The Research of Medical Science Review
ISSN: 3007-1208 & 3007-1216 Volume 3, Issue 9, 2025

ANALYSIS OF SERUM THYROID STIMULATING HORMONE (TSH) AMONG FEMALES EXERCISE PERFORMERS

Saman Zulfiqar[*1], Dr. Alamgir Khan[2], Dr. Muhammad Zafar Iqbal But[3], Dr. Shehzadi Sanam Roohi Farooqi[4], Manzoor Khan[5], Mir Jahanzeb Javeed Farooqi[6], Rana Waqas[7], Hassan Kamran[8], Hafiz Ghulam Nabi[9], Muhammad Saleem Akhtar[10], Dr.Zeliha Selamoglu[11]

[1,2,3,9]Department of Sports Sciences & Physical Education, University of the Punjab, Lahore, Pakistan
[4,7]Department of Sports Sciences and Physical Education, Riphah international University Faisalabad Campus
[6]Researcher, Chakwal 48800, Pakistan
[5]Department of Sports Sciences & Physical Education, University of Science & Technology, KP, Pakistan
[8]Harrisburg University of Science and Technology.
[10,11]Department of Medical Biology, Medicine Faculty, Nigde Omer Halisdemir University, Nigde, Türkiye

DOI: https://doi.org/10.5281/zenodo.17090499

Keywords
Thyroid Stimulating Hormone, Exercise, Risks, Benefits

Article History
Received: 11 June 2025
Accepted: 21 August 2025
Published: 06 September 2025

Corresponding Author: *
Saman Zulfiqar

Abstract

Background: *Thyroid Thyroid-stimulating hormones (TSH) stimulate the thyroid gland to produce and release thyroid hormones, primarily thyroxine (T4) and triiodothyronine (T3). This stimulation is necessary for keeping the body's metabolic rate, energy production, and overall health.*

Objective: *To determine the effect of moderate-intensity exercise on serum Thyroid Stimulating Hormone (TSH) levels in females.*

Materials and Methods: *Fourteen young women, aged 20 to 25 years, were randomly assigned to two groups: the control group (n = 7) and the experimental group (n = 7). All participants were healthy, with no history of thyroid disorders or chronic illnesses. The experimental group participated in an eight-week moderate-intensity exercise program, whereas the control group continued with their usual activities. Serum Thyroid Stimulating Hormone (TSH) levels were measured through 5 ml blood samples collected before and after the intervention.*

Results: *The findings indicate that the analysis of TSH levels reveals a significant effect of exercise. It indicates a notable difference between pretest and posttest TSH levels, as evidenced by a t-statistic of -2.799, which is statistically significant (p = 0.015). This suggests that the exercise affects TSH levels. Before the exercise, the mean TSH level was 1.4364, while after the intervention, it increased to 2.0036, indicating an overall rise in TSH levels. Furthermore, correlations exhibit a strong relationship (correlation coefficient of 0.668) between pretest and posttest TSH levels, emphasising the consistency of the findings. Collectively, these results underscore the influence of exercise on your TSH levels, potentially indicating a physiological response to the intervention.* ***Conclusion:*** *The eight-week moderate-intensity exercise program has a positive effect on serum Stimulating Hormone (TSH) levels in young women.*

INTRODUCTION

TSH stimulates the thyroid gland to produce and release thyroid hormones, primarily thyroxine (T4) and triiodothyronine (T3). This stimulation is necessary for keeping the body's metabolic rate, energy production, and overall health [1,2,4].

Exercise can have an impact on thyroid function, particularly on Stimulating Hormone (TSH) levels. The relationship between exercise and TSH is complex and the effects can differ depending on influences like the intensity and duration of exercise [8.10]

Regular exercise is generally associated with beneficial effects on thyroid function. It can enhance the sensitivity of thyroid hormone receptors and may contribute to better thyroid hormone utilization. Chronic exercise can lead to improved metabolic health and potentially reduced risk of thyroid disorders [1,9,15].

