Research Article

Effect of Exercise Regimen on Neurotransmitters and Hormones in Obese Women

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ABSTRACT:

Physical activity is an important factor in treating many diseases in women, and because good health is one of the important goals of sustainable development, the study addressed the treatment of obesity in women by re-regulating reproductive hormones, as the KISS1 hormone plays a role in regulating the hypothalamus-pituitary-gonadal axis and plays a fundamental role in human reproductive function, in addition to its effective contribution to regulating metabolism and hormones in the body by changing body weight and reaching the ideal weight, women who suffer from overweight and who suffer from hormonal and neurological disorders by linking hormones to the kisspeptin hormone secreted by the hypothalamus, ovaries, adipose tissue, pancreas, small intestine, liver and placenta. There are clear physiological effects of exercise on the levels of hormones, endocrine glands and neurotransmitters, especially the hypothalamus-pituitary-gonadal axis, by directing some intensive exercises to maintain the level of kisspeptin to be a target for regulating hormone levels.

KEYWORDS: KISS1 ، Obesity ، Physical activity، Reproductive Hormones ،infertility

تأثير نظام التمارين الرياضية على النواقل العصبية والهرمونات لدى النساء البدينات

الملخص

النشاط البدني عامل مهم في علاج العديد من الأمراض عند المرأة، ولأن الصحة الجيدة هي أحد الأهداف المهمة للتنمية المستدامة، تناولت الدراسة علاج السمنة عند النساء من خلال إعادة تنظيم الهرمونات التناسلية، حيث يلعب هرمون KISS1 دورًا في تنظيم محور تحت المهاد – الغدة النخامية – الغدد التناسلية ويلعب دورًا أساسيًا في الوظيفة التناسلية للإنسان، بالإضافة إلى مساهمته الفعالة في تنظيم التمثيل الغذائي والهرمونات في الجسم من خلال تغيير وزن الجسم والوصول إلى الوزن المثالي، النساء اللاتي يعانين من الوزن الزائد واللواتي يعانين من اضطرابات هرمونية وعصبية من خلال ربط الهرمونات بهرمون الكيسبيبتين الذي يفرز من تحت المهاد والمبيضين والأنسجة الدهنية والبنكرياس والأمعاء الدقيقة والكبد والمشيمة. هناك تأثيرات فسيولوجية واضحة للتمرين على مستويات الهرمونات والغدد الصماء والنواقل العصبية، وخاصة محور تحت المهاد – الغدة النخامية – الغدد التناسلية، وذلك بتوجيه بعض التمارين المكثفة للحفاظ على مستوى الكيسبيبتين ليكون هدفًا لتنظيم مستويات الهرمونات.

الكلمات الافتتاحية : KISS1، السمنة، النشاط البدني، الهرمونات الانجابية.

Introduction

A higher incidence of infertility due to anovulation is associated with overweight (BMI ≥25 kg/m2) and obese (BMI ≥30 kg/m2) individuals. However, compared with indices that do not explicitly distribute fat, BMI may not be as reliable in predicting reproductive failure[1].

Physical inactivity is the fourth biggest cause of mortality globally and one of the most significant public health issues because to the multiple negative effects it has been shown to have on an individual's health. Depending on its intensity, exercise can have both beneficial and detrimental physiological effects. Many common neurological and mental conditions are treated by physical activity. The precise processes by which exercise influences the brain remain unclear. On the one hand, intense exercise increases the generation of reactive oxygen species (ROS) by increasing mitochondrial oxygen consumption[2]. The HPG works for reproduction to occur. The pulsatile release of gonadotropin-releasing hormone (GnRH) from neurons in the hypothalamic arcuate nucleus triggers the anterior pituitary to secrete gonadotropins, specifically follicular stimulating hormone (FSH) and luteinizing hormone (LH). Frequent exercise increases tolerance to oxidative stress, which modifies the antioxidant system response .Many cells use endogenous defensive mechanisms, such as changes in endogenous enzymatic and non-enzymatic antioxidants, to counteract exercise-induced increases in ROS and oxidative stress.

Hormone Regulation

Kiss1 gene acting via G protein-coupled receptor 54 (GPR54), which affects the increased secretion of luteinizing hormone (LH) from the pituitary gland[3], ultimately leading to ovarian hyperandrogenism[4], and ovulatory dysfunction (irregular menstrual cycle) affecting early reproductive age[5]. Menstrual irregularity is a symptom of defects in the hypothalamic-pituitary-ovarian axis[5,6], including intra-ovarian[18], and autocrine/paracrine directors as figure 1.

