Erectile Dysfunction

ORIGINAL ARTICLE

Penile sensory thresholds in subtypes of premature ejaculation: implications of comorbid erectile dysfunction

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Penile hypersensitivity plays an important role in premature ejaculation (PE), but differences in penile sensitivity among subtypes of PE are unknown. Therefore, we compared penile sensory thresholds in PE subtypes of lifelong and acquired PE, PE with and without erectile dysfunction (ED), PE with an intravaginal ejaculation latency time ≤1 min and >1 min, and PE with and without orgasmic pleasure perceptual dysfunction. During August 2014 to January 2016, 136 patients with PE were included. Penile warm, cold, and vibratory thresholds were measured. Data of clinical characteristics, sexual life, Premature Ejaculation Diagnostic Tool (PEDT) score, and the 5-item version of the International Index of Erectile Function (IIEF-5) score were collected. Vibratory thresholds of the PE with ED group were higher in the right coronal sulcus (median amplitude: 4.92 *vs* 3.65 µm, P = 0.02) and the right penile shaft (median amplitude: 3.87 *vs* 3.30 µm, P = 0.03), while differences in penile sensory thresholds between other subtypes were not significant. The median PEDT score was lower in the PE without ED group (12 *vs* 14, P < 0.001). The IIEF-5 and PEDT scores were negatively correlated (r = −0.29, P < 0.001). Patients with orgasmic pleasure perceptual dysfunction had a lower median IIEF-5 score (20 *vs* 21, P = 0.02). Patients with PE and ED had lower penile sensitivity, and ED was associated with more severe symptoms and weaker orgasmic pleasure perception. In men with PE, management of comorbid ED is necessary. In case of side effects in erectile function, topical anesthetics should be cautiously used in men with PE and ED.

INTRODUCTION

Premature ejaculation (PE) is a common male sexual problem globally.[1] There are several definitions of PE that were drafted by different organizations, but all contain features of a short ejaculatory latency, inability to control or delay ejaculation, and related distress or interpersonal difficulty.[1] The prevalence of PE varies from 3.82%–40.6%, depending on the definition,[2] and the prevalence of self-reported PE in China is 25.8%.[3] Although PE is not life-threatening, it seriously affects the quality of life of men and their partners.[4]

The etiology of PE has not been clarified yet. PE was once considered as a psychological disease until the physiology of ejaculatory reflex was demonstrated.[1,5] Recently, except for psychological factors, serotonin, penile hypersensitivity, hormones, and urological comorbidities are also considered as possible etiological factors of PE.[1,5–8] Based on the hypothesis that penile hypersensitivity plays a role in the pathogenesis of PE, spray or cream of topical anesthetics is used in the therapy of PE.[6,7] Several randomized controlled trials have shown the efficacy of topical anesthetics on PE, and these drugs are recommended for treatment of PE by the latest guidelines.[1,9]

There is contradictory evidence in studies that compared penile sensitivity between patients with PE and controls. Xin *et al*.[10] showed

that potent volunteers without PE had a higher penile vibratory threshold than patients with PE (n = 120). However, Rowland *et al*.[11] and Paick *et al*.[12] (n = 17 and n = 18, respectively) did not find any significant difference in penile vibratory threshold between these groups of patients. Salonia *et al*.[13] reported a higher penile vibratory threshold in patients with lifelong PE (n = 42) compared with controls. Discrepancies in sample size, ethnicity, and methodology contribute to this contradiction. Additionally, penile sensitivity may vary among PE subtypes. Therefore, this study aimed to determine the differences in penile sensory thresholds of warmth, cold, and vibration in different PE subtypes.

MATERIALS AND METHODS

Study population

Participants were prospectively and consecutively recruited from Shanghai Key Laboratory of Forensic Medicine, Academy of Forensic Science from August 2014 to January 2016. Men aged 18–60 years old who complained about PE and received penile quantitative sensory testing were enrolled in this study. The research protocol was approved by the ethics committee of the Academy of Forensic Science (Sijianlunzi[2014] 01) and all enrolled

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participants signed informed consent. The research process is shown in **Supplementary Figure 1**.

Inclusion and exclusion criteria
Men who had stable or regular heterosexual intercourse for more than 6 months, complained of recurrent or persistent early ejaculation that caused personal distress, and failed to control or delay ejaculation during intercourse were included. The exclusion criteria were as follows: men without experience of vaginal intromission or a frequency of sexual activity ≤1 time per month; those who underwent circumcision in the past 3 months; those who underwent surgery related to the pelvic floor, prostate, lower urinary tract, penis, or dorsal nerve of the penis; a surgical/traumatic history of the brain, spine, or pelvis; those receiving medications that affect sexual function; genitourinary malformation or penile dermatosis; and abnormal gonadal hormone or prolactin levels.

Questionnaire survey
Participants completed a self-administered questionnaire before quantitative sensory testing. The questionnaire consisted of sections of demographic characteristics, medical history, sexual life, and assessment of symptoms. The section of sexual life comprised questions related to characteristic of early ejaculation, self-estimated intravaginal ejaculation latency time (self-estimated IELT), expected IELT, marital status, frequency of sexual activity, and perception of sexual pleasure/orgasm. Symptoms of PE and erectile dysfunction (ED) were evaluated by the Chinese version of the Premature Ejaculation Diagnostic Tool (PEDT) and 5-item version of the International Index of Erectile Function (IIEF-5).[14–16] Answers of the questionnaire were rechecked and confirmed in a semi-structured interview after quantitative sensory testing.

