RESEARCH ARTICLE

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Evaluation of Risky Decision-Making and Impulsivity in Individuals with Premature Ejaculation

ABSTRACT

Objective: Different mechanisms such as psychological, neurobiological, autonomic, and genetic factors might be involved in the etiology of lifelong Premature Ejaculation (PE). Albeit cortical activity changes have been reported, the relationship between PE and impulsivity/decision-making has been minimally studied to date. The present study aimed to assess impulsivity and risky decision-making in individuals with lifelong PE for the first time.

Methods: 26 lifelong PE patients were diagnosed by the International Society for Sexual Medicine (ISSM-2014) criteria and 26 healthy volunteers were recruited. The Premature Ejaculation Diagnostic Tool, International Erectile Function Index, Barratt Impulsiveness Scale-11, Patient Health Questionnaire-9, Balloon Analogue Risk Task, and Monetary Choice Questionnaire-27 were administered.

Results: The mean age was 37. No differences were found between groups in risky decision-making and impulsivity.

Conclusions: No alterations of impulsivity and risky decision-making were found in lifelong PE patients. Impulsivity may only exist in a subset of individuals with lifelong PE or may only be evident in neural levels or specific subtypes of impulsivity.

Keywords: Decision-Making, Delay Discounting, Impulsivity, Neurophysiology, Premature Ejaculation.

Prematür Ejakülasyon Tanılı Bireylerde Karar Verme ve Dürtüselliğin Değerlendirilmesi

ÖZET

Amaç: Yaşamboyu Prematür Ejakülasyon (PE) etiyolojisinde psikolojik, nörobiyolojik, otonomik ve genetik faktörler gibi farklı mekanizmalar rol oynayabilir. Kortikal aktivite değişiklikleri bildirilmiş olsa da, PE ile dürtüsellik/karar verme arasındaki ilişki bugüne kadar çok az çalışılmıştır. Bu çalışma, yaşam boyu PE'si olan bireylerde ilk kez dürtüsellik ve riskli karar vermeyi değerlendirmeyi amaçlamaktadır.

Gereç ve Yöntem: Uluslararası Cinsel Tıp Derneği (ISSM-2014) kriterlerine göre 26 yaşamboyu PE hastası teşhis edildi ve 26 sağlıklı gönüllü çalışmaya alındı. Prematür Ejakülasyon Tanısal Aracı, Uluslararası Erektil Fonksiyon İndeksi, Barratt Dürtüsellik Ölçeği-11, Hasta Sağlık Anketi-9, Balon Analog Risk Görevi ve Parasal Seçim Anketi-27 uygulandı.

Bulgular: Örneklemin yaş ortalaması 37 idi. Riskli karar verme ve dürtüsellik açısından gruplar arasında fark bulunmadı.

Sonuç: Yaşam boyu PE hastalarında dürtüsellikte ve riskli karar vermede herhangi bir değişiklik bulunmadı. Dürtüsellik, yalnızca yaşamboyu PE'si olan bireylerin bir alt kümesinde mevcut olabilir veya yalnızca nöral seviyelerde veya belirli dürtüsellik alt tiplerinde belirgin olabilir.

Anahtar Kelimeler: Dürtüsellik, Karar Verme, Nörofizyoloji, Prematür Ejakülasyon, Zamansal Değersizleştirme.

INTRODUCTION

Premature Ejaculation (PE) is one of the most common sexual disorders in men that crucially affects self-esteem, subjective well-being, quality of life, quality of interpersonal relationships, and sexual satisfaction (1). Albeit various pharmacological and nonpharmacological interventions are currently available worldwide (1), there is still a requisite for therapeutic approaches directly aimed at ameliorating neurocognitive differences which have been scantily studied thus far. To this end, delineating the cognitive processes underlying the distinct subtypes of the disease may guide therapeutic interventions considerably.