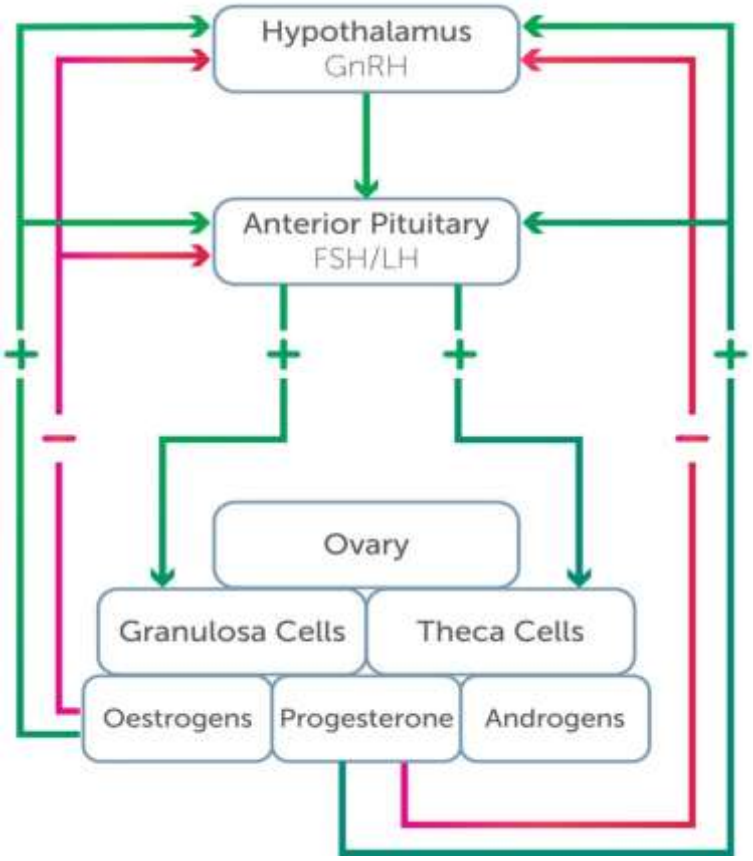

Figure 1: Hormone Regulation from Hypothalamus to Ovary

Neurotransmitter Effects

Physical and psychological factors can influence the endocrine balance that governs women's reproductive function. Hormone production, metabolism, and clearance rates must all be balanced for blood levels to remain stable. Intense physical activity can alter this equilibrium through a variety of factors, including competitive stress, dieting, weight loss, heat generation, and hypoxia.[9, 10].

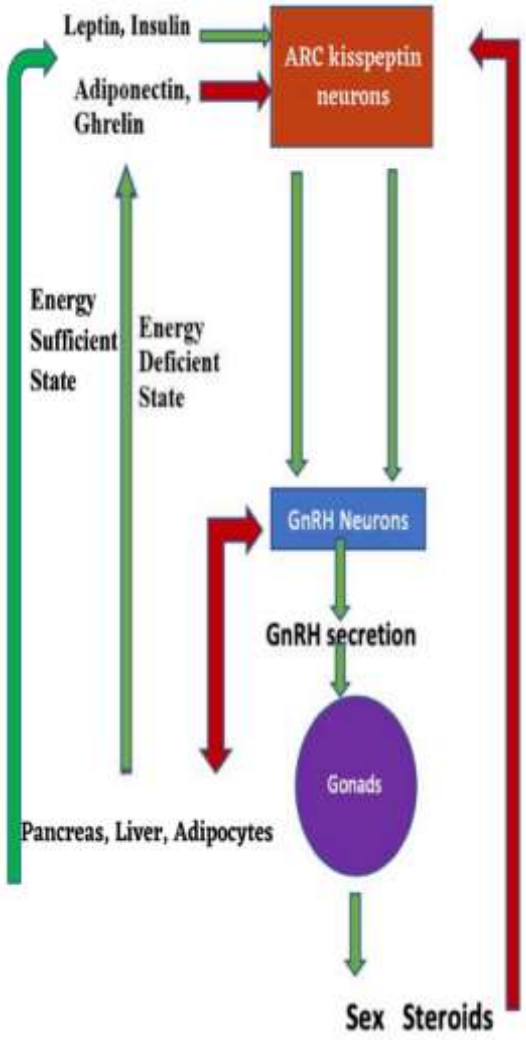

Figure 2: Effect of leptin and adiponectin on kisspeptin to the regulation of the reproductive cycle of humans[11]

