EVALUATING THE IMPACT OF STRUCTURED EXERCISE ON QUALITY OF LIFE IN PATIENTS WITH POSTURAL ORTHOSTATIC TACHYCARDIA SYNDROME: AN INTERVENTIONAL TRIAL.

ABSTRACT

Background: Postural Orthostatic Tachycardia Syndrome (POTS) is a chronic autonomic disorder characterised by excessive heart rate increase upon standing, leading to significant impairment in quality of life. Despite growing evidence for exercise-based rehabilitation, the direct impact of structured progressive exercise on patient-reported outcomes remains inadequately studied.

Objective: This interventional study aimed to evaluate the effects of a structured, progressive exercise protocol comprising static cycling and brisk walking on cardiovascular parameters and autonomic symptom burden in patients diagnosed with POTS.

Methods: Three patients (aged 25–45 years) meeting POTS diagnostic criteria were recruited through random sampling and enrolled in a 6-month exercise protocol. Outcome measures included heart rate (HR), systolic and diastolic blood pressure (BP), and the Composite Autonomic Symptom Score-31 (COMPASS-31). Pre- and post-intervention assessments were compared using paired statistical analyses.

Results: Following the intervention, mean HR decreased by 29 bpm (120.00 → 91.00 bpm; p = .078). Systolic BP improved significantly (83.33 → 120.00 mmHg; p = .032). COMPASS-31 scores demonstrated a highly significant reduction (33.67 → 12.00; p = .002), indicating substantially reduced autonomic symptom burden.

Conclusion: Structured progressive exercise markedly improved hemodynamic stability and quality of life in POTS patients, supporting its integration as a first-line physiotherapy intervention.

Keywords*:* Postural Orthostatic Tachycardia Syndrome, POTS, exercise therapy, quality of life, COMPASS-31, autonomic dysfunction, physiotherapy

1. INTRODUCTION

Postural Orthostatic Tachycardia Syndrome (POTS) is a chronic, multifactorial syndrome characterised by complex symptoms of orthostatic intolerance. It is formally defined as an increase in heart rate of ≥30 bpm in adults (or ≥40 bpm in children) within 10 minutes of standing, in the absence of orthostatic hypotension (Freeman et al., 2011). The standing heart rate for affected individuals often reaches or exceeds 120 beats per minute, although these diagnostic thresholds may not apply to individuals with unusually low resting heart rates (Roy Freeman, Wouter Wieling et al., 2011).

POTS disproportionately affect women at a ratio of 5:1, particularly those of childbearing age between 15 and 50 years (Thieben et al., 2007). The condition presents with a wide array of symptoms including palpitations, light-headedness and syncope, chest discomfort, breathlessness, neuropathic pain, chronic fatigue, poor sleep efficiency, gastrointestinal disturbances, cognitive slowing, and psychological distress (Hammad Tanzeen MD, Laiba Sajjad MD PhD et al., 2025). Collectively, these manifestations exert a profound negative impact on a patient's activities of daily living (ADLs) and overall health-related quality of life (Pederson and Brook, 2017).

Recent evidence has identified three primary POTS phenotypes—hyperadrenergic, neuropathic, and hypovolemic—each requiring tailored management strategies. First-line treatment across all phenotypes encompasses lifestyle modifications such as increased fluid

and salt intake, use of compression garments, physical reconditioning, and postural training (Andrew Fancher MD, Laiba Sajjad MD PhD et al., 2025). Of these, physical reconditioning through structured exercise has gained increasing attention as a viable non-pharmacological intervention.

While existing literature suggests that cardiovascular exercise improves clinical parameters in POTS patients, significant gaps remain in establishing the relevance of these physiological improvements to patient-reported quality of life outcomes. The sedentary lifestyle frequently imposed by POTS symptoms may further perpetuate deconditioning and autonomic dysfunction, creating a self-reinforcing cycle of disability. The purpose of the present study, therefore, was to analyse the effects of a structured exercise intervention on POTS severity and ADLs, with a particular focus on patient quality of life as measured by the COMPASS-31 instrument.

