

## FSD SEXUAL DYSFUNCTION

# To Compare the Effects of two Pelvic Floor Muscle Treatments on Quality of Life and Sexual Function in Female Patients With Urinary Incontinence



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## ABSTRACT

**Background:** Adjuncts used clinically to improve the efficacy of Pelvic floor muscle training (PFMT) include electromyographic biofeedback (EB) and electrical stimulation (ES).

**Aim:** The purpose of this study was to investigate the effects of PFMT on patients' quality of life and sexual function in UI treatment. Different PFMT with different EB + ES treatments were designed in this study. In order to distinguish between 10 minutes of electrical stimulation at the beginning of PFMT treatment to fully arouse the patient's body response and then Kegel training, or one electric stimulation and a Kegel action, which is better. For this purpose, we designed two different treatment groups: 10ES-20EB and 15ES-15EB. Whether changing pelvic floor treatment regimen can better improve quality of life and sexual function in female patients with urinary incontinence?

**Methods:** Patients diagnosed urinary incontinence (UI) were from January 2020 to April 2021 at our Hospital, Jiangsu Province.

**Outcome:** Primary outcome including I-QOL and PISQ-12, and secondary outcome including measurements of pelvic floor musculature by glazer method were compared before and after treatment in both groups.

**Results:** 78 patients were enrolled including 37 cases in 10ES-20EB group and 41 in 15ES-15EB group. Both groups made similar gains in quality of life and sexual function. There was no statistical difference between the two groups in Glazer total score and I-QOL and PISQ-12 questionnaire results. However, 15ES-15EB significantly improved the flick contractions average peak more than the 10ES-20EB group ( $P < 0.05$ ).

**Clinical Implications:** Pelvic floor muscle training is a commonly recommended physical therapy treatment that has been shown to improve the outcome of UI, Comparison of the main observation indicators I-QOL and PISQ-12 before and after treatment between the two groups have good clinical significance

**Strengths and Limitations:** The sample is single, the sample size is small, and the participating patients are all from the same hospital.

**Conclusions:** These two different pelvic floor muscle treatment (10ES-20EB and 15ES-15EB) were examined and found to may improve the quality of life and sexual function of women with UI. **Wang Y, Chen W, Li W. To Compare the Effects of two Pelvic Floor Muscle Treatments on Quality of Life and Sexual Function in Female Patients With Urinary Incontinence. Sex Med 2022;10:100561.**

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**Keywords:** Urinary Incontinence; Pelvic Floor Muscle Treatments; Electromyographic biofeedback (EB); Electrical Stimulation (ES); Quality of Life; Sexual Function

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## INTRODUCTION

Women are twice as likely to suffer from UI than men, with reported prevalence rates ranging between 25% and 45%, depending on the population and study design.<sup>1,2</sup> The development of UI in women is typically related to pregnancy, childbirth, menopause, or old age.<sup>3</sup> This condition can have serious

effects on the patient's quality of life and can alter their private, social and professional lifestyle.<sup>4</sup> In a study conducted by Dutkiewicz and Kapusta<sup>5</sup> on a group of 60 women, 91.7% of the participants reported a change in lifestyle and a decrease in social contacts, while 65% reported feelings of shame related to their condition.

Sexual function problems in women with urination Female UI patients with abnormal sexual function are common and may be related to anatomical abnormalities, as well as psychological and emotional factors. Women with UI often leak urine and smell during sex. Some female UI patients have recurrent vaginitis and cystitis, vaginitis dryness and atrophy, as well as dyspareunia and pain during sexual intercourse. Such symptoms have been associated with a decrease in the frequency of coitus and sexual quietus, in almost 50% of women with UI.<sup>6</sup> Another explanation is that urine overflow may affect the pH of the normally acidic vagina, disrupt the normal flora, cause vaginal dryness and vaginal lubrication dysfunction, and cause dyspareunia and pain.<sup>7</sup>

Managing UI starts with behavioral changes that include bladder training and timed voiding, as well as lifestyle changes such as weight loss, increased activity, smoking cessation and limiting alcohol and caffeine intake.<sup>8</sup> Smoking cessation can relieve symptoms in patients with frequent urination. Nicotine, as a stimulant, is considered a risk factor for urgency urinary incontinence (UUI). For overweight or obese UI women, weight loss can make a big difference in improving symptoms and related troubles.<sup>9</sup> The study showed that those who participated in the weight-loss program lost at least 3 to 5 percent of their body weight, reduced their stress incontinence episodes by 47 percent, and reduced their urge incontinence episodes.<sup>10</sup>

