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ORIGINAL ARTICLE

Male Sexual Dysfunction

Validity of premature ejaculation diagnostic tool and its association with International Index of Erectile Function-15 in Chinese men with evidence-based-defined premature ejaculation

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The premature ejaculation diagnostic tool (PEDT) is a brief diagnostic measure to assess premature ejaculation (PE). However, there is insufficient evidence regarding its validity in the new evidence-based-defined PE. This study was performed to evaluate the validity of PEDT and its association with IIEF-15 in different types of evidence-based-defined PE. From June 2015 to January 2016, a total of 260 men complaining of PE and defined as lifelong PE (LPE)/acquired PE (APE) according to the evidence-based definition from Andrology Clinic of the First Affiliated Hospital of Anhui Medical University, along with 104 male healthy controls without PE from a medical examination center, were enrolled in this study. All individuals completed questionnaires including demographics, medical and sexual history, as well as PEDT and IIEF-15. After statistical analysis, it was found that men with PE reported higher PEDT scores (14.28 ± 3.05) and lower IIEF-15 (41.26 ± 8.20) than men without PE (PEDT: 5.32 ± 3.42 , IIEF-15: 52.66 ± 6.86 , $P < 0.001$ for both). It was suggested that a score of ≥ 9 indicated PE in both LPE and APE by sensitivity and specificity analyses (sensitivity: 0.875, 0.913; specificity: 0.865, 0.865, respectively). In addition, IIEF-15 were higher in men with LPE (42.64 ± 8.11) than APE (39.43 ± 7.84 , $P < 0.001$). After adjusting for age, IIEF-15 was negatively related to PEDT in men with LPE (adjust $r = -0.225$, $P < 0.001$) and APE (adjust $r = -0.378$, $P < 0.001$). In this study, we concluded that PEDT was valid in the diagnosis of evidenced-based-defined PE. Furthermore, IIEF-15 was negatively related to PEDT in men with different types of PE.

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INTRODUCTION

The prevalence of premature ejaculation (PE) varies by different areas and diverse definitions, with 20%–40% of adult men suffering from this embarrassing disease.^{1–3} There are ongoing debates on the prevalence, definition, and classification of PE due to the absence of a universally accepted definition of PE. In 2009 and 2013, the International Society for Sexual Medicine (ISSM) proposed the evidence-based definitions of lifelong PE (LPE) and acquired PE (APE). The definitions characterized PE as male sexual dysfunction which included three perspectives: (1) intravaginal ejaculatory latency time (IELT); (2) lacking control to delay ejaculation; and (3) negative personal consequences.⁴ According to the definition, when dealing with PE patients, we need to consider three main factors: time, control, and stress. As the most common sexual dysfunction, PE might have a harmful effect on conjugal relations, although it may be difficult to discern whether the couple's troubles are the cause or the effect of PE.⁵

As for assessment of PE, medical history, physical examination, stopwatch/self-estimation assessment of IELT, and assessment

instruments such as the premature ejaculation profile (PEP), index of premature ejaculation (IPE), and premature ejaculation diagnostic tool (PEDT) have played vital roles in the assessment of PE.⁶ Huang *et al.*⁷ concluded that the Chinese version of PEDT was valid for Chinese men, and it was in strong agreement with the clinical diagnosis of PE. However, there is insufficient evidence concerning its validity in the new evidence-based-defined PE.

It was reported that there were more comorbidities occurring in men with a complaint of PE, for example, diabetes mellitus and chronic prostatitis.⁸ Lee⁹ also concluded that erectile dysfunction (ED) was independently correlated with PE. Laumann *et al.*¹⁰ reported that a history of difficulty with erections was an independent predictor of early ejaculation in a global study. It was conjectured that PE was related to ED. However, there have been few studies systematically evaluating the relationship between ED and evidence-based-defined PE to date.

As a consequence, this study was undertaken to investigate whether PEDT was concordant with evidence-based-defined PE and its association with the International Index of Erectile

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Function-15 (IIEF-15), which assessed not only erectile dysfunction but also several other dimensions of male sexual functioning in Chinese patients with LPE/APE.

