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Original Research

The effects of diaphragmatic breathing exercises on individuals with premature ejaculation: a randomized controlled trial

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Abstract

Background: There are no standardized, evidence-based rehabilitation protocols for premature ejaculation (PE) which hinders effective management, the development of validated patient-reported outcomes, regulatory oversight, and the potential benefits of targeted interventions.
Aim: To investigate the effect of diaphragmatic breathing exercises (DBE) on PE.
Methods: Sixty-two participants with PE were randomly assigned to Group I ($n = 31$) or Group II ($n = 31$). Both groups received behavioral therapy (BT) and pelvic floor muscle training (PFMT) twice daily, three days a week, for eight weeks. Additionally, Group I recieved DBE twice daily, every day, for eight weeks. Intravaginal ejaculation latency time (IELT) was calculated with a stopwatch, at the end of the 8th week (post-treatment), and at 1-year follow-up. Pelvic floor muscle (PFM) strength and endurance were evaluated with ultrasound, and changes in the in the autonomic nerves system (ANS) parameters (including the root mean square of successive differences [RMSSD], proportion of NN50 [PNN50], low-frequency [LF] power, and high-frequency [HF] power) were evaluated with an Elite HRV device at pre-treatment and post-treatment by a blinded assessor.
Outcomes: Primary outcome measurements were IELT, PFM strength and endurance, and changes in ANS paramaters.
Results: The study was completed by 29 participants (mean age = 31.4 ± 6.5 years) in Group I and 30 (mean age = 31.3 ± 7.6 years) in Group II. At post-treatment, all outcome measures showed significant improvements in both groups ($P < .001$ for all). Compared to Gropu II, Group I showed significantly greater improvements in IELT(P=0.12), RMSDD (P<.001), PNN50 (P=.003), LF Power (P<.001), HF Power (P=.003), strength(P<.001), and endurance (P<.001). The median IELT increase from baseline to post-treatment was 283 seconds (range: 84-870; 900%) in Group I and 204 seconds (range: 44- 581; 690%) in Group II. While IELT declined significantly from post-treatment to 1-year follow-up in Group II, no statistically significant change was found in Group I.
Clinical Implications: The effect of DBE on the ANS may help regulate the ejaculatory reflex.
Strengths and Limitations: This is the first study to apply breathing exercises with BT and PFMT in men with PE. Limitations include the lack of exercise adherence records beyond 8 weeks and the estimation-based IELT measurement at baseline.
Conclusion: Adding DBE, to BT and PFMT, yields better results in IELT (at 8 weeks and 1 year) and inreases PFM strength and endurance of PFM (at 8 weeks) in men with PE.

Keywords: Behavioral therapy; diaphragmatic breathing exercises; intravaginal ejaculation latency time; pelvic floor muscle training; premature ejaculation.

Introduction

Premature ejaculation (PE) is the most common sexual dysfunction in men.[1] PE is defined as ejaculation that persistently occurs within 1 minute of intercourse from the first sexual experience (lifelong PE), or as a significant reduction in ejaculation time to 3 minutes or less later in life (acquired PE).[2] Symptoms must be present for at least 6 months and occur on almost all (approximately 75%-100%) occasions of sexual activity.[1] In addition to lifelong and acquired PE, variable and subjective forms exist. Variable PE involves occasional early ejaculation, and is considered a natural variation rather than a disorder.[2] PE is also associated with distress in personal, partner, and interpersonal relationships.[2]

In a recent systematic review, recommended treatment modalities included behavioral therapy (BT), tricyclic antidepressants, selective serotonin reuptake inhibitors, local anesthetic agents, and phosphodiesterase type 5 inhibitors.[3] Another systematic review, which aimed to inestigate the effectiveness of pelvic floor muscle training (PFMT), concluded that PFMT is effective for treating PE, although no optimal treatment protocol has been established.[4]

The two most frequently used BT techniques are the “stop-and-start” technique (SST) and the “squeeze” method (SM). The SM involves starting to stimulate the penis and upon pre-orgasmic sensation, stopping stimulation and applying a firm squeeze for 5–10 seconds to the penis frenulum until the

