# The Effectiveness Of Trigger Point Treatment In Chronic Pelvic Pain; A Pilot Randomised Controlled Trial

## Wirksamkeit der Triggerpunkt-Therapie bei chronischen Unterbauchschmerzen – eine randomisierte kontrollierte Pilotstudie

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## ABSTRACT

**Objective** To investigate the effectiveness of ischemic compression and low-level laser therapy methods combined with exercise on the myofascial trigger points in women with Chronic Pelvic Pain and to determine which method is more effective.

**Methods** It was a parallel designed, single-blind pilot randomized clinical trial. Patients were recruited at physiotherapy laboratory of the Istanbul University from September 2017 to June 2019. Twenty-eight women patients with Chronic Pelvic Pain were included into the trial. Patients were randomized into two groups. Group 1 received ischemic compression and Group 2 received low-level laser therapy twice a week for 6 weeks. Both groups received the same standard exercise program. Pain, range of motion, pelvic floor symptom severity, quality of life, satisfaction, anxiety, and depression were assessed after 6 weeks, and 1-year follow up.

**Results** Following the treatment, significant differences were observed within both group subjects in pain, range of motion, symptom severity, quality of life, and anxiety-depression ($p < 0.05$). This significant improvement in pain, symptom severity, symptoms related quality of life and pain subgroup of Short Form 36, continued after 1-year follow up ($p < 0.05$). In comparison between group, Group 1 have more significant improvement than Group 2 in terms of symptoms related quality of life ($p < 0.05$).

**Conclusion** Both methods have shown efficacy and can be used safely in chronic pelvic pain patients. Because it is more effective on symptoms related quality of life, the ıschemic compression method may be preferred for primary use.

## ZUSAMMENFASSUNG

**Fragestellung** Ziel der Studie war es, die Wirksamkeit der ischämischen Kompression und der Low-Level-Lasertherapie in Kombination mit Übungen auf die myofaszialen Triggerpunkte bei Patientinnen mit chronischen Unterbauchschmerzen (chronic pelvic pain, CPP) zu prüfen und zu ermitteln, welches Verfahren wirksamer ist.

**Methodik** Es handelte sich um eine einfachblinde, randomisierte, klinische Pilotstudie mit Parallelgruppendesign. Die Rekrutierung der Patientinnen erfolgte im Physiotherapie-Labor der Universität Istanbul von September 2017 bis Juni 2019. Insgesamt wurden 28 Patientinnen mit chronischen Unterbauchschmerzen in die Studie aufgenommen und randomisiert in zwei Gruppen eingeteilt: Gruppe 1 wurde mit ischämischer Kompression und Gruppe 2 mit Low-Level-Lasertherapie zweimal wöchentlich über sechs Wochen behandelt. In beiden Gruppen kam dasselbe Standardübungsprogramm zur Anwendung. Schmerz, Bewegungsumfang, Schweregrad der Beckenbodensymptome, Lebensqualität, Zufriedenheit, Angst und Depression wurden nach 6 Wochen und bei der Nachuntersuchung nach einem Jahr erhoben.

**Ergebnisse** Nach der Behandlung fanden sich statistisch signifikante Unterschiede bei den Patientinnen beider Gruppen für die Parameter Schmerz, Bewegungsumfang, Schweregrad der Symptome, Lebensqualität und Angst/Depression ($p < 0,05$). Die signifikante Verbesserung in den Bereichen Schmerz, Schweregrad der Symptome und symptombezogene Lebensqualität sowie in der Schmerz-Subgruppe im SF-36-Fragebogen zum Gesundheitszustand hielt bei der Kontrolle nach einem Jahr noch an ($p < 0,05$). Im Vergleich der beiden Gruppen findet sich in Bezug auf die symptombezogene Lebensqualität in Gruppe 1 eine deutlichere Besserung als in Gruppe 2 ($p < 0,05$).

**Schlussfolgerung** Für beide Verfahren konnte die Wirksamkeit und Sicherheit bei Patientinnen mit chronischen Unterbauchschmerzen nachgewiesen werden. Aufgrund ihrer besseren Wirksamkeit in Bezug auf die symptombezogene Lebensqualität kann die ischämische Kompression als primäres Verfahren in der Therapie angewandt werden.

## Introduction

Chronic pelvic pain (CPP) is chronic or persistent pain perceived in structures related to the pelvic region. CPP prevalence range between 5,7 % and 26,6 % in women. CPP is associated with symptoms suggestive of the lower urinary tract, sexual, bowel, pelvic floor, or gynecological dysfunction. It is often associated with negative emotional consequences and impaired quality of life (QoL) [1].