Classification of PE subtype
The most recognized PE subtype category proposed by Waldinger and Schweitzer[17,18] is classified according to the characteristics of PE as follows: (1) lifelong PE (LPE) is defined as early ejaculation beginning at approximately the first sexual intercourse and occurring in almost every intercourse; (2) acquired PE (APE) usually has a normal ejaculatory experience before the first complaint, and early ejaculation occurs suddenly or gradually at some point in life; (3) natural variable PE (NVPE) is defined as early ejaculations that occur inconsistently and irregularly; (4) premature-like ejaculation dysfunction (PLED) is preoccupied and subjective perception of early ejaculation during intercourse, but with a normal or even longer IELT, and cannot be explained by another mental disorder. Moreover, all subtypes share the characteristic that the ability to delay imminent ejaculation is diminished or absent.

However, we noticed that some participants did not fit within the existing PE subtypes. The specific characteristics of this group of patients were as follows: early ejaculation occurred recurrently or consistently in specific conditions (sexual intercourse with a specific mate, in specific surroundings, or in a specific position), and seldom occurred in intercourse without these specific conditions; and the ability to control ejaculation was diminished, especially in these specific conditions. As a result, we categorized these characteristics into a fifth PE subtype of PE in specific conditions (PESC). Therefore, participants were divided into five PE subtype categories in this study.

Comorbidity of ED is common in patients with PE.[19–21] To evaluate ED, the IIEF-5, a scale containing five questions related to erectile function and satisfaction of sexual life (scores of 0–25), was used. The IIEF-5 scale included a question concerned with satisfaction of sexual intercourse, which is easily affected by early ejaculation. Therefore, the IIEF-5 diagnostic criteria for ED in the general population are inappropriate for patients with PE.[22] Consequently, we modified the IIEF-5 scoring system for ED in the PE population. Patients with PE who complained about impotence with an IIEF-5 score ≤18 were classified as PE with ED, while the remaining patients were classified as PE without ED.

IELT is an objective indicator of PE and can be easily and conveniently measured by participants. Self-estimated IELT was used in this study because it correlates relatively well with severity of symptoms of PE.[23] Referring to the evidence-based definition of PE by the International Society of Sexual Medicine, we classified PE as an IELT ≤1 min (severe PE) and IELT >1 min (mild PE) to distinguish severity.[1]

A lack of orgasm or diminished orgasmic pleasure is prevalent in the PE population.[20,24] Nonetheless, defining this subgroup as anorgasmia is not recommended because patients can perceive orgasms, although diminished, and many of them have experienced an intact orgasm previously. Therefore, we defined another PE subtype, PE with orgasmic pleasure perceptual dysfunction (OPPD), as patients with PE and diminished orgasmic pleasure. In our study, we enquired perception of sexual pleasure/orgasm after ejaculation during intercourse in the last 3 months. Patients with PE that can perceive sexual pleasure in most of the intercourses were classified as PE without OPPD, and others were classified as PE with OPPD.

Quantitative sensory testing
Participants received a sensory test in the supine position in a quiet, thermostatic room. Thalposis and pallesthesia thresholds were measured by the PATHWAY model ATS Pain and Sensory Evaluation System and Genito-Sensory Analyzer (Medoc Ltd., Ramat Yishai, Israel), respectively. Thermal (temperature, 0–55°C) and vibratory (frequency of 100 Hz, amplitude of 0.1–130 μm) probes were cylinders with a round, flat contact surface (diameter: 6 mm and 10 mm, respectively). The probe was stably held by an investigator and gently contacted with the skin to provide a clear and comfortable perception of pressure to the participant. Stimuli of warmth, cold, or vibration were generated in an intensity ascending modality until the participant reported a sensation by pressing a feedback button. The thermal stimuli started from a baseline temperature of 32°C with a gradient of 1°C s⁻¹, while the change in rate for vibratory amplitude was 1 μm s⁻¹. Three consecutive measures with <2°C deviation for the thalposis threshold and <1 μm deviation for the pallesthesia threshold were determined as valid data. The mean of three measures was recorded as the threshold value. Thresholds were first measured at the center of the right palm and then bilaterally on the penile shaft and coronary sulcus in a flaccid status, with foreskin retracted. The test locations are shown in **Supplementary Figure 2**.

Statistical analyses
The Shapiro-Wilk test was used to check normality of the data. The independent two-sample *t*-test, Wilcoxon rank-sum test, and Chi-square test were used for comparison between groups. The two-tailed test was performed and a $P < 0.05$ was considered as statistically significant. The association between two variables was assessed by Spearman's correlation. All statistical procedures were performed by SAS (version 8.02; SAS Institute, Cary, NC, USA).

RESULTS
A total of 173 participants were recruited and 136 were included for further analysis. The reasons for exclusion were as follows: without

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experience of vaginal intromission; frequency of coitus <1 time per month; circumcision in 3 months; surgery on the penis or dorsal nerve of the penis; surgical/traumatic history of the spine or pelvis; using medications that affect sexual function; genitourinary malformation or penile dermatosis; and abnormal prolactin levels. The characteristics, medical history, sexual life, and sensory thresholds of the overall population are shown in **Table 1** and **Figure 1**.

LPE and APE

According to the five-subtype PE classifications, the proportions of PE subtypes were as follows: LPE was 63.24% ($n = 86$), APE was 30.15% ($n = 41$), NVPE was 2.21% ($n = 3$), PLED was 2.94% ($n = 4$), and PESC was 1.47% ($n = 2$). Because the sample size of NVPE, PLED, and PESC was <5, we were unable to compare them with LPE and APE. Therefore, we only analyzed data from the LPE and APE groups ($n = 127$).