Although medication and surgery are treatment options for patients with UI, typically the first-line therapy for UI is pelvic floor muscle training (PFMT)<sup>11,12</sup> with or without adjuncts like electromyographic biofeedback (EB) or electrical stimulation (ES).<sup>13</sup> PFMT is a commonly recommended physical therapy treatment that has been shown to improve the outcome of UI.<sup>14</sup> PFMT increases the contractility of the pelvic floor muscles and the strength, coordination, speed and endurance to maintain the pelvic floor muscles, keep the bladder elevated when the intra-abdominal pressure rises, keep the urethra closed adequately, and support and stabilize the pelvic organ.<sup>15</sup> Electromyographic biofeedback uses a vaginal probe to capture the electrical activity of the pelvic floor muscles, which is displayed on a screen. Used in tandem with PFMT, electromyographic biofeedback aims to facilitate teaching of the correct contraction technique and home exercise programs.<sup>16</sup> Additionally, biofeedback allows women to visualize the activity of their pelvic floor muscles while exercising, potentially motivating them, and enhancing adherence to the prescribed exercises. Electromyographic biofeedback has become an increasingly popular method of UI treatment, at the same time teaching women self-awareness of their bodies and the physiological processes taking place in them. Pelvic floor ES is one of

the first-line conservative treatments for female urinary incontinence.<sup>17,18</sup> Electrical stimulation prior to biofeedback can elicit the patient's proprioceptive response.<sup>19</sup> Terlikowski et al.<sup>20</sup> proposed the use of transvaginal electrostimulation with biofeedback for the treatment of UI, creating a safe method that should be carried out on a daily basis for 3–6 months to maintain improved PFM strength. Herein, we examine two different PMFT protocols with utilize at ES and EB in UI treatment and show their effect on pelvic floor muscle performance, quality of life and sexual function. During PFMT, there was no equipment for EMG examination and this examination was not performed.

## MATERIALS AND METHODS

### Study Design and Subjects

This study was a retrospective analysis of 78 female outpatients from January 2020 to April 2021 at the Pelvic Floor Treatment Center of our Hospital. All participants with the following criteria were excluded from this study: (1) vaginal bleeding (uncleanness of lochia postpartum or menstruation), (2) synchronous pacemaker, (3) vaginal stenosis (such as severe vaginal scar, vaginal atrophy), (4) recent pelvic floor surgery (within one month), (5) pelvic and abdominal malignancy, and (6) nervous system diseases that prevent patients from actively cooperating with the treatment. This study was approved by the Ethics Committee of our Hospital (No. 2021-007).

The primary outcome measures of this study included I-QOL and PISQ-12, and the secondary outcome measures included glazer method for measuring pelvic floor muscle. According to the I-QOL scale, a parallel controlled clinical trial design was adopted, which was divided into the 10ES-20EB group and the 15ES-15EB group. It is assumed that the probability of class I error in this study  $\alpha=0.05$  and the degree of certainty  $(1-\beta)=90\%$ , and the two groups of samples are not equal. In this study, it is planned to include  $n=37$  in the 10ES-20EB group and  $n=41$  in the 15ES-15EB group.

### Diagnosis of UI

All patients are clinically classified into the three types of UI based on their symptoms by an experienced physician. IUGA/ICS defines the three main types of UI in women as: stress urinary incontinence (SUI), urgency urinary incontinence (UUI), and mixed urinary incontinence (MUI). SUI is defined as the involuntary loss of urine during sneezing, coughing, or other types of physical effort<sup>21</sup> UUI is characterized by an involuntary loss of urine related with urgent conditions; MUI is the mixture of stress and urge UI.<sup>22</sup>

Participants were patients with degree 1 to 2 UI as measured by the Ingelman-Sundberg scale. Degree 1: Incontinence occurs when coughing and sneezing and does not require the use of a pad; Degree 2: urinary incontinence occurs when running, jumping, walking and other daily activities, requiring the use of

urinary pads; Degree 3: urinary incontinence occurs when slight activity or recumbent position changes.<sup>23</sup>

Lack or insufficiency of pelvic floor muscle function is the main cause of SUI.<sup>24</sup> UUI is caused by overactivity of the bladder detrusor muscle, which affects the proper storage of urine. The underlying cause is multifactorial, including abnormal bladder receptors, peripheral and central innervation, pelvic floor muscles, and behavioral factors.<sup>25</sup> Biofeedback can increase the patient's perception of pelvic floor muscle contraction and correct correct muscle contraction pattern.) The American Urological Association (AUA) recommends that lifestyle changes in patients with UUI, combined with pelvic floor muscle training (PFMT), be the first-line treatment for UUI.<sup>26</sup>

### Typical Hospital ES and EB Assisted Sessions

All participants were randomly assigned to one of two different treatment regimens. The treatment of the participants was determined by the treating physician, who was the same person who diagnosed them. Each participant went through 10 30-minute physician-directed sessions in the hospital and sessions were separated by at least 48 hours. Participants were educated on the female pelvic floor anatomy and the pathogenesis of urinary incontinence prior to treatment.

Therapeutic apparatus brand model: PHENIX USB4; Manufacture: ELECTRONIC CONCEPT LIGNON INNOVATION; Place of origin: France. In the treatment menu of the therapeutic instrument, there are treatment modes suitable for various pelvic floor dysfunction diseases, which are selected by the therapist according to the diagnosis and condition of the patient. Pelvic floor ES and EB were performed in every session with an intra-vaginal electrode. All patients were grouped into 10ES-20EB and 15ES-15EB respectively according to the different protocols they received.

