ghrelin increases eating in rats and humans [15]. Recent studies show that low or moderate intensity exercise increases levels of ghrelin, which is dependent on exercise duration. Stimulation of food intake during prolonged exercise is probably not due to changes in ghrelin levels [10]. Mirzaei et al. (2009) studied plasma acylated ghrelin levels after aerobic exercise in obese women. Exercise program included 30 minutes of running with 65 to 75% of

maximum heart rate for 8 weeks. In all these cases, both ghrelin increased significantly, but the level of AG was not significant. A comprehensive study has not been performed about the changes in plasma ghrelin levels in athletes of different fields. Most studies have not given attention to the control of energy costs as an important factor, but ghrelin is a metabolic hormone, and certainly can be associated with energy costs. Takano *et al.* (2005) found no significant difference in plasma ghrelin levels among 13 men 26 to 46 years after exercise on an ergometer, but a significant increase was seen after activity with coronary leg occlusion. Borer and his colleagues (2005) studied subjects with the intensity of 40% oxygen consumption with 400 kcal and maximal exercise in morning and afternoon sessions separately. The results showed that the energy expended in exercise mode overnight fasting are effective significantly on ghrelin and growth hormone levels compared with control one. Given the importance of body weight control in public health, some research has been done in different ways to reduce obesity. Dall and colleagues (2002) tested plasma ghrelin levels in healthy subjects and patients with defects until exhaustion in growth hormone secretion. They exercised at lactate threshold (2.5 Mm.L) equivalent to 65%<sub>vo2m</sub> on treadmill and at the end of 45 minutes, growth hormone concentration reached its peak. However, plasma ghrelin level with growth hormone was significantly lower in patients compared with the healthy group. Kraemer *et al.* (2001) studied the effect of running on a treadmill for 2 min with 60% oxygen, 5 min with 90%, and 10 min with 75% of oxygen consumption on a periodic time of 40 minutes. A rest was given in 3.5 to 4 minutes between exercise intensity (walking). The results showed that growth hormone increased significantly at 75% of the intensity and the intensity reaches the peak at 100%, but plasma ghrelin levels remain constant during exercise at different intensities and no significant differences was observed between control and experimental groups. Kraemer *et al.* (2002) studied relationship between hormones and blood glucose regulators and plasma ghrelin in healthy young men (10 years old).

The results indicated that ghrelin decreased in a resistive four movements, four times with intensity of 80% IRM and 12 repetitions (with 90 seconds rest) meanwhile, before and after exercise and also the reduction was significant after 15 minutes of exercise and the recovery period. However, significant changes were observed after a contraction concentric. Leidy and colleagues (2004) studied plasma ghrelin levels during a period of weight loss with diet and exercise program. Individuals practiced an exercise program with 70 to 80% of maximum heart rate, 5 times a week and the results showed that ghrelin levels were significantly decreased in weight loss group. On the other hand, a significant relationship between body weight and some of disruptive energy balance shows the ability to change the plasma ghrelin levels. Vaziri *et al.* (2006) showed that aerobic exercise decreases significantly the acylated ghrelin levels of obese women. Fattahi *et al.* (2005) found ghrelin's role as an important factor on cellular energy balance in male rats, so that exercise reduces levels of cellular energy reserves in muscles and liver, and ghrelin secretion increases in response to the lack of energy. Zygm (2010) discovered some people tend to eat appetite-causing foods, even after reaching satiety. Previous studies showed that hormone ghrelin is produced when the individual feels hunger, in fact it affects human brain to behave so. But a new study in mice conducted by scientists from South West Texas University Medical Center in the United States showed that hormone ghrelin in the brain also causes some people continue to eat even after a complete course of food enjoyment. The researchers also found that stopping the activity of the hormone ghrelin in mice prevents the feeling and the desire of overeating. Dr. Zygm says: What we showed is that sometimes people are looking for edible which is nice even when they are well fed and have no reason for it except their brains dictate them to do so. The researchers showed that when ghrelin injected into the rodents, animals seek more food, even if they have satisfied of eating. But when the scientists inactivated this substance, the animal lost the desire to eat. Ghrelin is secreted in the bloodstream in a low-calorie diet or a period of not eating. The researchers gave an explanation why individuals still want to eat dessert after eating lots of food. The scientists discovered the part of the brain which regulates the activity of ghrelin. They said that eating before sleeping is caused obesity. They believe the timing for eating is important role in ideal weight regulation. Studies show that increasing breakfast meals more than dinners can be an important factor in weight regulation [17]. Eating at inappropriate times is a major cause of weight gain, hormone ghrelin could be an important factor in this case [12]. For this reason and due to the limited research in this area, it is necessary to speed up weight loss by reducing appetite and increasing metabolism by the hormone ghrelin, try to find suitable methods. So we decided to evaluate the effect of 5 km velocity of running in the same caloric intake on ghrelin secretion. Increasing importance of ghrelin in individuals with negative energy balance make them select the fatty foods than sugar ones. There is a negative relationship between ghrelin with changes in lean mass, fat mass, percent body fat, BMI and daily caloric intake, too. Ghrelin changes occur in the late period of weight loss with exercise training [3]. On the other hand, a significant correlation between body weight and energy balance can be disruptive in some circumstances, there is potential for changes in plasma ghrelin levels. Increasing importance of ghrelin in patients with negative energy balance, the selection of their desire to consume fatty substances than sugar is also a negative correlation between ghrelin with changes in lean mass, fat mass, percent body fat, BMI and daily caloric intake. The results can help to resolve existing uncertainties to advise the individuals to do correct and suitable exercises for weight loss used by physicians and specialists.