Analgesics, hormone therapy, physiotherapy, psychological treatment, and surgical methods are widely used in the treatment of CPP [1]. Medications provide pain and visceral management, surgery provides correction of structure, but physiotheray approachs provides functional restoration. Musculoskeletal pelvic pain is commonly originated myofascial, musculoskeletal, neuromuscular structures [2]. CPP patients have myofascial trigger points (MTrPs) located in the lower back, abdominal wall, and pelvic girdle, which may be the primary source of pain [3]. These MTrPs are usually located in levator ani, obturator internus, piriformis, gluteal muscles, quadratus lumborum and abdominal wall muscles [4]. The MTrPs are hyperirritable spots within a taut band, activated by repeated or chronic muscular overload [5].

Ischemic compression (IC), in the other words trigger point compression, is an effective method in the treatment of MTrPs in many musculoskeletal problems. IC changes the circulatory perfusion of skin and is especially valuable in muscles that are not suitable for stretch [6]. It is less common to use pelvic floor rehabilitation [7], urological CPP [8], interstitial cystitis and painful bladder syndrome [9] and CPP [10] yet. Low-level laser therapy (LLLT) reduces pain in MTrPs lead to musculoskeletal system disorders [11–14]. LLLT increases oxygen supply to hypoxic cells in MTrPs areas by regulating microcirculation as well as it has analgesic, biostimulation, and wound healing effects [15]. In the literature, it is seen that IC and LLLT are effective on MTrPs, and IC is used in pelvic pain in a few studies. But the use of LLLT in pelvic pain has not been found. It is a known fact that exercise is the basis for these MTrPs treatments. Considering this knowledge, we hypothesized that both IC and LLLT combined with exercise would be an effective method in the management of CPP.

The purpose of our study was to investigate the effectiveness of IC and LLLT methods combined with exercise on the MTrPs in women with CPP in short and long term and determine which method is more effective.

## Materials and Methods

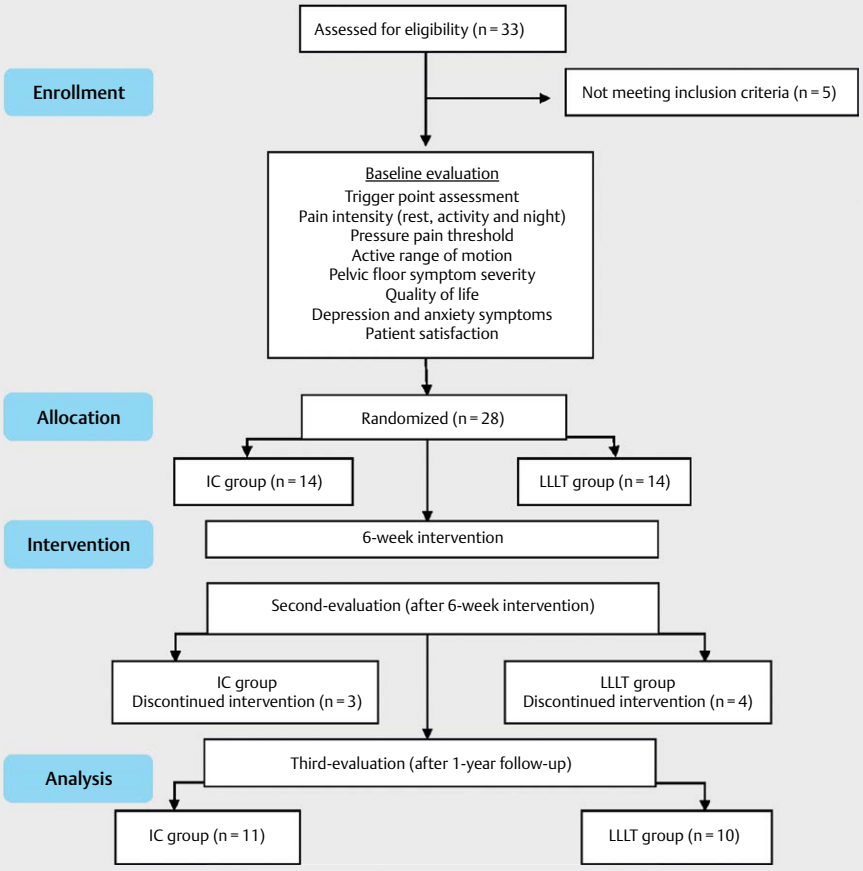
### Participants

A single-blind pilot randomized clinical trial with the parallel design was conducted in patients with CPP. Since the patients were enrolled in the Department of Obstetrics and Gynecology (at Istanbul University), only women patients were included. The patients were diagnosed by a gynecologist and then referred to the clinical laboratory of physiotherapy and rehabilitation to participate in the trial. The study was conducted from September 2017 to June 2019, in accordance with the Declaration of Helsinki.

To be eligible, participants had to be between 18–50 years of age, had pain/discomfort in the lower abdominal and pelvic region lasting for 3 months in the last 6 months. Patients with MTrPs in at least two of the examined muscles (rectus abdominis, piriformis, quadratus lumborum, gluteus maximus-medius, adductor magnus, hamstring) were included to perform statistical analysis.