Protocol with 10 min ES plus 20 min EB (name as 10ES-20EB): Patients who were treated with electrical stimulation for 10 minutes to fully arouse the proprioceptive response of the pelvic floor muscles. According to the instructions of the therapeutic instrument, electrical stimulation was performed on type I muscle with the frequency of 8-33Hz and pulse width of 320-740 $\mu$ s, and on Type II muscle with frequency of 20-80Hz and pulse width of 20-320 $\mu$ s. The current waveform is a two-phase rectangular wave and the current is an alternating current. Specific stimulation range is based on whether the patient feels the pelvic floor muscles have a tightening sense, and within the patient's maximum tolerance value and biofeedback treatment of type I and type II muscles on the pelvic floor was performed in the remaining 20 minutes. Type I and type II muscles were exercised for 10 minutes each. In this study, the frequency and pulse width of the current used to treat type I and type II muscles were adjusted according to the parameters set by the device. In the future, how to select the frequency and pulse width of the current and the related principles will be further studied.

Protocol with 15 min ES, low frequency, and high pulse width (name as 15ES-15EB): Patients who received electrical stimulation before each biofeedback, also to evoke the body response of the patient's muscles. The frequency of electrical stimulation for type I muscles and type II muscles was the same as 10ES-20EB. Type I and type II muscles work for 15 minutes each.

### Conventional Family Training and Bladder Training

Each participant was assigned home workouts, with a total of 150 Kegel workouts done at home each day in 2-3 sessions. In general, participants are advised to train the two muscle types equally. If the biofeedback results indicate that a muscle type is weak, they tend to increase the training of that muscle type. Before each visit, the doctors were briefed on the participants' family training. Each time participants came for treatment, the treating physician asked participants about their training at home, and pelvic floor muscle strength assessments were performed at the beginning and end of treatment to assess changes in muscle strength. After the treatment, the deficiencies were pointed out according to the biofeedback graph of the participants, and the content of family training was adjusted. Because Chinese patients do not have the habit of keeping training diaries, and patients in this age group have limited education, they do not keep training diaries. Moreover, Chinese women in this age group not only have to do social work but also do most of the housework, leaving little time for Kegel's training, so the results of family training are mostly not satisfactory to the therapists.

Bladder training is used to correct urination habits. bladder training may be a more effective way of dealing with the symptoms of frequency and nocturia than any of these therapies alone. In order to fully understand the therapeutic effect of PFMT on UI, none of the enrolled patients received drug therapy. Patients were advised to limit caffeine intake as it may diminish the symptoms of urgency and frequency.<sup>27</sup>

### Data Collection and Definition

The following baseline characteristics were collected and analyzed: diagnosis, BMI, age, education level, spouse's education level, marital length, job nature, family monthly income, living environment, menarche, menstrual cycle, menstrual period, mother or sister's history of urinary incontinence, history of surgery, history of vaginal delivery.

Data of Quality of Life Questionnaire (I-QOL)<sup>28</sup> and Urinary Incontinence Sexual Function Questionnaire (PISQ-12) were collected. There were 22 I-QOL questions and 12 PISQ-12 questions, which were scored according to the participants' chief complaints. In addition to the I-QOL total score, the subscales were assessed in the areas of restricted behavior, psychosocial impact and social embarrassment. In addition, PISQ-12 has three domains: behavior, emotion, and partner-related. All questionnaires and personal information were kept strictly

confidential, and the participants' answers were used only to inform the doctor of key questions about the participants' sex life.<sup>29</sup> These two scales were completed by the treating physician. The treatment duration is generally 22 days. If the patient has menstruation during the treatment period, the treatment needs to be suspended, and the total treatment time will be extended.

Each participant was evaluated for pelvic floor muscle strength by Glazer assessment<sup>30</sup> before treatment and again after treatment to understand changes in pelvic floor muscle strength. Improvements in quality of life and sexual function in UI patients are associated with improvements in pelvic floor muscle strength. Glazer can objectively reflect changes in pelvic floor muscle strength. The Glazer score objectively reflected the status of the pelvic floor muscles of the participants.

## Statistical Analysis

Continuous variables were reported as the mean  $\pm$  standard deviation (SD). Comparisons between groups were performed using t-test for continuous variables and the chi-square test for categorical variables. Confidence interval which was 95% and  $p < 0.05$  were considered significant. Statistical analyses were performed using SPSS software (Statistical Package for Social Sciences) version 21.0.

## RESULTS

There was no significant difference between the 10ES-20EB and the 15ES-15EB groups in baseline characteristics, such as body mass index (BMI), age, the number of vaginal deliveries, type of UI diagnosis, and cultural background. However, there was a statistically significant difference between the two groups for living environments, history of UI in the mother or sister, menopause, and the nature of work (Table 1).

