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# THE ROLE OF PHYSICAL ACTIVITY IN THE TREATMENT OF HASHIMOTO'S THYROIDITIS – A LITERATURE REVIEW

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**ABSTRACT**

**Introduction:** The root cause of Hashimoto thyroiditis (HT), a chronic inflammation of the thyroid gland, is still not fully understood. HT has a multipronged influence on the general health condition, especially because the thyroid regulates the overall metabolism of an organism. Disruption of such a balance may result in weight gain and weakening of the muscles, and eventually resignation from any kind of physical activity.
**Objective:** This work aims to review the current knowledge regarding the extent to which physical activity may play a role in the treatment of HT.
**Methods:** Literature review of PubMed and Google Scholar.
**Conclusions:** Although pharmacological treatment with levothyroxine remains the foundation of Hashimoto's thyroiditis (HT) management, current evidence suggests that physical activity (PA) may play a supportive role in improving both thyroid function and overall quality of life. Regular and appropriately structured exercise appears to have beneficial effects on hormone levels, immune function, and common symptoms such as fatigue, weight gain, and reduced physical capacity.
Findings indicate that not all forms of physical activity are equally effective. Voluntary, planned, and restorative exercise (RE) is associated with more favourable outcomes compared to occupational physical activity (OPA), which may exert additional stress on the body and worsen certain thyroid-related parameters.
Future studies should focus on identifying the most effective exercise modalities and intensities, as well as their long-term impact on autoimmune activity and disease progression.

**KEYWORDS**

Hashimoto's Disease, Hashimoto's Thyroiditis, Hypothyroidism, Physical Activity, Mental Health

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## 1. Introduction:

The root cause of Hashimoto thyroiditis (HT), a chronic inflammation of the thyroid gland, is still not fully understood. It is currently regarded as the most prevalent endocrine illness, autoimmune disease, and cause of hypothyroidism (Caturegli et al., 2014) – especially in regions with adequate iodine intake (Vuletić et al., 2024). The term "hypothyroidism" refers to the prevalent pathological state of thyroid hormone insufficiency (Chaker et al., 2017). It can have fatal consequences and cause major negative health repercussions if left untreated (Chaker et al., 2017). Between 5% and 10% of the general population is thought to have HT (Vuletić et al., 2024). The classic type of HT is far more prevalent in women than men ( from seven to ten times more often) and usually manifests in the fifth decade of life (Bhandari & Mahto, 2025; Caturegli et al., 2014; Klubo-Gwiezdzinska & Wartofsky, 2022). Clinical characteristics include both systemic and local symptoms, with each type of HT having unique characteristics (Caturegli et al., 2014); some of them can be presented in *Table 1*.

HT has a multifaceted influence on overall health. Especially because the thyroid regulates the overall metabolism of an organism. Disruption of such a balance may result in weight gain and weakening of the muscles and eventually resignation from any kind of physical activity. Patients with hypothyroidism often have diminished physical capacity or experience fatigue and arthralgia due to PA (Lankhaar, Kemler, Hofstetter, et al., 2021); therefore, it has been proposed that these symptoms may continue even after starting supplemental levothyroxine (LT4) medication (Vuletić et al., 2024). Eventually, the limitation of PA among patients suffering from HT leads to being overweight or obese (Kamińska et al., 2023). Therefore, lifestyle modification as a way to support the treatment of HT is more often taken into consideration. It has started a discussion, whether diet or physical activity may enhance the pharmacological means, like for other chronic diseases, for example, patients with diabetes mellitus. It has already been demonstrated that PA improves blood

glucose regulation and delays the onset of type 2 diabetes in both men and women (Dhuli et al., 2022). However, on the other hand, compared to the general population, those with chronic illnesses, such as autoimmune diseases, typically engage in less physical activity (Lankhaar, Kemler, Hofstetter, et al., 2021). For this reason, it is crucial to assess various aspects of HT to understand in depth the potential benefits coming from PA as a part of treatment.

**Table 1.** Presenting local and systemic symptoms of Hashimoto's thyroiditis

| Local symptoms | Systematic symptoms |
|---|---|
| - dysphonia<br>- dyspnoea<br>- dysphagia | - weight gain,<br>- cold intolerance,<br>- fatigue<br>- constipation<br>- increased bile duct stone formation<br>- hair loss<br>- dry, cold, yellowish, and thickened skin<br>- bradycardia<br>- increased risk of coronary artery disease<br>- sore muscles with delayed relaxation and false hypertrophy<br>- depression |

This work aims to review the current knowledge regarding the extent to which physical activity may play a role in the treatment of HT.