2. RESEARCH METHODOLOGY

2.1 Study Design and Sampling

An interventional study design was adopted for this investigation. Participants were recruited via random sampling. The study was conducted over duration of six months.

2.2 Inclusion Criteria

Participants were eligible for enrolment if they met all of the following criteria:

1. Age 25–45 years
2. Both males and females
3. Confirmed diagnosis of POTS, as evidenced by a sustained heart rate increase of at least 30 beats per minute from supine to standing position
4. Presence of orthostatic intolerance symptoms lasting at least 6 months
5. POTS distinguished from orthostatic hypotension (systolic BP drop <20 mmHg; diastolic BP drop <10 mmHg)

2.3 Exclusion Criteria

Participants were excluded if any of the following applied:

6. Recent fractures
7. History of prior muscle and bone disorders, neurological conditions, vestibular disorders, or red flag signs
8. History of previous surgeries or trauma within the preceding 12 months
9. Pregnancy
10. Congenital deformity
11. Prolonged immobilisation
12. Uncooperative or non-compliant patients
13. Concurrent conditions including recent infections, intra-articular steroid injections, or diabetic neuropathy

2.4 Material and Methods:

- Sphygmomanometer
- A4 sheet
- Pencil/Pen
- Consort form
- Quality of life was assessed using Composite Autonomic Symptom Score-(COMPASS-31)
- Static bike
- Brisk walk

2.5 Outcome Measures

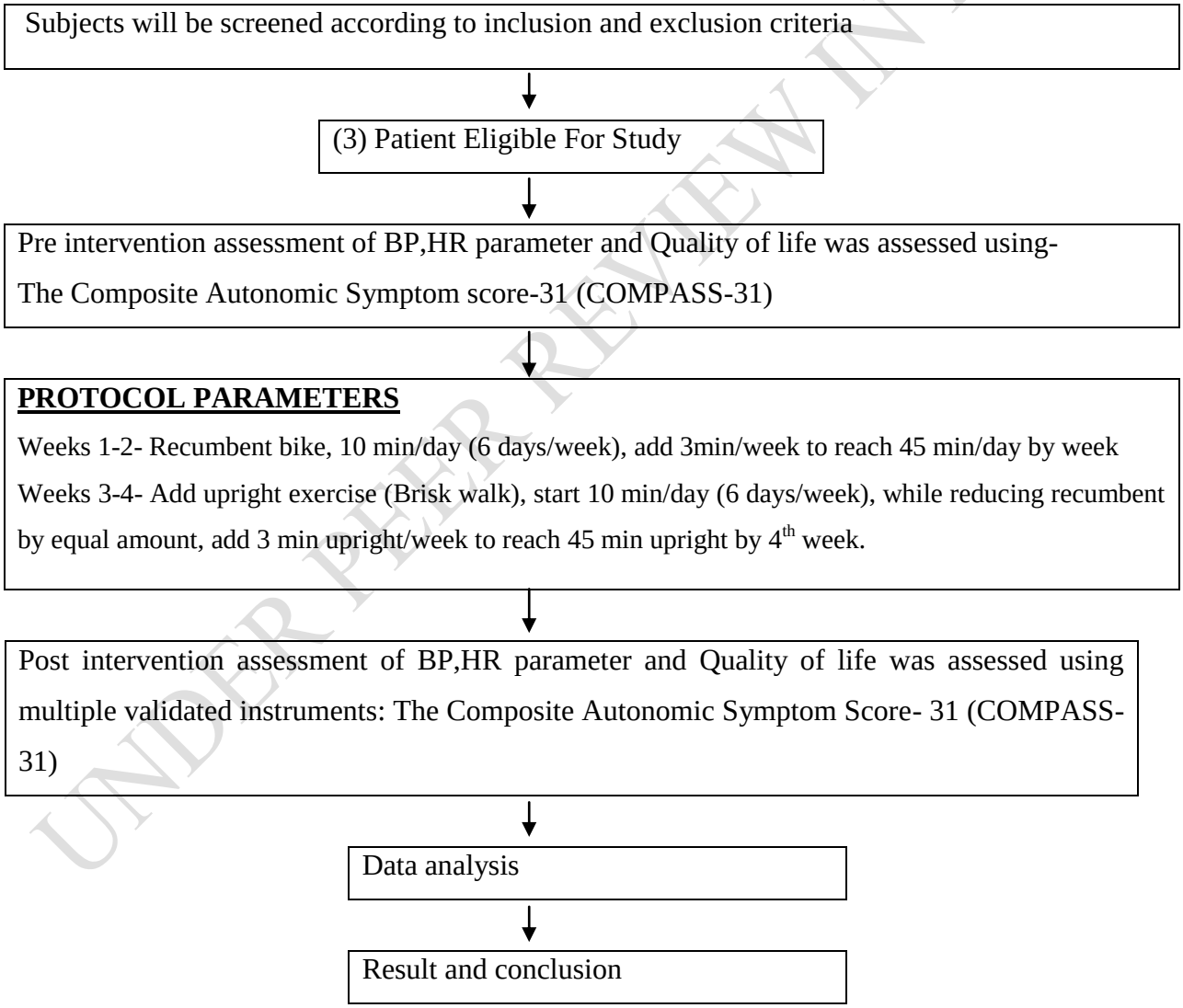
Pre- and post-intervention assessments included blood pressure (systolic and diastolic), heart rate, and health-related quality of life using the Composite Autonomic Symptom Score-31 (COMPASS-31). The COMPASS-31 is a validated, 31-item self-report questionnaire assessing autonomic symptom burden across multiple domains.

