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Physiotherapy Interventions in Postural Orthostatic Tachycardia Syndrome – A Literature Review.

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Abstract

Background: Postural orthostatic tachycardia syndrome (POTS) is a condition that causes a number of symptoms when you transition from lying down to standing up. It is characterized by symptoms of orthostatic tachycardia including tachycardia, palpitations, syncope or presyncope, lightheadedness, cognitive dysfunction, nausea, exercise or heat intolerances, and fatigue.

Aim: This systematic review aims to evaluate current literature on physiotherapy interventions for Postural orthostatic tachycardia syndrome (POTS) focusing on studies published between 2010 and 2025. The review seeks to identify effective physiotherapy approaches that enhances cardiovascular functions, helps in daily life activities and improves the quality of life.

Methods: A comprehensive literature search was conducted using databases such as Google Scholar, Research gate, PubMed, and Medline. Keywords included "POTS," "physiotherapy management", "physical intervention," "orthostatic syndrome," and "lifestyle intervention" Articles published in English and meeting inclusion criteria were considered for review.

Selection criteria: Studies on POTS patients (all stages) using physiotherapy, multimodal approaches, or combined with medication, assessed with validated tools, including cohort studies, case reports, and systematic reviews, published in English since 2010 was included.

Results: Out of 44 initially identified articles, 6 met the inclusion criteria for detailed analysis. These studies employed various physiotherapy techniques such as aquatic therapy, aerobic exercises, cardiovascular training and multidisciplinary rehabilitation. The reviewed literature highlightens the improvements in the overall quality of life.

Conclusion: The interventions included that aquatic therapy and reconditioning programs may be effective treatment options for patients with postural orthostatic tachycardia syndrome (POTS). It highlights that exercise progression tailored to patient tolerance, under physician supervision can improve outcomes. The training program helped normalize heart rate and improved quality of life for patients. Additionally, the study identified that fatigue in POTS patients is a complex, multidimensional issue.

Keywords: POTS, orthostatic tachycardia syndrome, physiotherapy intervention, physiotherapy management, rehabilitation.

Introduction

Postural orthostatic tachycardia syndrome (POTS) is a condition where there is an excessive increase in heart rate in the upright position associated with symptoms of orthostatic intolerance [1,2]. It is also associated with Ehlers-Danlos syndrome [3,4]. Each individual diagnosed with POTS have varying symptoms which can include cardiac and/or non-cardiac symptoms [2,5]. While the pathophysiology of POTS is not fully understood, a main mechanism of dysfunction in the autonomic nervous system leads to excessive blood pooling in the lower extremities. The idiopathic forms of POTS are widely recognized as partial dysautonomia (neuropathic) and hyperadrenergic. In neuropathic POTS, sympathetic denervation of the lower extremities results in excessive blood pooling and reflex tachycardia. Hyperadrenergic POTS is the most complicated form of POTS. It is characterized by increased urinary output, increased blood pressure, increased sweating and hypothermia [6,7]

Autonomic disorder like postural orthostatic tachycardia syndrome (POTS), is characterized by postural tachycardia, orthostatic intolerance, dizziness, fatigue, and headache, along with several other symptoms. [8,9] These symptoms are often relieved when individuals assume a supine or reclining position [10,11] Typically, experienced symptoms in patient with POTS are light-headedness, palpitations, tremors, blurry vision, exercise intolerance, and breathlessness after assuming an upright position [1,11,12,13]. POTS can be triggered by surgery, pregnancy, menarche, vaccination, or concussion [8]. These patients can also exhibit a lower peak oxygen uptake (VO_{2peak}) compared to healthy sedentary individuals, indicating reduced physical fitness levels [6] with breathlessness being a common symptom in patients with POTS [14]

Other potential triggers include hereditary factors, underlying conditions such as diabetes, amyloidosis, sarcoidosis, cancer, or after a viral illness, traumatic event, or may be associated with autoimmune disorders such as lupus, Sjogren syndrome, and celiac disease. Additionally, alcohol or metal poisoning, and chronic fatigue syndrome may lead to POTS [6,7]. It is also observed that the act of limiting physical activity to avoid the symptoms can actually aggravate the condition by reducing myocardial work and causing ventricular

remodelling, which has been seen with prolonged bed rest [15].