## 2. Research materials and methods

The methodology of this review included database research of PubMed and Google Scholar. Searched phrases were: *Hashimoto's disease or Hashimoto's thyroiditis, physical activity, mental health, and occupational activity*. Inclusion Criteria: studies, clinical trials, and meta-analyses analysing the multi-sided influence of physical activity on the health of patients with Hashimoto's disease. Exclusion criteria: animal studies, systematic reviews.

### 3.1. Physical activity and its influence on the human organism

Any bodily movement generated by skeletal muscles at the expense of energy utilization is the definition of physical activity (PA) (Dhuli et al., 2022). Examples of PA include: lifting, exercising, playing, traveling, walking, cycling, dancing, gardening, housework, aerobic, etc. (Dhuli et al., 2022; Vuletić et al., 2024). The PA compilation is useful for calculating the metabolic intensity of exercise in terms of metabolic equivalent tasks (METs) relative to a resting state (Dhuli et al., 2022). Activities may be categorised by using METs: inactive, light-intensity, moderate intensity, and energetic intensity.

The research findings have demonstrated that even a small increase in PA, like going for an hour-long walk once a week, can have a major positive impact on general health and lower mortality risk (Dhuli et al., 2022). Dhuli et al. (Dhuli et al., 2022) indicated that engaging in strenuous or high-intensity physical activity enhances general health by improving lipid profile and reducing the risk of cardiovascular diseases. Exercises involving weight endurance and weight support, such as leaping, skipping, weight training, and using playground equipment, promote the growth of strong bones, muscular strength, and musculoskeletal fitness (Dhuli et al., 2022).

### 3.2. Physical activity and thyroid

The numerous ways in which PA affects general health are undeniable; however, what influence does PA have on the thyroid? Christopher L. Klasson et al. (Klasson et al., 2022) used a sizable representative sample of 2417 American men and 2562 women from the National Health and Nutrition Examination Survey (NHANES) in order to investigate the relationship between daily physical activity and thyroid hormones as well as immune system activity. The obtained results imply that TSH and T4 levels were generally lower in more active individuals, and their TSH reaction to decreased T4 levels was slightly attenuated. All of these findings lend credence to the idea that increasing daily physical exercise tends to reduce metabolic activity in other bodily systems. Additionally, the amount of circulating TSH and T4, as well as the strength of the TSH reaction to decreased T4 levels, are both influenced by PA. Physically active adults seem to create less TSH

when their T4 levels are low. The hypothalamic-pituitary axis has been suggested in the modification of TSH production, highlighting the pervasive effects of PA on the brain and indicating that PA may influence thyroid hormone signalling to alter metabolic energy consumption in tissues across the body. This cross-sectional analysis has certain limitations; for example, it is limited to evaluating correlations between variables and is unable to prove that PA has a direct impact on thyroid levels. Finally, although the Constrained Energy Expenditure hypothesis serves as the framework for this research, metabolic rate measurements are not included. Rather, Christopher L. Klasson et al. used accelerometers and questionnaires to quantify physical activity as an indicator of energy expenditure. Another study, which assessed thyroid function in twenty-four young military cadets participating in a ranger training course, demonstrates that the thyroid hormones display a biphasic pattern when extended physical exertion is coupled with energy and sleep deprivation (Opstad et al., 1984). Exercise caused the serum levels of T4, fT4, T3, rT3, and thyroxin binding globulin (TBG) to rise by roughly 10–20% over the first 24 hours after exercise. In the next four days of the course, due to an energy deficit, there was a progressive drop in T4, fT4, T3, and TBG, along with an increase in rT3. In all participants, TSH dropped after the first 24 hours of activity and stayed low throughout the duration. In conclusion, during the first day of the course, an increased thyroid secretion was observed because of activation of peripheral deiodinations of T4 to T3 in response to PA. Despite everything, due to the study being conducted on too small a sample, it could be considered to replicate the research method with a larger number of participants.

### 3.3. The intensity of physical activity and thyroid function

The study concerning the relationship between PA intensity and thyroid function was conducted by Jeongmin Lee et al. (Lee et al., 2025) to determine whether PA's beneficial health outcomes include thyroid function. In terms of this research, the authors included 5372 participants and categorised them into three groups of individuals performing PA with different intensities, presented in *Table 2.* below.

