

REVIEW ARTICLE

Therapeutic Exercise in Systemic Lupus Erythematosus: Review Article

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ABSTRACT

Introduction: Systemic Lupus Erythematosus (SLE) is a prototype of an autoimmune disease characterized by the production of antibodies against cell nucleus components with a broad spectrum of clinical patterns. The SLE will cause long-term complications so that SLE patients tend to have sedentary lifestyle and decrease physical activity which reduces exercise capacity. The aim of therapeutic exercise is to improve a variety of clinical symptoms in SLE patients by alleviate the inflammatory process and modifying the disease's natural course.

Methods: All of references have searched in 2018 within the areas of rheumatology, immunology, cardiology, physical education and physiotherapy.

Results: Therapeutic exercise in SLE has an anti-inflammatory effect by inhibiting the release of inflammatory mediators including TNF- α . Therapeutic exercise in the form of aerobic and resistance exercise able to improve aerobic capacity, reduced fatigue, increasing chronotropic reserve, heart rate recovery, functional performance, functional capacity, muscle strength and increase bone turn over. Therapeutic exercise was not aggravated disease activity as measured by SLE Activity Index (SLEDAI) and SLE Activity Measure (SLAM) index.

Conclusion: Supervised aerobic and resistance exercise seems to help improve health, vitality and self perceived physical capacity in SLE patients.

Keywords: *Systemic lupus erythematosus , therapeutic exercise, SLEDAI, SLAM index*

ABSTRAK

Pendahuluan: Systemic Lupus Erythematosus (SLE) adalah penyakit autoimun berupa produksi dari antibodi melawan komponen nukleus sel dengan pola klinis spektrum luas. SLE akan mengakibatkan komplikasi jangka panjang sehingga pasien SLE biasanya memiliki gaya hidup kurang aktif. Tujuan dari terapi latihan adalah untuk memperbaiki gejala klinis pada SLE, dengan menurunkan proses peradangan dan memodifikasi perjalanan natural penyakit.

Metode: Semua referensi ditelusuri pada tahun 2018 dalam area reumatologi, imunologi, kardiologi, edukasi fisik dan fisioterapi.

Hasil: Terapi latihan pada SLE memiliki efek anti-radang dengan menghambat pelepasan mediator radang termasuk TNF- α . Terapi latihan dalam bentuk aerobik dan resistensi dapat memperbaiki kapasitas aerobik, mengurangi kelelahan, meningkatkan reservasi kronotropik, perbaikan denyut jantung, performa fungsional, kapasitas fungsional, kekuatan otot dan meningkatkan proses pergantian tulang. Terapi latihan tidak memperparah aktivitas penyakit sebagaimana diukur oleh indeks Aktivitas SLE (*SLE Activity Index* - SLEDAI) dan Indeks Pengukuran Aktivitas SLE (*SLE Activity Measure* - SLAM).

Kesimpulan: Terapi latihan aerobik dan resistensi di bawah supervisi dapat membantu memperbaiki kesehatan, vitalitas dan kapasitas fisik pada pasien SLE.

Kata kunci: Sistemik lupus eritematosus, terapi latihan, SLEDAI, indeks SLAM

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INTRODUCTION

The worldwide prevalence of lupus ranges from 14 to 172 cases per 100,000 people while the incidence of this disease has tripled in the last 40 years due to improvements in diagnosis. It is estimated that around 3.7 per 100.000 people per year suffer from this

disease according to the American College of Rheumatology (ACR) criteria.^{1,2}

The etiology and pathophysiology of SLE are still not clearly known. Some evidence showed that genetic, environmental and hormonal effects on immune responses develop SLE. Genetic factors play an important role in susceptibility and expression of disease. About 10-20% of SLE patients have a first-degree relative who also suffers from SLE.³ Most common clinical manifestations of SLE were arthritis (48.1%) including joint pain and joint stiffness. Many patients with a complicated course of illness resulting in joint deformity, muscle weakness, or deconditioning after prolonged illness. SLE can reduce the physical function and the quality of life.^{4,5}