The characteristics, medical history, and sexual life of the LPE and APE groups are shown in **Supplementary Table 1–3**. Participants in the APE group were older (median age: 33 *vs* 29 years, $P < 0.01$) and

Table 1: Characteristics of the overall population

Variables	Values
Age (year, median with quartile range in the parentheses)	31 (27, 35)
Height (cm, median with quartile range in the parentheses)	173 (170, 176)
Weight (kg, median with quartile range in the parentheses)	69 (63, 75)
BMI (kg m⁻², median with quartile range in the parentheses)	22.69 (20.98, 25.30)
Self-estimated IELT (min, median with quartile range in the parentheses)	1.0 (0.5, 1.3)
Expected IELT (min, median with quartile range in the parentheses)	10 (5.5, 15)
PEDT score, median (lower quartile, upper quartile)	12.5 (10, 15)
IIEF-5 score, median (lower quartile, upper quartile)	21.0 (17, 22)
Smoking, *n* (%)	37 (27.21)
Alcohol consumption, *n* (%)	6 (4.41)
Diabetes mellitus, *n* (%)	1 (0.74)
Hypertension, *n* (%)	5 (3.68)
Hyperlipidemia, *n* (%)	6 (4.41)
Thyroid disease, *n* (%)	0
Urinary tract infection, *n* (%)	4 (2.94)
Prostatitis, *n* (%)	35 (25.74)
Male infertility, *n* (%)	3 (2.21)
Deny history of diseases, *n* (%)	84 (61.76)
Marital status, *n* (%)	
Married	85 (62.5)
Unmarried	51 (37.5)
Frequency of sexual activity, *n* (%)	
≥3 times per week	20 (14.71)
2 times per week	33 (24.16)
1 time per week	45 (33.90)
<1 time per week	38 (27.94)
Perception of sexual pleasure, *n* (%)	
Most intercourses	81 (59.56)
More than half intercourses	21 (15.44)
Less than half intercourses	11 (8.09)
Seldom	23 (16.91)

BMI: body mass index; IELT: intravaginal ejaculation latency time; PE: premature ejaculation; PEDT: PE diagnostic tool; IIEF-5: 5-item version of the International Index of Erectile Function
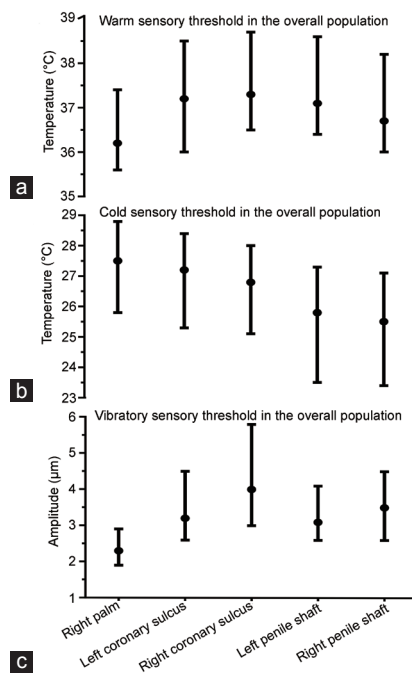
more participants were married (75.61% *vs* 56.98%, $P = 0.04$) compared with the LPE group. Self-estimated IELT was longer in the APE group than in the LPE group (median time: 1.0 *vs* 0.7 min, $P < 0.001$), but differences in expected IELT, PEDT, and IIEF-5 scores were not significant between the groups. No significant difference was detected in sensory thresholds between the groups (**Figure 2**).

PE without ED and PE with ED

Among all participants, 95 were classified as PE without ED (69.85%) and 41 as PE with ED (30.15%). Comparisons between the two groups are shown in **Supplementary Table 4–6**. The PE without ED group had a higher IIEF-5 score (median score: 21 *vs* 15, $P < 0.001$) and a lower PEDT score (median score: 12 *vs* 14, $P < 0.001$), but similar self-estimated IELT compared with the PE with ED group. Penile sensory thresholds of each group are displayed in **Figure 3**. Vibratory thresholds of the PE with ED group were higher in the right coronal sulcus (median amplitude: 4.92 *vs* 3.65 μm, $P = 0.02$) and right penile shaft (median amplitude: 3.87 *vs* 3.30 μm, $P = 0.03$) compared with the PE without ED group. Parallel results were observed in the left coronal sulcus (median amplitude: 3.32 *vs* 3.12 μm, $P = 0.09$) and left penile shaft (median amplitude: 3.42 *vs* 2.92 μm, $P = 0.08$), but they were not significant.

IELT ≤1 min and IELT >1 min

Ninety-six participants had an IELT ≤1 min (70.59%) and 40 had an IELT >1 min (29.41%). Comparisons of characteristics, medical history, and sexual life are shown in **Supplementary Table 7–9**. The IELT >1 min group had a longer self-estimated IELT (median time: 1.5 *vs* 0.65 min, $P < 0.001$), a lower PEDT score (median score: 11 *vs* 13, $P < 0.01$), and a lower percentage of patients with LPE (45.00% *vs* 70.83%, $P < 0.01$) than did the IELT ≤1 min group. The median expected IELT of the two groups was the same (10 min), but the Wilcoxon rank-sum test showed that it was longer ($P < 0.01$) in the IELT >1 min group.

Figure 1: Sensory threshold in the overall population. Sensory threshold of (**a**) warm, (**b**) cold, and (**c**) vibration in each location. The dot indicates the median and the whiskers indicate lower and upper quartile.

