Impact of aerobic physical exercise on Restless Legs Syndrome

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ABSTRACT

Objective: Therapeutic approaches to the Restless Legs Syndrome and Periodic Limb Movement sleep disorders are often implemented concomitantly. The objective of this study was to assess the effect of aerobic physical exercise on the symptoms of Restless Legs Syndrome.

Methods: The study included 11 patients who were diagnosed with RLS and with on the severity scale established by the International Restless Legs Syndrome Scale (IRLSS), which was translated and validated into Brazilian Portuguese. The patients completed 72 sessions of aerobic exercises prescribed at Anaerobic Ventilatory Threshold Intensity on an ergonomic cycle. Patients performed 3 50-minute sessions per week for approximately 6 months. Each patient completed a severity scale questionnaire of Restless Legs Syndrome prior to the first training session and after sessions 1, 36 and 72.

Results: In response to aerobic physical exercise, the patients demonstrated a significant reduction in symptoms of Restless Legs Syndrome after 36 sessions (score: 24 to 15). This reduction was maintained even after 72 sessions (score: 7) of aerobic exercises (p<0.001).

Conclusions: The aerobic exercise proved to be efficient in diminishing Restless Legs Syndrome symptoms.

Keywords: restless leg syndrome/therapy; exercise; sleep disorders; exercise therapy.

RESUMO

Objetivo: As abordagens terapêuticas para os distúrbios do sono, Síndrome das Pernas Inquietas e Movimentos Periódicos das Pernas, são frequentemente implementadas concomitante. Assim, o objetivo deste estudo foi avaliar o efeito do exercício físico aeróbio sobre os sintomas da Síndrome das Pernas Inquietas.

Métodos: Foram estudados 11 pacientes diagnosticados com Síndrome das Pernas Inquietas e com a escala de gravidade estabelecida pela International Restless Legs Syndrome Study Group, que foi traduzida e validada para o português. Os pacientes realizaram 3 sessões de 50 minutos por semana completando 72 sessões de exercício físico aeróbio prescrito na Intensidade do Limiar Anaeróbio Ventilatório em um ciclo ergométrico. Foi preenchido um questionário de escala de gravidade de Síndrome das Pernas Inquietas antes do início da primeira sessão de treino e depois das sessões 1, 36 e 72.

Resultados: Em resposta ao exercício físico aeróbio, os pacientes demonstraram uma redução significativa nos sintomas da síndrome após 36 sessões (pontuação: 24 a 15). Essa redução foi mantida mesmo após 72 sessões (pontuação: 7) de exercícios aeróbios (p<0,001).

Conclusão: Nossos resultados sugerem que o exercício físico aeróbio é eficaz na diminuição dos sintomas da Síndrome das Pernas Inquietas.

Palavras-chave: síndrome das pernas inquietas/terapia; exercício; transtornos do sono; terapia por exercício.

INTRODUCTION

Therapeutic approaches to the Restless Legs Syndrome (RLS) and Periodic Limb Movement (PLM) sleep disorders are often implemented concomitantly.1-2

The variability in the epidemiological data on RLS is likely due to the non-standardized diagnosis of the disorder. In 1995, the International Restless Legs Syndrome Study Group (IRLSSG) published a standard for RLS diagnosis.3

The report defined RLS as a movement-relieved disorder, citing the presence of discomfort in the legs that worsens at night or when at rest as one of the diagnosis criteria. In addition to differing diagnostic criteria, varying data collection strategies have been employed. These differences may have also affected findings and lead to different types of treatment. Depending on the severity of the sleep disorder and its impact on patient health, several types of RLS/PLM treatment have been described in the literature4.

Aukerman et al. investigated a program of combined exercises (aerobic and muscular strength). The 11 volunteers who participated in aerobic and strength exercises 3 times per week for 12 weeks showed a statistically significant reduction in RLS symptoms, compared with those in the control group (12 volunteers), by week 6. The International Restless Legs Syndrome Scale (IRLSS) was used to analyze RLS-related variables at the start of the program and after 3, 6, 9 and 12 weeks5.
De Mello et al. recorded polysomnography (PSG) data from athletes with spinal cord injuries while performing acute exercise (maximum effort test level) and chronic exercise (training for 44 days at ventilatory threshold 1). They found that PLM during sleep diminished significantly. The effect of aerobic physical exercise did not significantly differ from L-dopa treatment (the standard pharmacological treatment for RLS/PLM)\(^6\,9\).

In a recent study conducted by our group, both acute (1 session) and chronic aerobic physical exercise (72 sessions) were effective in reducing the levels of PLM and inducing beta-endorphin release\(^10\).

The analyses presented here are an extension of the results obtained by Esteves et al.\(^10\). The results were not published together because the IRLSS questionnaire had not yet been validated.

Therefore, the objective of the current study was to assess the reduction of RLS symptoms in response to aerobic physical exercise.

### Materials and methods
The study was approved by the Ethics Research Committee of Universidade Federal de São Paulo (UNIFESP), CEP n.º 481/01.

Candidate patients were initially contacted based on diagnoses provided by the Sleep Institute. The 11 (6 women) participants selected were those who presented complaints of leg discomfort and whose diagnosis was performed by a physician. They displayed no other signs of sleep disorder or clinical disease and had never received pharmacological treatment for RLS/PLM. All of the subjects underwent ECGs at rest and during stress and were tested for any pathology that would contraindicate physical exercise. Based on the results, experimental sample was standardized.