In this study, the initial values of each dependent variable did not differ statistically between groups. There was no significant difference between the 10ES-20EB group and the 15ES-15EB group in the three domains of limited behavior, psychosocial impact and social embarrassment in I-QOL scale before treatment (Table 2). According to I-QOL score of 10ES-20EB group before and after treatment, the quality of life of patients was improved ( $P < .05$ ). In the 10ES-20EB group, there were improvements in the three domains of limited behavior, psychosocial impact and social embarrassment ( $P < .05$ ) (Table 4). In the 15ES-15EB group, changes in I-QOL score before and after treatment also showed improvement in patient's quality of life ( $P < .05$ ), and improvement in the three domains of behavioral restriction, psychosocial impact and social embarrassment ( $P < .05$ ) (Table 5). The mean I-QOL scores of patients in the two groups showed no significant difference in the treatment results ( $13.54 \pm 11.29$  vs.  $15.66 \pm 11.09$ ,  $P = .406$ ), and no significant difference in the treatment results in the three domains of behavioral restriction, social psychological impact and social embarrassment between the two groups (Table 6).

There were participants who denied sexual history in both groups. According to statistics, 34 people in the 10ES-20EB group and 37 people in the 15ES-15EB group participated in filling in the PISQ-12 scale. There was no significant difference between the 10ES-20EB group and the 15ES-15EB group in emotion, behavior and partner relationship in PISQ-12 scale before treatment (Table 3). The total score of PISQ-12 scale showed that the sexual life quality of the 10ES-20EB group was improved ( $P < .05$ ) (Table 7), and the emotion and behavior were significantly improved ( $P < .05$ ), with statistically significant differences. But there was no significant improvement in partner relationship ( $P = .05$ ) (Table 7). According to the total score of PISQ-12 scale, the sexual life quality of the 15ES-15EB group was improved, including significant improvement in emotion and behavior ( $P < .05$ ), and the differences were statistically significant. But there was no significant improvement in partner relationship ( $P = .05$ ) (Table 8). There was no significant difference in the mean difference of the scores of the two groups for PISQ-12 ( $3.38 \pm 2.34$  vs.  $2.92 \pm 3.22$ ,  $P = .493$ ) for groups 10ES-20EB and 15ES-15EB. Respectively, there was no statistical significance in the effect of PISQ-12 on emotion, behavior and partner relationship in 10ES-20EB group and 15ES-15EB group (Table 9).

There was no statistically significant difference between the effect of the two protocols on the mean difference of the total glazer scores ( $7.83 \pm 7.54$  vs.  $9.18 \pm 9.66$ ,  $P = .5$ ) (Table 10). All measured parameters in the Glazer evaluation had no significant difference between the two groups, except for the flick contractions average peak which was significantly improved by the 15ES-15EB group over the 10ES-20EB group ( $1.18 \pm 10.96 \mu V$  vs.  $6.69 \pm 11.57 \mu V$ ,  $P = 0.03$ ).

## DISCUSSION

It is well documented that lifestyle and intimacy are markedly affected by UI. Both groups reported significant improvement in quality of life and sexual function through the I-QOL and PISQ-12 questionnaires. The Glazer method was used to measure pelvic floor muscular performance in type I and II muscles. Patients in both groups saw significant improvement in pelvic muscle performance for tonic contractions and endurance, however only the 15ES-15EB group showed an improvement in flick contractions.

Increased pelvic floor muscle strength supports the urethra, prevents urinary leakage during physical activity<sup>31</sup> and may also inhibit detrusor contraction during urgent urinary incontinence.<sup>32</sup> Evidence suggests that daily pelvic floor muscle training for 3 months is safe and effective, with an estimated improvement in symptoms in 40-60% of women with urinary incontinence.<sup>33</sup> Pelvic floor muscle training comprises the repetitive timed contraction and relaxation of pelvic muscles to improve the endurance, strength, and relaxation of the musculature in that region. The gains in urinary control can significantly

**Table 1.** Comparison of baseline characteristics (The general information of the patient is given at the beginning of treatment)