The exclusion criteria were anticoagulation or bleeding disorders, neuropathy, central nervous system disorders, advanced psychiatric disorders, significant pelvic pathology or abnormality, severe prolapse, pregnancy, to have undergone major surgery and pelvic surgery with general anesthesia in the last 3 months, to have received treatment including electrotherapy and manual therapy for the pelvic region in the last 6 months.

33 partients were assessed for eligibility and 28 of them met the criteria, please refer to the Consort flow diagram (▶ **Fig 1**). After being informed verbal and in writing, they signed the consent form which was approved by the Clinical Research Ethics Committee at Istanbul University (IRB:2017/1190). This study has been registered at clinicaltrials.gov as clinical trial (NCT05546203).




▶ **Fig. 1** Design of the study (Consort flow diagram).

Sample size was determined using the Power and Sample Size Program. The minimal clinically important difference of visual analog scale (VAS) as 33.9 mm and the standard deviation of VAS as 24 mm [16], the 95 % confidence interval and 85 % power were used to calculate the sample size. Sample size was calculated as 10 for each group. The probability of falling from the study was considered, 14 patients were included in each group.

## Randomization and Blinding

After the baseline assessment, the participants were randomized to one of two intervention groups (ratio 1:1) using "Research Randomizer" an online randomization web service (https://www.randomizer.org/). Simple randomization procedures were performed, sequentially numbered index cards containing the random assignments were prepared by an investigator (a student in the faculty) with no clinical involvement in the study to ensure allocation concealment. The index cards were folded and placed in sealed opaque envelopes. The first physiotherapist opened each envelope and allocated the participants to the IC or LLLT group according to the selected index card, then performed all interventions. The evaluations were carried out by another physiotherapist who did not know which participants belonged to each group (assessor-blinded).

## Intervention

All participants received IC or LLLT treatments with the same standardized exercise program at the clinic (2 times a week), consisting of 12 sessions of approximately 50 min. Previously mentioned muscles of the patients were examined by physiotherapist and MTrPs were determined.

IC was applied over the detected MTrPs and the participant was asked to describe the pressure and pain she felt [17]. It was started with moderate tolerable pressure (7/10) and then severity was increased. The color of the thumb pulp was observed to control the pressure. The pressure was continued for 90 sec. The patient's pain sensation continued to be questioned and the pressure was controlled to a level at "comfortable pain" [6].

LLLT was applied for 90 sec at each MTrPs with a frequency of 2000 Hz (3 J) using a GaAs diode laser instrument (Roland Serie Elettronica Pagani, wavelength 904 nm, the frequency range of 5–7000 Hz and maximum peak power of 27, 50 or 2764 W) [14]. The laser probe was held perpendicular to the MTrPs in skin contact without pressure.

The standardized exercise program included stretching and pilates exercises for core stabilization. All exercises were supervised by the same physiotherapist whom certificated by The Australian Physiotherapy and Pilates Institute (APPI). Pilates exercises were selected from APPI's matwork exercises and performed in accord-

ance with APPI principles. Details of the exercises were presented in Appendix 1. In addition, patients performed stretching exercises for 5 days a week and pilates exercises for 3 days a week at home. They were advised to continue home exercises at least one year.

### Outcome measures

The primary (VAS and Pressure Pain Threshold (PPT)) and secondary outcomes measures (ROM, pelvic floor symptom severity, QoL, anxiety/depression and patient satisfaction) were obtained at baseline, at the end of treatment (6 weeks) and, follow up 1-year.

Pain intensity was assessed using the VAS, in which the patients were asked to indicate their perceived pain during rest, activity and at night (0–10 numeric pain rating scale, with 0 as no pain and 10 as worst imaginable pain) [18].

Handheld pressure algometer (Commander Algometer, J Tech Medical Industries, Midvale, Utah; maximum output = 111.6 N/cm$^2$) was used to measure PPT on the MTrPs determined by clinical examination. We asked the subjects to say "stop" as soon as a discernible sensation of pain was felt. When the subject lying on loose position, a 1-cm$^2$ algometer probe was placed perpendicularly on the MTrPs, and the pressure was increased gradually (1 lb/s). First painful threshold was recorded, mean value of two measurements, with 3 minutes interval, was used for analysis [19].

Lumbar spine active ROM from full extension to full flexion, and hip active ROM on flexion, extension and mediolateral rotation was measured [20] using a digital goniometer (Baseline Evaluation Instrument, Fabrication Enterprises, Inc.). Average of 3 repetitions was recorded for analysis.

The Pelvic Floor Bother Questionnaire (PFBQ) was used to identify the presence and degree of bother related to common pelvic floor problems. It had excellent test–retest reliability (0.998, $p < 0.0001$)[21].

Urogenital Distress Inventory (UDI-6) was used to assess urinary symptoms related QoL. It consists of 6 questions covering three domains: stress urinary incontinence, detrusor overactivity, bladder outlet obstruction. It had high internal consistency (Cronbach's alpha: 0.74) and test-retest reliability (Spearman's rho:0.99, $p < 0.001$)[22]. Additionally Short Form Health Survey-36 (SF-36) was used to assess the general QoL. It consists of 36 items, 8 subscales: physical and social functioning, role limitations due to physical health and emotional problems, emotional well-being, pain, energy-fatigue, general health status [23, 24]. It has recently been shown to be highly reliable (Cronbach alpha value of the subscales varied in the range 0.792–0.992) in chronic pain [25].