Therapeutic exercise has its role in improving physical function. It consists of systematic, planned performance of bodily movements, postures, or physical activities. The programs should be individualized to the unique needs of each patient. Therapeutic exercise interventions include aerobic conditioning and reconditioning, muscle performance' exercises (strength, power and endurance technique), stretching technique, postural and balance exercise, relaxation technique and breathing exercise.⁶

In SLE patients, therapeutic exercise that proven to affect the immunological system is aerobic exercise, while resistance exercise is proven to be able to increase bone turn over although body composition remains unchanged.

METHODS

All databases were searched up to 2018. The search criteria for inclusion of articles were as follows: a) studies that dealt with SLE that discussed physical

fitness, aerobic exercise, aerobic capacity, muscle strength, resistance exercise, exercise capacity and functional capacity and b) database searches were carried out using Pubmed, Cochrane, Science direct within the areas of rheumatology, immunology, cardiology, physical education and physiotherapy.

SYSTEMIC LUPUS ERYTHEMATOSUS (SLE)

Definition

SLE is a prototype of an autoimmune disease characterized by the production of antibodies against cell nucleus components with a broad spectrum of clinical patterns.³

SLE can be diagnosed by classification criteria developed by ACR in 1971 then revised in 1982 and 1997, which now widely used worldwide. Based on these latest criteria, SLE is diagnosed if at least 4 out of the 11 criteria are found.(Table 1)^{7,8}

Table 1. Modified 1997 classification criteria for systemic lupus erythematosus^{7,8}

CRITERION	DEFINITION
1. Malar rash	Fixed malar erythema, flat or raised.
2. Discoid rash	Erythematous raised patches with keratotic scaling and follicular plugging; atrophic scarring may occur in older lesions.
3. Photosensitivity	Skin rash as an unusual reaction to sunlight, by patient history or physician observation.
4. Oral ulcers	Oral or nasopharyngeal ulcers, usually painless, observed by physician.
5. Arthritis	Nonerosive arthritis involving two or more peripheral joints, characterized by tenderness, swelling, or effusion.
6. Serositis	a. Pleuritis (convincing history or pleuritic pain or rub heard by physician or evidence of pleural effusion) <i>or</i>
	b. Pericarditis (documented by electrocardiogram, rub, or evidence of pericardial effusion)
7. Renal disorder	a. Persistent proteinuria (>0.5 g/day or >3+) <i>or</i>
	b. Cellular casts of any type

CRITERION	DEFINITION
8. Neurologic disorder	a. Seizures (in the absence of other causes) <i>or</i> b. Psychosis (in the absence of other causes)
9. Hematologic disorder	a. Hemolytic anemia <i>or</i> b. Leukopenia (<4000/ μ L on two or more occasions) <i>or</i> c. Lymphopenia (<1.500/ μ L on two or more occasions) <i>or</i> d. Thrombocytopenia (<100,000/ μ L in the absence of offending drugs)
10. Immunologic disorder	a. Anti-double-stranded DNA <i>or</i> b. Anti-Sm <i>or</i> c. Positive finding of antiphospholipid antibodies based on (1) an abnormal serum level of immunoglobulin G or M anticardiolipin antibodies, (2) a positive test result for lupus anticoagulant using a standard method, or (3) a false-positive serologic test for syphilis known to be positive for at least 6 months and confirmed by Treponema pallidum immobilization or fluorescent treponemal antibody absorption test.
11. Antinuclear antibody	An abnormal titer of antinuclear antibody by immunofluorescence or an equivalent assay at any time and in the absence of drugs known to be associated with "drug-induced lupus syndrome"
For identifying patients in clinical studies, a person shall be said to have SLE if any 4 or more of the 11 criteria are present, either serially or simultaneously, during any interval of observation.	

