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CASE REPORT

AEROBIC EXERCISE IN INDIVIDUALS WITH RESTLESS LEGS SYNDROME: A CASE SERIES STUDY

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ABSTRACT

Purpose: Exercise has been demonstrated to alleviate symptoms of restless legs syndrome (RLS) in individuals with RLS, but there are few studies on physical health in primary RLS. This case series aims to describe the outcome of supervised aerobic exercise training in individuals with RLS.
Case Report: Five individuals with RLS were given supervised aerobic exercise training 2 days a week for 12 weeks. The International Restless Legs Syndrome Study Group Rating Scale (IRLS) was used to detect the severity of RLS. The Turkish version of the Pittsburgh Sleep Quality Index (PSQI) was used to measure sleep quality. The functional effect of fatigue was assessed using the Fatigue Impact Scale (FIS). The Six-Minute Walk test (6MWT) was used to determine the functional exercise capacity. All assessments were taken at baseline and post-intervention.
Conclusion: Following aerobic exercise, clinically meaningful changes in RLS severity, PSQI, and 6MWT were reported in all individuals with severe RLS. Four out of 5 patients improved their FIS at post-intervention. These results suggest that 24-session supervised aerobic exercise training might help to improve RLS severity, sleep quality, fatigue, and exercise capacity in an individual with RLS.

Keywords: aerobic exercise, restless legs syndrome, sleep, fatigue, six-minute walk test.

INTRODUCTION

Restless legs syndrome (RLS) is a sensory-motor disorder that consists of an irresistible urge to move the legs in the evening and at night, predominantly at rest (1). Symptoms of RLS are common in the general adult population. The prevalence increases with age and is higher in women. Individuals with RLS experience sleep disturbances, including difficulty in falling asleep, increased awakenings with RLS symptoms, and reduced the total sleep time. These conditions can negatively affect the well-being and quality of life of individuals with RLS (2).

The current management of RLS is primarily pharmacological treatment (3). Recent systematic reviews have synthesised studies that investigated the effectiveness of non-pharmacological interventions, such as yoga, exercise, and massage techniques in coping with RLS symptoms (4,5). It has

Table 1. Participant demographics and baseline characteristics

	Participants				
	1	**2**	**3**	**4**	**5**
Sex	Female	Female	Male	Male	Female
Age (*year*)	65	42	68	64	44
Body weight (*kg*)	76.0	72.0	76.0	72.0	59.0
Height (*m*)	1.57	1.73	1.68	1.69	1.70
BMI (*kg/m²*)	30.8	24.1	27.0	25.2	20.4
Duration of symptoms (year)	8	3	19	10	10

Abbreviations: BMI, body mass index

not yet been established whether exercise could improve in RLS symptoms of individuals with RLS. Therefore, the aim of this case series was to describe the outcome of supervised aerobic exercise training in individuals with RLS.

CASE REPORT

Five individuals (3 females, 2 males) with a diagnosis of idiopathic RLS were referred by their neurologist to the Department of Neurology at the Dokuz Eylul University between October 2019 and December 2022. Baseline demographic characteristics of the participants are shown in Table 1. The body weight of the subjects was measured by weighing (Xiaomi Mi Body Composition Scale), while height was measured using a tape measure. Body mass index was calculated as body weight in kilograms divided by height in meters squared. The mean and standard deviation of age was 56.6 ± 12.5 years. Individuals were excluded if they had any of the following: RLS secondary to any other disease (including Parkinson's disease, multiple sclerosis, etc.), iron deficiency (a ferritin of less than 50 ng/mL), regular participation in an exercise program in the past year. The study was carried out with the approval of Dokuz Eylul University, Non-interventional Research Ethics Committee on 13.02.2019 (Decision No: 2019/03-24) and 03.04.2019 (Decision No: 2019/08-32) (Protocol number: 4548-GOA). All individuals provided written informed consent to participate in the study. All study procedures were conducted in accordance with the Declaration of Helsinki.

Aerobic exercise

Participants received a 24-session intervention program, scheduled twice a week, over a period of 12 weeks. The sessions were supervised by a qualified physiotherapist (B.N.A. or S.B. or B.N.A). Aerobic exercise training was performed cycling on a stationary bike according to the guidelines of the American College of Sports Medicine. Each session consisted of a warm-up (10-min), an aerobic activity and a cool-down period (5-min). The warm-up and cool-down periods were performed at an unloaded pedaling on a stationary bike. Participants were instructed to cycle at 40 to 60% of heart rate reserve during aerobic activity period. The targeted heart rate was calculated using the following formula: "[(220–age–HRrest)×% intensity desired]+HRrest" (6). During the first 3 weeks of the participants were instructed to perform 15 min of stationary bicycle training at an intensity of 40-50% of their targeted heart rate. In the sixth week, the intensity of the exercise was increased to 50-60% of the targeted heart rate. The duration of the exercise was gradually increased by 5 minutes each week for 3 weeks. The intensity of the exercise was monitored during each session with a pulse oximeter probe.

Clinical outcome assessments

The International Restless Legs Syndrome Study Group Rating Scale (IRLS) was used to measure the severity of RLS in individuals with RLS. Consisting of 10 questions, the IRLS is scored between 0 (none/never) and 4 (very severe/often). The total point score ranges from 0-40. Participants have been divided into mild [0-10], moderate [11-20], severe [21-30] and very severe [31-40] (7). It has been validated in individuals with RLS in the Turkish population (8). Sleep quality was measured with the Turkish version of the Pittsburgh Sleep Quality Index (PSQI). It comprises 19 items classified into seven components. Each component is scored from 0 to 3. A total PSQI score was generated by summing up the scores of the seven components ranging from 0-21, with higher scores indicating worse sleep quality. It is a valid and reliable questionnaire in the Turkish population (9). The Fatigue Impact Scale (FIS) was used to assess the functional effect of fatigue. Participants respond to the level of fatigue in 40 items

Table 2. RLS severity, sleep quality, fatigue, and exercise capacity outcomes at baseline and post-intervention.