The Hospital Anxiety and Depression Scale (HADS) [26] was used to identify the anxiety disorders and depression among patients. It has anxiety and depression subscale, both containing seven items. It had high internal consistency (Cronbach's alpha coefficient: 0.8525 for anxiety subscale and 0.7784 for depression subscale) [27].

Patient Global Impression of Improvement (PGII) used to assess patient satisfaction. It consists of 7-point question (1 = very much better, 7 = very much worse) asking the patient's level of recovery after treatment. PGII have a significant correlation with incontinence episode frequency, stress pad test, and incontinence-related quality of life [28].

### Data analysis

The data were evaluated using the Statistical Package for the Social Sciences 21.0 program for Windows and by analyzing descriptive statistics (frequency, mean, and standard deviation). Before the statistical analysis, "The Kolmogorov-Simirnov Test" was used to assess the distribution of the data. Our data were found to be normally distributed and thus a parametric test was used. Statistical significance was set for all tests at $p < 0.05$. Baseline demographic data were compared between treatment groups using analysis of "The Independent Sample T Test" and the "Chi-square Test" to assess the adequacy of the randomization. Comparisons of score changes measuring improvements were carried out using the "Paired Sample T Test" with time (baseline to 6 weeks and baseline to 1-year follow-up) as the within-subject variable. The effects of treatment were analyzed using a 2-by-2 and 2-by-3 mixed-model repeated-measures ANOVA with treatment group (Groups 1–2) as the between-subject factor and time (baseline, after 6 weeks and 1-year follow-up) as the within-subject factor. A Chi-square test was used to analyze patient satisfaction. Effect sizes were determined dividing the changes in mean baseline and follow-up scores by the baseline standard deviation. The effect sizes of 0.2, 0.5, and 0.8 were considered small, moderate, and large, respectively [29].

## Results

Total of 28 patients were included in the study; 14 were randomized to per intervention groups; seven participants discontinued treatment; therefore, 21 patients were analyzed at the end of the treatment, please refer to the Consort flow diagram (▶ **Fig. 1**). The mean age and body mass index of patients in Group 1/Group 2 were 38.91(9.78)/33.7(9.03) years and 25.47(3.36)/24.1(2.72) kg/m$^2$, respectively. All baseline demographics, are presented in ▶ **Table 1**, were similar between groups ($p > 0.05$).

Following the 6 weeks of treatment, significant differences were observed within both group subject in pain (VAS, PPT), ROM, pelvic floor symptom severity (PFBQ), QoL (UDI-6, physical functioning, emotional wellbeing, pain and vitality subgroups) and anxiety-depression ($p < 0.05$). This significant improvement within both group subject in VAS, PFBQ, UDI-6, and pain subgroup of SF-36, continued after 1-year follow up ($p < 0.05$) (▶ **Tables 2,3**).

In comparison between groups, Group 1 have more significant improvement than Group 2 in terms of UDI-6 after 6 weeks of treatment ($p < 0,05$) (▶ **Tables 2,3**).

There were no significant differences between the groups in terms of patient satisfaction ($p > 0.05$). Overall, 7(63.6 %) in Group 1 and 4(40 %) in Group 2 reported "much better" or "very much better" improvement after 6 weeks and 5(46 %)/1(10 %) after 1-year follow up.

## Discussion

Our results indicated that providing either IC or LLLT in addition to exercise therapy presented benefits in terms of pain, ROM, symptom severity, QoL, anxiety-depression and patient satisfaction. Improvement in pain, symptom severity and symptom related QoL continued until 1-year follow up in both groups. Also, IC more effective in symptom related QoL parameters than LLLT.

▶ **Table 1** Baseline Demographics of Groups.

| | Group 1 (n = 11) | Group 2 (n = 10) | p[a] |
|---|---|---|---|
| | Mean ± SD | Mean ± SD | |
| **Age (year)** | 38.91 ± 9.78 | 33.7 ± 9.03 | 0.22 |
| **BMI (kg/m²)** | 25.47 ± 3.36 | 24.1 ± 2.72 | 0.32 |
| **Marital Status** | **n (%)** | **n (%)** | **p[b]** |
| Married | 10 (90.9) | 9 (90) | 0.94 |
| Single | 1 (9.1) | 1 (10) | |
| **Employment** | | | |
| Homemaker | 10 (90.9) | 7 (70) | 0.22 |
| Employed | 1 (9.1) | 3 (30) | |
| **Menopause** | | | |
| No | 8 (72.7) | 9 (90) | 0.31 |
| Yes | 3 (27.3) | 1 (10) | |
| **Number of deliveries** | | | |
| None | 3 (27.3) | 3 (30) | 0.73 |
| One | 1 (9.1) | 2 (20) | |
| Two and more | 7 (63.6) | 5 (50) | |
| **Misscary-abortion** | | | |
| None | 7 (63.6) | 6 (60) | 0.36 |
| One | 1 (9.1) | 3 (30) | |
| Two and more | 3 (27.3) | 1 (10) | |
| **Abdominal surgeries** | | | |
| None | 8 (72.7) | 8 (80) | 0.86 |
| One | 1 (9.1) | 1 (10) | |
| Two and more | 2 (18.2) | 1 (10) | |