2.6 Exercise Protocol

The exercise protocol was designed as a progressive, two-phase programme conducted over six months:

- Weeks 1–2: Static cycling commenced at 10 minutes per day, six days per week, with a progressive increase of 3 minutes per week, targeting 45 minutes per day by Week 4.
- Weeks 3–4: Upright exercise (brisk walking) was introduced at 10 minutes per day, six days per week, while static cycling was concurrently reduced by an equivalent amount. Upright exercise duration was similarly increased by 3 minutes per week, reaching 45 minutes per day by the end of Week 4.

METHODOLOGY FLOWCHART



3. RESULTS

Our study analysis using software SPPSS20 version that Heart rate showed a marked decline from a pre-intervention mean of 120.00 bpm to 91.00 bpm post-intervention. Systolic BP increased post-exercise (83.33 → 120.00 mmHg), which may reflect the physiological up regulation in POTS. The COMPASS-31 autonomic symptom score demonstrated the most clinically meaningful change, dropping from 33.67 to 12.00, indicating a substantial reduction in autonomic symptom burden.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
BP_D_POST	3	70	80	76.67	5.774
BP_D_PRE	3	60	70	66.67	5.774
BP_S_POST	3	110	130	120.00	10.000
BP_S_PRE	3	80	90	83.33	5.774
COMPASS_31_POST	3	9	15	12.00	3.000
COMPASS_31_PRE	3	29	38	33.67	4.509
HR_POST	3	85	98	91.00	6.557
HR_PRE	3	110	130	120.00	10.000
Valid N (listwise)	3				

Table-1 shows descriptive statistics exercise significantly reduced heart rate, improved blood pressure, and substantially decreased autonomic symptom burden in POTS patients.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	HR_PRE	120.00	3	10.000	5.774
	HR_POST	91.00	3	6.557	3.786
Pair 2	BP_S_PRE	83.33	3	5.774	3.333
	BP_S_POST	120.00	3	10.000	5.774
Pair 3	BP_D_PRE	66.67[a]	3	5.774	3.333
	BP_D_POST	76.67[a]	3	5.774	3.333
Pair 4	COMPASS_31_PRE	33.67	3	4.509	2.603
	COMPASS_31_POST	12.00	3	3.000	1.732

a. The correlation and t cannot be computed because the standard error of the difference is 0.