Furthermore, patients have reported having other comorbid conditions like depression, high -lightened anxiety, cognitive dysfunction, migraine, irritable bowel syndrome, or chronic fatigue syndrome which can cause episodic tachycardia symptoms in the absence of POTS. [13,16]. Although the prevalence of POTS in adolescents is not known, it has been estimated that up to 500,000 patients between the ages of 15- 50 in the United States have POTS [17,18,19] It has been estimated that a quarter of the adult patients diagnosed with POTS are unable to work and are disabled. Similar impairments in functioning have been observed in adolescents. [17]

POTS can be highly debilitating with affected individuals reporting poorer quality of life [10] increased time off work and school and difficulty participating in social and recreational events and activities of daily living [1]. POTS is more common in women than in men (5:1) [20], especially those women of child bearing age. [14,21]. The diagnostic criteria for POTS are, an increase in heart rate of at least 30 beats per minute within 10 min of standing or during a tilt table test, absence of orthostatic hypotension and symptoms of orthostatic intolerance present for at least six months [8,11]. The preferred method for diagnosing POTS, is with a head-up tilt table test (HUT) where the patient is laying on a table and the head end is gradually lifted to a near upright position, while monitoring heart rate and blood pressure. Increasing evidence supports the recommendation that supervised exercise training is effective and should be included as an important part of treatment plan for POTS [6,22,4].

Exercise and other non-pharmacological treatments are uniformly implemented in the management of POTS because they have minimal side effects, are cost-effective, and are readily available for patients. [8]. A progressive aerobic exercise routine starting with recumbent aerobic exercises and leg resistance training, and eventually transitioning to upright exercises was shown to improve quality of life and reduce orthostatic syndrome in many patients [6]. The positive effects of intense cardiovascular exercise were also seen in patients with POTS and the results were remarkable for the improvement of autonomic, cardiovascular parameters and the quality of life [1] current literature

supports the use of cardiovascular exercise as a cornerstone of nonpharmacologic interventions. [6]

This article is done to provide a review on the various physiotherapy intervention done for the treatment of POTS.

Methodology

Study design: This study is a literature review designed to understand the physiotherapy interventions in existing research on Postural Orthostatic Tachycardia Syndrome (POTS). The literature search was performed using electronic databases including google scholar, research gate, PubMed, Medline and more. The literature review was conducted from the time period of 2010-2024.

Search strategy: The search was conducted using a combination of terminologies related to the topic which includes Postural orthostatic tachycardia syndrome, (POTS), physiotherapy intervention, physical therapy management, exercise program, autonomic dysfunction, orthostatic intolerance.

Sample size: Sample size of 44 articles were obtained after searching from databases using the following keywords: Postural Orthostatic Tachycardia Syndrome, (POTS), physiotherapy intervention, physical therapy management, exercise program, autonomic dysfunction, orthostatic intolerance. Based on inclusion and exclusion criteria and year of publication, further articles were scrutinized and finally, 6 articles were obtained for the review.

Inclusion criteria:

1. Studies published full texts.
2. Research articles that mainly focused on the physiotherapy intervention for POTS.

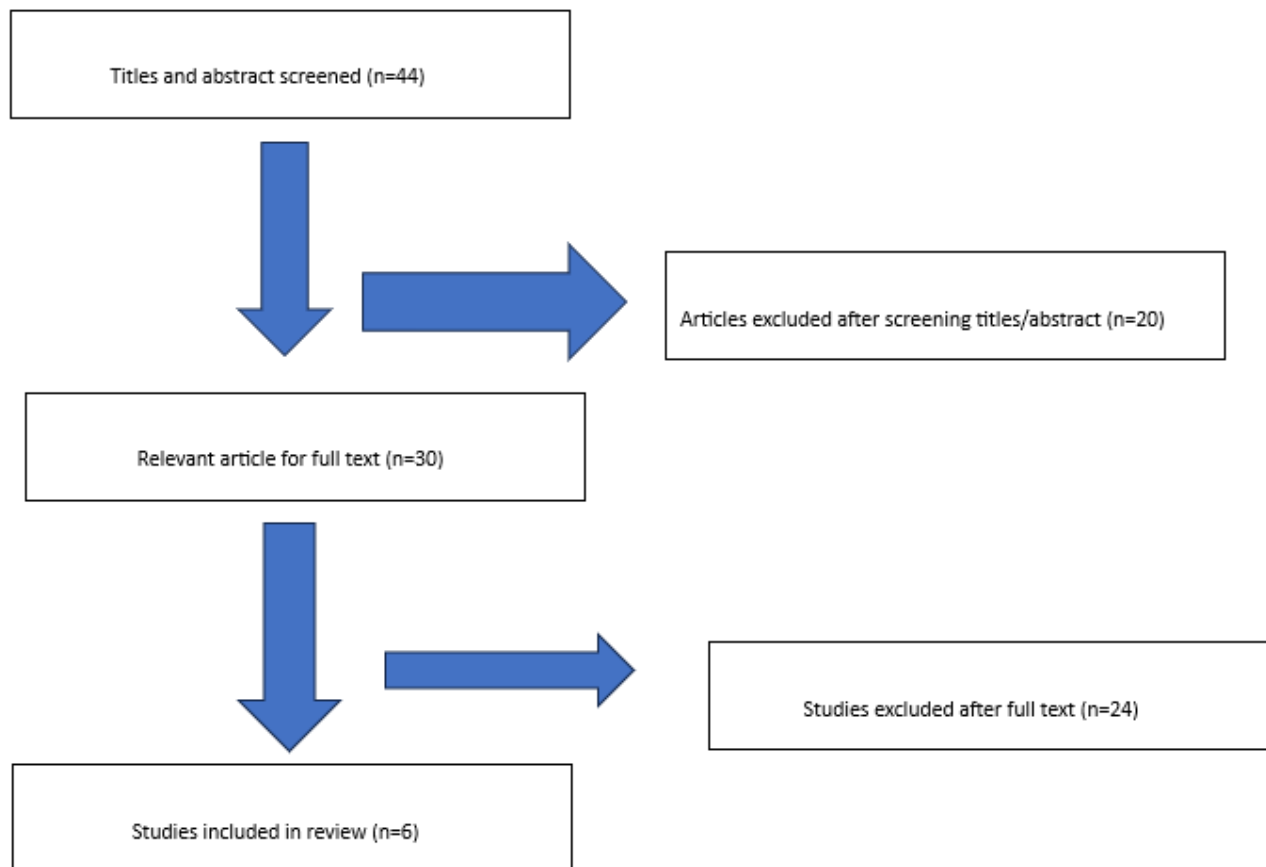
3. Experimental studies, cohort studies, case studies and case reports were taken into consideration.
4. Articles that were published after 2010 and were written in English literature.

Exclusion criteria:

1. Research articles that did not contain sufficient information on the physiotherapy intervention for POTS were excluded.
2. Studies that contain only abstract.
3. Studies that were conducted on animals were excluded.
4. Articles that were published before 2010 and without full text were excluded.

Selection Of Inclusion and Exclusion Criteria:

Six articles were selected on the basis of the inclusion and exclusion criteria. Articles were chosen in English for analysis to ensure accuracy and reduce errors in interpretation. Non-English articles were excluded to prevent potential misunderstandings and ensure that the data analysed is appropriate for the review. The selected articles were published between 2010-2024, excluding those published before 2010. Only articles with full texts were included to ensure comprehensive information gathering. Articles without any relevant data on postural orthostatic tachycardia syndrome, and their prevalence were excluded. As they did not align with the study's focus on physiotherapy management of postural orthostatic tachycardia syndrome.



Results

Out of a total of 44 articles initially identified, the table below presents the 6 articles that were chosen based on the specified eligibility criteria outlined earlier. Numerous articles were excluded during the selection process for various reasons, including failure to meet the defined requirements, non-compliance with the inclusion and exclusion criteria, and duplication in the

content. These exclusions were necessary to ensure that only relevant and unique studies were included for thorough analysis. We reviewed all relevant articles, case reports and experimental studies to gain insights into the nature of the impairments associated with Postural Orthostatic Tachycardia Syndrome. This information provides a theoretical foundation and recommendation for effective physiotherapy interventions.