Pathogenesis

The etiology and pathophysiology of SLE are still not clearly known. However, there is much evidence showed that the pathogenesis of SLE is multifactor involving genetic, environmental and hormonal influences on immune responses.

The pathogenesis of SLE is hypothesized as follows:

The presence of one or several triggering factors such as sex hormone, ultraviolet radiation, and infections in individuals who have genetic predisposing will produce abnormal endorsing power to T CD₄⁺ cell so T cell loses its tolerance to self-antigens. As a result, an autoreactive T cell appears which causes the induction of B cell that produces autoantibodies. In SLE, autoantibodies that

are formed are directed against antigens that are mainly located in the nucleoplasm. This autoantigen is not tissue-specific and is an integral component of all kinds of cells. These antibodies and antigens are called ANA (anti nuclear antibody) which forms immune complexes and circulates in the circulation. This immune complex will alleviate the organ due to the occurrence of complement fixation in the organ. This will stimulate an inflammatory reaction and cause symptoms in the organ related such as kidneys, skin, joints, etc.³

Clinical Manifestation

SLE can be categorized as mild, moderate, and severe or life threatening. Mild SLE criteria are clinically stable, no life-threatening signs or symptoms and normal

organ function namely kidneys, lungs, heart, CNS, joints, and skin. Mild to moderate nephritis (Class I and II), thrombocytopenia ($20-50 \times 10^3/\text{mm}^2$) and major serositis are found in moderate SLE. While life-threatening SLE is characterized by endocarditis, pulmonary hypertension, proliferative nephritis, profound vasculitis, neutropenia, hemolytic anemia or thrombocytopenia ($<20.000/\text{mm}^3$).⁶

Most common symptoms were joint deformity, muscle weakness, or deconditioning after prolonged illness. The other symptoms of SLE is fatigue which often cause people to reduce their daily activities or stop exercising altogether, which can make symptoms worse. The cause of fatigue is most likely multifactorial. Many potential causes include cytokines associated with active inflammation, sleep disturbance, sedentary lifestyle, anemia, depression, stress and medications such as steroids and beta-blockers. This decrease in physical fitness resulted in reduced functional capacity.^{4,5}

THERAPEUTIC EXERCISE IN SLE

Autoimmune rheumatic diseases were characterized by chronic inflammation. Therefore, inhibiting inflammation is the main strategy in SLE. But, glucocorticoid treatment and immunosuppressive drugs in prolong used, have side effects, including bone and muscle mass wasting and cardiovascular dysfunction. In this context, exercise training has as a non-pharmacological strategy aimed to improving a variety of clinical symptoms in SLE patients.¹⁰

DISCUSSION

Given the potential role of inflammation in the etiology as well as in the clinical symptoms of autoimmune rheumatic diseases, one may postulate that exercise training, if able to alleviate the inflammatory process, could also be helpful in treating the symptoms, as well as in modifying the disease's natural course of autoimmune rheumatic diseases, as illustrated in Figure. 1.¹⁰

