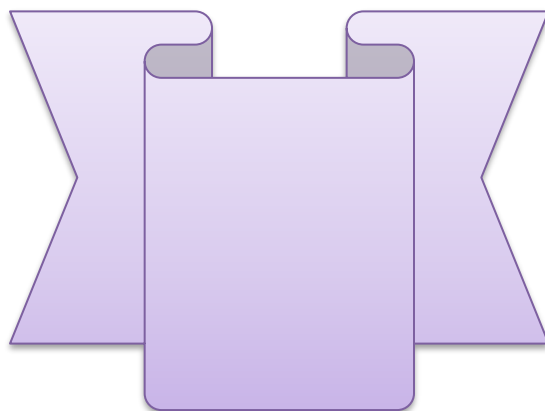


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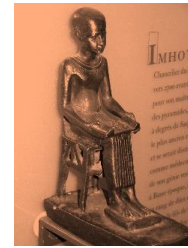
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## Original Article

# Effect of Adding Laser Acupuncture to Pedometer-Based Walking on Quality of Life in Post-COVID 19 Patients: A Randomized Clinical Trial

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## ABSTRACT

### Article information

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**Background:** “Corona virus disease 2019 or COVID-19” causes significant respiratory, internal, physical, and psychological problems affecting quality of life [QoL]. Pedometer-based walking and laser acupuncture may improve the health of patients with COVID-19 but more research is needed.

**Aim of the Work:** This study aimed to investigate the effect of pedometer-based walking alone or combined with laser acupuncture on QoL in post-COVID patients.

**Patients and Methods:** Sixty post-COVID-19 patients of both genders with ages ranging from 35-48 years old were recruited from the Chest-disease outpatient clinic of El Khankah Central Hospital and divided equally to Group A & B. Group A underwent laser acupuncture 3 session per week, with pedometer-based walking [3000 steps] for 4 weeks. Patients of Group B received daily pedometer-based walking [3000 steps] for 4 weeks. They were evaluated regarding C-reactive protein, white blood cells, lymphocytes, neutrophils, six-minute walk test, fatigue assessment, and short form 36.

**Results:** There were significant improvements in all outcomes [P-value < 0.05] after both treatments that were significantly higher in group A.

**Conclusion:** Combining laser acupuncture and pedometer-based walking is better than pedometer-based walking alone in improving QoL in post COVID-19 patients. However, both treatments were effective. Program of management of patients with post COVID-19 syndrome should include pedometer-based walking and laser acupuncture.

**Keywords:** Laser acupuncture; Pedometer-based walking; Post COVID-19 syndrome; Quality of life.



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**Highlights:**

- Post-COVID-19 patients had abnormal levels of blood markers and significant fatigue, physical disability, and impaired life quality.
- Pedometer-based walking improved quality of life in these patients.
- Addition of laser acupuncture significantly increased effect of walking in this population.

## INTRODUCTION

“Corona virus disease 2019 or COVID-19” is a pandemic and leads to dyspnea, chest pain, fatigue, joint/muscle pain, weakness, and many laboratory abnormalities, i.e., lymphopenia and elevated inflammatory markers, among others [1, 2]. Egypt shows increasing COVID-19 cases who continue to complain even after recovery period. So, new interventions are needed to treat these complications and decrease financial burdens [3,4].

Exercises [supervised or home by internet or new technologies] are beneficial for patients during COVID-19 crisis to improve exercise adherence and hence improve health, function/physical activity, life quality, other COVID-19 complications and decrease infection risk [5-11].

Smartphone pedometer application can help to measure and improve walking ability that is recommended [150 minutes weekly] and hence improve health [12-14]. Physical activity and exercise can improve psychology and immunity that are important for COVID-19 patients [15].

Acupuncture, type of traditional Chinese medicine [TCM], was effective, inexpensive, and safe treatment for symptomatic respiratory complications and other conditions [1, 16]. Low Level Laser Therapy [LLLT] is effective and safe as a non-invasive modality for different symptoms of chronic pulmonary diseases [17]. Acupuncture can decrease inflammation and improves cardiopulmonary system function [e.g. SPO2 and heart rate] [18].

New technologies that improve walking steps had inconclusive evidence of the effectiveness [19]. New interventions are needed for patients during the recovery from COVID-19 [20].

This study aimed to explore the effect of pedometer-based walking alone and combined with laser acupuncture on quality of life [QoL] in post COVID patients.

## PATIENTS AND METHODS

This study was done according to the “Declaration of Helsinki” principles and approved by the “research ethical committee of faculty of physical therapy, Cairo University”. Informed consent was provided by patients.