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ejaculation reflex is inhibited. SST is preferable and similar to the SM method except applying the squeeze to the penis frenulum.[3] La Pera et al. found that pelvic floor muscle (PFM) contraction before the pre-orgasmic phase is effective in controlling the ejaculatory reflex.[5]

Male pelvic floor dysfunction has been associated with male sexual dysfunctions.[6] It is also known that the sympathetic nervous system and anxiety level are higher in individuals with premature ejaculation,[7] and diaphragmatic breathing exercises (DBE) can affect the sympathetic nervous system[8] and anxiety.[9] DBE involves slow deep breathing, that modulates autonomic nervous system (ANS) functions.[10] Contraction of the diaphragm increases intra-abdominal pressure and decreases intrathoracic pressure, enhancing stability unloading spinal segments, and working synergistically with the pelvic floor.[11]

One theory in the pathophysiology of PE suggests that serotonin 5-hydroxytryptamine (5-HT) is involved in ejaculatory control. Focusing on the lower abdomen during breathing is correlated with a significant increase in whole-blood 5-HT levels, which are believed to be related to ejaculatory control.[12]

There are currently no standardized, evidence-based rehabilitation protocols for PE, complicating clinical management. The lack of standardized guidelines not only makes it difficult to develop validated patient-reported outcome measures but also complicates regulatory oversight. As a result, individuals with PE may not fully benefit from specific treatment interventions that could improve their condition. Based on this, this study aimed to investigate the effect of combining DBE with BT and PFMT on PE.

Method

This prospective, randomized, controlled, single-blind trial was approved by the **Bahcesehir University Clinical Research Ethics Committee** (approval no: 2021-19/01) and registered at ClinicalTrials.gov (NCT: **05517694**). The study was performed in accordance with the Declaration of Helsinki, and informed consent was obtained from all participants.

Participants

The study was performed at the **Kurbaa** Education and Consultancy Center between December 2021 and May 2023. The diagnosis was confirmed by intravaginal ejaculatory latency time (IELT).[2] Demographic characteristics (age, height, weight, and BMI) of eligible participants were recorded.

Out of 80 men with PE, 62 (54 with lifelong PE and eight with acquired PE) met the inclusion criteria and were randomly assigned into two groups of the same size (Figure 1). “Research Randomizer,” an online randomization web service, was used to allocate the participants.

Inclusion criteria were as follows: having an IELT score less than 60 seconds,[2] being diagnosed with PE according to the Premature Ejaculation Diagnostic Tool (PEDT) (score > 11),[13] being in a stable relationship with a partner for at least 6 months, and having sexual intercourse once a week or more. Exclusion criteria were as follows: a score of less than 22 on the International Index of Erectile Function (IIEF), the presence of prostatitis, hyperthyroidism, diabetes, or neurological deficits, a score of less than 15 on the Beck Anxiety Inventory (BAI), and the use of any medication for PE.

Using G*Power, it was calculated that a minimum sample size of 52 (26 per group) was required to obtain an effect size of Cohen's $d = 0.8$ with 80% power (alpha = .05, two-tailed). Taking a 20% drop-out rate into consideration, a total of 62 subjects were included in the study.

Interventions

Group II received BT and PFMT, and Group I received DBE in addition to BT and PFMT. A three-step treatment protocol was used in the study: Step (1) Awareness and specific contraction of PFM: Patients were asked to contract their PFM using the cue stop urination.[14] ‘A rectal examination was performed’ in the supine position to facilitate this contraction. Patients were also asked whether they were aware that the contraction of these muscles could help prevent the ejaculatory reflex.[5] Step (2) Teaching the timing of PFM contraction in the pre-orgasmic phase with BT and maintaining PFM contraction until the orgasmic sensation disappeared. To teach how to inhibit the ejaculatory reflex with SST, training was given on contracting PFM before and during the pre-orgasmic sensation. After the ejaculatory reflex was inhibited, the patient continued to masturbate and this cycle was repeated 3 or 4 times in the same session. After 4 or 5 cycles, the patient could reach ejaculation. Step (3) Strengthening the PFM.[15] For slow-twitch fibers, 10 seconds of submaximal contraction followed by 10 seconds of relaxation with 15 repetitions, and for fast-twitch fibers, 1 second of submaximal contraction followed by 1 second of relaxation with 10 repetitions[16] were prescribed twice a day, three days a week, for eight weeks.