	RLS severity (*0-40*)		PSQI (*0-21*)		FIS (*0-160*)		6MWT (*meter*)	
	B	**Post**	**B**	**Post**	**B**	**Post**	**B**	**Post**
1	27.0	22.0	6.0	4.0	58.0	5.0	400.0	474.0
2	28.0	21.0	11.0	8.0	94.0	19.0	514.8	606.0
3	21.0	22.0	11.0	9.0	23.0	41.0	460.0	576.0
4	24.0	13.0	16.0	15.0	41.0	13.0	462.0	561.0
5	21.0	11.0	13.0	2.0	16.0	11.0	510.0	555.0
Mean ±SD	23.3±3.6	19.0±5.6	9.7±5.4	6.8±4.9	44.7±25.3	20.7±14.3	481.8±51.6	557.0±44.4
MD*	-4.3		-2.9		-24.0		75.2	

Abbreviations: B, baseline; Post, post-intervention; RLS, restless legs syndrome; PSQI, Pittsburgh Sleep Quality Index; FIS, Fatigue Impact Scale; 6MWT, Six-Minute Walk test; SD, standard deviation; MD, mean difference.
*The change scores from baseline to post-intervention

on a 5-point scale (0=no problem, 4=extreme problem). The Turkish version of the FIS was translated by Armutlu et al. (10).

The Six-Minute Walk test (6MWT) was used to detect functional exercise capacity according to the American Thoracic Society guidelines. Participants were asked to walk as quickly as possible on a 15-meter corridor for 6 minutes.

All clinical outcomes were evaluated prior to baseline and post-intervention. All participants were allowed to continue taking their usual medication.

Data analysis

Data were analysed through descriptive statistics using IBM Statistic (version 24.0). Outcome measures were IRLS, PSQI, FIS, and 6MWT scores. The mean difference between baseline and post-intervention was calculated as follows: “the post-intervention score – baseline score”.

Results

Following aerobic exercise, the severity of RLS decreased, and sleep quality (PSQI) and exercise capacity (6MWT) improved in all participants. Four out of 5 patients improved their functional effect of fatigue (FIS) at post-intervention (Table 2). The adherence rate for exercise sessions was more than 90% of sessions. No side effects or adverse eventswere reported by any of the participants.

DISCUSSION

Our study described the outcome of 5 individuals with severe RLS who attended supervised aerobic exercise training. In the current case series, we found that 24-session aerobic exercise training utilized for the treatment of RLS relieved RLS severity, improved sleep quality, exercise capacity. The improvement in fatigue was achieved in all participants, except for subject 3. Supervised aerobic exercise training did not increase the risk of side effects or adverse events. Metabolic factors (hypoxia and muscle fatigue), which contribute to the possible mechanism of RLS may lead to altered central and peripheral excitability and affect peripheral nerve function in individuals with RLS (11). Impaired oxygen transport plays a role in the pathogenesis of RLS through microvascular abnormalities (12) and autonomic alterations (13). Anemia has been linked to the appearance of RLS symptoms (14). Exercise is known to provide an increase in cardiac output (15). Increased blood flow reduces RLS symptoms by decreasing peripheral hypoxia, which is closely related to RLS severity in individuals with RLS (16). Aerobic exercise has also shown to increase mitochondrial function and endorphin production and reduce inflammatory response (17). The first randomized controlled trial published by Aukerman et al. (18) reported that aerobic and lower body resistance exercises can be used to cope with RLS symptoms. They found that RLS symptoms improved over 6 weeks and were maintained throughout the 12-week intervention period. In a study where trauma release exercise (TRE) was applied for 6 weeks, RLS severity tended to decrease in both TRE and control groups although the difference was not statistically significant (19). They also found an improvement in sleep quality. We found that aerobic exercise training decreased the severity of RLS and improved sleep quality after the intervention. Healthcare professionals should emphasize the importance of exercise in the management of RLS and its potential adverse effects.

To the best of our knowledge, our case series is the first to report the effect of aerobic exercise training on exercise capacity and fatigue in individuals with RLS. It is well known that individuals with RLS most commonly complain of sleep disturbances (2). In addition, the importance of sleep for physical performance has been recognised (20). Zhan et al.,2022 reported a relationship between abnormal sleep duration and poor physical performance in hemodialysis patients (21). A randomized controlled systematic review by Song et al. found that exercise can reduce fatigue (22). Our case series supported that the physical performance and fatigue findings of the participants could be improved by supervised aerobic exercise training. Additionally, only one in five patients (subject 3) experienced an increase in the functional effect of fatigue after the intervention. Based on the subject 3 and 4, these participants were male and similar in their body weight and duration of RLS symptoms. This may be due to the severity of RLS (21 vs. 22) after the intervention in subject 3, as well as psychological factors. Further research may be needed to investigate the long-term effectiveness of exercise training and the psychological factors involved.

This case series has strengths and limitations. The most important strength is that the participants in our sample had severe RLS and all participants had a ferritin of more than 50 ng/mL. The lack of a control group and follow-up are the other limitations. We were also unable to describe the outcome of individuals with mild, moderate, or very severe RLS.

CONCLUSION

Twelve weeks of supervised aerobic exercise training reduces the severity of RLS, and improves sleep quality, fatigue and exercise capacity in individuals with RLS. We suggest that further randomized controlled trials be conducted to further validate our clinical findings.

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