Variable	(n=78)	10ES-20EB (n=37)	15ES-15EB (n=41)	T (X <sup>2</sup> )	P value
BMI	23.38 ± 3.23	23.83 ± 3.17	22.97 ± 3.27	1.174	0.244
Age (years)	48.50 ± 10.36	48.22 ± 8.895	48.76 ± 11.625	-0.228	0.82
Marital length (years)	24.40 ± 11.58	24.59 ± 10.524	24.22 ± 12.579	0.142	0.887
Gain weight during childbirth (Kg)	9.48 ± 5.26	9.92 ± 5.30	9.09 ± 5.26	0.696	0.488
Fetal weight (Kg)	3.27 ± 0.50	3.27 ± 0.433	3.26 ± 0.56	0.137	0.891
The living environment					
Lives in town	57 (73.08%)	28 (75.68%)	29 (70.73%)	9.761	<b>0.021</b>
Lives in the country	13 (16.67%)	4 (10.81%)	9 (21.95%)		
Migrant worker	8 (10.26%)	5 (13.51%)	3 (7.32%)		
Mother and sister have urinary incontinence					
Don't know	11 (14.1%)	8 (21.6%)	3 (7.3%)	18.607	<b>&lt;0.001</b>
No	51 (65.4%)	23 (62.2%)	28 (68.3%)		
Yes	16 (20.5%)	6 (16.2%)	10 (24.4%)		
Number of vaginal deliveries					
0	12 (15.38%)	7 (18.92%)	5 (12.20%)	1.532	0.821
1	48 (61.54%)	22 (59.46%)	26 (63.41%)		
2	15 (19.23%)	7 (18.92%)	8 (19.51%)		
3	2 (2.56%)	1 (2.70%)	1 (2.44%)		
4	1 (1.28%)	0 (0.00%)	1 (2.44%)		
Diagnosis					
MUI	4 (5.13%)	0 (0.00%)	4 (9.76%)	5.386	0.068
UUI	23 (29.49%)	9 (24.32%)	14 (34.15%)		
SUI	51 (65.38%)	28 (75.68%)	23 (56.10%)		
Whether menopause					
Yes	54 (69.23%)	32 (86.49%)	22 (53.66%)	9.839	<b>0.002</b>
No	24 (30.77%)	5 (13.51%)	19 (46.34%)		
Cultural background					
Master's degree	2 (2.56%)	1 (2.70%)	1 (2.44%)	2.016	0.959
Undergraduate course	6 (7.69%)	2 (5.41%)	4 (9.76%)		
College	13 (16.67%)	5 (13.51%)	8 (19.51%)		
High school	10 (12.82%)	4 (10.81%)	6 (14.63%)		
Technical secondary school	3 (3.85%)	2 (5.41%)	1 (2.44%)		
Junior high school	31 (39.74%)	16 (43.24%)	15 (36.59%)		
Primary school	11 (14.10%)	6 (16.22%)	5 (12.20%)		
Illiteracy	2 (2.56%)	1 (2.70%)	1 (2.44%)		
Whether there is a laceration in the perineum					
Don't know	1 (1.28%)	0 (0.00%)	1 (2.44%)	1.064	0.587
No	61 (78.21%)	30 (81.08%)	31 (75.61%)		
Yes	16 (20.51%)	7 (18.92%)	9 (21.95%)		
First delivery mode					
Cesarean section was delivered directly before labor	10 (12.82%)	5 (13.51%)	5 (12.20%)	2.346	0.309
Vaginal delivery	66 (84.62%)	30 (81.08%)	36 (87.80%)		
Vaginal delivery midway to cesarean section	2 (2.56%)	2 (5.41%)	0 (0.00%)		
Nature of work					
Housework	21 (26.92%)	19 (51.35%)	2 (4.88%)	24.679	<b>&lt;0.001</b>
Mental labor and manual labor	14 (17.95%)	5 (13.51%)	9 (21.95%)		
Mental work	31 (39.74%)	12 (32.43%)	19 (46.34%)		
Manual labor	12 (15.38%)	1 (2.70%)	11 (26.83%)		

improve patients' lives as the effect of UI on the patient's quality of life is multidimensional, with serious implications in health issues such as increased risk of infections, but also major effects on the psychological and social aspects of the patient's life.<sup>34</sup> In

this study, the quality of life of UI patients in both groups was improved compared with that before treatment, and the following three domains were improved: behavioral restriction, psycho-social impact and social embarrassment.

**Table 2.** Comparison of I-QOL scale scores between 10ES-20EB group and 15ES-15EB group before treatment

Measurements	10ES-20EB (n=37)	15ES-15EB (n=41)	Mean difference	P Value
	Before treatment	Before treatment		
Restricted behavior	32.81 ± 5.75	30.95 ± 5.26	1.86	0.140
Psychosocial impact	39.81 ± 4.41	37.73 ± 6.39	2.08	0.102
Social embarrassment	19.62 ± 3.00	19.59 ± 5.21	0.04	0.970
Total score	92.24 ± 11.47	88.27 ± 14.64	3.97	0.189

**Table 3.** Comparison of PISQ-12 scale scores between 10ES-20EB group and 15ES-15EB group before treatment

Measurements	10ES-20EB (n=34)	15ES-15EB (n=37)	Mean difference	P Value
	Before treatment	Before treatment		
Emotion	8.00 ± 2.20	7.62 ± 3.41	0.38	0.584
Behavior	18.21 ± 2.33	17.22 ± 2.07	0.99	0.062
Partner-related	9.24 ± 1.21	8.84 ± 0.93	0.40	0.123
Total score	35.44 ± 4.47	33.68 ± 4.88	1.77	0.117

**Table 4.** Comparison of treatment before and after 10ES-20EB I-QOL scale

Measurements	10ES-20EB (n=37)		Mean difference	P Value
	Before treatment	After treatment		
Restricted behavior	32.81 ± 5.75	38.19 ± 1.81	-5.38	<0.001
Psychosocial impact	39.81 ± 4.42	43.97 ± 1.40	-4.16	<0.001
Social embarrassment	19.62 ± 3.00	23.62 ± 1.74	-4	<0.001
Total score	92.24 ± 11.47	105.78 ± 3.74	-13.54	<0.001

**Table 5.** Comparison of treatment before and after 15ES-15EB I-QOL scale

Measurements	15ES-15EB (n=41)		Mean difference	P Value
	Before treatment	After treatment		
Restricted behavior	30.95 ± 5.26	36.98 ± 3.57	-6.02	<0.001
Psychosocial impact	37.73 ± 6.39	43.49 ± 2.70	-6.76	<0.001
Social embarrassment	19.59 ± 5.21	23.46 ± 2.61	-3.88	<0.001
Total score	88.27 ± 14.64	103.93 ± 7.94	-15.66	<0.001