In the first session, DBE was demonstrated by the physiotherapist to the Group 1 participants. While sitting upright on a chair, with shoulders relaxed and the pelvis in a neutral position, the patient was instructed to place their hands on both sides of the lower ribs, take 3 seconds of inspiration through the nose and feel the ribs expanding outward and upwards, followed by 7 seconds of expiration[15] through the nose feeling the ribs moving inward. These exercises were repeated at least 10 times in each session, with two sessions per day,[17] every day.

The day after the first session, all participants were interviewed face-to-face again to check whether they performed all the exercises correctly. Adherence was confirmed by a phone call once a week. Participants were told that if they did not exercise regularly or missed exercises, they would be dismissed from the study.

Participants were also advised not to use condoms or topical anesthetics.[18] After eight weeks of treatment, both groups were advised to continue the exercises and Group I was also advised to maintain normal respiratory frequency during sexual activity.

Outcome measurements

The primary outcome of the study was IELT, and the secondary outcomes were PFM and ANS functions. Outcome measurements were performed three times: pre-treatment, post-treatment, and at the 1-year follow-up.

IELT: IELT was used both as an inclusion criterion and to evaluate the effectiveness of the treatment program. Participants were instructed to start the stopwatch when intravaginal penetration and stop it at ejaculation. To obtain accurate measurements, data collection began after at least four trials. Patients were instructed that only the first sexual intercourse in a single session should be measured. They were asked to

Table 1. Demographic characteristics of the participants.

	Group I (DBE + PFMT) ($n = 29$) Mean (SD) Median (min–max)	Group II (PFMT) ($n = 30$) Mean (SD) Median (min–max)	*t/z*	*P*
Age (years)	31.4 (6.5)	31.3 (7.6)	0.21	.965[t]
Height (cm)	175.9 (4.0)	175.6 (4.4)	−0.030	.835[t]
Weight (kg)	78.1 (8.0)	18.1 (8.5)	−0.141	.976[t]
Body mass index (kg/m^2)	25.2 (2.2)	25.3 (2.3)	0.044	.888[t]
IIEF	29 (26-30)	29 (24-30)	−0.064	.937[m]
PEDT	15 (12-22)	15 (12-20)	−0.054	.969[m]
BAI	9 (8-11)	9 (8-11)	−0.274	.784[m]
	n (%)	*n* (%)		
Lifelong PE	25 (86.2)	26 (86.7)		
Acquired PE	4 (13.8)	4 (13.3)		

[t]Independent samples *t*-test, [m]Mann–Whitney *U* test Abbreviations: DBE + PFMT, diaphragmatic breathing exercises + pelvic floor muscle training; PFMT, pelvic floor muscle training; IIEF, International Index of Erectile Function; PEDT, Premature Ejaculation Diagnostic Tool; BAI, Beck Anxiety Inventory

start intercourse in the position where the female partner was on top.

PFM functions: Non-invasive transabdominal ultrasonography (TrA-US)[19] was used to assess PFM strength and endurance. Measurements were performed according to Sherburn et al.[20] The patient was positioned supine with hips flexed head supported with pillows, lumbar spine in neutral, and the suprapubic area positioned in the transverse plane (Figure 2).

A Sonosite M Turbo (FUJIFILM Sonosite Inc., Bothell, WA, USA) ultrasound device and a 2–5-MHz convex probe were used. For PFM strength, a marker was placed on the bladder base, then after maximal PFM contraction, the bladder base was marked again, and the distance between the two markers was measured. For PFM endurance, a marker was placed on the bladder base after maximal contraction (Figure 3A-B), and the stopwatch was started. As soon as the bladder base level shifted, the stopwatch was stopped and the time was recorded. These procedures were repeated three times, and the average values were taken.[21]