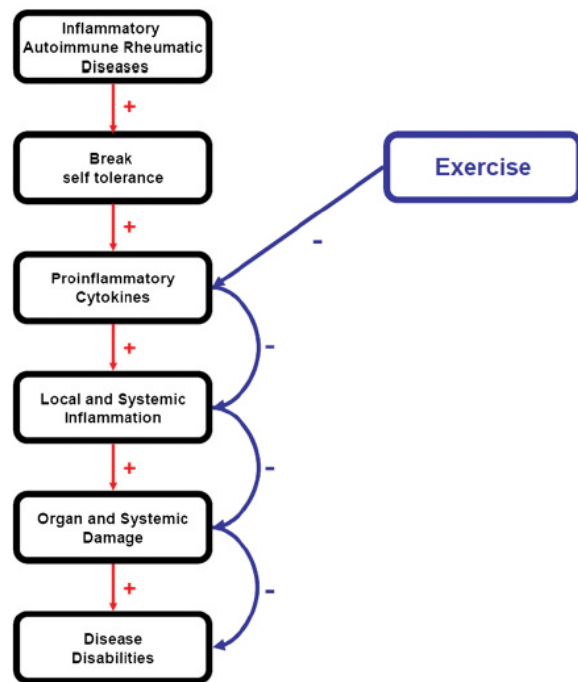


Figure. 1. Physiopathology cascade leading to poor clinical outcomes triggered by exacerbated inflammation in autoimmune rheumatic diseases (red arrows). The potential role of exercise in “stalling” this cascade by preventing inflammation is illustrated in blue.¹⁰

Skeletal muscle that recently recognized as an “endocrine organ” is able to express and secrete a number of cytokines (also called “myokines”). In response to muscle contraction, the first

cytokine secreted is interleukin-6 (IL-6), which is subsequently followed by anti-inflammatory cytokines, such as interleukin 1 receptor antagonist (IL-1ra), interleukin-10 (IL-10) and tumor necrosis factor receptor (TNF-R). It is interesting to note that intramuscular cytokine expression differs from that in macrophages, where IL-6 signaling is dependent upon the activation of the NF κ B signaling pathway, thus provoking a pro inflammatory response. Conversely, intramuscular IL-6 expression is thought to be activated by a network of signaling cascades involving the Ca²⁺ nuclear factor of activated T cells (NFAT) and glycogen/ p38 MAPK pathways regulated independently of a preceding TNF response or NF κ B activation. Therefore, IL-6 produced during physical exercise has been considered an anti-inflammatory rather than a pro-inflammatory cytokine.¹⁰

In order to further exploration the role of exercise in inhibiting the inflammatory process, Starkie, et al gave E.Coli endotoxin infusion in 8 healthy subjects to create low-grade inflammation. 1.5 hours later at rest, the TNF- α level were increased 2-3 times compared to baseline. Subjects were then given an acute session of cycling exercise at 70% of VO₂ max and the TNF- α increase was fully blunted. These findings are of great relevance considering the suggestion that anti-inflammatory effects of regular exercise training may be a summation of stimuli produced after each exercise.¹¹

Another main mediator in inflammatory cytokine responses during exercise appears to be catecholamines. Immediate activation of the sympathetic nervous system (SNS) during exercise results in markedly increased

levels of catecholamines in circulation. It is well documented that sympathetic nerves densely innervate cellular compartments of lymphoid organs and the adrenal glands. Sympathetic activation during exercise induced catecholamines production and was hypothesized that it influences leukocyte functions, therefore, inhibit cytokine production.¹²

To investigate the effects of catecholamines on intracellular TNF production by monocytes during exercise, Dimitrov, et al gave a standardized exercise challenge to forty seven physically and mentally healthy subjects. All participants underwent exercise testing to determine the participant's maximal exercise capacity by measuring peak oxygen consumption (VO₂ peak). Participants trained on a treadmill until maximal exertion. The standard Bruce protocol was used where the speed and inclination of the treadmill increased gradually by 1.7 mph and 10% every 3 min. Participants returned 7–14 days later to exercise on the treadmill for 20 min at 65–70% of their VO₂ peak, normally rated as “somewhat hard” on Borg's perceived exertion scale. TNF- α levels were measured before and immediately after the 20-min exercise challenge. As expected, exercise elevated circulating catecholamine levels and plasma TNF- α levels did not change pre- to post-exercise.¹³

In patients who have SLE, severity of fatigue and physical disability was been associated strongly with decrease in aerobic capacity as measured by oxygen consumption (VO₂).