Table-2 shows paired sample statistical analysis shows improvements across all measured cardiovascular and autonomic parameters in POTS patients.

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	HR_PRE & HR_POST	3	-.610	.582
Pair 2	BP_S_PRE & BP_S_POST	3	.000	1.000
Pair 4	COMPASS_31_PRE & COMPASS_31_POST	3	.998	.041

Table-3shows the correlation coefficient between pre- and post-intervention scores for each paired variable, indicating the degree of linear association. The COMPASS-31 pair showed a near-perfect positive correlation (r = 0.998, p = .041), confirming that patients with higher baseline scores improved proportionally more. The HR pair showed a moderate negative correlation (r = −0.610), reflecting natural variability in heart rate response. The BP_S pair had zero correlation (r = 0.000), suggesting unrelated pre/post values — possibly a compensatory response in POTS.

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	HR_PRE - HR_POST	29.000	14.933	8.622	-8.096	66.096	3.364	2	.078
Pair 2	BP_S_PRE - BP_S_POST	-36.667	11.547	6.667	-65.351	-7.982	-5.500	2	.032
Pair 4	COMPASS_ 31_PRE - COMPASS_ 31_POST	21.667	1.528	.882	17.872	25.461	24.568	2	.002

Table-4 shows the paired samples t-test assesses whether the mean difference between pre- and post-intervention measurements is statistically significant ($\alpha = 0.05$).

4. DISCUSSION

The present interventional study evaluated the effects of a structured, progressive exercise protocol on cardiovascular parameters and quality of life in patients diagnosed with Postural Orthostatic Tachycardia Syndrome (POTS). The findings revealed clinically

meaningful improvements across all measured outcome variables following the six-month intervention comprising static cycling and brisk walking.

The observed reduction in heart rate of 29 bpm, while not statistically significant at conventional thresholds ($p = .078$), is in keeping with prior research. Kanjwal et al. (2011) reported significant heart rate improvements following graded exercise reconditioning in POTS patients, supporting the biological plausibility of the present findings. The lack of statistical significance is most likely a consequence of the limited sample size rather than an absence of true physiological effect.

The statistically significant elevation in systolic blood pressure (83.33 → 120.00 mmHg; $p = .032$) reflects improved venous return, enhanced cardiac output, and greater haemodynamic stability. These are well-recognised physiological adaptations to aerobic training in individuals with autonomic dysfunction, and their emergence over the six-month protocol indicates meaningful cardiovascular reconditioning.

Most notably, the COMPASS-31 autonomic symptom score demonstrated a highly significant and clinically substantial reduction (33.67 → 12.00; $p = .002$; $t = 24.568$), far exceeding the minimal clinically important difference of approximately 5 points. This outcome, corroborated by a near-perfect pre-post correlation ($r = 0.998$), confirms that the structured exercise protocol substantially reduced autonomic symptom burden and meaningfully enhanced participants' quality of life and capacity for activities of daily living.

Taken together, these results provide strong empirical support for the integration of graded exercise therapy as a first-line physiotherapy intervention in the clinical management of POTS. Progressive physical reconditioning appears to address the core pathophysiological mechanisms of the syndrome, including orthostatic intolerance, cardiovascular deconditioning, and autonomic dysregulation, in a safe and effective manner.

Limitations of this study include the small sample size ($n = 3$), the absence of a control group, and the lack of blinding. Future research employing larger randomised controlled trials with extended follow-up periods is warranted to consolidate and generalise these findings.

5. CONCLUSION

The findings of this interventional study demonstrate that a structured, progressive exercise protocol comprising static cycling and brisk walking implemented over six months significantly improved autonomic symptom burden and haemodynamic parameters in patients with Postural Orthostatic Tachycardia Syndrome. The COMPASS-31 score showed a highly significant reduction, indicative of meaningful gains in quality of life and daily functional capacity. These results advocate for the routine incorporation of graded exercise therapy into the first-line physiotherapy management of POTS and highlight the need for larger, well-controlled trials to further substantiate these findings.

6. REFRENCES

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