Acute exercise can temporarily suppress TSH levels. This is often referred to as "exercise-induced suppression of TSH." The reduction in TSH during and immediately after intense exercise is believed to be a result of altered hypothalamic-pituitary-thyroid axis activity (7) (8).

Aerobic exercise stimulates the heart and lungs, increases blood flow, and strengthens muscles. After 12 weeks of aerobic exercise, there was no noticeable difference in the plasma levels of thyroid hormones (T3 and T4) or TSH. After the exercise session, there was a small rise in TSH and T3, but not a significant one. Additionally, there was a minor decrease in T4 levels between pre- and post-training; however, these changes were also not statistically significant [3,12,14].

Walking, swimming, or yoga are examples of mild exercise that stimulate thyroid gland secretion and increase tissue sensitivity to thyroid hormones. A variety of physiological and pathological conditions can modify the peripheral metabolism of THs, which may modify the deiodination pathway and change the level of THs in rotation [2,5,6].

Comparing obese versus lean subjects, serum TSH levels were higher in the former. With a higher BMI, TSH levels increased. The relationship between serum TSH and body weight was substantial and positive [17].

It's valuable to state that the influence of exercise on TSH can vary between individuals. Some people may experience more significant changes in TSH levels with exercise, while others may have relatively stable TSH levels ([4,5,10.16].

Materials and Methods

This study adopted a dual-method research design, incorporating both cross-sectional and longitudinal study approaches. The combination of these designs enabled a comprehensive investigation into serum Thyroid Stimulating Hormone (TSH) levels among female exercise performers.

Participants, Recruitment criteria and Sample characteristics

The study focused on females aged 20 to 25 years affiliated with the Department of Sports Sciences and Physical Education at the University of the Punjab. The study included a sample size of 14 female participants, recruited through personalised invitations sent via email. The participants were classified into two groups, i.e., control group (CG) and experimental group (EG), with each group composed of seven subjects. This targeted recruitment method aimed to ensure the participation of individuals meeting the specified criteria. Participants in the study were selected based on the absence of known medical issues as determined through interviews, ensuring a healthy and homogeneous sample.

Description of Exercise Protocol

The exercise sessions were structured with a duration ranging from 30 to 45 minutes, incorporating a 5–10-minute warm-up at the beginning and concluding with a 5–10-minute cool-down period. This warm-up and cool-down routine was implemented to ensure a gradual transition into and out of the exercise regimen, promoting participant safety and physiological adaptability.

The frequency of these exercise sessions was set at 6 days a week, fostering a consistent and sustained engagement with the prescribed exercise protocol. This approach aimed to capture a holistic understanding of the impact of regular, moderate-

intensity exercise on serum Thyroid Stimulating Hormone (TSH) levels among female participants.

Blood Sampling and TSH Analysis

Blood sampling (5ml) was collected using established aseptic procedures to guarantee the integrity of the samples. Subsequently, the collected blood samples underwent TSH analysis using the Fluorescence Immunoassay (FIA) instrument. FIA, a sophisticated and precise technology, enhanced the sensitivity and specificity of TSH measurements. This methodological approach ensured a meticulous evaluation of the impact of exercise on thyroid function, as reflected in TSH levels, with a focus on producing accurate and reliable data.

The statistical analysis of the data involved the application of the t-test to assess the significance of differences in serum Thyroid Stimulating Hormone (TSH) levels between pre- and post-intervention periods. This parametric test was well-suited for comparing means between two related groups, allowing us to evaluate the impact of the exercise interventions on TSH levels. Descriptive statistics, including means, median, mode, ranges and standard deviations, were calculated to provide a clear overview of the central tendencies and variability within the data. These statistical analyses were executed using the Statistical Package for the Social Sciences (SPSS), a robust software widely utilised for data analysis in research studies.