Randall E. Keyser, et al conducted a study

to determine whether oxygen consumption (VO_2) on-kinetics differed between groups of sedentary women with SLE ($n=12$) and sedentary but otherwise healthy controls ($n=10$). Women with SLE had Systemic Lupus Activity Measure/SLAM scores indicating their disease activity had been negligible to mild with no flares for the previous 30 days. All participants completed a maximum treadmill test according to the modified Bruce protocol. The participants stopping point for this test was the participant's indications that she could not continue exercising despite strong encouragement from the testing staff. Pulmonary gas exchange was measured by every breath cardiopulmonary exercise testing system. This study showed that VO_2 rate was lower in women in SLE than in controls ($P<0.028$). VO_2 was decreased in work rates that are of moderate intensity for most healthy subjects.¹⁴

A study conducted by Marivone Arruda Leite, et al evaluated respiratory compromise in forty-five stable SLE patients by means of 6 Minutes Walking Test /6MWT. This study showed that subjects with desaturation $\geq 4\%$ had a significant reduction in walking distance ($P=0.023$), and a spirometry restrictive defect (FVC below the lower limit of predicted value, $P=0.027$, with a normal FEV_1/FVC ratio). These findings suggest that desaturation during the 6MWT may be a useful tool to evaluate SLE patients without respiratory symptoms.¹⁵

To counter this aerobic insufficiency therapeutic exercise has a role in improving aerobic capacity. One Systematic review of a controlled clinical trial was conducted by Strömbeck, et al to studied the effects of aerobic exercise on the rehabilitation of adults

with SLE. It seems that intensity, frequency and duration of the exercise program should be similar to those recommended in their population groups. In patients with low disease activity, moderate exercise proved to be safe, and different positive effects derived from engaging in it could be expected. These effects included the improvement of aerobic capacity, asthenia, tolerance to exercise, and possibly, of the physical function and depression.¹⁶

Robb-Nicholson, et al conducted a study to counter fatigue experienced by SLE patients. 23 patients with SLE and fatigue were randomly allocated into exercise group and control group. The exercise group was instructed to do exercise at home for 30 min three times per week for 8 weeks to attain 60-80% of their maximum heart rate achieved during the previous exercise tolerance test (the target range) on a bicycle ergometer. Patients were instructed to warm up for 5 min, followed by exercising in a target range of heart rate achieved for 20 min, and cooling down for 5 min. After 8 weeks of conditioning, there were no significant differences between treatment and control group in Systemic Lupus Erythematosus Activity Index/SLEDAI. There were significant differences in the responses to all questions in the fatigue scale except for questions number two ($P<0.005$, $P<0.0005$, $P<0.05$) respectively, demonstrating significant improvement of fatigue in exercise group.¹⁷

Avaux, et al also evaluated the effect of two different exercise programs on chronic fatigue in SLE patients. Forty-five SLE patients suffering from fatigue, as defined by Krupp's fatigue severity scale (FSS) ≥ 3.7 were randomized in 3 groups : supervised training

group, home training group, and control group. Patients in supervised and home training group were asked to exercise 3 h per week during 12 weeks. The training consisted in (i) : endurance exercises with bicycle starting at 30 W and increased by 30 W every 2 min, until subject's heart rate reached at least 75% of maximal heart rate; and (ii): strengthening exercises. The control group did not participated in any form of exercises. This study demonstrates that participation of lupus patients whether home-based or supervised, has positive effect on their fatigue, as measured by the Krupp's FSS at the end of month 3 ($P < 0.003$).¹⁸

The other studies that showed effectiveness of exercises on fatigue level in SLE patients was conducted by Kamel, et al. 70 SLE patients were recruited and divided into treatment group and control group. Treatment group received the exercise intervention including flexibility and aerobic exercise including walking for 20 to 30 minutes per day, three days a week and being physically active throughout the day. This current study illustrated that there was a significant difference between the study and the control group regarding the Piper Fatigue Scale score post intervention ($P = 0.05$).¹⁹