Abbreviations: BMI, Body Mass Index; SD, Standard Deviation, **p[a]**,Independent Sample T Test; **p[b]**, Chi Square Test.

Pain was our primary outcome measurement parameter, which was mainly responsible for the negative impact of quality of life and psychological status. In this study, both IC and LLLT methods showed a good effect on pain after treatment consistently with previous studies [6, 11, 30] in literature. Additionally, we analyzed the 1-year effect and this improvement in pain was continued to 1-year.

Montenegro et al. administered IC on the MTrPs during one weekly session for four weeks in 30 women with CPP [10]. Although a considerable improvement of PPT was observed immediately after the IC, this improvement was not maintained until 12 weeks follow-up. In the literature, LLLT is used for various musculoskeletal problems, but not the pelvic region. Manca et al. applied LLLT for 2 weeks on MTrPs in the upper trapeze and reported a significant improvement in PPT after 2 weeks and 12 weeks [31]. Hakgüder et al. applied LLLT with stretching exercises to the neck/upper back muscles for 10 consecutive days, reported effect on the PPT after 3 weeks [30]. At our study both IC and LLLT showed a significant improvement in PPT at 6th week.

MTrPs on the pelvic floor and abdominal wall may cause bladder symptoms and pelvic floor dysfunction by the mechanism of referred pain [7]. By applying manual therapy to these MTrPs, significant improvement was observed in urgency-frequency and sexual function scale scores in various studies [8, 9]. At another study, by the IC of internal pelvic floor muscles, recovery was seen in severity of urgency, frequency problems, and interstitial cystitis [7]. Similarly, in this study there was an improvement in pelvic floor symptom severity in both groups.

At previous studies, 10 sessions of LLLT were found effective in improving the QoL in myofascial pain syndrome [30], manual therapy that applied to women with interstitial cystitis and painful bladder syndrome showed improvement in physical and mental health [9]. In this study, there were improvements in symptoms related QoL, physical health, mental health, pain, and vitality parameters of QoL scale. Additioally, improvement in symptoms related QoL continued up to 1-year. This long-term effect may be due to the core stabilization exercises that provide coactivation of the pelvic floor muscles [32].

In a study HADS used to evaluate only the initial status of patients [10]. We used the same scale; at the end of our treatment, anxiety and depression values were improved as secondary to recovery in pain and pelvic floor symptom severity. Depression level improved in a study performed with LLLT [12] like us. Anxiety and depression evaluations were not given much attention in MTrPs research. We consider that the level of anxiety and depression are a part of recovery therefore to assess it is necessary. Another important indicator of recovery is also patient satisfaction. It has even been included in some studies as a primary outcome measure [8, 9]. Studies on patients with urological CPP [8], interstitial cystitis and painful bladder syndrome receiving myofascial manual physiotherapy [9], and patients with myofascial pelvic pain receiving self-myofascial release combined with biofeedback and electrical stimulation [33] showed high satisfaction rate. Likewise, this study showed high satisfaction rate in both groups.

There were some limitations in our study. The fact that we received patients from only one institution, affects the generalizability of the results. It was intended to be a pilot for a future study, so its sample size is relatively small, which might lead to Type II errors; therefore, its findings should be interpreted with caution. In this study, adherence with home exercise could not be evaluated with a tool. Different results can be obtained by evaluating compliance with home exercise with a reliable method.

To our knowledge, this study differs between the MTrPs studies in the literature in terms of comparing a phototherapy with a manual method. In the future, studies that perform various MTrPs therapy with a higher number of patients with CPP create more evidence and contribute to a consensus.

As a conclusion, it appears to be beneficial to adding a MTrPs therapy combined with exercise to the treatment of CPP patients. Both IC and LLLT methods have shown efficacy and can be used safely in CPP patients. Because it is more effective on symptom related QoL, the IC method may be preferred for primary use.