AUTHOR AND YEAR	TITLE OF THE STUDY	TYPE OF STUDY	NO. OF PARTICIPANTS	OUTCOME MEASURE	INTERVENTION	CONCLUSION
Falk T & 2023	Physical Therapy Management of a Young Woman with Postural Orthostatic Tachycardia Syndrome: A Case Report	Case report	1	10 -min stand test, heart rate and blood pressure.	4 weeks protocol for cardiovascular exercise program (20 mins walking program)	The results of this case suggest that exercise progression and modifying activity based on patient tolerance can

						be included for treatment of patient with POTS.
Koc TA et al & 2020	Management of a Patient with Postural Orthostatic Tachycardia Syndrome, A New Perspective for the Physical Therapist: A Case Report	Case report	1	SF-36 Form	A Multimodal exercise program which included aerobic, functional and strength training.	The result of this study is that the incorporation of the multimodal training methods helped the patient relieved the symptoms of POTS and thus enhanced the quality of life.
Tito C et al & 2017	Aquatic Therapy for a Patient with Postural Orthostatic Tachycardia Syndrome: a Case Report	Case Report	1	WHOQOL-BREF questionnaire , Vitals (Heart Rate & BP)	10 weeks protocol of cardiovascular interval training in an aquatic environment with the water temperature between 80°F and 85°F	The results of this case report suggest that aquatic therapy may be an appropriate exercise modality for patients with POTS
Richardson MV et al & 2017	Using an exercise program to improve activity tolerance in a female with postural orthostatic	Case Report	1	one-mile track walk test (1-MWT) , heart rate and blood pressure	4 weeks endurance and strengthening 'reconditioning' program.	the result of the case report suggests that reconditioning programs can be included in the treatment of POTS.

	tachycardia syndrome: A case report					
George SA et al & 2015	The International POTS Registry: Evaluating the Efficacy of an Exercise Training Intervention in a Community Setting	Experimental study	103	SF-36 form, 10-min stand test	Endurance training (3-5 times/week, 30-45 mins/session) And strength training	These results suggest that this training program can be implemented in the community setting with physicians' supervision and is effective in the treatment of POTS.
Fu Q et al & 2010	Cardiac Origins of the Postural Orthostatic Tachycardia Syndrome	Experimental study	19	A modified astrand - saltin incremental treadmill protocol	3 months specially designed exercise training program & SP-36 form	the result suggests that the training program helped patients to get a normal heart rate and the quality of life improved.

Discussion

The aim of the study is to evaluate current literature on physiotherapy interventions for Postural orthostatic tachycardia syndrome (POTS) focusing on studies published between 2010 and 2024. This review seeks to identify effective physiotherapy approaches that enhance cardiovascular functions, help in daily life activities and improve quality of life. There have been studies done on POTS in the past, suggesting different treatment approaches with respect to physiotherapy. In this article few are reviewed based on the inclusion and exclusion of the study, out of 44 initially identified articles, 6 articles met the selection criteria.

This article summarizes the studies done on POTS, the interventions used, the results obtained and conclusions generated from each study.

Falk T (2023) did an evidence-based treatment approach for physical therapy management of POTS. The intervention consisted of an endurance program and progressive strength program. The strength and endurance programs were made to target the patient's impairments found on evaluation and build tolerance to being in the upright position for longer periods of time. The 10-minute stand test consists of taking heart rate and blood pressure while the patient is in supine and then when the patient stands up every minute for 10

minutes. The patient showed improvements in subjective reporting of functional mobility and objectively through strength training progressions and tolerance to more upright positions. Therefore, it is important to remember that a physical therapist is an essential member of the healthcare team for patients with POTS. [23]

Koc TA et al & 2020 used a different approach that consisted of a multimodal training method. The training program was for 12 weeks which consisted of 30 physical therapy sessions for 60 mins each. The multimodal training program focused on the patient's aerobic activities, functionality and strength training. The training program initially utilized patient-control breaks which further progressed to therapist-controlled rest intervals. At the end of the treatment, the patient improved exercise tolerance and improved quality of life using 36-item Short Form Health Survey. [24]