Therapeutic exercise also had a benefit in childhood-onset SLE patients (C-SLE). Prado, et al reported the safety and efficacy of a supervised aerobic training program in nineteen physically inactive C-SLE patients. Patients were divided into training group and control group. The exercise program consisted of 12 weeks of twice-weekly supervised moderate-intensity aerobic exercise training. Training session comprised by 20 to 50 minutes of a maximal graded treadmill training in an intra

hospital gymnasium. The VO_2 was obtained through breath-by-breath sampling. The heart rate recovery, chronotropic reserve, and BMD were also measured. The study showed decreased in resting HR, increased peak VO_2 and chronotropic reserve. No significant changes were observed in body composition and BMD after intervention probably because C-SLE patients underwent only moderate-intensity of aerobic exercise, which is unlikely to provide sufficient stimulus to promote bone mass accretion.²⁰

In addition, Barnes et al. (n=41) compared active patients with sedentary patients and with healthy controls, observing that the arterial stiffness (measured through the Aorta Augmentation Index) was greater in sedentary patients than in active patients and that in the healthy population ($P < 0.05$), while carotid stiffness was lower ($P < 0.05$). These authors found a reverse correlation between the degree of physical activity and arterial stiffness ($r = -0.30$) or the tumor necrosis factor α ($r = -0.3$), but they do not report the p-value.²¹

A study by Miossi, et al evaluated the efficacy of a 3 months exercise training program in counteracting the chronotropic incompetence and delayed heart rate recovery in patients with SLE. Twenty-four inactive SLE patients were randomly assigned into 2 groups; exercise group and control group. All subjects underwent exercise test using a maximal-graded exercise protocol. As expected, after 3-month of exercise training program, the treatment group showed significant increases in chronotropic response and improved heart rate recovery ($P = 0.007$ and $P = 0.009$, respectively).²²

Reis-Neto, et al also evaluated the effect of supervised physical exercise on endothelial function. Eighteen patients were allocated in the exercise group and 20 patients in control group. The exercise group performed an exercise protocol three times per week for 60 min (a 10 min- warm up, 40 min of walking and 10 min cool-down) for 16 weeks. Endothelial function was evaluated by ultrasound of the brachial artery with flow-mediated dilatation (FMD). In the end of 16 weeks there was a significant increase in FMD in the exercise group.²³

The beneficial effect of supervised aerobic exercise was also observed in a randomized clinical trial (RCT) (n=72) conducted by De Carvalho, et al which obtained an improvement of the aerobic threshold, maximum O₂ consumption, and functional capacity in the intervention group ($P=0.0001$, $P=0.007$, and $P=0.03$, respectively), compared with the control group, as well as an increase in functional capacity in the intervention group compared with the baseline condition ($P<0.01$).²⁴

A pilot randomized controlled trial with a very small number of participants (n=10) was carried out by Ramsey-Goldman, et al. Ten patients with systemic lupus erythematosus (SLE) were randomly placed in either an aerobic exercise group (group 1: n=5) or a range of motion / muscle strengthening (ROM/MS) exercise group (group 2: n=5). Each exercise program was divided into 2 phases, phase I and phase II. In phase I of the aerobic exercise, patients were instructed to exercise to 70–80% of their maximum heart rate. The aerobic exercise group met for 50

minutes 3 times per week. Phase I lasted 2 months in order to maximize the likelihood of a cardiovascular training effect. In phase II of the aerobic exercise, patients continued to exercise in the supervised setting for the first month and then in an unsupervised home exercise program for the next 6 months. In phase I of the ROM/MS exercise group, health professionals led an exercise program limited to isolated upper and lower extremity joint range of motion as well as to limb movement patterns. Care was taken to include several rest periods so as not to influence cardiovascular fitness. The group met 3 times a week for 50-minute sessions. Duration of the program was 2 months. In phase II, muscle strengthening was added to the range of motion exercise. A typical strengthening program included 2 to 3 sets of 10 repetitive isotonic contractions per muscle group using increasing weights from 1 to 2 pounds depending on subject tolerance. Patients were instructed in a formal training for 1-month, with frequency 3 times a week, and 40-minute duration for each session. Patients were then instructed and encouraged to continue these exercises at home for an additional 6 months. As result, patients in both exercise groups showed some improvement in fatigue, functional status, cardiovascular fitness, muscle strength, and increased bone turnover, but BMD was unchanged.²⁵