Autonomic nervous system function: ANS function was evaluated objectively using heart rate variability (HRV), which measures fluctuations in intervals between two consecutive heartbeats.[22,23] For the evaluation of the ANS in this study, data were obtained using the Elite HRV CorSense device (Elite HRV Inc., Asheville, NC, USA), connected to a smartphone via Bluetooth. The patient was seated during the measurement, and the device was attached to the index finger. Each measurement lasted for 1 minute, and the following HRV parameters were recorded: RMSSD (root mean square of successive differences), which represents the square root of the mean of the squared differences between successive normal heartbeats; PNN50 (proportion of NN50), the percentage of successive R-R intervals differing by more than 50 ms relative to the total number of R-R intervals, where the R-R interval refers to the time between two successive heartbeats; low-frequency (LF) power, which corresponds to the low-frequency component of heart rate variability within the 0.04–0.15-Hz range; and high-frequency (HF) power, which represents the high-frequency component of heart rate variability within the 0.15–0.40-Hz range. Before the test, patients were instructed to avoid caffeine and nicotine for at least 3-4 hours, refrain from alcohol for at least 8 hours, and discontinue sympathomimetic and anticholinergic medications at least 24 hours prior. During measurement, they were required to remain still and silent.

Statistical analysis

Data were analyzed using IBM SPSS Statistics for Windows, version 20.0 (IBM Corp., Armonk, NY, USA). The Kolmogorov–Smirnov test assessed data distribution. Differences between groups in baseline characteristics (age, height, weight, and BMI) were assessed using the independent samples *t*-test.

To analyze the changes between baseline and post-treatment measurements, the Mann–Whitney *U* test was used for between group comparisons and the Wilcoxon signed-rank test for in-group comparisons. The level of statistical significance was accepted as $P < .05$.

After 1-year of follow-up of 51 patients, the Friedman test was used to analyze repeated measurements. Once the differences between the mean scores were determined, the least significant difference post hoc test with Benferroni correction was applied. Depending on the repetition of the outcome measures, significance was accepted as $P < .05/3 = .016$.

The "$r = z/\sqrt{(nx2)}$" formula was used to determine effect sizes (ESs) of changes between baseline and the 8th-week outcome scores of Group I and Group II. ES values were interpreted as small ($r = .1$), moderate ($r = .30$), and large ($r = .5$).[24] We accepted $r < .1$ negligible, $.1 \le r \le .29$ small, $.3 \le r \le .49$ moderate, and $\ge .5$ large.

Results

The study was completed with 59 participants, 29 in Group I (25 lifelong, 4 acquired) and 30 in Group II (26 lifelong, 4 acquired), following the withdrawal of two participants in Group I and one in Group II. At pre-treatment, both groups were homogenous in terms of demographic data as well as IIEF, BAI, and PEDT scores ($P > .05$ for all) (Table 1). After 1 year of follow-up, 26 patients in Group I and 25 in Group II were available for repeated measurements. The study flow diagram is shown in Figure 1.

Significant improvements were observed in both groups from pre-treatment to post-treatment with respect to IELT, RMSSD, PNN50, LF power, HF power, PFM strength,