**Table 6.** Comparison of efficacy evaluation of I-QOL scale between 10ES-20EB and 15ES-15EB

Measurements	10ES-20EB (n=37)	15ES-15EB (n=41)	Mean difference	P Value
	After - Before treatment	After - Before treatment		
Restricted behavior	5.38 ± 5.49	6.02 ± 4.93	-0.65	0.586
Psychosocial impact	4.16 ± 4.09	5.76 ± 4.77	-1.59	0.119
Social embarrassment	4.00 ± 3.20	3.88 ± 4.64	0.12	0.894
Total score	13.54 ± 11.29	15.66 ± 11.09	-2.12	0.406

**Table 7.** Efficacy evaluation and analysis of PISQ-12 scale in 10ES-20EB group

Measurements	10ES-20EB (n=34)		Mean difference	P Value
	Before treatment	After treatment		
Emotion	8.00 ± 2.20	9.24 ± 2.10	-1.24	<0.001
Behavior	18.21 ± 2.33	19.82 ± 1.64	-1.62	<0.001
Partner-related	9.24 ± 1.21	9.76 ± 1.08	-0.53	0.005
Total score	35.44 ± 4.47	38.82 ± 3.21	-3.38	<0.001

**Table 8.** Efficacy evaluation and analysis of PISQ-12 scale in 15ES-15EB group

Measurements	15ES-15EB (n=37)		Mean difference	P Value
	Before treatment	After treatment		
Emotion	7.62 ± 3.41	8.86 ± 2.88	-1.24	<0.001
Behavior	17.22 ± 2.07	18.70 ± 2.34	-1.49	<0.001
Partner-related	8.84 ± 0.93	9.03 ± 1.38	-0.19	0.268
Total score	33.68 ± 4.88	36.59 ± 5.12	-2.92	<0.001

**Table 9.** Comparison of PISQ-12 efficacy evaluation between the 10ES-20EB group and the 15ES-15EB group

Measurements	10ES-20EB (n=34)	15ES-15EB (n=37)	Mean difference	P Value
	After - Before treatment	After - Before treatment		
Emotion	1.24 ± 1.37	1.24 ± 1.67	-0.01	0.983
Behavior	1.62 ± 1.89	1.49 ± 2.14	0.13	0.786
Partner-related	0.53 ± 1.02	0.19 ± 1.02	0.34	0.166
Total score	3.38 ± 2.34	2.92 ± 3.22	0.46	0.493

**Table 10.** Comparison of Glazer score between 10ES-20EB and 15ES-15EB (After treatment - before treatment)

Measurements	10ES-20EB (n=37) (mean±SD)	15ES-15EB (n=41) (mean±SD)	P Value
	After - Before	After - Before	
Rest (pre-baseline)—average mean ( $\mu V$ )	-0.93 ± 2.71	-0.58 ± 2.72	0.57
Rest(pre-baseline)—variability (%)	0.03 ± 0.41	0.1 ± 0.55	0.52
Flick contractions—average peak ( $\mu V$ )	1.18 ± 10.96	6.69 ± 11.57	<b>0.03</b>
Flick contractions—time before peak (s)	-0.24 ± 1.01	-0.04 ± 0.26	0.23
Flick contractions—time after peak (s)	-0.09 ± 0.26	-0.06 ± 0.37	0.73
Tonic contractions—average mean ( $\mu V$ )	3.75 ± 6.9	6.84 ± 7.3	0.06
Endurance contraction—variability (%)	-0.04 ± 0.08	-0.05 ± 0.11	0.86
Rest (post-baseline)—average mean ( $\mu V$ )	-0.56 ± 3.14	-0.15 ± 3.44	0.58
Rest (post-baseline)—variability (%)	0.01 ± 0.21	0 ± 0.15	0.87
Total score	7.83 ± 7.54	9.18 ± 9.66	0.5

A quarter of incontinence women report that urinary leakage impairs their sexual function, and urinary incontinence may adversely affect the quality of their sexual life.<sup>35</sup> The causes of female sexual dysfunction are multifactorial, involving physical, social and psychological aspects. Sexual function can be described as four stages: desire, arousal, orgasm, and sexual satisfaction. Dysfunction may affect any of these areas and may be organic, psychological, mixed, or of unknown etiology.<sup>36</sup> UI patients were lack of desire, and the fear of leaking urine during intercourse may gradually lead to loss of confidence and self-esteem, depression, as well as the elimination of libido and enhanced feelings of sexual aversion.<sup>37</sup> Low libido and sexual arousal may come from psychological and emotional factors, not entirely anatomical ones, and the positive effects of PFMT on sexual function are mainly due to the relief of this painful condition. In this study, sexual function in both groups was significantly improved compared with before treatment. Participants' behavior and mood improved significantly, but sexual function and partner relationship did not improve significantly before and after treatment. Further efforts should be made in this aspect in future treatment.