METHODS

Study design and setting

From June 2015 to January 2016, a total of 260 consecutive heterosexual men who were diagnosed as LPE or APE according to the new evidence-based definitions were enrolled in the study. All patients were recruited from the Andrology Clinic of the First Affiliated Hospital of Anhui Medical University in Hefei, China. Another 104 male healthy volunteers without PE complaint from our medical examination center for physical examination were enrolled as the control group. After providing written informed consent, all of the individuals were required to fill in questionnaires including demographics, such as weight, height, age, marital status, occupational status, educational status, monthly income, and residence, past medical history and sexual history, PEDT, as well as IIEF-15 scale.

Before the survey, a presurvey was completed by thirty individuals to refine the questions and improve their clarity. This study was approved by the Ethics Committee of the First Affiliated Hospital of Anhui Medical University.

Participants

To be included in the study, men with LPE/APE had to meet the following criteria: (1) in a heterosexual stable sexual relationship with the same female partner for at least 6 months; (2) no major psychiatric or somatic disorder, and had not consumed any drug that could affect sexual function and/or psychological status; (3) attempting intercourse once or more per week; and (4) meeting the evidence-based definition proposed by ISSM in 2013 (LPE:^[1] IELT ≤ 1 min from the first sexual experience,^[2] inability to delay ejaculation,^[3] related negative personal consequences, such as distress, bother, frustration, and/or the avoidance of sexual intimacy; APE:^[1] a clinically significant reduction in IELT, often ≤ 3 min,^[2] lacking the ability to delay ejaculation,^[3] related negative personal consequences as similar with that of LPE).⁴ The 104 male healthy volunteers without PE had to meet the same criteria of (1), (2), and (3), but not be in accordance with (4).

Variables and measurements

Assessment of PE

PE is assessed by the Chinese version of PEDT which has been shown to be valid in detecting the presence of PE among Chinese patients.⁷ It includes five questions: “how difficult is it for you to delay ejaculation?”, “Do you ejaculate before you wish?”, “Do you ejaculate with very little stimulation?”, “Do you feel frustrated because of ejaculating before you want to?” and “How concerned are you that your time to ejaculation leaves your partner sexually unfulfilled?”. Each item has a score of zero to four, and the PEDT is scored by considering all five items together.¹¹

Assessment of ED and several other dimensions of male sexual functioning

The Chinese version of IIEF-15 is used to measure ED and several other dimensions of male sexual functioning, which includes five domains: erectile function (items 1–5, 15), intercourse satisfaction (items 6–8), orgasmic function (items 9, 10), sexual desire (items 11, 12), and overall satisfaction (items 13, 14). The IIEF-15 was scored by taking all fifteen items together.^{12,13} The reliability of the IIEF-15 was assessed with Cronbach’s alpha coefficient. The internal consistency was 0.83.

Bias

In order to address potential bias, two people inputted data to address information bias, and all individuals with or without PE were chosen according to the strict criteria to address confounding bias.

Statistical analysis

The SPSS 19.0 software (SPSS Inc., Chicago, IL, United States) was used for statistical analysis. Comparison of quantitative data (expressed as mean \pm s.d.) and proportions (expressed as percentage) was performed by the two-tailed unpaired Student’s *t*-test and Chi-square test. For the sensitivity and specificity of PEDT, receiver operating characteristic (ROC) analysis was performed. Furthermore, to eliminate the influence of some related factors such as age, partial correlation was used to illuminate the association between PEDT and IIEF-15. $P < 0.05$ was considered statistically significant.

RESULTS

Demographic information

The detailed demographic information of all individuals is shown in **Table 1**. There were no significant differences in age, BMI, educational status, occupational status, monthly income, and residence between the PE and control groups (all $P > 0.05$). When the LPE and APE groups were compared, it was found that individuals with APE were older than those with LPE, but no significant differences were found in other characteristics (all $P > 0.05$).

Validation of PEDT in men with different types of PE

A total of 148 men with LPE and 112 individuals with APE as well as 104 cases without PE were enrolled for evaluation and validation. Two criteria were set in the ROC curve: the maximum value of sensitivity + specificity and the minimum value of $(1 - \text{sensitivity})^2 + (1 - \text{specificity})^2$. The cutoff point met both criteria. It was found that the cutoff point was 9.5 between LPE and without PE, as well as between APE and without PE (**Table 2** and **Figure 1** and **2**).