Figure 2: Sensory threshold in LPE and APE group. Sensory threshold of (**a**) warm, (**b**) cold, and (**c**) vibration in each location. The dot indicates th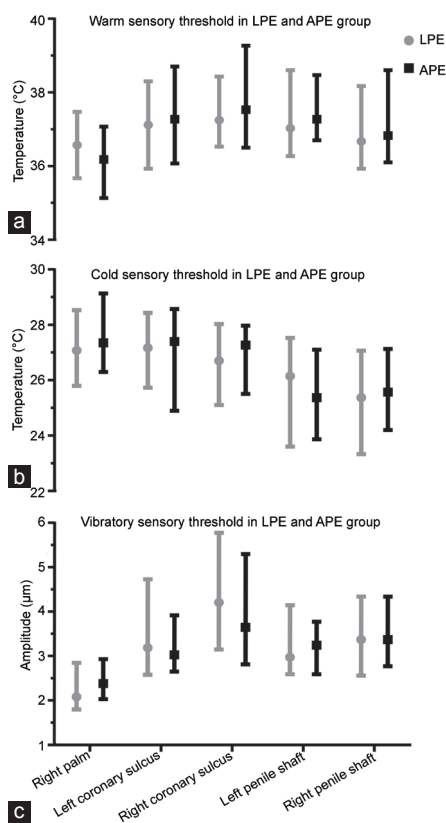e median and the whiskers indicate lower and upper quartile. No significant difference between LPE and APE group (Wilcoxon rank-sum test). LPE: lifelong premature ejaculation; APE: acquired premature ejaculation.

Figure 3: Sensory threshold in PE without ED and PE with ED group. Sensory threshold of (**a**) warm, (**b**) cold, and (**c**) vibration in each location. The dot indicates the median and the whiskers indicate lower and upper quartile. $*P < 0.1$, $^{\#}P < 0.05$ (Wilcoxon rank_sum test, comparison between PE without and with ED group). PE: premature ejaculation; ED: erectile dysfunction.

Additionally, a medical history of smoking was more prevalent in the IELT >1 min group than in the IELT ≤1 min group (40.00% *vs* 21.88%, $P = 0.03$). No difference in penile sensory thresholds was found between the groups (**Figure 4**).

PE without OPPD and PE with OPPD
In the overall population, 81 patients had PE without OPPD (59.56%) and 55 had PE with OPPD (40.44%). The PE without OPPD group had better erectile function than did the PE with OPPD group (median IIEF-5 score: 21 *vs* 20, $P = 0.02$). There were no differences in medical history, sexual life, and penile sensory thresholds between the groups (**Supplementary Table 10–12** and **Figure 5**).

DISCUSSION
PE is a prevalent sexual dysfunction that seriously and negatively affects couples' quality of life.[4] In this study, we examined the differences in penile sensory thresholds and clinical characteristics among four PE classification modalities in a Chinese population. To the best of our knowledge, this is the first study to investigate penile sensory thresholds in different subtypes of PE.

On the basis of Waldinger's classification for PE,[17,18] we defined PESC as a new subtype and proposed a five-subtype classification for PE. However, only LPE and APE were analyzed because of the small sample size of NVPE, PLED, and PESC. Consistent with evidence-based definitions for LPE and APE,[1] we observed a shorter self-estimated IELT in the LPE group than in the APE group. We also found that the APE group had an older age and a higher marriage rate compared
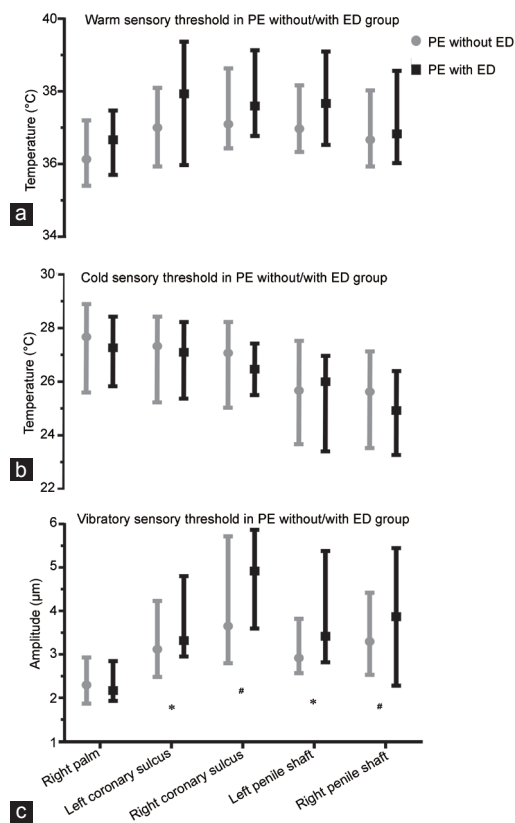
with the LPE group, which can be attributed to the later onset time. Distinction in penile sensory thresholds between LPE and APE was not found. Therefore, the evidence is inadequate to determine the role of penile sensitivity in LPE and APE.

In our study, more severe symptoms of PE were observed in impotent patients with PE. A negative correlation between the IIEF-5 score and PEDT score was also observed ($r = -0.29$, $P < 0.001$). We speculate that comorbid ED in patients with PE may derive from a serious psychological burden.[4,25] Men may ejaculate prematurely because of insufficient confidence in their ability to achieve and maintain a reliable erection.[26] A vicious cycle may form under psychological stress.[27] When a man tries to delay ejaculation, he may instinctively reduce the level of excitation, which results in ED. When a man tries to maintain an erection, he may increase the level of excitation, which results in PE.

Similar to Rowland *et al*.'s study,[11] we showed that the penile vibratory threshold in the PE with ED group was higher than that in the PE without ED group. Another study found that the penile vibratory threshold in patients with diabetes was higher than that in controls, but lower than that in impotent patients with diabetes.[28] Because only one participant in our study suffered from diabetes, we speculate that penile hyposensitivity is an intrinsic characteristic of ED. Other organic/psychogenic risk factors of ED, such as diabetes, can further reduce penile sensitivity.