The alterations of the serotonergic system were contemplated to have a more pivotal role than psychological factors in lifelong PE (2). Selective serotonin reuptake inhibitors (SSRIs) are among the most commonly used drugs to treat PE (1) which are also shown to reduce impulsiveness (3,4) and increase metabolic activity in the orbitofrontal cortices (5). To boot, serotonergic pathways in the central nervous system are involved in the regulation of impulsivity and motor behavior in general (6,7) as well as impulsive decision-making (8,9) and response inhibition processes (10,11). Moreover, abnormalities in the prefrontal and parietal cortices, which are chiefly involved in risky decision-making and impulsivity (12–14) as well as delay discounting (15,16), are indicated in individuals with lifelong PE (17). Hence, changes in impulsiveness and metabolic activity in the orbitofrontal cortices may contribute to the therapeutic effects of SSRIs in lifelong PE. Besides, a recent study reporting the potential clinical efficacy of modafinil in individuals with PE (18) also suggests a possible relationship between PE and impulsivity as modafinil has been indicated to reduce impulsivity and increase functional connectivity during impulsive decision-making (19–21). Individuals with PE also had a considerably higher incidence of adult attention deficit hyperactivity disorder (ADHD) (22,23) (especially the hyperactive and impulsive subtypes) while individuals with ADHD have also been reported to have higher rates of PE (24) which also suggests a relationship between impulsivity as ADHD is among the most common causes of impulsivity in the general population.

From a neurobehavioral point of view, impulsiveness has long been known as the choice of earlier less rewarding over late more rewarding alternatives (25) which may be tested with delay discounting paradigms (26). Delay discounting is the inability to delay receiving a lesser reward to obtain a larger reward at a later time which is also one of the widely accepted measures of impulsivity (27) and is also suggested as a part of the initial assessment of impulsivity in a systematic review (28). Even though delay discounting has not been assessed in individuals with PE before; impulsivity, novelty seeking, risk-taking, and excitement as temperament characteristics have been depicted to be higher in individuals with lifelong PE which may also point out to impulsiveness (29). Moreover, we further hypothesized that PE might also stem from an inability to delay a reward, considering the neurophysiological outputs of ejaculation as a natural rewarding behavior in males (30).

Overall, alterations of impulsivity were propounded to be evident in individuals with PE (31). However, the relationship between impulsivity and lifelong PE has not been directly tested thus far. Under the guidance of the emergent aforementioned literature, the present study aimed to assess differences in impulsivity between individuals with lifelong PE and healthy individuals. We postulated that patients with lifelong PE might have higher levels of impulsivity and altered risky decision-making.

MATERIAL AND METHODS

Setting: The present cross-sectional pilot study was conducted at Muğla Sıtkı Koçman University Faculty of Medicine. Medical examinations were performed in the Urology Outpatient Clinic and assessments of impulsivity were carried out in the Department of Physiology. Participants were selected from individuals who were admitted to the Urology Outpatient Clinic and they were referred to the Department of Physiology for further assessments if they volunteered for the present study. Participants in the control group were male patient companions of the urology service who had no urological complaints. Participants were not compensated for their time and their routine treatment was maintained.

Ethical approval was obtained from the local ethical committee (10th April 2022, decision number 26). Written informed consent was provided by all participants. All utilized procedures complied with the Declaration of Helsinki.

Participants: 26 individuals with lifelong PE and 26 healthy individuals aged between 18-55 years were recruited. An *a priori* sample size calculation was calculated using GPower 3.1.9.4 (32) with the following parameters: 2 groups, an alpha-error rate value of 0.05, the statistical power value of 0.8, and a Cohen's d value of 0.8 with regard to the effect size regarding the serotonergic challenge and impulsivity studies in a meta-analysis (33).

Individuals with lifelong PE were diagnosed as having lifelong PE by the International Society of Sexual Medicine Criteria (34) after clinical evaluation by experienced urologists. Participants were excluded if they were not sexually active or had less than four sexual intercourses in the last month as at least four Intravaginal Ejaculatory Latency Time (IELT) measurements from the last month were needed to calculate average IELT (35).