A full-night PSG was performed to analyze the baseline parameters of each participant’s sleep\(^11\).

#### Experimental procedure
The volunteers performed 50 minutes of aerobic training on an ergometric cycle 3 times per week. Over the course of 6 months, each patient completed 72 sessions.

The morning after the 36th and 72nd sessions of aerobic physical exercise, each volunteer filled out the IRLSS questionnaire\(^12\,13\).

#### Questionnaire adapted from IRLSS
The IRLSS questionnaire used in the current study contained ten questions evaluating RLS symptoms based on severity, frequency and impact on quality of life\(^12\). This questionnaire, translated into Brazilian Portuguese, demonstrated good reliability and validity\(^13\).

#### Physical training regimen
Aerobic physical exercise was determined based on the Maximum Effort Test (MET) and Anaerobic Ventilatory Threshold (the point at which respiratory response to work deviates from linearity). Stretching was performed for 10 minutes before and after sessions\(^14\).

### Maximum Effort Test
The MET was used to measure aerobic capacity and to determine the volume and intensity of aerobic physical exercise for each individual. Tests were conducted at a controlled temperature (24°C ± 2) on an ergometric cycle (Life Cycle 9,500 HR, USA). The respiratory and metabolic variables were generated by measuring gaseous respiratory exchanges with a metabolic system (COSMED PFT\(_4\), ITALY). After an initial warm-up for 3 minutes at 33 watts, a progressive load of 25-watts was added every 2 minutes. The test was terminated when the volunteer reached exhaustion or the maximal heart rate (HRmax=220 - age)\(^14\).

### Statistical analysis
Repeated measures of ANOVA were used for statistical analysis followed by the Tukey test. Data are expressed as the means and standard errors (SE). The significance level was set at 5% (p≤0.05), and calculations were performed with the aid of the software Statistica, version 7.

### RESULTS
Table 1 shows the physical characteristics and baseline parameters of the participants’ sleep.

Statistical analysis of the RLS data showed a significant decrease in questionnaire scores after sessions 36

| Physical characteristics and parameters of participants’ sleep (n=11) |
|-------------------------------------------------|------------------|
| Physical characteristics                         |                   |
| Age (years)                                      | 50.2±3.78        |
| Gender                                          | Male/Female      |
| Height (cm)                                      | 164±0.02         |
| Body mass (kg)                                   | 66.45±3.33       |
| BMI (kg/m\(^2\))                                 | 24.50±0.94       |
| Sleep parameters - PSG                           |                   |
| Total sleep time (hour)                          | 5.08±0.60        |
| Sleep efficiency (%)                             | 65.03±7.77       |
| Sleep latency (min)                              | 39.4±9.50        |
| REM sleep latency (min)                          | 143.22±25.19     |
| Wake time during TST (min)                       | 109.22±25.23     |
| Wake index per hour                              | 10.45±2.06       |
| Stage 1 (%)                                      | 5.21±1.78        |
| Stage 2 (%)                                      | 72.21±3.42       |
| Stage 3 (%)                                      | 1.90±0.63        |
| Stage 4 (%)                                      | 5.17±2.07        |
| REM (%)                                          | 15.50±2.82       |
| Apnea index per hour                             | 3.68±1.93        |
| PLM index per hour                               | 27.21±4.73       |

Values are expressed as mean and standard deviation.

BMI: body mass index; PSG: polysomnography; PLM: periodic limb movement; REM: rapid eye movement; TST: total sleep time.
DISCUSSION
The results demonstrate that aerobic physical exercise, performed at Anaerobic Ventilatory Threshold intensity, was efficacious in diminishing symptoms of RLS.

Symptoms of RLS were significantly reduced after 36 sessions (12 weeks) of training. Aerobic physical exercise improved RLS symptoms in a time frame similar to that of pharmacological treatment for RLS/PLM\textsuperscript{15,16}.

The current findings corroborate the results presented in Aukerman et al., in which a 12-week program of combined aerobic and resistance exercise improved RLS scores\textsuperscript{7}.

Data presented in Garcia-Borreguero et al. demonstrated a correlation between IRLS scores and the objective parameters of PLM motor dysfunction, thus demonstrating a common pathophysiological mechanism\textsuperscript{17}.

The present study found that aerobic exercise at Anaerobic Ventilatory Threshold intensity was efficient in diminishing RLS symptoms after 36 sessions (as scored by the IRLSS). A previous study found a similar result for PLM indexes after 72 sessions (evaluated by PSG)\textsuperscript{10}.

The perceived improvement in symptoms of RLS before the reduction of PLM with the practice of physical exercise may be associated with the different forms of evaluation. Unlike the results obtained from the IRLSS questionnaire, PSG data reflect a particular night and do not exclude the possibility of the volunteer being exposed to external factors that affect their night’s sleep. The reduction in perceived symptoms of RLS may directly or indirectly suggest that aerobic physical exercise improved the participants’ quality of life. However, the improvement of RLS symptoms likely preceded the diminished PLM symptoms because the subjective evaluation is more readily perceived by the patients.

Thus, the results of this study demonstrate that aerobic physical exercise reduces symptoms of RLS. However, future studies are needed to determine the relationship and pathophysiology of these disorders and why physical exercise is effective in the improvement of their symptoms.

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* Differs from baseline (ANOVA - Tukey).

**Figure 1.** International Restless Legs Syndrome Scale (IRLSS) questionnaire scores for the baseline period and after training sessions 36 and 72. Data expressed as mean±standard errors.
REFERENCES