Gao *et al*.[21] suggested that a short IELT was associated with severe anxiety and depression, indicating that IELT not only reflects

the severity of PE, but also affects the patient's confidence. Similar to their study,[21] we found that participants with an IELT ≤1 min had a shorter expected IELT and higher PEDT score, reflecting more severe symptoms and less confidence in sexual function. More participants were smokers in the IELT >1 min group, but there is currently no evidence to associate tobacco with IELT or PE. This phenomenon may be due to the higher percentage of APE in the IELT >1 min group because a previous study reported that patients with APE were more likely to smoke.[29] In normal men, no correlation between the penile vibratory threshold and IELT was found, and penile sensitivity cannot explain variability in IELT.[30] We validated this conclusion in the PE population by finding no difference in the penile sensory thresholds between the IELT ≤1 min and IELT >1 min groups, and there was no correlation between penile sensitivity and IELT.

Perception of pleasure during intercourse and ejaculation is vital for sexual satisfaction. Several studies have shown that sexual satisfaction is decreased in patients with PE.[31,32] We also found that 40.44% of the PE population had OPPD in this study. Patients with PE tend to reduce their excitation in an attempt to increase control over ejaculation, and thus erection and orgasmic sensation diminish.[24,27] Our study supports this hypothesis because we found a lower IIEF-5 score in the PE with OPPD group than in the PE without OPPD group. However, the difference in IIEF-5 score was only one point. This minor change was not great enough to affect the penile sensory threshold and was not clinically significant to affect erectile function. Moreover, psychological stress in the PE population may have a negative effect in orgasmic pleasure perception.[24]

In line with the findings of Corona *et al.*,[33] our results also suggest an interplay of ED and PE. Comorbid ED in patients with PE reduces

quality of life and increases their distress, whereas treatment for ED can improve symptoms in patients with PE. Evidence has indicated that phosphodiesterase Type 5 inhibitors are ineffective in prolonging IELT. However, confidence, anxiety, perception of ejaculatory control, and sexual satisfaction of patients with PE are improved with these drugs, especially in those with comorbid ED.[1,9] We support the idea that ED should be treated before dealing with PE.[25] The present study indicates that reducing penile sensitivity may affect erectile function. Consistent with our finding, trials conducted in impotent patients with PE also demonstrated that ED was a common adverse event for topical anesthetics.[34–36] Therefore, topical anesthetics should be used with caution, particularly in patients with both ED and PE.

The participants in our study were mostly seriously distressed by PE. Even though the frequency of sexual intercourse was similar to outpatients from an andrology clinic in China,[37] the population of our study represented patients with more severe symptoms, and they were more concerned about PE. We found that self-estimated IELT was shorter, and the proportions of LPE, APE, and comorbid ED were higher than those from an andrology clinic. Caution is advised for extending our conclusions to the general PE population or people without PE.

Compared with similar studies that focused on penile sensitivity, the number of patients with PE in our study is the largest (*n* = 136), but the sample size for some subtypes (NVPE, PLED, and PESC) is still insufficient. The nonvalidated Chinese version of the modified IIEF-5 scoring system and diagnostic criteria of OPPD may also have caused bias. Another limitation is the observational and cross-sectional nature of the present study. Therefore, our results need verification in a future longitudinal study or clinical trial.
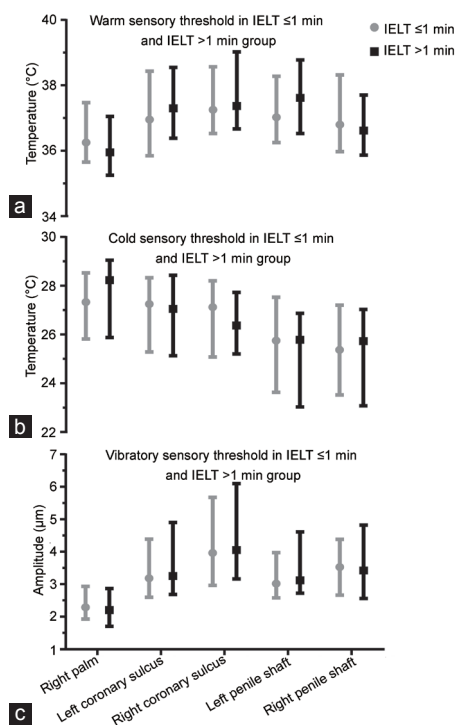

Figure 4: Sensory threshold in IELT ≤1 min and IELT >1 min group. Sensory threshold of (**a**) warm, (**b**) cold, and (**c**) vibration in each location. The dot indicates the median and the whiskers indicate lower and upper quartile. No significant difference between IELT ≤1 min and IELT >1 min group (Wilcoxon rank-sum test). IELT: intravaginal ejaculation latency.

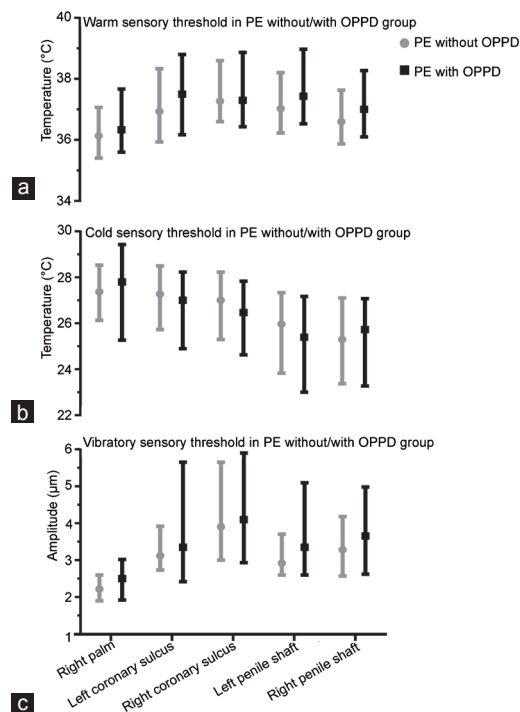**Figure 5:** Sensory threshold in PE without OPPD and PE with OPPD group. Sensory threshold of (**a**) warm, (**b**) cold, and (**c**) vibration in each location. The dot indicates the median and the whiskers indicate lower and upper quartile. No significant difference between PE without OPPD and PE with OPPD group (Wilcoxon rank-sum test). PE: premature ejaculation; OPPD: orgasmic pleasure perceptual dysfunction.