A small, pre and post, pilot study design (n= 6) conducted by Clarke-Jenssen, et al that assessed aerobic exercise did not obtain relevant clinical results but showed a significant improvement in the vitality subscales ($P=0.03$) and physical function of SF-36 ($P=0.03$) and oxygen consumption ($P=0.05$).²⁶

There is still a question whether exercise in SLE affect and aggravates symptoms and disease course. The effect of exercise on the tissue damage by SLE was assessed in the study with the pre and post test design of Yuen, et al. (n=15) without finding any worsening after the intervention.²⁷

Tench, et al conducted a study to test the efficacy of a graded aerobic exercise program in ninety-three SLE patients without active disease. Subjects were divided into three groups (exercise group, relaxation group, and no intervention group). Subjects in the exercise group were asked to exercise at home at least three times a week, 30 and 50 min each session for a period of 12 weeks with moderate intensity indicated by heart rate corresponding to 60% of peak oxygen consumption. The main exercise was walking but subjects were encouraged to take other forms of exercise, such as cycling and swimming, and were seen every 2 weeks for a supervised exercise session. Disease activity was measured using the Systemic Lupus Activity Measure (SLAM) index done by a single rheumatologist. Analysis by intention to treat showed no significant difference in exercise group for SLAM index nor did any important adverse events arise after 12 weeks ($P = 0.20$).²⁸

The RCT of Robb-Nicholson, et al. (n=23) and the pilot study with pre-post design of Clarke-Jenssen, et al. (n=6), reported that the result did not find any significant differences either before or after the intervention, in either of the cases assessed with the Systemic Lupus Erythematosus Disease Activity Index (SLEDAI).^{17,26}

In a cross-sectional study (n=242) by Volkmann, et al that assessed the association of physical exercise with certain cardiovascular risk markers did not find any correlation between activity or damage of SLE and exercise.²⁸

Prado, et al and Reis-Neto, et al also found that aerobic exercise program did not worsen SLEDAI scores and the levels of ESR, CRP, C3 and C4 and anti DNAs antibodies were unaltered throughout the study ($P>0.05$).^{20,23}

It is also important to remember that exercise is only given to SLE patients who are stable with mild to moderate disease activity. In addition, SLE patients are known to have photosensitivity to ultraviolet (UV) radiation, thereby limiting outdoor exercise. UV radiation could induce skin manifestations especially in cutaneous lupus erythematosus or “butterfly rash” where most lesions are in areas of the skin that exposed to UV radiation. Therefore exercise should be done indoors and protected from UV Radiation. Patients with neuropsychiatric manifestations should be monitored for cognitive dysfunctions and may need precautions for seizures. A heart rate monitor is recommended to ensure the patient is maintaining an adequate intensity of exercise. Swimming or water exercise require periodic checks of heart rate levels to ensure an adequate intensity of exercise.

CONCLUSION

Exercise in SLE has an anti-inflammatory effect by inhibiting the release of inflammatory mediators including TNF- α . It also has effects on improving aerobic capacity, reducing

fatigue, increasing chronotropic reserve, heart rate recovery, functional performance and functional capacity. It should be performed with supervision on stable and mild to moderate degrees SLE patients. Aerobic exercise should be given 2-3 times a week, start at low intensity including walking, treadmill, stationary cycling and swimming for 20-30 minutes. Gradual sessions of aerobic physical exercise controlled by a health professional is recommended at home, in the form of walking, static cycling, swimming for stable SLE, due to its global improvement effect on a series of self-perceived measures by SLE patients. Promoting regular physical exercise in people with stable SLE with low to moderate disease activity is also recommended. Exercise in SLE patients will not affect or aggravate disease activity as measured by SLEDAI and SLAM index. Notably, further work must be done to support this assumption.

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