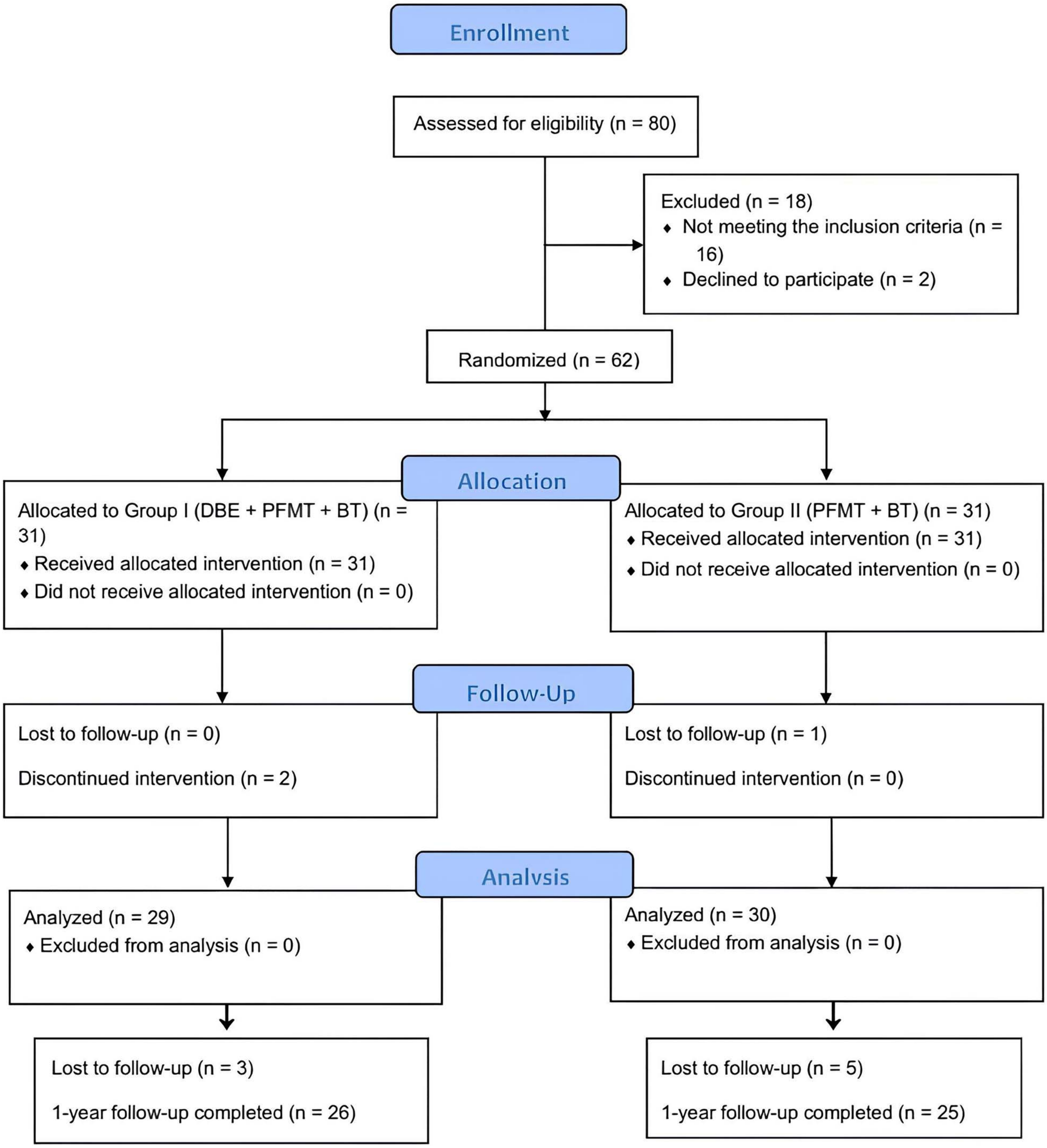

Figure 1. Flow diagram.

and PFM endurance ($P < .001$). When the groups were compared, the post-treatment values of IELT ($P = .012$), RMSSD ($P < .001$), PNN50 ($P = .003$), LF power ($P < .001$), HF power ($P = .003$), US-S ($P < .001$), and US-E ($P < .001$) were significantly better in Group I (Table 2). At the end of the 8-week treatment, the effects sizes (ES) were moderate for LF power in Group II and large for all other parameters in both groups. The PNN50 value was higher in Group I for LF and HF power (Table 2).

The overall group × time interaction for analyzed by the Friedman test was significant for IELT in both groups ($P < .001$). In Group I, there was a significant increase in IELT between pre-treatment and post-treatment ($P < .001$). The increase in IELT continued between post-treatment and the 1-year follow-up examination, but this change was not statistically significant ($P = .946$). In Group II, statistically significant differences were found both between baseline and post-treatment ($P < .001$) and between post-treatment and 1-year follow-up ($P < .001$). Unlike Group I, IELT decreased between post-treatment and the 1-year follow-up (Table 3). Therefore ES was negligible for Group I between post-treatment and 1-year follow-up, while ES was large for Group II, though this was due to the decrease in IELT. Between-group analysis for IELT no statistically significant difference at

Table 2. Comparison of outcome measurements between pre-treatment and post-treatment.