**Table 2.** The claimed definitions of different intensities of physical activity

| Intensity of physical activity | Definition |
|---|---|
| High PA | • individuals who performed 1500 MET-min per week for at least three days of intense aerobic PA, or those who engaged in any combination of vigorous aerobic PA; or<br>• individuals who performed moderate PA and walking seven or more days a week, and logging at least 3000 MET-min. |
| Moderate PA | • individuals who performed intense aerobic PA for three or more days a week for at least twenty minutes each day.<br>• individuals walking for at least half an hour each day or engaging in moderate aerobic PA for longer than five days; or<br>• individuals who performed any mix of walking with at least 600 MET-min per week, moderate aerobic PA, and vigorous aerobic PA. |
| Low PA | • Individuals who didn't fit the high or moderate PA requirements. |

The results showed that in the studied part of the Korean population, elevated TSH and free T4 levels were only linked to moderate PA. Moderate PA had a noticeably higher connection with thyroid function test (TFT) parameters. Furthermore, reduced TPOAb levels are also linked to moderate PA. According to TPOAb levels, this research emphasizes the value of moderate PA in supporting healthy thyroid function and possibly reducing thyroid autoimmunity (Lee et al., 2025). The low-PA group, however, had the lowest amounts of free T4 in the TFT, while the three PA groups' TSH levels did not differ substantially (Lee et al., 2025). Interestingly, the high PA group showed no discernible changes in free T4, TSH, or Thyroid Peroxidase Antibodies (TPOAb) titer, and since the connection between moderate PA and TFT parameters was noticeably stronger, Jeongmin Lee et al. (Lee et al., 2025) hypothesize that through heightened inflammation or immunological responses, high-intensity PA may negatively impact thyroid function and TPOAb levels. It is also worth noting that free T4 showed a substantial positive link with PA, while TSH level was adversely correlated with PA in the overweight or obese group (Lee et al., 2025). These outcomes are said to be the reason why TSH levels are lowered by lower leptin levels, particularly in obese patients. Importantly, the results obtained from sex-based subanalysis of this research showed that mild PA affects the magnitude of the TSH response in addition to lowering TSH and raising free T4 levels. Thyrotroph T4 Resistance Index (TTR4I) and TSH index (TSHI) levels dropped in the moderate-PA group in both males and females.

### 3.4. Physical activity and Hashimoto thyroiditis

Marko Vuletić et al. (Vuletić et al., 2024) split PA into two subcategories – occupational physical activity (OPA) and engagement in regular exercise (RE). This research included 438 participants and defined OPA as a work-related activity carried out during the course of an eight-hour workday, and most importantly, there are fewer possibilities for workers to relax because it is a required activity linked to job tasks and productivity. Conversely, RE is PA done willingly in order to increase physical fitness while providing enough time for rest (Vuletić et al., 2024). Additionally, RE is repetitious, organized, and planned (Vuletić et al., 2024). The results of this study imply that PA may improve thyroid function. Furthermore, it is proposed that these two distinguished types of activities have conflicting effects on thyroid function. Firstly, OPA was observed to be correlated with an increase in TSH and TPOAb (thyroid peroxidase antibody) and also a decrease in fT4. However, sensitivity analysis showed that the subgroup of patients not receiving LT4 medication is primarily responsible for the association between OPA and elevated TSH (Vuletić et al., 2024). Secondly, RE occurred to decrease levels of TSH in OVERT patients with HT, and in the general population, it may be preventive against hypothyroidism. In addition, the study concluded that the greater thyroid function malfunction, the greater the benefits from RE were obtained. This indicates that the introduction of RE to the daily routine enhances the effectiveness of hormone therapy. Marko Vuletić et al. (Vuletić et al., 2024) found a nominally significant association between RE and lower thyroglobulin antibodies (TgAb) levels in OVERT patients, which supports the observations that PA contributes to immunomodulation. The authors' reasoning for these results is based on a *physical activity health paradox* (Vuletić et al., 2024) – this term refers to an observation that, whereas OPA may not always be good for health and may even be harmful at times, leisure-time PA is typically linked to favourable health outcomes (Ko et al., 2023).

Another object of interest for scientists is the effectiveness of the lifestyle interventions that are meant to improve body composition. For instance, an intervention programme consisting of an introduction of the Mediterranean Diet (MD) without caloric restriction in combination with enhanced PA (Kamińska et al., 2023). The study sample consists of 53 women, including 14 women with Hashimoto's disease and 15 women with polycystic ovary syndrome. The remaining 24 women were assigned to the control group. In every group of women Kamińska et al. tested, they were able to reduce the amount of fat in body composition and BMI. Such a reduction potentially results in lowering the risk of abdominal obesity and related chronic non-communicable diseases. The great majority of 1724 female respondents to the research of Lankhaar et al. (Lankhaar, Kemler, Stubbe, et al., 2021) (with treated hypothyroidism) are sedentary and have chronic exercise intolerance. Hence, it was recognised that promoting regular PA in this population is crucial given the negative health effects of physical inactivity. As it was presented in another study, when patients recognise the importance of PA on their condition, they exhibit a higher tendency to train more than one discipline (Lankhaar, Kemler, Hofstetter, et al., 2021).