Outcomes of PEDT and IIEF-15 in men with LPE/APE and without PE

There were significant differences in PEDT and IIEF-15 between men with and without PE ($P < 0.001$ for both). Compared to men without PE, PE cases had significantly higher PEDT of 14.28 ± 3.05 . Moreover, the mean IIEF-15 score in men with PE was 41.26 ± 8.20 , which was significantly lower than that in men without PE. Similar differences were found in all five domains of IIEF-15 between men with and without PE. The detailed data are shown in **Table 3**.

As for the comparison between men with LPE and APE, it was found that men with LPE had higher total IIEF-15 score (42.64 ± 8.11) than men with APE (39.43 ± 7.84 , $P < 0.001$), although no differences were found in PEDT and some domains (intercourse satisfaction,

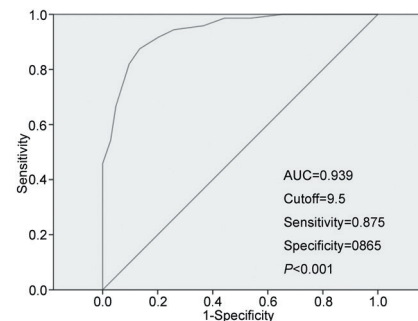


Figure 1: Receiver operating characteristic curve analysis of PEDT scores for LPE classifier.

Table 1: The general characteristics of the males according to the presence of premature ejaculation complaints

	With PE (n=260)	Without PE (n=104)	t/χ^2	P^*	With LPE (n=148)	With APE (n=112)	t/χ^2	P^*
Age (year)	32.73±10.02	34.92±10.83	1.780	0.075	28.99±9.26	37.67±12.85	6.057	<0.001
BMI (kg m ⁻²)	23.95±3.53	24.22±3.31	0.690	0.490	24.09±2.98	23.77±3.30	0.807	0.420
Educational status								
Illiterate	8 (3.1)	2 (1.9)	5.165	0.160	4 (2.7)	4 (3.6)	4.135	0.247
Primary education	27 (10.4)	7 (6.7)			12 (8.1)	15 (13.4)		
High school	118 (45.4)	39 (37.5)			64 (43.2)	54 (48.2)		
Higher education	107 (41.2)	56 (53.9)			68 (45.9)	39 (34.8)		
Occupational status								
Unemployed	48 (18.5)	25 (24.0)	1.114	0.291	29 (19.6)	19 (17.0)	0.293	0.588
Employed	212 (81.5)	79 (76.0)			119 (80.4)	93 (83.0)		
Monthly income, CNY (%)								
<2000	36 (13.8)	11 (10.6)	4.368	0.113	19 (12.8)	17 (15.2)	3.359	0.186
2000–3000	98 (37.7)	30 (28.8)			50 (33.8)	48 (42.9)		
>3000	126 (48.5)	63 (60.6)			79 (53.4)	47 (42.0)		
Residence								
Urban	138 (53.1)	46 (44.2)	2.326	0.127	87 (58.8)	51 (0)	0.748	0.387
Rural	122 (46.9)	58 (55.8)			61 (41.2)	61 (0)		

*Difference between men with and without PE or different subtypes of PE were assessed by *t*-test or Chi-square test, as appropriate. PE: premature ejaculation; LPE: lifelong premature ejaculation; APE: acquired premature ejaculation; BMI: body mass index; CNY: Chinese yuan

Table 2: Diagnostic cutoff point of premature ejaculation diagnostic tool in men with lifelong premature ejaculation and acquired premature ejaculation

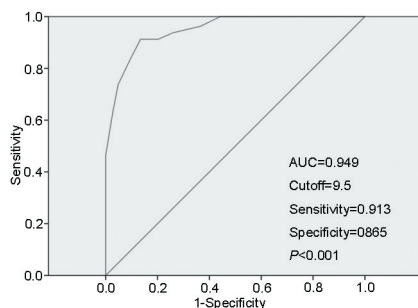
	Cut-off point	Sensitivity	Specificity	Criteria 1 Sensitivity + specificity	Criteria 2 (1-sensitivity) ² + (1-specificity) ²
LPE	8.5	0.917	0.798	1.715	0.048
	9.5	0.875	0.865	1.740	0.034
	10.5	0.819	0.904	1.723	0.042
APE	8.5	0.913	0.798	1.711	0.041
	9.5	0.913	0.865	1.778	0.026
	10.5	0.838	0.904	1.742	0.035