	Group I (DBE + PFMT) (n = 29) Median (min–max)	Group II (PFMT) (n = 30) Median (min–max)	z	P
IELT (s)				
Pre-treatment	30 (19-43)	30 (21-45)	−0.237	.812[m]
Post-treatment	302 (118-902)	238.5 (89-602)	−2.511	**.012**[m]
Difference from pre- to post-treatment	283 (84-870)	204 (44-581)	−2.328	**.020**[m]
Difference as a percent	900%	690%		
Within-group difference P	**<.001**[w]	**<.001**[w]		
z	−4.703	−4.782		
ES	**−0.61**	**−0.61**		
RMSSD (ms)				
Pre-treatment	29.7 (18.2-41.3)	28.6 (14.8-40.8)	−0.091	.928[m]
Post-treatment	60.0 (52.1-111.7)	46.0 (41.1-52.0)	−6.595	**<.001**[m]
Difference from pre- to post-treatment	33.5 (15.7-75.1)	16.6 (4.1-33.0)	−5.443	**<.001**[m]
Within-group difference P	**<.001**[w]	**<.001**[w]		
z	−4.703	−4.782		
ES	**−0.61**	**−0.61**		
PNN50 (%)				
Pre-treatment	7.0 (0.0-21.0)	7.5 (0.0-24.0)	−.380	.704[m]
Post-treatment	30.0 (13.0-60.0)	23.0 (4.0-38.0)	−3.020	**.003**[m]
Difference from pre- to post-treatment	22.0 (−4.0 to 53.0)	16.0 (−6.0 to 32.0)	−2.746	**.006**[m]
Within-group difference P	**<.001**[w]	**<.001**[w]		
z	−4.703	−4.782		
ES	**−0.86**	**−0.83**		
LF power (ms^2)				
Pre-treatment	707.7 (113.0-6581.2)	601.1 (165.9-7581.4)	−.182	.856[m]
Post-treatment	3596.6 (945.8-9955.9)	1721.1 (61.4-6350.5)	−3.821	**<.001**[m]
Difference from pre- to post-treatment	2333.2 (−819.1 to 9685.1)	550.1 (−7167.0 to 5789.5)	−3.305	**.001**[m]
Within-group difference P	**<.001**[w]	**.028**[w]		
z	−4.573	−2.191		
ES	**−0.60**	**−0.28**		
HF power (ms^2)				
Pre-treatment	109.0 (25.3-1116.5)	156.7 (26.8-778.2)	−1.152	.249[m]
Post-treatment	818.1 (191.2-4986.1)	401.3 (71.2-1563.2)	−2.972	.003[m]
Difference from pre- to post-treatment	759.9 (−720.6 to 4960.8)	277.0 (−432 to 1468.2)	−2.744	**.006**[m]
Within-group difference P	**<.001**[w]	**<.001**[w]		
z	−4.184	−3.507		
ES	**−0.77**	**−0.64**		
PFM strength (cm)				
Pre-treatment	0.8 (0.6-1.1)	0.8 (0.5-1.2)	−1.139	.255[m]
Post-treatment	1.4 (0.9-1.9)	1.2 (0.9-1.5)	−3.881	**<.001**[m]
Difference from pre- to post-treatment	0.5 (0.3-0.9)	0.4 (0.2-0.5)	−5.024	**<.001**[m]
Within-group difference P	**<.001**[w]	**<.001**[w]		
z	−4.711	−4.795		
ES	**−0.87**	**−0.87**		
PFM endurance (s)				
Pre-treatment	11.0 (8.0-16.3)	10.7 (8.3-15.3)	−1.026	.305[m]
Post-treatment	24.7 (17.3-45.3)	19.3 (15.7-31.3)	−4.393	**<.001**[m]
Difference from pre- to post-treatment	14.0 (4.3-33.7)	8.0 (2.3-22.0)	−3.034	**.002**[m]
Within-group difference P	**<.001**[w]	**<.001**[w]		−.87
z	−4.704	−4.784		−.87
ES	**−0.87**	**−0.87**		

[m]Mann–Whitney *U* test; [w]Wilcoxon test Abbreviations: DBE+ PFMT, diaphragmatic breathing exercises + pelvic floor muscle training; PFMT, pelvic floor muscle training; IELT, intravaginal ejaculatory latency time; RMSSD, root mean square of successive differences; PNN50, proportion of NN50; LF power, low-frequency power; HF power, high-frequency power; LF/HF, low frequency/high frequency; PFM strength, pelvic floor muscle strength; PFM endurance, pelvic floor muscle endurance; ES, effect size, statistically significant p values ($p < .05$) were bolted

pre-treatment, but post-treatment and 1-year follow-up values were statistically significantly better in Group I ($P = .011$ and $P < .001$, respectively).