To truly assess the extent to which PA may influence the treatment of HT, it is worth considering its effect in a broader aspect. For instance, depressive symptoms in patients with HT. It is a crucial aspect of treating these individuals, since it profoundly affects their compliance, which, in fact, was observed during some research on lifestyle interventions in HT treatment. Kamińska et al. (Kamińska et al., 2023) report that individuals with HT were observed to have significantly higher discontinuation rates than individuals with polycystic ovary syndrome (PCOS), which corresponds with results obtained during another study (Lankhaar, Kemler, Hofstetter, et al., 2021). Gacek et al. (Gacek et al., 2025) studied how physical activity affects depressive symptoms among 219 women with HT in the age group from 20 to 50 years old. It was observed that women's feelings of depression increased in intensity as their level of moderate physical exercise decreased. Moreover, women who experienced depressive symptoms at moderate or high severity were less likely to engage in strenuous physical exercise. The findings of earlier trials, which indicate that recreational physical exercise with health training components helps to lower melancholy in women, partly align with the tendencies shown in this study. Gacek et al. (Gacek et al., 2025) speculate that these outcomes may be explained by a synthesis of endorphins during PA, which alleviates pain and contributes to overall improvement of well-being. On the other hand, one shall bear in mind that lowered PA could be a clinical symptom of depressive disorder, which can require the intervention of a psychiatrist to be treated.

A randomised trial studied 60 women with hypothyroidism involved in various types of activities reported that all PA contributed to improvement of T4 levels, lipids, and quality of life (QoL) (Ahmad et al., 2023). However, the most significant drop in TSH and QoL was attributed to PA consisting of elements from both aerobic and resistance training (Ahmad et al., 2023). Furthermore, Silva et al. (DA Silva et al., 2022) pointed out the possibility that an order of exercises from resistance training may be important in maximizing

the beneficial impact on the thyroid. However, the sample of this research is rather too small to be certain; hence, this matter requires more research in order to determine the long-term effects of resistance training. Randomised controlled trial on women with subclinical hypothyroidism managed to establish that regular aerobic training lasting 16 weeks can improve the QoT of patients (Werneck et al., 2018). Yoga has been reported to have a beneficial effect on patients with hypothyroidism as well – not only was it observed to alleviate symptoms of depression and anxiety (Baishya & Metri, 2024; Bhandari & Mahto, 2025), but also to improve lipid profiles and the function of the thyroid gland (Baishya & Metri, 2024). Abhijit Baishya et al. (Baishya & Metri, 2024) speculate that since HT is thought to be the most prevalent cause of hypothyroidism, the immune-modulating qualities of yoga may be the mechanism behind its advantages in improving outcome measures in this condition. Yoga reduces inflammatory cytokines, which helps to regulate immunological function (Baishya & Metri, 2024).

### 3.5. Physical activity and triathletes diagnosed with Hashimoto thyroiditis

To bring a deeper understanding of the impact PA has on HT, it is important to analyse patients who have already been active before receiving a diagnosis. Gierach and Junik (Gierach & Junik, 2023) conducted a study focusing on a group of 32 women who are triathletes and were newly diagnosed with HT. A sequential swim, cycle, and run constitutes the endurance combination sport known as the triathlon (Gierach & Junik, 2023). To be successful, one needs to be able to endure high intensity of PA and possess an adequate body structure – the study aimed to demonstrate the possible variations in metabolic parameters measured by a medical body composition analyser in triathletes before starting L-thyroxine medication and after three and six months of treatment. The results from the body composition analyser not only showed a decrease in fat mass and visceral adipose tissue in comparison to the time before L-thyroxine treatment, but also a higher composition of skeletal muscle mass. Thyroid function tests (TSH and fT4) performed throughout the recruitment phase and three and six months after therapy were also shown to differ significantly. It indicates an existence of: (a) positive correlation between TSH and BMI and visceral adipose tissue, and (b) negative correlation between fT4 and BMI and visceral adipose tissue (Gierach & Junik, 2023). Gierach and Junik suggest that this may be connected with adipokine leptin. In the paraventricular nucleus, leptin controls the expression of the thyrotropin-releasing hormone (TRH) gene, and TSH, in turn, promotes the generation of leptin from adipose tissue (Gierach & Junik, 2023). Additionally, leptin controls the transformation of T4 into T3 (Gierach & Junik, 2023).