Participants without a heterosexual monogamic partner were excluded as PE diagnostic criteria for homosexual men and latency times for intercourse other than penile-vaginal intercourse have not been clearly determined yet (36). Participants that had a serious neurologic, psychiatric, or other medical illness, had a history of major pelvic/penile surgery, had retrograde/painful ejaculation or anejaculation, had a sexual partner with sexual dysfunction, or a serious medical illness. Participants who had a Body Mass Index above 40 were excluded due to the observed relationship between impulsivity and obesity (37,38) as well as conceivable cognitive changes in the obese brain (39,40). Four patients currently using phosphodiesterase inhibitors (due to a possible underdeclared erectile dysfunction risk), SSRIs, or other topical/systemic medications indicated in PE were also excluded. The lifelong PE group had a mean IELT of less than one minute in the last month, a Premature Ejaculation Diagnostic Tool (PEDT) score of more than 11, and an International Index of Erectile Function- Erectile Function subscale (IIEF-EF) score of more than 21 to exclude erectile dysfunction. Healthy individuals had a mean IELT of more than one minute in the last month, a PEDT score of less than 11, and an IIEF-EF score of more than 21 to exclude erectile dysfunction.

Procedures: General mental health status was assessed with the Patient Health Questionnaire-9 (PHQ-9) (41) while the PEDT was utilized to assess the severity of PE (42) and the IIEF-EF was utilized to evaluate the erectile function (43). Impulsivity markers consisted of the Barratt Impulsiveness Scale-11 (BIS-11) (44) and the Balloon Analogue Risk Task (BART) (45). Monetary Choice Questionnaire-27 (MCQ-27) was utilized to assess delay discounting, which was indicated to be a robust predictor of an array of behaviors related to impulsivity (26).

Measures

Patient Health Questionnaire-9 (PHQ-9): PHQ-9 is a self-report scale consisting of 9 items assessing depression levels. It originated from the PRIME-MD diagnostic instrument for common mental disorders and includes DSM-IV criteria for major depressive disorder. The interpretation of the total score is as follows: minimal/no depression (0–4), mild depression (5–9), moderate depression (10–14), or severe depression (15–21) (46).

Premature Ejaculation Diagnostic Tool (PEDT): PEDT is a 5-point Likert-type self-report diagnostic instrument consisting of 5 items (47). It is a practical tool with an approximate duration of 2 minutes which has been depicted to be a valid and reliable instrument to diagnose PE (42). Total scores between 9-10 mean probable PE while 11 or more mean definite PE.

International Index of Erectile Function-Erectile Function Subscale (IIEF-EF): The International Index of Erectile Function is a 6-point Likert-type self-report scale that consists of 5 parts as follows (43): Erectile function, orgasmic function, sexual desire, intercourse satisfaction, and overall satisfaction. The Erectile Function subscale (IIEF-EF) was calculated from the sum of the first five items as well as the 15th item. Its diagnostic validity is similar to laboratory tests of Erectile Function (48). An IIEF-EF total score of below 21 presumably depicts the existence of erectile dysfunction.

Monetary Choice Questionnaire-27 (MCQ-27): The MCQ-27 is a 2-choice scale consisting of 27 items which are among the most common instruments to assess delay discounting. Participants were asked to choose an early low-value or a late high-value monetary prize for each item. The main outcome measure is the k coefficient while secondary measures like proportions of consistency, and large rewards. A lower k coefficient and a higher proportion of large rewards mean lower delay discounting. On the other hand, the proportion of consistency defines the consistency throughout the test. All of them were calculated by an automated calculator (26).