LPE: lifelong premature ejaculation; APE: acquired premature ejaculation

Table 3: Comparison of premature ejaculation diagnostic tool and Index of Erectile Function-15 according to the presence and subtypes of premature ejaculation complaints

	With PE (n=260)	Without PE (n=104)	t/χ^2	P^*	With LPE (n=148)	With APE (n=112)	t/χ^2	P^*
PEDT	14.28±3.05	5.32±3.42	23.271	<0.001	14.02±2.96	14.62±3.18	1.552	0.121
IIEF-15	41.26±8.20	52.66±6.86	13.519	<0.001	42.64±8.11	39.43±7.84	3.221	<0.001
Erectile function	18.37±3.98	22.18±3.14	9.655	<0.001	19.04±4.03	17.48±3.25	3.454	<0.001
Intercourse satisfaction	5.73±1.29	7.03±1.32	8.543	<0.001	5.62±1.22	5.88±1.31	1.648	0.101
Orgasmic function	7.23±2.10	8.65±1.58	7.016	<0.001	7.49±2.21	6.89±1.92	2.337	0.020
Sexual desire	6.38±1.72	7.24±1.44	4.860	<0.001	6.48±1.70	6.25±1.78	1.052	0.293
Overall satisfaction	3.55±1.82	7.55±1.50	21.575	<0.001	4.01±1.93	2.94±1.62	4.854	<0.001

*Difference between men with and without PE or different subtypes of PE were assessed by *t*-test or Chi-square test, as appropriate. PEDT: premature ejaculation diagnostic tool; IIEF-15: Index of Erectile Function-15; PE: premature ejaculation; LPE: lifelong premature ejaculation; APE: acquired premature ejaculation

**Figure 2:** Receiver operating characteristic curve analysis of PEDT scores for APE classifier.

orgasmic function, and sexual desire) of IIEF-15 between men with LPE and APE. These results are also shown in **Table 3**.

Association between PEDT and IIEF-15 in men with PE

Considering that age might be related to male sexual function, and to eliminate the influence of this factor, partial correlation was used to determine the association between PEDT and IIEF-15. It was found that PEDT showed a significant negative correlation with total IIEF-15 score (adjust $r = -0.288$, $P < 0.001$) and some domains (erectile function, intercourse satisfaction, and overall satisfaction) of IIEF-15 in men with PE. Similar results were also found in men with LPE and APE. Detailed correlations are shown in **Table 4**.

Table 4: Correlations between premature ejaculation diagnostic tool and Index of Erectile Function-15 in men with different premature ejaculation syndromes after adjusting for age

PEDT	IIEF-15		Erectile function		Intercourse satisfaction		Orgasmic function		Sexual desire		Overall satisfaction	
	Adjust r	P*	Adjust r	P*	Adjust r	P*	Adjust r	P*	Adjust r	P*	Adjust r	P*
PE	-0.288	<0.001	-0.248	0.003	-0.221	0.022	-0.032	0.628	0.153	0.160	-0.502	<0.001
LPE	-0.225	<0.001	-0.183	0.021	-0.286	0.015	-0.014	0.847	0.110	0.102	-0.332	0.004
APE	-0.378	<0.001	-0.324	<0.001	-0.170	0.054	-0.082	0.541	0.058	0.372	-0.582	<0.001

*Partial correlation was used to assess correlations between PEDT and IIEF-15 in men with different PE syndromes after adjusting for age. PEDT: premature ejaculation diagnostic tool; IIEF-15: Index of Erectile Function-15; PE: premature ejaculation; LPE: lifelong premature ejaculation; APE: acquired premature ejaculation

DISCUSSION

In this study, we found that PEDT was highly valid in screening the presence of evidenced-based-defined LPE/APE. In addition, PEDT was found to be negatively related to IIEF-15 in men with LPE and APE. To the best of our knowledge, this is the first study to systematically evaluate the validity of PEDT in evidenced-based-defined LPE/APE.