Data Analysis

Results

Independent Sample t Test

Table 1 Independent sample statistics of Pretest CG and EG

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Pretest TSH	Equal variances assumed	1.261	.284	-2.346	12	.037	-.56143	.23928	-1.08278	-.04008
	Equal variances not assumed			-2.346	7.582	.049	-.56143	.23928	-1.11855	-.00431

Table 1 indicates a significant difference in Pretest TSH levels between the Experimental and Control Groups. The Experimental Group, consisting of 7 participants, exhibited a mean TSH level of 1.1557 (SD = 0.59444), while the Control Group, also with 7 participants, showed a higher mean TSH level of 1.7171 (SD = 0.21777). The independent samples t-test demonstrated a statistically significant lower mean TSH level in the Experimental Group compared to the Control Group, with t-values of -2.346 (p = .037) assuming equal variances and -2.346 (p = .049) when variances were not assumed to be equal.

Table 2 Paired sample t statistics of pretest and posttest TSH of CG and EG

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pretest TSH - Posttest TSH	-.56714	.75809	.20261	-1.00485	-.12944	-2.799	13	.015

The above table 4.2 indicates the analysis of TSH levels reveals a significant effect of exercise. The paired samples test indicates a notable difference between pretest and posttest TSH levels, as evidenced by a t-statistic of -2.799, which is statistically significant ($p = 0.015$). This suggests that the exercise intervention has an impact on TSH levels. Before the exercise intervention, the mean TSH level was 1.4364, while after the intervention, it increased to 2.0036, indicating an overall rise in TSH levels. Furthermore, the paired samples correlations exhibit a strong relationship (correlation coefficient of 0.668) between pretest and posttest TSH levels, emphasizing the consistency of the findings. Collectively, these results underscore the influence of exercise on your TSH levels, potentially indicating a physiological response to the intervention.

Discussion

This research intended to delve into the specific effect of moderate-intensity exercise on TSH levels among females. This study's findings echo previous research by demonstrating a notable influence of exercise on TSH levels, as supported by [6,7] by indicating that there is an intricate relationship between exercise and thyroid function, particularly Thyroid Stimulating Hormone (TSH) levels.

These findings resonate with the work of [2], who conducted research at the University of Gaziantep in Turkey to explore the effects of exercise on TSH levels, particularly in individuals with lower TSH levels. The previous study identified aerobic exercise, grouped as 70% of maximum heart rate, as yielding the most favourable outcomes for improving TSH levels.

Regular exercise is widely recognised for its positive impact on thyroid function [7]. The study further suggested that exercise can enhance the sensitivity of thyroid hormone receptors and improve thyroid hormone utilisation, thereby promoting overall metabolic health.

Conclusion

Based on data analysis and findings, the researcher concludes that there significant impact oc moderate-intensity exercises on serum Thyroid Stimulating Hormone (TSH) concentration in females. The analysis revealed notable differences in serum TSH levels between exercise performers and non-exercise performers, affirming the significant impact of exercise on thyroid function. Specifically, statistically significant differences were observed in pre-test TSH levels between the experimental and control groups, indicating baseline disparities in thyroid function among participants. However, no significant differences were found in post-test TSH levels between the two groups. These findings suggest that moderate-intensity exercise may influence TSH levels in females, highlighting the importance of regular physical activity for thyroid health. Moving forward, these insights could inform future strategies for promoting women's health and wellness, emphasizing the role of exercise in optimizing thyroid function and overall well-being.

References

Fliers, E., Alkemade, A., & Wiersinga, W. M. (2001). The hypothalamic-pituitary-thyroid axis in critical illness. Best Practice & Research Clinical Endocrinology & Metabolism, 15(4), 453-464.

Shahid MA, Ashraf MA, Sharma S. Physiology, Thyroid Hormone. In: StatPearls. StatPearls Publishing, Treasure Island (FL); 2022. PMID: 29763182.

Bansal, A., Kaushik, A., Singh, C. M., Sharma, V., & Singh, H. (2015). The effect of regular physical exercise on the thyroid function of treated hypothyroid patients: An interventional study at a tertiary care center in Bastar region of India. Archives of Medicine and Health Sciences, 3(2), 244-246.