## MATERIALS AND METHODS

### Subjects

20 healthy university male non-athlete students (18-29 years old) with a BMI greater than or equal to 30 were selected voluntary. All subjects were examined for medical examination and obtained consent and a questionnaire included Information regarding age, medical history, smoking and drugs usage, surgery, awake and sleep time.

### Research project

This research was a quasi-experimental one and was conducted with a group of subjects with repeated measurements.

### Research Methods

To control the activity effect, the subjects were prohibited doing any vigorous physical activity and exercise 24 hours previous the test and got familiar with treadmill. Before the test the heart rate, weight, height and BMI of subjects were determined. The energy cost of 400 calories at speed of 5 km per hour was calculated for each of the individuals and the subjects ran on a treadmill in two separate sessions with an interval of one week. Ambient temperature and humidity of the room was fixed during the test sessions due to the use of air conditioning.

**Table 1. Subjects characteristics (Mean  $\pm$  St. dev)**

| N  | Mean         | Height Mean    | Weight Mean |
|----|--------------|----------------|-------------|
| 20 | 19 $\pm$ 4.2 | 170.02 $\pm$ 5 | 87 $\pm$ 1  |

**Table 2. Ghrelin in 3 measurements**

| Index Velocity | 5 km velocity | Control |
|----------------|---------------|---------|
| N              | 20            | 20      |
| Mean           | 16.8955       | 14.0925 |
| Median         | 16.04         | 14.76   |
| St dev         | 3.81          | 1.9     |
| Min            | 10.8          | 10.96   |
| Max            | 25.3          | 16.48   |

**Table 3. Comparison of Ghrelin before and after 5 Km velocity**

| Variable                | N  | Mean  | St dev. | T     | Df | P     |
|-------------------------|----|-------|---------|-------|----|-------|
| Ghrelin before activity | 20 | 14.09 | 1.9     | -3.67 | 19 | 0.002 |
| Ghrelin before activity | 20 | 16.89 | 3.81    |       |    |       |

As it is shown in Table 3, there is a significant difference in ghrelin before and after a 5 Km velocity between control and experimental group ( $p=0.002$ ). The changes are more among experimental group.

## DISCUSSION

The purpose of this study was to study the effect of 5 km rate of exercise on hormone ghrelin on untrained obese men. Blood samples were collected to measure hormone ghrelin levels before, immediately before running and after on a treadmill and other blood samples were taken immediately after completion of the subjects. Hormone ghrelin levels were significantly increased at the rate of 5 km ( $p < 0.02$ ). The result of this study is similar to most research in this area [1, 3, 11, 15, 17]. The result of this research has shown that exercise can increase hormone Ghrelin, but the results are not parallel to Kraemer et al. (2001), Dall et al. (2004). The reason for this contradiction could be due to difference in intensity, duration and type of exercise. The person's weight, BMI and inconsistent of intake calories can also be a factor that was not considered. It seems that hormone Ghrelin is secreted in greater resistance training and endurance exercises. Ghrelin levels in obese men is more than ordinary people [7].

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