CONCLUSION

This study shows that patients with PE and ED have a higher penile vibratory threshold than do patients with PE but not ED. ED is associated with more severe symptoms and weaker orgasmic pleasure perception in patients with PE. There are no differences in penile sensory thresholds among other subtypes of PE. Evaluating and treating ED in patients with PE are necessary. When using topical anesthetics for therapy of PE, especially in men with comorbid ED, attention should be paid to their side effects on erectile function.

AUTHOR CONTRIBUTIONS

XC, FXW, and JCD designed this study; XC, CH, NQY, and JCD recruited the patients and collected clinical data; XC and FXW conducted the questionnaire survey and quantitative sensory testing, and performed data analysis and interpretation; XC prepared the figures and drafted the manuscript; FXW and JCD revised the manuscript. All authors read and approved the final manuscript.

COMPETING INTERESTS

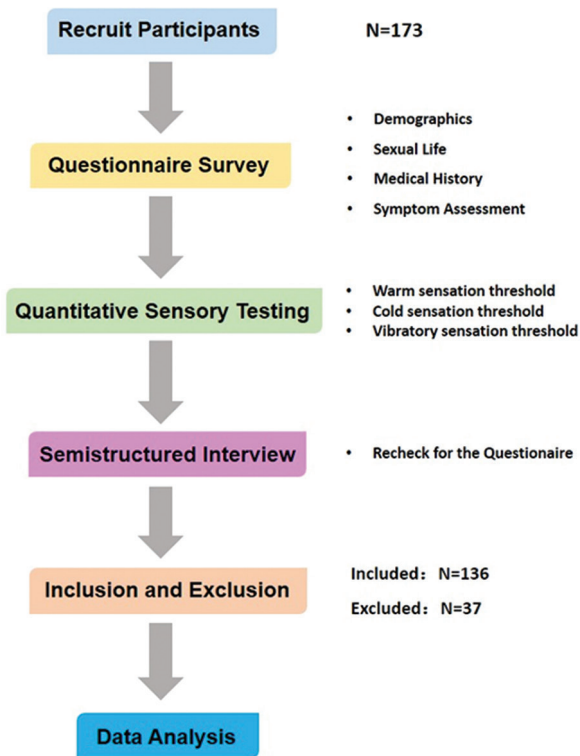All authors declared no competing interests.

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Supplementary Figure 1: Flow diagram of research process.

Supplementary Figure 2: Quantitative sensory test location on palm and penis. Blue circles indicate test locations on palm (a) and penis (b).

Supplementary Table 1: Comparison of characteristics between lifelong premature ejaculation and acquired premature ejaculation group

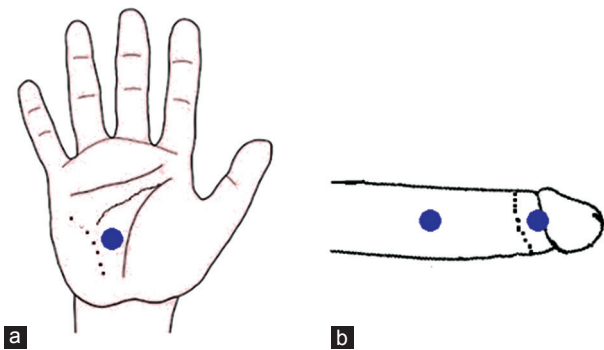| Variable	LPE	APE	P
Age (year)	29 (27, 34)	33 (29, 37)	<0.01
Height (cm)	173.05±4.82	172.46±5.62	0.55
Weight (kg)	69.08±8.93	70.30±10.21	0.49
BMI (kg m^{-2})	23.07±2.77	23.64±3.23	0.30
Self-estimated IELT (min)	0.7 (0.4, 1.0)	1.0 (0.8, 1.5)	<0.001
Expected IELT (min)	10 (7, 15)	10 (5, 15)	0.51
PEDT score	13 (11, 15)	12 (10, 15)	0.54
IIEF-5 score	20 (17, 22)	21 (18, 23)	0.10

Normal distributed measurement data were presented as mean±s.d., abnormal distributed data were presented as median (lower quartile, upper quartile).
PE: premature ejaculation; LPE: lifelong PE; APE: acquired PE; BMI: body mass index; IELT: intravaginal ejaculation latency time; PEDT: PE diagnostic tool; IIEF-5: 5-item version of the International Index of Erectile Function; s.d.: standard deviation

Supplementary Table 2: Comparison of medical history between lifelong premature ejaculation and acquired premature ejaculation group

Variables	LPE (%)	APE (%)	P
Medical history			
Smoking	19 (22.09)	14 (34.15)	0.15
Alcohol consumption	4 (4.65)	2 (4.88)	1.00
Diabetes mellitus	0	1 (2.44)	0.32
Hypertension	2 (2.33)	2 (4.88)	0.59
Hyperlipidemia	2 (2.33)	4 (9.76)	0.08
Thyroid disease	0	0	-
Urinary tract infection	4 (4.65)	0	0.30
Prostatitis	23 (26.74)	8 (19.51)	0.38
Male infertility	2 (2.33)	1 (2.44)	1.00
Deny history of diseases	54 (62.79)	26 (63.41)	0.95