▶ **Table 2** Comparison of Pain and Range of Motion within group and between groups.

| Assessment | Group | Baseline | After 6 weeks | | Efect Size | Paired Sample T Test | ANOVA 2×2 | 1 year follow up | | Efect Size | Paired Sample T Test | ANOVA 2×3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Visual Analog Scale (VAS)** | | **Mean ± SD** | **Mean ± SD** | **Within-group score change Mean ± SD** | | ***p* whitin group** | ***p* between group** | **Mean ± SD** | **Within-group score change Mean ± SD** | | ***P* whitin group** | ***P* between group** |
| **VAS-rest** | Group 1 | 5.45 ± 2.15 | 3.09 ± 1.75 | 2.36 ± 1.12 | 1.09 | **0.001** | 0.59 | 2.64 ± 2.11 | 2.81 ± 2.71 | 1.30 | **0.006** | 0.36 |
| | Group 2 | 5.2 ± 1.47 | 4.1 ± 1.1 | 1.1 ± 0.73 | 0.74 | **0.001** | | 3.80 ± 1.93 | 1.4 ± 1.34 | 0.95 | **0.01** | |
| **VAS-activity** | Group 1 | 7.18 ± 2.27 | 5.0 ± 2.19 | 2.18 ± 1.25 | 0.96 | **0.001** | 0.15 | 4.36 ± 2.15 | 2.81 ± 1.99 | 1.23 | **0.001** | 0.09 |
| | Group 2 | 8.2 ± 1.47 | 6.3 ± 1.16 | 1.9 ± .99 | 1.29 | **0.001** | | 6.00 ± 1.76 | 2.20 ± 0.91 | 1.49 | **0.001** | |
| **VAS-night** | Group 1 | 3.36 ± 2.5 | 1.45 ± 1.63 | 1.9 ± 1.3 | 0.76 | **0.001** | 0.38 | 1.55 ± 1.57 | 1.81 ± 2.35 | 0.72 | **0.02** | 0.38 |
| | Group 2 | 3.1 ± 1.52 | 2.6 ± 1.26 | 0.5 ± 0.7 | 0.32 | 0.05 | | 2.40 ± 1.0 | 0.70 ± 1.56 | 0.46 | 0.19 | |
| **Pressure Pain Treshold (PPT)** | | | | | | | | | | | | |
| **Rektus Abdominus -R** | Group 1 | 3.0 ± 1.17 | 5.3 ± 3.46 | 2.24 ± 3.05 | 1.91 | **0.03** | **0.01** | 3.2 ± 0.95 | 0.13 ± 1.69 | 0.11 | 0.79 | **0.006** |
| | Group 2 | 2.0 ± 0.8 | 2.48 ± 0.86 | 0.48 ± 1.1 | 0.6 | 0.21 | | 2.42 ± 0.64 | 0.42 ± 0.55 | 0.51 | 0.04 | |
| **Rektus Abdominus-L** | Group 1 | 3.24 ± 1.02 | 5.64 ± 4.15 | 2.4 ± 4.26 | 2.35 | 0.09 | **0.01** | 3.83 ± 2.77 | 0.59 ± 3.32 | 0.57 | 0.93 | **0.01** |
| | Group 2 | 2.23 ± 0.81 | 2.76 ± 1.15 | 0.53 ± 1.25 | 0.65 | 0.21 | | 2.48 ± 0.7 | 0.25 ± 0.77 | 0.30 | 0.37 | |
| **Quadratus Lumborum-R** | Group 1 | 3.02 ± 0.66 | 7.03 ± 4.13 | 4.01 ± 3.95 | 6.07 | **0.02** | 0.006 | 6.65 ± 4.45 | 3.6 ± 4.33 | 5.45 | 0.05 | **0.004** |