The pathophysiological mechanism of urinary incontinence during intercourse is unclear, but some urodynamic studies have confirmed simultaneous bladder contraction and urethral relaxation during orgasm.<sup>38</sup> The strengthening of pelvic floor muscles can cause spontaneous precontraction before and during orgasm, often referred to as "backsupport", which helps reduce urine overflow during intercourse. In our study, women who reported urinary leakage during sex experienced significant improvement with PFMT.<sup>39</sup>

PFMT may improve sexual function, as the pelvic floor muscles are directly responsible for the amount of sensation a woman feels during intercourse, and for the amount of grip felt by her partner. Rhythmic contractions of the pelvic floor contribute to arousal and the ability to achieve orgasm for many women. In addition, exercise improves muscle tone and improves circulation, which is particularly important for the smaller muscles of the pelvic floor that are responsible for engorging the clitoris when women are aroused.<sup>40</sup>

Our results indicate that by improving muscle strength and performance, women utilizing these protocols were better able to control UI, and as a result they experienced an improved quality of life and intimacy. Although both protocols under evaluation

proved efficacious, the protocol followed by the 15ES-15EB group may offer additional benefits in that greater muscular improvements were observed in tonic and flick contractions.

The limitations of this study are: (1) participants were enrolled from a tertiary hospital, (2) most patients suffered from mild symptoms, leaving little room for improvement and making it difficult to detect difference in symptom severity between groups, (3) the small sample size used in the study, and (4) the two groups examined in the study had statistically significant differences in baseline characteristics such as menopause and nature of work that might affect the results of study. (5) This study lacked an EMG assessment to verify whether PFM was altered. Therefore, the results should be interpreted with these limitations in mind.

## CONCLUSION

In summary, two different pelvic floor muscle treatments (10ES-20EB and 15ES-15EB) were examined and found to be efficacious for improving the quality of life and sexual function of women with UI. According to the results of I-QOL and PISQ-12 scale, there was no significant difference in the efficacy of the two groups. Based on the results of the Glazer score, the 15ES-15EB group may offer additional benefits, but a larger sample size is needed to support this observation.

## ETHIC STATEMENT

This study was approved by the Ethics Committee of Zhenjiang Maternal and Child Health Hospital (No. 2021-007).

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## STATEMENT OF AUTHORSHIP

Yiqun Wang and Wei Li contributed to the study conception and design. All authors collected the data and performed the data analysis. All authors contributed to the interpretation of the data and the completion of figures and tables. All authors contributed to the drafting of the article and final approval of the submitted version.

## REFERENCES

- Abrams P, Cardozo L, Wagg A, et al. Incontinence. 6th Edition. 2017.
- Milsom I, Coyne KS, Nicholson S, et al. Global prevalence and economic burden of urgency urinary incontinence: a systematic review. *Eur Urol* 2014;65:79–95.
- Sun MJ, Chen GD, Chang SY, et al. Prevalence of lower urinary tract symptoms during pregnancy in Taiwan. *J Formos Med Assoc* 2005;104:185–189.
- Klimaszewska K. The social aspects of urinary incontinence of women. *Pielęgniarstwo XXI wieku /Nursing in the 21st Century*; 2017.
- Dutkiewicz S, Kapusta K. Risk factors and quality of life in urinary incontinence females in the Care and Medical Centre in Kielce. *Menopause Review/Przegląd Menopauzalny* 2011;10:493–499.
- Sutherst J, Brown M. Sexual dysfunction associated with urinary incontinence. *Urol Int* 1980;35:414–416.
- Bø K, Talseth T, Vinsnes A. Randomized controlled trial on the effect of pelvic floor muscle training on quality of life and sexual problems in genuine stress incontinent women. *Acta Obstet Gynecol Scand* 2000;79:598–603.
- Grzybowska ME, Rechberger T, Wrobel A, et al. The Urogynecology Section of the Polish Society of Gynecologists and Obstetricians guidelines on the management of non-neurogenic overactive bladder syndrome in women. *Ginekol Pol* 2021;92:236–251.
- Subak LL, Richter HE, Hunskaar S. Obesity and urinary incontinence: epidemiology and clinical research update. *J Urol* 2009;182:S2–S7.
- Subak LL, Wing R, West DS, et al. Weight loss to treat urinary incontinence in overweight and obese women. *N Engl J Med* 2009;360:481–490.
- Dumoulin C, Cacciari LP, Hay-Smith EJC. Pelvic floor muscle training versus no treatment, or inactive control treatments, for urinary incontinence in women. *Cochrane Database Syst Rev* 2018;10:Cd005654.
- Burkhard FC, Bosch JLHR, Cruz F, et al. Guidelines on Urinary Incontinence. *Eur Assoc Urol* 2020. <https://uroweb.org/guideline/urinary-incontinence/#4> (10.01.2020).
- Chaffee DM, Harpster ET. Pelvic floor muscle training for treatment of urinary incontinence in women. *Am Fam Physician* 2019;100.
- Thüroff JW, Abrams P, Andersson K-E, et al. EAU Guidelines on Urinary Incontinence. *Eur Urol* 2011;59:387–400.
- Berghmans LC, Hendriks HJ, Bo K, et al. Conservative treatment of stress urinary incontinence in women: a systematic review of randomized clinical trials. *Br J Urol* 1998;82:181–191.
- Hagen S, Elders A, Stratton S, et al. Effectiveness of pelvic floor muscle training with and without electromyographic bio-feedback for urinary incontinence in women: multicentre randomised controlled trial. *BMJ (Clinical Research Ed)*. 2020;371:m3719.