Based on the intensity and length of the exercise, Figure 2 illustrates how leptin and adiponectin affect kisspeptin and how physical activity raises adrenergic system activity, which in turn raises plasma levels of neurotransmitters such catecholamines[12]. Through its stimulating and inhibitory effects on the gonadotropin-releasing hormone (GnRH) neurons, these transmitters are among the crucial ones that control the release of LH[10].

Due to these hormonal changes, women who regularly exercise at high intensities may be more susceptible to menstruation disorders such amenorrhea, delayed menarche, and oligomenorrhea. A prominent hormonal finding with exercise-induced menstrual abnormalities is impaired gonadotrophin production, which results

in luteal phase insufficiency and anovulation. However, a number of other hormones may exhibit notable changes.

Training Protocol

In this article, we review the latest research on how moderate physical activity on the waist area above the ovaries[13], designed with a specific exercise regimen, affects infertile women with the effect of exercise on their health and the degree of reaction that directly or indirectly controls their reproductive functions[14].

The daily routine for women should be walking for 30 minutes/day in the morning for three days in the first week and then five days a week starting at a low speed to warm up and gradually increase it and then reduce the speed during the last 5 minutes to cool down[15].

Then follow the exercises specified below because they have an effect on the neurotransmitter first and then the indirect impact on hormones because the impact of leptin is direct on kisspeptin in obese women[16].

Sports and diet

1st exercise

Stand with your feet shoulder-width apart.
Hold a weight ball in your hands.
Lower your body as if you were going to sit on an imaginary chair.
Be careful not to let your knees go past your toes.
Rise back up and return to the starting position.
Repeat this exercise 50 times (4 days a week)

2nd exercise

Sit on the floor with your legs extended in front of you and your hands by your sides.

Lower your torso down and extend your arms until your chest is completely touching your knees.

Return to the starting position

Repeat 50 times, 4 days a week.

3rd exercise

Sit on the floor with your legs bent under you and close together facing to the right.

Turn your torso to the left side.

Return to the starting position.

Repeat this exercise 50 times, then change your legs and make your torso face to the right in this case and repeat it again 50 times. For 4 days during the week

Neurotransmitter changes due to exercise in obese women

In this study, the metabolic pathways of neurotransmitters were compared as a result of specific exercise targeting the ovarian area and their effect on hormones due to changes in the leptin and adiponectin hormone pathway and insulin level in obese women depending on the regularity of exercise[17], as any differences in the concentrations of leptin, glucose and insulin in the serum lead to different hormonal responses over time and reducing fat cells[18], which in turn secrete a lower level of leptin and also lead to a decrease in the level of insulin in the blood[19], helps reduce the level of the neurotransmitter kisspeptin, which stimulates the re-regulation of reproductive hormones that controlled by hypothalamus-pituitary-gonadal (HPG)axis, KISS1 as a neuropeptide has effect on this axis [11] by secretion of GnRH that regulated LH and FSH [20].

Previous studies have shown that choosing a regular exercise protocol is important because it leads to an actual response in the correct way in the leptin hormone, as in the study of Sofia Spanoudaki-2025[21] , which showed that the leptin level did not change in short-term exercises, which means that a high level of leptin and a high level of insulin and what makes insulin resistance itself, unlike regular[22], long-term and daily exercises that lead to increased stimulation of fat metabolism and decreased concentration of insulin and leptin levels and modification of the kisspeptin - reproductive hormones pathway[21].

CONCLUSION

Exercise is of great importance in the health aspect of human life, especially women, in light of the laziness resulting from the increased use of modern devices. Since the health aspect is one of the most important goals of sustainable development, exercise can have a significant impact on stimulating the regularity of insulin and leptin levels and their direct effect on kisspeptin and modifying the reproductive hormonal pathway in obese women. This is particularly noticeable in the case of regular and moderate exercise, in addition to its quality in improving the fat metabolism pathway..

CONFLICT OF INTERESTS

The authors have declared no conflict of interests.

AUTHOR CONTRIBUTIONS

Conception and design of the study: Noor J. T. Al-Musawi.

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