There have been plenty of studies concerning the validity of PEDT in the diagnosis of PE. Kam *et al.*¹⁴ conducted an investigation in Korea, and found that the cutoff point of 8.5 was applicable between PE and non-PE. In addition, it was worth mentioning that Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition Text Revision (DSM-IV-TR) criteria were used to define PE in this study. However, a Chinese study found excellent concordance between PEDT diagnosis and clinical diagnosis when the PEDT scores ≥ 11 .⁷ In this study, we found that PEDT ≥ 10 indicated LPE or APE. As different criteria were used to assess PE, the cutoff points for PEDT were diverse.

As for the associations between PE and ED, different specialists have diverse perspectives. Porst *et al.*¹⁵ conducted a comprehensive survey enrolling 12 133 individuals, and found that men with PE were more likely to report accompanying sexual dysfunctions than men without PE, such as ED. In addition, Zhang *et al.*¹⁶ conducted an investigation to analyze the factors related to four PE syndromes, and also found that individuals with PE more frequently reported several comorbidities, including ED. On the contrary, no associations between PE and ED were found in other researches.^{17,18} In this study, it was found that men with PE reported higher PEDT and lower IIEF-15 than those without PE, and PEDT was negatively related to IIEF-15, especially erectile function domain of IIEF-15 after adjusting for age in men with PE, which suggested that PE might be related to ED. Differences in populations, culture, etc., might account for the different results obtained concerning the relationship between PE and ED. On the other hand, various definitions of PE and diverse assessment methods for PE and ED might also lead to different results.¹¹

Although PE and ED might be comorbid conditions in some men,¹⁹ the underlying mechanism of the association between PE and ED remains unclear. Rowland *et al.*²⁰ suggested that a vicious cycle might be constituted by PE and ED in some instances. A man might try to delay his ejaculation deliberately by decreasing the level of excitation, and this behavioral pattern might lead to an imperfect erectile situation, even increasing the risk of ED over time. On the other hand, in some circumstances, a man might try to obtain a basic erection by increasing the level of excitation instinctively, which might lead to early ejaculation. Furthermore, the negative personal consequences arising from poor sexual performance might give rise to other sexual problems, such as PE or ED.

In this study, it was also found that individuals with APE had lower IIEF-15 scores, as well as lower scores for the erectile function domain

of IIEF-15 than men with LPE, which might indicate that men with APE had worse erectile function. A study conducted by Gao *et al.*²¹ showed that men with APE had lower IIEF-5 scores than men with other PE syndromes. In their study, it was found that patients with APE were older and heavier, smoked more, and exercised less than patients with other types of PE. These bad habits might account for the higher rates of ED in men with APE. Similar results were shown in an investigation conducted by Serefoglu *et al.*²² in Turkey.

Several limitations of this study should be considered. First, individuals in our study finished the questionnaires in the face-to-face interview with investigators, which might have caused the individuals to feel embarrassed, resulting in a negative influence on the accuracy of the findings. Second, only 260 individuals with PE and 104 healthy men were enrolled in this study; the small sample size might have had an effect on the results. We will gather more cases for further studies in the future. Third, we did not evaluate the testosterone values of individuals in this study, which might have an effect on patients' sexual function. Fourth, no stopwatch-measured IELT values were recorded in this study, which might influence the accuracy of results; therefore, we will record IELT in the follow-up study. Fifth, validation of the Chinese version of IIEF-15 has not been performed before, although it was applied in this study. At the same time, some new diagnostic tools for sexual dysfunction, such as "Female Sexual Distress Scale-Revised-Premature Ejaculation questionnaire" and "Orgasmometer," etc., will be validated in a further study.^{23,24}

CONCLUSIONS

The PEDT was highly valid in screening the presence of both LPE and APE defined by the evidence-based definition. Men with PE complaints reported worse PEDT and IIEF-15 than men without PE complaints. Besides, men with APE had worse IIEF-15 than men with LPE. Moreover, PEDT was negatively related to IIEF-15 in men with LPE and APE. Further researches are needed to determine the underlying mechanisms of the relationship between ED and PE.

AUTHOR CONTRIBUTIONS

DDT, CL, and XSZ designed the study, and all authors acquired the data. DDT and XSZ performed the statistical analysis and wrote the paper. All authors read and approved the final manuscript.

COMPETING INTERESTS

The authors declared no competing interests.

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