Discussion

This study aimed to investigate the effect of DBE on IELT in individuals with PE. Group I received DBE in addition to BT and PFMT for eight weeks, while Group II received only the BT and PFMT program. At the end of eight weeks, IELT durations, as well as strength, and endurance of the PFM increased in both groups, with a greater increase observed in Group I. At the 1-year follow-up, both treatment protocols demonstrated beneficial effects on IELT in PE patients. These findings suggest that adding DBE to BT and PFMT yields better results in IELT and improves PFM strength and endurance in PE patients.

A reduction in PFM tone may directly impact the ejaculatory process.[25] However, it has also been suggested that PFMT should include a multifaceted treatment approach including

Table 3. Comparisons of repeated measures of the IELT.

IELT	Pre-treatment Median (min–max)	Post-treatment Median (min–max)	z	P	ES	1-Year follow-up Median (min–max)	z	P	ES	Friedman P
Group I (DBE + PFMT) (n = 26)	27 (19-43)	360 (177-902)	−4.458	**<.001**^{w}	0.61	441 (118-923)	−0.067	.946 ^{w}	0.009	**<.001**
Group II (PFMT) (n = 25)	26 (21-41)	240 (179-602)	−4.373	**<.001**^{w}	0.61	180 (87-600)	−3.79	**<.001**^{w}	0.53	**<.001**
Between-group difference P	.856^{m}	**.011**^{m}				**<.001**^{m}				
z	−0.181	−2.546				−3.556				

^{m}Mann–Whitney U test; ^{w}Wilcoxon signed-rank test Abbreviations: IELT, intravaginal ejaculatory latency time; DBE + PFMT, diaphragmatic breathing exercises + pelvic floor muscle training; PFMT, pelvic floor muscle training, statistically significant p values ($p<.05$) were bolted

Figure 2. TrA-US measurement position.

behavioral components.[26] Cooper et al.[27] stated that SM, SST, and sensory focus techniques improved IELT to 7-9 min. In the current study, the average IELT improvement from before to after treatment was 302 (range: 118- to 902) seconds in Group I, and 238.5 (range 89 - to 602) seconds in Group II. BT was considered to be effective in this increase in time in both groups, and therefore adding BT methods to the treatment protocol may positively affect IELT.

In La Pera's study, [15] PFMT combined with BT resulted in an increase in IELT from 2 to 10 min. Our Group II showed a comparable IELT improvement, increasing from 89 to 602 seconds (approximately 1.5-10 minutes). In contrast, Group I demonstrated a more pronounced increase in IELT, from 118 to 902 seconds (approximately 2- to 15 minutes). Notably, the mean age in La Pera's study was 41 ± 8 years, whereas in our study, the mean ages were 31.4 ± 6.5 years in Group I and 31.3 ± 7.6 years in Group II. The greater improvement in IELT observed in Group I may be attributed to the addition of DBE to BT and PFMT, and the relatively younger age of the participants.

The relationship between the diaphragm and pelvic floor has been proven. Park et al.[28] stated that pelvic floor and the diaphragm move together. In the current study, Group I performed DBE and at the end of eight weeks, PFM contraction strength and endurance improved significantly more than in Group II, although the difference at one year was not statistically significant. It was concluded that adding DBE to the treatment in a clinical setting has a positive effect on IELT and can be included in clinical protocols.

Changes in HR can be evaluated using smartphone applications.[29–31] A previous study assessed the validity and reliability of Pulse Express Pro, a smartphone app, by comparing its ultra-short and short-term HRV measurements with electrocardiograms recordings.[27] Finding acceptable agreement for LF and HF components over consecutive 3-minute recordings.

In the current study, significant increases in parasympathetic activation, (RMSDD, PNN50 and HF Power) were observed in both groups, with greater changes in Group I, attributed to DBE. Regarding sympathetic activation, a small increase in LF power was detected in both groups, with significantly higher values in Group I compared to Group II. This may indicate that sympathetic reflex activation may have been triggered by enhanced parasympathetic activity. In addition, the differences in LF power between groups may have been influenced by the short, 1-minute measurement period. A similar finding was reported in a another study, which showed that continuous vagal stimulation can trigger a sympathetic co-activation reflex.[32]

Strength and limitations

A strong aspect of this study is that it is the first study to apply DBE combined with BT and PFMT in PE treatment, contributing to the development of rehabilitation protocols. Limitations of our study include the lack of exercise records from eight weeks to one year and the estimation of IELT at baseline.