Klein, I., & Ojamaa, K. (2001). Thyroid hormone and the cardiovascular system. New England Journal of Medicine, 344(7), 501-509.

Braverman L. E. Cooper D. S. Werner S. C. & Ingbar S. H. (2013). Werner & ingbar's the thyroid : a fundamental and clinical text (10th ed.). Wolters Kluwer/Lippincott Williams & Wilkins. Retrieved October 31 2023 from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=booktext&D=books3&AN=01641771/10th_Edition/5&XPATH=.

Dietrich JW, Landgrafe G, Fotiadou EH. TSH and thyrotropic agonists: key actors in thyroid homeostasis. J Thyroid Res. 2012;2012:29. Article ID 351864.

Ross, D. S. (2001). Serum thyroid-stimulating hormone measurement for assessment of thyroid function and disease. Endocrinology and metabolism clinics of North America, 30(2), 245-264.

Taddei, S., Caraccio, N., Virdis, A., Dardano, A., Versari, D., Ghiadoni, L., ... & Monzani, F. (2006). Low-grade systemic inflammation causes endothelial dysfunction in patients with Hashimoto's thyroiditis. The Journal of Clinical Endocrinology & Metabolism, 91(12), 5076-5082.

Montero, D., & Díaz-Cañestro, C. (2016). Endurance training and maximal oxygen consumption with ageing: Role of maximal cardiac output and oxygen extraction. European journal of preventive cardiology, 23(7), 733–743. https://doi.org/10.1177/2047487315617118

Swan, K. Z., Nielsen, V. E., Godballe, C., Thrane, J. F., Mortensen, M. R., Schytte, S., ... & Bonnema, S. J. (2018). Is serum TSH a biomarker of thyroid carcinoma in patients residing in a mildly iodine-deficient area?. Endocrine, 61, 308-316.

Onsori, M., & Galedari, M. (2015). Effects of 12 weeks aerobic exercise on plasma level of TSH and thyroid hormones in sedentary women. European Journal of Sports and Exercise Science, 4(1), 45-9.

Garber, J. R., Cobin, R. H., Gharib, H., Hennessey, J. V., Klein, I., Mechanick, J. I., ... & Woeber for the American Association of Clinical Endocrinologists and American Thyroid Association Taskforce on Hypothyroidism in Adults, K. A. (2012). Clinical practice guidelines for hypothyroidism in adults: cosponsored by the American Association of Clinical Endocrinologists and the American Thyroid Association. Thyroid, 22(12), 1200-1235.

Henze, M., Brown, S. J., Hadlow, N. C., & Walsh, J. P. (2017). Rationalizing thyroid function testing: which TSH cutoffs are optimal for testing free T4?. The Journal of Clinical Endocrinology & Metabolism, 102(11), 4235-4241.

RossDouglas, S., BurchHenry, B., CooperDavid, S., Carol, G., Luiza, M., RivkeesScott, A., ... & WalterMartin, A. (2016). 2016 American Thyroid Association guidelines for diagnosis and management of hyperthyroidism and other causes of thyrotoxicosis. Thyroid.

Rothacker, K. M., Brown, S. J., Hadlow, N. C., Wardrop, R., & Walsh, J. P. (2016). Reconciling the log-linear and non–log-linear nature of the TSH-free T4 relationship: intra-individual analysis of a large population. The Journal of Clinical Endocrinology & Metabolism, 101(3), 1151-1158.

Mario R., Paola L., Antonella L., Barbara P., Teresa M., Rodolfo F., Flavia M., & Luca C., Raised serum TSH levels in patients with morbid obesity: is it enough to diagnose subclinical hypothyroidism?, European Journal of Endocrinology, Volume 160, Issue 3, Mar 2009, Pages 403–408, https://doi.org/10.1530/EJE-08-0734