Barratt Impulsiveness Scale-11 (BIS-11): Barratt Impulsiveness Scale-11 (BIS-11) is a well-established and 30-item 4-point Likert-type self-report scale that was developed to conceptualize the behavioral construct of impulsiveness (44). It was validated in a variety of diagnostic populations as well as an array of distinct cultures after 50 years of relevant research. Aside from the total score, it also has six first-order factors and three second-order factors (attentional, motor, and non-planning).

Balloon Analogue Risk Task (BART): The BART is a computerized easily administered behavioral test to assess risky decision-making. The performance of BART was considerably correlated with a myriad of real-life risk behaviors (49) as well as general risk propensity (50). Participants were told that they had 30 consequent balloons and were asked to earn money as much as they could throughout the test. Participants always had the opportunity to choose between pumping the balloon or transferring the temporary reward to the permanent account using the mouse and buttons on the screen. While up to 128 pumps were available in each balloon, there was always the risk of a random explosion. Each pump increased the temporary monetary reward from that balloon. However, participants were not able to transfer the temporary reward from a balloon in case of an explosion. The main outcome measure of the test was the adjusted average number of pumps which is the average number of pumps in unexploded balloons (45). The total number of bursts was also calculated.

Statistical Analyses: The normality of the data was assessed with Shapiro-Wilk tests. Independent Samples T-tests or Mann-Whitney *U* tests were performed to compare demographic, clinical variables, and impulsivity parameters

between individuals with lifelong PE and healthy individuals. Age, height, weight, the BART Average Adjusted Pumps (AAP), the BART number of bursts, and the BIS-11 non-planning subscale scores were normally distributed. Spearman tests were used to determine correlations between demographics, clinical variables, and impulsivity parameters.

RESULTS

Demographic and Clinical Features: Demographic, clinical features and impulsivity parameters are shown in Table 1. The mean age was 37.28 (18-55). A significant age difference was found between individuals with lifelong PE and healthy individuals (p = 0.002). The mean PEDT scores and the PHQ-9 scores of the PE patients were 9.67 and 5.69, which were higher than healthy individuals (p < 0.001). No other differences were observed between the groups. A moderate correlation between the PEDT and the PHQ-9 scores (p < 0.001; r = 0.481) was found. A weak correlation was found between the BIS-11 and the PHQ-9 scores (p = 0.038; r = 0.288).

Table 1. Differences in demographic, clinical features, and impulsivity parameters between individuals with Premature Ejaculation and healthy individuals

Variables	PE (n=26)	Healthy (n=26)	Z/t	Effect size*	*P-values*
A. Demographic and Clinical					
Age	33.23 ± 8.81	41.34 ± 8.69	3.341	0.92	**0.002**
Education (years)	12.26 ± 3.21	13.11 ± 3.39	-1.111	-0.21	0.267
Number of intercourses (Last week)	2.73 ± 1.77	1.92 ± 1.44	-1.529	-0.30	0.126
Number of intercourses (Last month)	9.38 ± 2.69	8.80 ± 3.63	-1.083	-0.21	0.279
Height (centimeters)	177.26 ± 6.98	174.30 ± 7.98	-1.424	0.39	0.161
Weight (kilograms)	84.03 ± 8.82	79.96 ± 15.19	0.917	0.32	0.376
PEDT	13.57 ± 4.90	5.76 ± 3.06	-5.145	-1.01	**<0.001**
IIEF-EF	25.53 ± 2.65	26.69 ± 2.47	-3.674	-0.72	0.148
PHQ-9	6.96 ± 1.66	4.42 ± 2.49	-0.377	-0.07	**<0.001**
B. Impulsivity parameters					
BIS-11	57.46 ± 7.46	54.88 ± 8.66	-1.149	-0.22	0.256
BIS Motor	16.73 ± 3.51	17.92 ± 3.67	-1.316	-0.25	0.188
BIS Nonplanning	25.88 ± 4.51	23.50 ± 5.18	-1.769	0.49	0.083
BIS Attentional	14.84 ± 3.83	13.46 ± 3.19	-1.158	-0.22	0.247
BART AAP	30.02 ± 15.30	28.14 ± 12.48	-0.479	0.13	0.634
BART Number of Bursts	8.96 ± 5.37	7.88 ± 4.05	-0.816	0.22	0.418
MCQ-27 k coefficient	0.07 ± 0.09	0.11 ± 0.11	-1.145	-0.22	0.252
MCQ-27 proportion of consistency	95.15 ± 4.41	95.72 ± 4.01	-0.400	-0.07	0.689
MCQ-27 PLR	31.76 ± 20.79	26.89 ± 25.56	-0.994	-0.19	0.320