| | Group 2 | 1.87 ± 0.5 | 3.05 ± 0.62 | 1.17 ± 0.24 | 2.34 | **0.001** | | 2.35 ± 0.55 | 0.47 ± 0.26 | 0.94 | 0.001 | |
| **Quadratus Lumborum-L** | Group 1 | 2.9 ± 0.92 | 5.5 ± 3.71 | 2.6 ± 3.79 | 2.82 | **0.03** | **0.03** | 4.6 ± 2.96 | 1.7 ± 2.95 | 1.27 | 0.12 | **0.01** |
| | Group 2 | 1.97 ± 0.45 | 2.8 ± 0.83 | 0.82 ± 0.64 | 1.82 | **0.02** | | 2.37 ± 0.55 | 0.4 ± 0.36 | 0.88 | 0.02 | |
| **Gluteus Maksimus-R** | Group 1 | 2.7 ± 0.88 | 4.72 ± 3.31 | 2.16 ± 2.93 | 2.45 | **0.02** | 0.23 | 6.11 ± 4.61 | 3.41 ± 4.29 | 3.87 | 0.1 | 0.09 |
| | Group 2 | 2.14 ± 0.72 | 3.25 ± 0.6 | 1.11 ± 0.39 | 1.54 | **0.01** | | 2.6 ± 0.81 | 0.45 ± 0.49 | 0.62 | 0.52 | |
| **Gluteus Maksimus- L** | Group 1 | 2.5 ± 0.6 | 4.71 ± 3.65 | 2.21 ± 3.86 | 3.68 | **0.04** | 0.2 | 6.03 ± 4.68 | 3.53 ± 4.87 | 5.8 | 0.13 | 0.09 |
| | Group 2 | 2.05 ± 0.66 | 3.2 ± 0.84 | 1.14 ± 0.59 | 1.72 | **0.01** | | 2.64 ± 0.95 | 0.58 ± 0.43 | 0.87 | 0.01 | |
| **Range of Motion** | | | | | | | | | | | | |
| **Lumbal spine flexion** | Group 1 | 78.81 ± 7.69 | 79.45 ± 8.05 | 0.63 ± 0.8 | 0.08 | **0.03** | 0.82 | 79.0 ± 7.83 | 0.18 ± 0.4 | 0.02 | 0.16 | 0.81 |
| | Group 2 | 79.6 ± 7.53 | 80.2 ± 7.68 | 0.6 ± 0.96 | 0.07 | 0.09 | | 79.9 ± 7.56 | 0.3 ± 0.67 | 0.03 | 0.19 | |
| **Lumbal spine extention** | Group 1 | 18.36 ± 5.12 | 20.09 ± 4.92 | 1.72 ± 0.78 | 0.33 | **0.001** | 0.68 | 19.45 ± 4.84 | 1.09 ± 0.94 | 0.21 | **0.003** | 0.66 |
| | Group 2 | 18.2 ± 4.84 | 18.5 ± 4.74 | 0.3 ± 0.48 | 0.06 | 0.09 | | 18.4 ± 4.81 | 0.2 ± 0.42 | 0.04 | 0.16 | |
| **Hip flexion-R** | Group 1 | 108.36 ± 8.38 | 108.72 ± 8.25 | 0.36 ± 0.5 | 0.04 | **0.04** | 0.61 | 108.45 ± 8.46 | 0.45 ± 0.68 | 0.05 | 0.34 | 0.62 |
| | Group 2 | 106.5 ± 8.07 | 106.9 ± 8.13 | 0.4 ± 0.51 | 0.04 | **0.04** | | 106.8 ± 8.14 | 0.7 ± 0.48 | 0.08 | 0.08 | |
| **Hip flexion-L** | Group 1 | 108.36 ± 8.6 | 108.72 ± 8.48 | 0.36 ± 0.5 | 0.04 | **0.04** | 0.61 | 108.81 ± 8.45 | 0.09 ± 0.3 | 0.01 | 0.05 | 0.62 |
| | Group 2 | 106.4 ± 8.16 | 107.0 ± 7.91 | 0.6 ± 0.51 | 0.07 | **0.01** | | 107.1 ± 7.89 | 0.3 ± 0.48 | 0.03 | **0.001** | |