## 4. Discussion

The evidence presented in this review highlights a growing interest in understanding the role of PA as an adjunctive tool in the treatment of HT. Although pharmacological treatment with levothyroxine remains the standard of care, many patients continue to experience symptoms such as fatigue, weight gain, and muscle weakness despite achieving biochemical euthyroidism. This observation suggests that other factors, including lifestyle interventions, may help to address the persistent clinical burden of HT.

A key finding from the reviewed literature is that regular, voluntary physical activity (RE) may have beneficial effects on both thyroid function and overall well-being. Studies such as Vuletić et al. (Vuletić et al., 2024) show that while OPA — often linked with increased stress and limited recovery — may correlate with adverse thyroid profiles, RE appears to support better regulation of TSH and antibody levels. These opposing effects highlight the importance of not only promoting activity but ensuring that it is appropriately structured, intentional, and allows for sufficient rest. The chances for compliance are greater when a chosen PA brings joy to patients, which implies that possibly physicians should be more considerate and supportive while encouraging their patients to see a PA. Various disciplines and types of PA were observed to be beneficial for thyroid function – for example, regular aerobic exercises, resistance training, or yoga.

Moreover, Klasson et al. (Klasson et al., 2022) demonstrated a negative association between daily PA levels and thyroid hormone concentrations (TSH and T4), as well as immune markers. Their findings support the notion that PA may modulate the hypothalamic-pituitary-thyroid axis and influence immune function. This connection is particularly relevant in HT, which is fundamentally an autoimmune condition. By potentially downregulating immune system hyperactivity, PA could theoretically play a role in slowing disease progression or improving symptomatology. Additionally, these outcomes correspond with the results obtained from the meta-analysis (Sundus et al., 2025), which only underlines the importance of further research regarding the potential mechanism that would explain how PA decreases TSH and may increase fT4 serum levels.

It is also worth noting the broader physiological benefits of PA, including improved lipid profiles, cardiovascular health, bone density, and mood — all of which are often negatively impacted in HT patients. These systemic effects reinforce the idea that incorporating PA into HT management could yield multi-faceted improvements beyond thyroid hormone levels alone.

However, the optimal type, intensity, and frequency of PA for patients with HT remain unclear. While moderate aerobic activity is commonly recommended, further studies are needed to determine individualized PA prescriptions for HT patients, considering factors such as baseline fitness, symptom severity, and comorbidities.

## 5. Limitations

This work is a narrative review and, as such, is limited by the scope and availability of currently published literature. The number of high-quality, randomized controlled trials specifically investigating the role of PA in patients with HT remains low. Most of the cited studies are observational or cross-sectional, which restricts the ability to draw causal conclusions regarding the impact of PA on thyroid function and autoimmune processes.

Additionally, there is considerable variability in the methodologies used across studies — including differences in how PA is measured, the intensity and type of exercise, and the clinical characteristics of study populations — which complicates direct comparison and interpretation. Furthermore, individual factors such as age, sex, disease severity, comorbidities, and medication status may significantly influence the effects of PA, but were not consistently controlled for in the available research.

It is also worth noting that numerous patients with HT report experiencing muscle pain and fatigue, despite achieving long-term euthyroidism (Jordan et al., 2021). This may be a significant obstacle to encouraging patients to PA. Furthermore, patients suffering from depressive symptoms may not be able to follow the guidelines regarding sports activity or diet, therefore it is important to distinguish what kind of intervention would be the most suitable for the patient to start with before introducing other improvements that are complementary to hormone therapy.

Due to these limitations, the conclusions drawn in this review should be interpreted with caution. More robust and targeted clinical studies are required to establish clear recommendations regarding PA in the treatment of HT.

## 6. Conclusions

Although pharmacological treatment with levothyroxine remains the foundation of Hashimoto's thyroiditis (HT) management, current evidence suggests that physical activity (PA) may play a supportive role in improving both thyroid function and overall quality of life. Regular and appropriately structured exercise appears to have beneficial effects on hormone levels, immune function, and common symptoms such as fatigue, weight gain, and reduced physical capacity.

Findings indicate that not all forms of physical activity are equally effective. Voluntary, planned, and restorative exercise (RE) is associated with more favourable outcomes compared to occupational physical activity (OPA), which may exert additional stress on the body and worsen certain thyroid-related parameters.

While the reviewed studies provide encouraging results, further research is needed to define evidence-based guidelines for physical activity in HT patients. Future studies should focus on identifying the most effective exercise modalities and intensities, as well as their long-term impact on autoimmune activity and disease progression.

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