PE: premature ejaculation; LPE: lifelong PE; APE: acquired PE

Supplementary Table 3: Comparison of sexual life between lifelong premature ejaculation and acquired premature ejaculation group

Variables	LPE (%)	APE (%)	P
Marital status			
Married	49 (56.98)	31 (75.61)	0.04
Unmarried	37 (43.02)	10 (24.39)	
Frequency of sexual activity			
≥3 time/week	14 (16.28)	3 (7.32)	0.57
2 time/week	20 (23.26)	10 (24.39)	
1 time/week	26 (30.23)	18 (43.90)	
<1 time/week	26 (30.23)	10 (24.39)	
Perception of sexual pleasure			
Non-OPPD	49 (56.98)	28 (68.29)	0.22
OPPD	37 (43.02)	13 (31.71)	

PE: premature ejaculation; LPE: lifelong PE; APE: acquired PE; OPPD: orgasmic pleasure perceptual dysfunction

Supplementary Table 4: Comparison of characteristics between premature ejaculation without erectile dysfunction and premature ejaculation with erectile dysfunction

Variables	PE without ED	PE with ED	P
Age (year)	31 (27, 35)	30 (27, 36)	0.70
Height (cm)	173.38±4.96	171.98±5.15	0.13
Weight (kg)	70 (62, 75)	67 (63, 75)	0.90
BMI (kg m^{-2})	23.08±3.01	23.36±2.86	0.61
Self-estimated IELT (min)	1.0 (0.5, 1.2)	0.7 (0.3, 1.5)	0.14
Expected IELT (min)	10 (5, 15)	10 (8, 15)	1.00
PEDT score	12 (10, 15)	14 (12, 16)	<0.001
IIEF-5 score	21 (20, 23)	15 (11, 17)	<0.001

Normal distributed measurement data were presented as mean±s.d., abnormal distributed data were presented as median (lower quartile, upper quartile). PE: premature ejaculation; ED: erectile dysfunction; BMI: body mass index; IELT: intravaginal ejaculation latency time; PEDT: PE diagnostic tool; IIEF-5: 5-item version of the International Index of Erectile Function; s.d.: standard deviation

Supplementary Table 5: Comparison of medical history between premature ejaculation without erectile dysfunction and premature ejaculation with Erectile dysfunction

Variables	PE without ED (%)	PE with ED (%)	P
Medical history			
Smoking	27 (28.42)	10 (24.39)	0.63
Alcohol consumption	4 (4.21)	2 (4.88)	1.00
Diabetes mellitus	1 (1.05)	0	1.00
Hypertension	2 (2.21)	3 (7.32)	0.32
Hyperlipidemia	5 (5.26)	1 (2.44)	0.78
Thyroid disease	0	0	-
Urinary tract infection	2 (2.11)	2 (4.88)	0.75
Prostatitis	25 (26.32)	10 (24.39)	0.81
Male infertility	2 (2.11)	1 (2.44)	1.00
Deny history of diseases	59 (62.11)	25 (60.98)	0.90

PE: premature ejaculation; ED: erectile dysfunction

Supplementary Table 6: Comparison of sexual life between premature ejaculation without erectile dysfunction and premature ejaculation with erectile dysfunction

Variables	PE without ED (%)	PE with ED (%)	P
PE subtype			
LPE	58 (61.05)	28 (68.29)	0.93
APE	30 (31.58)	11 (26.83)	
NVPE	2 (2.11)	1 (2.44)	
PESC	2 (2.11)	0	
PLED	3 (3.16)	1 (2.44)	
Marital status			
Married	60 (63.16)	27 (65.85)	0.76
Unmarried	35 (36.84)	14 (34.15)	
Frequency of sexual activity			
≥3 time/week	14 (14.74)	6 (14.63)	0.64
2 time/week	21 (22.11)	12 (29.27)	
1 time/week	38 (40.00)	7 (17.07)	
<1 time/week	22 (23.16)	16 (39.02)	
Perception of sexual pleasure			
Non-OPPD	61 (64.21)	20 (48.78)	0.09
OPPD	34 (35.79)	21 (51.22)	

PE: premature ejaculation; ED: erectile dysfunction; LPE: lifelong PE; APE: acquired PE; NVPE: natural variable PE; PESC: PE in specific conditions; PLED: premature-like ejaculation dysfunction; OPPD: orgasmic pleasure perceptual dysfunction

Supplementary Table 7: Comparison of characteristics between intravaginal ejaculation latency time ≤1 min and intravaginal ejaculation latency time >1 min group

Variables	IELT		P
	≤1 min	>1 min	
Age (year)	30 (27, 34)	32 (28, 36.5)	0.21
Height (cm)	172.95±4.79	172.98±5.66	0.98
Weight (kg)	69.5 (63, 75)	69 (61, 75)	0.82
BMI (kg m^{-2})	23.16±2.86	23.15±3.22	0.98
Self-estimated IELT (min)	0.65 (0.4, 1.0)	1.5 (1.5, 2.0)	<0.001
Expected IELT (min)	10 (5, 15)	10 (10, 15)	<0.01
PEDT score	13 (11, 15)	11 (9.5, 14)	<0.01
IIEF-5 score	21 (17.5, 22)	20 (17, 22)	0.73

Normal distributed measurement data were presented as mean±s.d., abnormal distributed data were presented as median (lower quartile, upper quartile). IELT: intravaginal ejaculation latency time; BMI: body mass index; PEDT: PE diagnostic tool; IIEF-5: 5-item version of the International Index of Erectile Function; PE: premature ejaculation; s.d.: standard deviation