## Sample and randomization

**Sample:** Sixty post-COVID-19 patients of both genders with age range from 35-48 years old and BMI of 25-29.9 kg/m<sup>2</sup> were recruited from the Chest-disease outpatient clinic of El Khankah Central Hospital and recovered from COVID-19 by 2 months [COVID-19 confirmed by physician as positive swab results or chest Computed Tomography scan with ground glass opacities] with oxygen saturation at room air  $\geq$  90% [21].

**Randomization:** The eligible patients were randomly assigned using closed envelop method into: two equal group in number; Group A: [n=30] patients received laser acupuncture, with pedometer-based walking and Group B: [n=30] patients received pedometer-based walking only.

**Evaluation procedures:** All patients were evaluated before and after 4 weeks of the treatment using the following measures; blood Kits [CRP, WBCS, neutrophil, lymphocyte], six-minute walk test, fatigue assessment scale, and the short-form [36] health survey [SF-36] questionnaire [22-24].

## Therapeutic intervention

**Pedometer based walking [step counter mobile application]:** A free application [e.g., Pedometer Lite] were downloaded and set up in each patient own phone who always carry in the pocket. They wore a smart band to measure the heart rate before and after session. Each patient was asked to achieve 3000 steps per day [60-70% of maximal heart rate] daily for 4 weeks, at home. It was a home program and follow up was by telephone counseling session to encourage the participants [25].

**Laser acupuncture:** Patients of group A were subjected to low level laser therapy [Astar polaris 2, European Union] over the acupuncture points of the immune system, thrice weekly for one month, using the following parameters; 808 nm, continuous, 200 M Watt per sec, 6 J per point, 30 sec per point. The acupuncture points of the immune system that were stimulated were: Zusanli or St.37 [lateral to the inferior end of the tibial tuberosity], Quchi or L.I.11 [at the outer end of the elbow crease], Dazhui or GV.14 [between the dorsal spines of the 7 cervical and 1st thoracic vertebra], Hegu or L.I. 4 [located bilaterally in

the web between the index and thumb on the dorsal aspect of the hand, and KI3 or Taixi [located bilaterally at the posterior edge of medial malleolus <sup>[18, 26]</sup>.

**Exclusion criteria:** Patients were excluded if they had; fever more than 38 degrees, cardiovascular diseases, autoimmune disease, psychological disorders, renal and hepatic disorders, metabolic disease as diabetes mellitus and hypertension, pregnancy, previous chest diseases, neurological diseases, or lower limb articular problems.

**Statistical analysis:** Independent t-test was conducted to detect differences in demographics [except sex] and outcomes between groups. Sex distribution was analyzed using chi-squared test. Dependent t-test was used for comparison of outcomes within groups. Alpha was  $p < 0.05$ . Sample size was 60 [30 per group] expecting large effect size based on work of **Hussieny et al.** <sup>[17]</sup> who found a significant effect of laser acupuncture on inflammatory markers compared with conventional chest physiotherapy. Calculations were made using G\*power with  $\alpha=0.05$ , power 80% and effect

size = 0.8 and allocation ratio N2/N1 = 1.

## RESULTS

**Demographics:** Demographic data of all patients were presented in table [1]. There was no significant difference between groups in basic characteristics of the patients [ $p>0.05$ ].

### Effect of laser acupuncture and pedometer on CRP, neutrophils, lymphocytes, leukocytes, 6MWT, SF-36, and FSS

**Within group comparison:** Pre and post-treatment mean values of CRP, neutrophils, lymphocytes, leukocytes, 6MWT, SF-36, and FSS in both groups were presented in table [2]. There was significant improvement in CRP, neutrophils, lymphocytes, leukocytes, 6 MWT, SF-36, and FSS post- treatment in both groups [ $p= 0.0001$ ]. There was no significant difference between groups [A and B] before treatment [ $p>0.05$ ]. When comparing the two groups after four weeks of treatment, there was a significant difference [ $p \leq 0.002$ ] in favor of group [A] [table 2].

**Table [1]:** Mean values of age, height, weight and BMI of groups [A and B]

	Group [A]	Group [B]	p-value
Age, mean± SD, years	40.7 ± 3.51	39.07 ± 2.83	0.052
Height, mean ± SD, m	1.69 ± 0.08	1.71 ± 0.08	0.264
Weight, mean ± SD, kg	79.2 ± 8.36	80.23 ± 8.8	0.643
BMI, mean ± SD, kg/m <sup>2</sup>	27.8 ± 1.01	27.4 ± 1.05	0.137
Sex n [%]	Males	13 [43]	16 [53]
	Females	17 [57]	14 [47]