17. Sand PK, Richardson DA, Staskin DR, et al. Pelvic floor electrical stimulation in the treatment of genuine stress incontinence: a multicenter, placebo-controlled trial. *Am J Obstet Gynecol* 1995;173:72–79.
18. Siegel SW, Richardson DA, Miller KL, et al. Pelvic floor electrical stimulation for the treatment of urge and mixed urinary incontinence in women. *Urology* 1997;50:934–940.
19. Gilling PJ, Wilson LC, Westenberg AM, et al. A double-blind randomized controlled trial of electromagnetic stimulation of the pelvic floor vs sham therapy in the treatment of women with stress urinary incontinence. *BJU Int* 2009;103:1386–1390.
20. Terlikowski R, Dobrzycka B, Kinalski M, et al. Transvaginal electrical stimulation with surface-EMG biofeedback in managing stress urinary incontinence in women of premenopausal age: a double-blind, placebo-controlled, randomized clinical trial. *Int Urogynecol J* 2013;24:1631–1638.
21. Haylen BT, de Ridder D, Freeman RM, et al. An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. *Neurourol Urodyn* 2010;29:4–20.
22. Novaes RD, Miranda AS, Dourado VZ. Usual gait speed assessment in middle-aged and elderly Brazilian subjects. *Revista Brasileira de Fisioterapia (Sao Carlos (Sao Paulo, Brazil))* 2011;15:117–122.
23. Zhu L. Pelvic floor science for women. Beijing: People's Medical Publishing House; 2014.
24. Oelke M, De Wachter S, Drake MJ, et al. A practical approach to the management of nocturia. *Int J Clin Pract* 2017:71.
25. Saks EK, Arya LA. Pharmacologic management of urinary incontinence, voiding dysfunction, and overactive bladder. *Obstet Gynecol Clin North Am* 2009;36:493–507.
26. Gormley EA, Lightner DJ, Burgio KL, et al. Diagnosis and treatment of overactive bladder (non-neurogenic) in adults: AUA/SUFU guideline. *J Urol* 2012;188:2455–2463.
27. Burkhard (Chair) FC, Bosch JLHR, Cruz F, et al. Guidelines on urinary incontinence. *Euro Assoc Urol* 2017. <https://uroweb.org/guideline/urinary-incontinence/#4>.
28. Schurch B, Denys P, Kozma CM, et al. Reliability and validity of the Incontinence Quality of Life questionnaire in patients with neurogenic urinary incontinence. *Arch Phys Med Rehabil* 2007;88:646–652.
29. Rogers RG, Coates KW, Kammerer-Doak D, et al. A short form of the pelvic organ prolapse/urinary incontinence sexual questionnaire (PISQ-12). *Int Urogynecol J Pelvic Floor Dysfunct* 2003;14:164–168 discussion 68.
30. Hacad CR, Glazer HI. The glazer intrapelvic surface electromyography (SEMG) protocol in a case of male urinary incontinence and a case of female hypoactive sexual desire disorder. *Biofeedback* 2012;40:80–95.
31. DeLancey JO. Structural aspects of the extrinsic continence mechanism. *Obstet Gynecol* 1988;72:296–301.
32. Godec C, Cass AS, Ayala GF. Bladder inhibition with functional electrical stimulation. *Urology* 1975;6:663–666.
33. Bø K. Pelvic floor muscle strength and response to pelvic floor muscle training for stress urinary incontinence. *Neurourol Urodyn* 2003;22:654–658.
34. Radzimińska A, Strączyńska A, Weber-Rajek M, et al. The impact of pelvic floor muscle training on the quality of life of women with urinary incontinence: a systematic literature review. *Clini Intervent Aging* 2018;13:957–965.
35. Salonia A, Zanni G, Nappi RE, et al. Sexual dysfunction is common in women with lower urinary tract symptoms and urinary incontinence: results of a cross-sectional study. *Eur Urol* 2004;45:642–648 discussion 48.
36. Wiegel M, Meston C, Rosen R. The female sexual function index (FSFI): cross-validation and development of clinical cut-off scores. *J Sex Marital Ther* 2005;31:1–20.
37. Moran PA, Dwyer PL, Ziccone SP. Urinary leakage during coitus in women. *J Obstet Gynecol* 1999;19:286–288.
38. Bø K. Pelvic floor muscle training is effective in treatment of female stress urinary incontinence, but how does it work? *Int Urogynecol J Pelvic Floor Dysfunct* 2004;15:76–84.
39. Graber B, Kline-Graber G. Female orgasm: role of pubococcygeus muscle. *J Clin Psychiatry* 1979;40:348–351.
40. Franco MM, Pena CC, de Freitas LM, et al. Pelvic floor muscle training effect in sexual function in postmenopausal women: a randomized controlled trial. *J Sex Med* 2021;18:1236–1244.