According to C Tito.et.al (2017) the use of interval training in aquatic environment would reduce the symptoms of POTS as aquatic therapy provides benefits for individuals with cardiovascular issues, mainly through the principle of hydrostatic pressure. Hydrostatic pressure aids in shunting the blood from the extremities back to the heart, increasing cardiac output while reducing the individual's heart rate. As physical therapy progressed, there was an increase in activity tolerance of the patient. Thus, it concluded that the positive effects of hydrostatic pressure on cardiovascular system contributes to the improvement in exercise tolerance and to overall conditioning and activity tolerance.[25]

According to Richardson MV.et.al (2017), the purpose of this study was to discuss the physiotherapy management in patient with POTS using exercise. A 34-year-old patient with the following symptoms dyspnea with mild exertion, light-headedness, fatigue, leg "heaviness," and the inability to perform normal work duties. It was also found that POTS shares clinical features with orthostatic hypotension, however the inclusion criteria and clinical features for POTS are not well known. The intervention included a 4-week physical therapy endurance and strengthening 'reconditioning' program. The result of the case report suggests that reconditioning programs can be included in the treatment of POTS.[26]

According George SA.et.al. (2015) the objective of their study was to evaluate the efficacy of exercise training

and lifestyle intervention in POTS patient in a community environment. A 3-month program involving mild to moderate intensity training program along with strength training was implemented. A 10-min stand test was performed at the physician's office and patient quality of life was assessed using the 36-item Short Form Health Survey. These results suggest that this training program can be implemented in the community setting with physicians' supervision and is effective in the treatment of POTS. [27]

According to Fu Q. et.al (2010) the purpose of the study was to test the hypothesis that a small heart coupled with reduced blood volume contributes to the postural orthostatic tachycardia syndrome (POTS) and this can be improved via exercise training. An experimental study was conducted with 19 patients using a 3 month specially designed exercise training program. Initially the patients trained 2 to 4 times per week for 30 to 45 mins. By end of the training, patients were exercising for 5 to 6 hours per week and they were encouraged to walk on the treadmill and to jog. The final results were that the function of the ANS was intact in cardiac patients and the exercise training increased the cardiac size and mass, expanded blood volume and improved or even cured POTS. [28]

As this study has reviewed different types of researches, it depicts a variety in treatment approaches which will vary based on the need of the hour, patient condition and patient prognosis.

However, as per results analysed aquatic therapy and reconditioning programs have seen better prognosis in patients with POTS.

Limitations

A total of 44 articles from the available databases were reviewed. Out of these, only 6 articles met the criteria for inclusion, indicating a limited number of studies on the physiotherapy management of postural orthostatic tachycardia syndrome. Some articles had lesser sample sizes. It is important to note that only articles written in English were considered for this review. Articles with cohort study designs were not available for inclusion.

Conclusion.

This study concludes that the articles that used interventions like aquatic therapy and reconditioning programs proved to be effective treatment options for

patients with postural orthostatic tachycardia syndrome (POTS). It highlights that exercise progression tailored as per patient tolerance, under a physician's supervision can improve outcomes. The training program helps to normalize heart rate and improve quality of life for patients. Additionally, the study identifies fatigue in POTS patients is a complex, multidimensional issue.

The studies we reviewed used different methods and measures to assess physiotherapy's effectiveness. Some focused-on reconditioning programs that involved strength and endurance training while others explored areas such as aquatic therapy.

However, the studies had limitations. Some had small number of participants and none used cohort study designs which would have provided strong evidence. Also, most of the studies were in English, potentially excluding valuable insights from non-English publications.

Despite these limitations, the research suggests that physiotherapy can help manage POTS symptoms, improve quality of life, and delay disease progression. Future studies should include more participants over longer periods and use consistent measures to better compare results and strengthen conclusions. This would help develop clear guidelines for using physiotherapy at different stages of postural orthostatic tachycardia syndrome.

In conclusion, while current research on physiotherapy for POTS shows promise, more studies are needed to improve treatment and outcomes for people living with this complex condition.

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