*Cohen's d for Independent Samples T-Tests and r for Mann-Whitney U tests. PE: Premature Ejaculation, PEDT: Premature Ejaculation Diagnostic Tool, IIEF-EF: International Index of Erectile Function-Erectile Function, PHQ-9: Patient Health Questionnaire-9, BIS-11: Barratt Impulsiveness Scale, BART: Balloon Analogue Risk Task; AAP: Adjusted Average Pumps, MCQ-27: Monetary Choice Questionnaire-27, PLR: Proportion of Large Rewards. Significant p-values are bold.

Impulsivity Parameters: No differences were found between groups in terms of BIS-11 and its subscales, the BART number of AAP and the number of bursts, MCQ-27 *k* coefficients, proportions of consistency, and large rewards (p > 0.05).

DISCUSSION

The present cross-sectional study endeavored to assess differences in impulsivity between individuals with lifelong PE and healthy individuals with multiple determinative tools for the first time. Contrary to expectations, an alteration of impulsivity in individuals with PE was not found. Thus, the proposed relationship between PE and impulsivity was not observed. Numerous potential reasons might account for the present results. Among them, the usage of impulsiveness measures that do not exactly fit the alterations in PE and a relatively low sample size come forward.

To begin with, alterations of impulsivity might not exist in individuals with lifelong PE despite preliminary putative evidence that comes from distinct sources. Even though a higher incidence of ADHD among individuals with lifelong PE has been reported (22,23), more than half of individuals with lifelong PE still do not have ADHD comorbidity. Therefore, apparent alterations of impulsivity may be extant in a subset of individuals with lifelong PE or individuals with other types of PE.

Impulsivity is a multidimensional construct that ensues as a result of multitudinous neurophysiological and psychological factors (7). Even though widely-accepted tools scrutinizing impulsivity were utilized in the present study, other tools to assess impulsivity such as the UPPS-P Impulsive Behavior Scale that focuses on sensation-seeking and urgency (51), monetary impulsivity in real-life settings (52) or sexual discounting (53) might still be affected. Moreover, delay discounting might reflect voluntary control of behavior while PE might stem from a deficit in involuntary control of the behavior (27)**.** Alternatively, alterations of impulsivity might only be discernible at neural

levels instead of behavioral/motor impulsivity changes. Bearing this in mind, studies employing neuroimaging or electroneurophysiological techniques are required to assess this assumption.

The present study was not without limitations that should be taken into account in further relevant research. Among them, the age difference between groups and the lack of a general cognitive function appraisal come forward. Nevertheless, levels of impulsivity largely remain stable in middle-aged populations and do not differ considerably before older ages (54). Besides, the present results should not be generalized into other cultural settings despite no cultural differences have been observed in impulsivity between different cultures in some studies (55). Finally, psychological factors might also play a role in the etiology of lifelong PE, although not as much as in other types of PE (2). Although the present study sample had a low level of depressive symptoms, levels of generalized anxiety or anxiety specific to sexual performance were not observed. Future scrutiny should also evaluate anxiety or other psychological factors as possible confounders.

The present study was not able to indicate an alteration of risky decision-making and increment of impulsiveness in individuals with lifelong PE, compared to healthy individuals. Studies with larger samples from different demographic settings utilizing distinct neurophysiological assessment tools are still needed to draw firm conclusions.

Disclosure statement

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