**Table [2]:** Pre and post- treatment mean values of all outcomes in both groups

	Study group [A] mean ± SD	Control group [B] mean± SD	P-value
C-reactive protein [CRP]	Pre	7.5 ± 0.93	7.78 ± 0.95
	Post	4.15 ± 1.23	5.13 ± 1.01
	P-value	0.0001	0.0001
White blood cells [WBCs]	Pre	7.62 ± 0.77	7.74 ± 0.92
	Post	5.45 ± 0.63	6.02 ± 0.72
	P-value	0.0001	0.0001
Neutrophils	Pre	7.87 ± 0.74	8.22 ± 0.98
	Post	5.14 ± 0.7	6.21 ± 0.94
	P-value	0.0001	0.0001
Lymphocytes	Pre	1.99 ± 0.51	1.79 ± 0.47
	Post	3.03 ± 0.57	2.52 ± 0.5
	P-value	0.0001	0.0001
Fatigue assessment scale [FAS]	Pre	36.9 ± 2.38	37.77 ± 2.52
	Post	25.07 ± 2.52	29.57 ± 3.29
	P-value	0.0001	0.0001
Short form 36 quality of life questionnaire [SF-36]	Pre	70.11 ± 4.2	68.43 ± 5.26
	Post	78.15 ± 4.16	73.51 ± 5.21
	P-value	0.0001	0.0001
Six-minute walk test [6MWT]	Pre	368.1 ± 10.96	365.77 ± 9.36
	Post	396.01 ± 13.26	385.83 ± 11.01
	P-value	0.0001	0.0001

## DISCUSSION

This study investigated the effect of pedometer-based walking alone and combined with laser acupuncture on quality of life in post COVID patients. It was hypothesized that no significant differences would be obtained after either treatment and between both treatments. However, results of the current study rejected the hypothesis, as there were significant improvements after both treatments that were higher in group A compared to group B.

The pandemic had negative effects on maintain simple physical activity as walking across age groups of the population, but tends to increase among elders. In addition to that, the pandemic has had negative effects on sleeping and psychological status of the COVID-19 patients with higher rates of insomnia, anxiety, and depression [27, 28].

Patients with COVID-19 had long term physical and psychological complications that reduce exercise capacity and impair life quality [29-32]. Physical inactivity was the strongest risk factor for hospitalization and death [33]. Even few days of hospitalization, significantly reduce muscle mass and strength [34]. Hospitalized patients continue to complain from disability for long period even after discharge [35, 36].

As a result, interventions that aid patients to self-manage their symptoms, partly from physical decline, are crucial. This could be done by using pedometers that increase exercise adherence as walking at home [37, 38].

Walk exercises are important and effective intervention for elder during COVID-19 pandemic [39]. Modern technology as pedometers can be used to promote PA and record physical parameters. Physical activity or home-based training can enhance health and thus it is recommended during the COVID-19 pandemic [40].

Findings of the current study support the notion that acupuncture relieves the symptoms caused by COVID-19 as anxiety, nausea, insomnia, leukopenia, and fatigue and hence may improve QoL [41]. Acupuncture induces traumatic physical stimulation that induces neuroendocrine immune regulation [42]. Moreover, acupuncture induces anti-inflammatory or immunological effects [43].

As well, the present study came in line with the report that low-level laser therapy [LLLT], has anti-inflammatory effects and can facilitate pain management, tissue healing, and lymphedema reduction. Furthermore, LLLT leads to improved cardiopulmonary status and decrease its symptoms as chest pain by decreasing inflammation and increasing immunity [44].

The current study found improved QoL after pedometer-based walking. This finding supports the work of **Armstrong et al.** [19] who found improvements in daily walking steps after pedometer physical activity promotion. Pedometers improve physical activity by changing behavior [45-47].

Physical or daily activities and low/moderate-intensity exercise at home is necessary and effective during recovery from COVID-19 [20, 38, 48-52]. Physical activity [household chores] can decrease risk of cardiovascular events [53].

Findings of the current study regarding decreased CRP, WBCs, Neutrophils, and increased lymphocytes came in line with the report that lymphocytes of who perform higher daily steps are increased and decreased inflammation. This is not surprising as lower daily steps increases body fats that impair immunity and increase inflammation [54].

**Conclusion:** Combining laser acupuncture and pedometer-based walking is better than pedometer-based walking alone in improving QoL in patients post COVID-19. However, both treatments were effective. Program of management of patients with post COVID-19 syndrome should include pedometer-based walking and laser acupuncture.

**Conflict of Interest and Financial Disclosure:** None.

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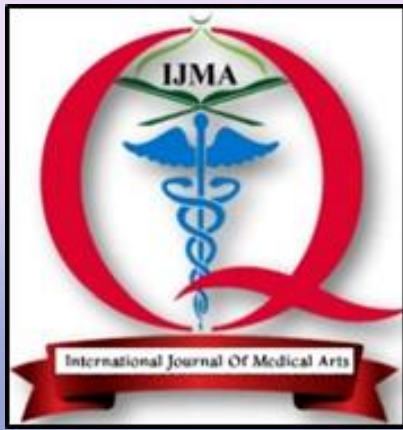


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