Conclusion

In conclusion, combining the DBE with BT and PFMT results in positive changes in IELT (both short and long term), and increases PFM strength and endurance (short term) for the managing of PE based on the findings of this study.

Ethical approval and informed consent

The study was conducted in accordance with the Declaration of Helsinki and approved by the ethics committee of Bahcesehir University Clinical Research Ethics Committee (Approval number: 2021-19/01).

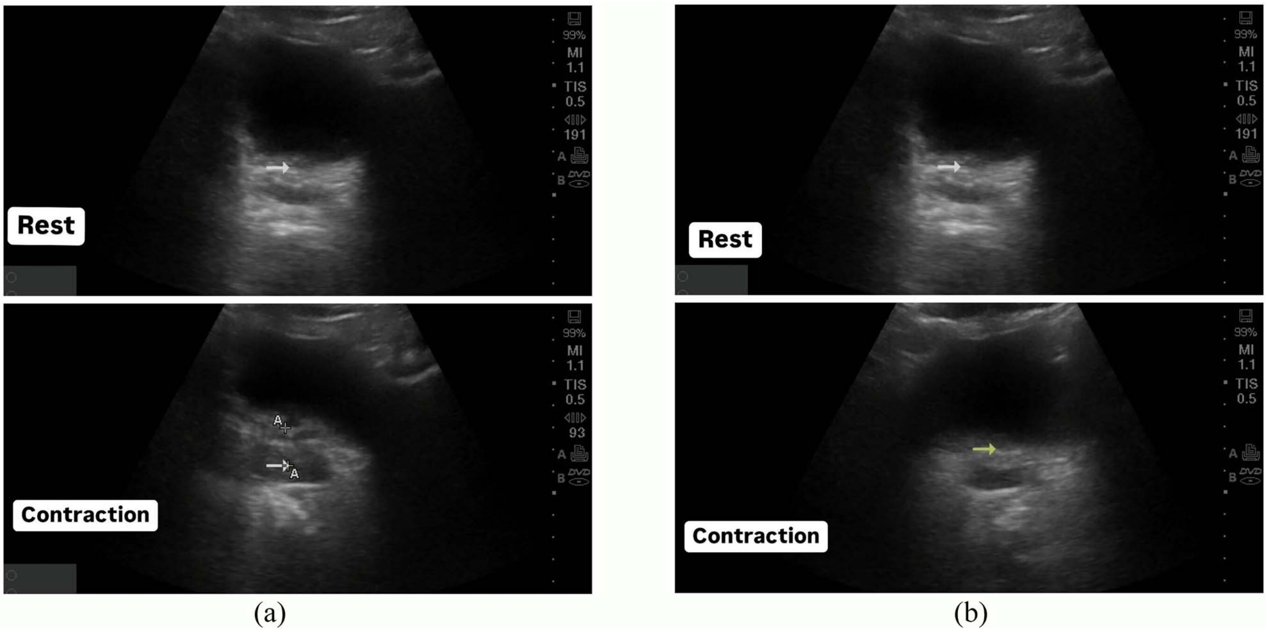

Figure 3. (a) Measurement of pelvic floor muscle contraction. (b) Measurement of pelvic floor muscle endurance.

Conferences

World Physiotherapy Congress 2023 Dubai, Poster Presentation.

24th World Meeting on Sexual Medicine, Oral Presentation.

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Author contributions

Umit Erkut (Protocol development, Conceptualization-Equal, Data curation-Lead, Investigation-Lead, Methodology-Lead, Resources-Lead, Software-Equal, Validation-Lead, Writing – original draft-Lead, Writing – review & editing-Lead), Dilber Karagozoglu Coskunsu (Protocol development, Formal analysis-Equal, Methodology-Supporting, Project administration-Supporting, Supervision-Supporting, Validation-Supporting, Writing – review & editing-Supporting), Kubra Erkut (Data curation-Supporting, Methodology-Supporting), and Ali Veysel Ozden (Protocol development, Project administration-Supporting, Supervision-Supporting).

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Conflicts of interest

None declared.

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