Supplementary Table 8: Comparison of medical history between intravaginal ejaculation latency time ≤1 min and intravaginal ejaculation latency time >1 min group

Variables	IELT		P
	≤1 min (%)	>1 min (%)	
Medical history			
Smoking	21 (21.88)	16 (40.00)	0.03
Alcohol consumption	4 (4.17)	2 (5.00)	1.00
Diabetes mellitus	1 (1.04)	0	1.00
Hypertension	2 (2.08)	3 (7.50)	0.30
Hyperlipidemia	3 (3.13)	3 (7.50)	0.50
Thyroid disease	0	0	-
Urinary tract infection	4 (4.17)	0	0.32
Prostatitis	24 (25.00)	11 (27.50)	0.76
Male infertility	1 (1.04)	2 (5.00)	0.43
Deny history of diseases	64 (66.67)	20 (50.00)	0.07

IELT: intravaginal ejaculation latency time

Supplementary Table 9: Comparison of sexual life between intravaginal ejaculation latency time ≤1 min and intravaginal ejaculation latency time >1 min group

Variables	IELT		P
	≤1 min (%)	>1 min (%)	
PE subtype			
LPE	68 (70.83)	18 (45.00)	<0.01
APE	26 (27.08)	15 (37.50)	
NVPE	1 (1.04)	2 (5.00)	
PESC	1 (1.04)	1 (2.50)	
PLED	0	4 (10.00)	
Marital status			
Married	59 (61.46)	28 (70.0)	0.34
Unmarried	37 (38.54)	12 (30.00)	
Frequency of sexual activity			
≥3 time/week	11 (11.46)	9 (22.50)	0.39
2 time/week	24 (25.00)	9 (22.50)	
1 time/week	35 (36.46)	10 (25.00)	
<1 time/week	26 (27.08)	12 (30.00)	
Perception of sexual pleasure			
Non-OPPD	60 (62.50)	21 (52.50)	0.28
OPPD	36 (37.50)	19 (47.50)	

PE: premature ejaculation; IELT: intravaginal ejaculation latency time; LPE: lifelong PE; APE: acquired PE; NVPE: natural variable PE; PESC: PE in specific conditions; PLED: premature-like ejaculation dysfunction; OPPD: orgasmic pleasure perceptual dysfunction

Supplementary Table 10: Comparison of characteristics between premature ejaculation without orgasmic pleasure perceptual dysfunction and premature ejaculation with orgasmic pleasure perceptual dysfunction

Variables	PE without OPPD	PE with OPPD	P
Age (year)	32 (28, 36)	30 (27, 33)	0.26
Height (cm)	173.31±5.24	172.44±4.74	0.13
Weight (kg)	68 (62, 75)	70 (64, 75)	0.98
BMI (kg m^{-2})	23.14±3.03	23.19±2.88	0.91
Self-estimated IELT (min)	1.0 (0.5, 1.2)	1.0 (0.5, 1.5)	0.67
Expected IELT (min)	10 (7, 15)	10 (5, 15)	0.19
PEDT score	12 (10, 15)	13 (10, 15)	0.78
IIEF-5 score	21 (19, 23)	20 (17, 21)	0.02

Normal distributed measurement data were presented as mean±s.d., abnormal distributed data were presented as median (lower quartile, upper quartile). PE: premature ejaculation; OPPD: orgasmic pleasure perceptual dysfunction; BMI: body mass index; IELT: intravaginal ejaculation latency time; PEDT: PE diagnostic tool; IIEF-5: 5-item version of the International Index of Erectile Function; s.d.: standard deviation

Supplementary Table 11: Comparison of medical history between premature ejaculation without orgasmic pleasure perceptual dysfunction and premature ejaculation with orgasmic pleasure perceptual dysfunction

Variables	PE without OPPD (%)	PE with OPPD (%)	P
Medical history			
Smoking	22 (27.16)	15 (27.27)	0.99
Alcohol consumption	4 (4.94)	2 (3.64)	1.00
Diabetes mellitus	1 (1.23)	0	1.00
Hypertension	4 (4.94)	1 (1.82)	0.63
Hyperlipidemia	5 (6.17)	1 (1.82)	0.43
Thyroid disease	0	0	-
Urinary tract infection	2 (2.47)	2 (3.64)	1.00
Prostatitis	21 (25.93)	14 (25.45)	0.95
Male infertility	2 (2.47)	1 (1.82)	1.00
Deny history of diseases	48 (59.26)	36 (65.45)	0.47

PE: premature ejaculation; OPPD: orgasmic pleasure perceptual dysfunction

Supplementary Table 12: Comparison of sexual life between premature ejaculation without orgasmic pleasure perceptual dysfunction and premature ejaculation with orgasmic pleasure perceptual dysfunction

Variables	PE without OPPD (%)	PE with OPPD (%)	P
PE type			
LPE	49 (60.49)	37 (67.27)	0.33
APE	28 (34.57)	13 (23.64)	
NVPE	2 (2.47)	1 (1.82)	
PESC	0	2 (3.64)	
PLED	2 (2.47)	2 (3.64)	
Marital status			
Married	54 (66.67)	33 (60.00)	0.43
Unmarried	27 (33.33)	22 (40.00)	
Frequency of sexual activity			
≥3 time/week	12 (14.81)	8 (14.55)	0.75
2 time/week	18 (22.22)	15 (27.27)	
1 time/week	28 (34.57)	17 (30.91)	
<1 time/week	23 (28.40)	15 (27.27)	

PE: premature ejaculation; OPPD: orgasmic pleasure perceptual dysfunction; ED: erectile dysfunction; LPE: lifelong PE; APE: acquired PE; NVPE: natural variable PE; PESC: PE in specific conditions; PLED: premature-like ejaculation dysfunction