Abbreviations:R, Right; L,Left; SD, Standard Deviation.

▶ **Table 3** Comparison of Pelvic Floor Function, Anxiety, Depression and Quality of Life within the group and between groups.

| Assessment | Group | Baseline | After 6 weeks | | Efect Size | Paired Sample T Test | ANOVA 2×2 | 1 year follow up | | Efect Size | Paired Sample T Test | ANOVA 2×3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean ± SD | Mean ± SD | Within-group score change Mean ± SD | | *p* whitin group | *p* between group | Mean ± SD | Within-group score change Mean ± SD | | *P* whitin group | *P* between group |
| **PFBQ** | Group 1 | 35.3 ± 21.95 | 25.2 ± 17.72 | 10.09 ± 6.21 | 0.45 | **0.001** | 0.09 | 26.2 ± 14.24 | 9.09 ± 13.37 | 0.41 | **0.04** | 0.08 |
| | Group 2 | 21.96 ± 7.29 | 15.5 ± 5.41 | 6.46 ± 2.67 | 0.88 | **0.001** | | 17.92 ± 6.83 | 4.04 ± 2.15 | 0.55 | **0.00** | |
| **UDI-6** | Group 1 | 28.74 ± 11.25 | 16.25 ± 6.58 | 12.49 ± 5.89 | 1.11 | **0.001** | **0.004** | 18.14 ± 9.9 | 10.6 ± 8.2 | 0.94 | **0.002** | **0.007** |
| | Group 2 | 14.98 ± 5.96 | 9.14 ± 4.72 | 5.84 ± 2.16 | 0.97 | **0.001** | | 11.22 ± 4.83 | 3.76 ± 3.06 | 0.63 | **0.004** | |
| **Short Form 36** | | | | | | | | | | | | |
| **Physical functioning** | Group 1 | 64.54 ± 24.43 | 74.54 ± 17.09 | 10.0 ± 11.83 | 0.40 | **0.02** | 0.64 | 64.09 ± 23.11 | 0.45 ± 25.24 | 0.01 | 0.95 | 0.8 |
| | Group 2 | 65.5 ± 12.34 | 73.5 ± 8.18 | 8.0 ± 7.14 | 0.64 | **0.01** | | 69.0 ± 11.0 | 3.5 ± 12.25 | 0.28 | 0.39 | |
| **Physical role limitations** | Group 1 | 20.45 ± 29.19 | 38.63 ± 34.21 | 18.18 ± 25.22 | 0.62 | **0.04** | 0.54 | 50.45 ± 41.56 | 30.0 ± 47.16 | 1.02 | 0.61 | 0.29 |
| | Group 2 | 20.0 ± 32.91 | 22.5 ± 32.16 | 2.5 ± 7.9 | 0.07 | 0.34 | | 27.0 ± 26.26 | 7.0 ± 19.03 | 0.21 | 0.27 | |
| **Bodily Pain** | Group 1 | 32.5 ± 20.4 | 57.63 ± 17.07 | 25.13 ± 14.2 | 1.23 | **0.001** | 0.48 | 56.81 ± 25.59 | 24.31 ± 20.0 | 1.19 | **0.02** | 0.42 |
| | Group 2 | 34.5 ± 16.32 | 45.0 ± 18.55 | 10.5 ± 7.52 | 0.64 | **0.001** | | 47.5 ± 23.00 | 13.0 ± 16.19 | 0.79 | **0.03** | |
| **Social functioning** | Group 1 | 54.54 ± 26.96 | 60.9 ± 25.67 | 6.36 ± 9.44 | 0.23 | 0.05 | 0.98 | 60.0 ± 29.77 | 5.45 ± 14.82 | 0.2 | 0.25 | 0.94 |
| | Group 2 | 55.0 ± 14.67 | 60.0 ± 16.45 | 5.0 ± 8.74 | 0.34 | 0.1 | | 58.5 ± 13.95 | 3.5 ± 9.36 | 0.23 | 0.26 | |
| **Emotional wellbeing** | Group 1 | 44.54 ± 11.73 | 52.18 ± 13.57 | 7.63 ± 8.28 | 0.07 | **0.01** | 0.22 | 52.81 ± 15.07 | 8.27 ± 15.55 | 0.01 | 0.1 | 0.29 |
| | Group 2 | 53.6 ± 14.5 | 57.6 ± 14.87 | 4.0 ± 3.77 | 0.27 | **0.01** | | 56.3 ± 14.1 | 2.7 ± 5.31 | 0.18 | 0.14 | |
| **Emotional role limitations** | Group 1 | 42.39 ± 36.76 | 54.5 ± 34.22 | 12.11 ± 22.46 | 0.32 | 0.1 | 0.83 | 55.91 ± 36.57 | 13.52 ± 34.6 | 0.36 | 0.22 | 0.68 |
| | Group 2 | 49.99 ± 36.0 | 40.99 ± 33.26 | 9.0 ± 28.46 | 0.25 | 0.34 | | 45.0 ± 29.62 | 4.99 ± 32.6 | 0.13 | 0.64 | |
| **Vitality** | Group 1 | 41.36 ± 17.76 | 52.72 ± 14.55 | 11.36 ± 5.95 | 0.63 | **0.001** | 0.87 | 50.9 ± 14.8 | 9.54 ± 19.93 | 0.53 | 0.14 | 0.94 |
| | Group 2 | 45.25 ± 19.09 | 51.25 ± 18.97 | 6.0 ± 5.67 | 0.31 | **0.01** | | 50.25 ± 18.27 | 5.0 ± 5.27 | 0.26 | **0.01** | |
| **General health** | Group 1 | 35.45 ± 17.95 | 37.27 ± 18.75 | 1.81 ± 3.37 | 0.1 | 0.1 | 0.8 | 39.81 ± 13.31 | 4.36 ± 19.6 | 0.24 | 0.47 | 0.76 |
| | Group 2 | 38.0 ± 17.02 | 38.5 ± 16.67 | 0.5 ± 1.58 | 0.02 | 0.34 | | 42.0 ± 17.82 | 4.0 ± 11.49 | 0.23 | 0.3 | |
| **Anxiety** | Group 1 | 9.9 ± 3.2 | 7.45 ± 2.94 | 2.45 ± 2.06 | 0.76 | **0.001** | 0.81 | 9.09 ± 2.94 | 0.81 ± 3.57 | 0.25 | 0.46 | 0.59 |
| | Group 2 | 9.5 ± 1.5 | 7.4 ± 0.84 | 2.1 ± 0.87 | 1.4 | **0.001** | | 8.2 ± 1.31 | 1.3 ± .82 | 0.86 | **0.001** | |
| **Depression** | Group 1 | 7.72 ± 3.84 | 5.54 ± 3.44 | 2.18 ± 1.72 | 0.56 | **0.001** | 0.60 | 7.27 ± 3.58 | 0.45 ± 3.32 | 0.11 | 0.66 | 0.42 |
| | Group 2 | 6.4 ± 2.45 | 5.5 ± 1.71 | 0.9 ± 0.87 | 0.36 | **0.01** | | 5.8 ± 1.98 | 0.6 ± 0.69 | 0.24 | **0.02** | |

Abbreviations: UDI-6. Urogenital Distress Inventory-6; PFBQ. Pelvic Floor Bother Questionnaire; SD: Standard Deviation.

## Conflicts of Interest

The authors have no conflicts of interest and no financial support to report.

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