

Evaluation of stress urinary incontinence in physically active and childless Polish females: a cross-sectional study

DOI: <https://doi.org/10.5114/pq/191514>

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Abstract

Introduction. Stress urinary incontinence (SUI) is a global health problem. The popularity of physical activity is increasing, and SUI affects more individuals, primarily young, physically active females. The aims of the study were to (I) determine the relationship between the type of physical activity and the frequency of SUI in females and (II) assess the treatment methods used for SUI by females.

Methods. The study was conducted using a 20-point questionnaire among females. The inclusion criteria were (I) childlessness, (II) physical activity > 2 times/week, and (III) a history of SUI. The questions were related to (I) socio-demographic characteristics, (II) type and description of physical activity, and (III) frequency of SUI and used treatment.

Results. Seventy-three females (aged 18–35 years) fulfilled the inclusion criteria. Thirty-four (46.6%) trained in endurance sports, 32 (43.8%) practiced strength training, and 7 (9.6%) preferred yoga. Most females had 2–3 weekly training sessions ($n = 51$, 69.9%). Seventy-one (97.2%) did not use any form of treatment for SUI. Females more often suffered from SUI during training than in everyday activities ($p = 0.003$), and this relationship was more frequently noticed during longer workouts ($p = 0.02$). There were no significant relationships between SUI and preferred sports discipline ($p = 0.38$), number of practiced sports disciplines ($p = 0.22$), training experience ($p = 0.21$), or weekly training volume ($p = 0.24$).

Conclusions. The frequency of SUI depends on the type and amount of physical activity. Females mostly do not use treatment for SUI. Physicians and physiotherapists should consider the type and level of patients' physical activity when diagnosing SUI and prescribing treatment.

Key words: stress urinary incontinence, females, sports, physical activity, training

Introduction

The World Health Organization (WHO) defines urinary incontinence (UI) as any episode of involuntary leakage of urine from the urinary bladder. UI is considered one of the most important health problems and has the status of a social disease. It is also a serious hygienic problem [1]. Next to hypertension, diabetes, and depression, UI is one of the most common female health conditions. UI is not a separate disease entity. It is defined as a symptom resulting from complex structural, functional, and hormonal changes in the female body. However, the precise epidemiology and underlying factors of UI are not known [1].

More than 423 million people in the world struggle with stress urinary incontinence (SUI) (including 303 million females). In Poland, there are around 4–6 million of them [2]. Although the highest incidence of SUI occurs between the ages of 50 and 80 years, younger age groups also struggle with SUI [3]. SUI is manifested by involuntary leakage of urine while performing an activity that causes a sudden increase in pressure in the abdominal cavity, particularly an increase in the pressure exerted on the urinary bladder. This may be sneezing, coughing, laughing, or, above all, strenuous physical activity [4].

Numerous factors predispose females to SUI. Those factors may be permanent and unchangeable (age or sex), but

most of them depend largely on lifestyle. Triggers can accumulate, which may cause the problem to appear earlier or intensify existing symptoms. The main non-modifiable risk factor for the occurrence of any type of UI, including SUI, is age. The risk and severity of symptoms increase gradually, peaking around menopause [3, 5]. The mounting aspect of this health condition highlights the importance of quick and appropriately selected prevention techniques [5].

One of the few areas where physical activity can have negative effects is SUI. Whereas moderate physical activity appears to strengthen the muscles of the pelvic floor with beneficial effects, heavy training appears to weaken them and raise the risk of SUI [6–8]. It has been shown that SUI occurs more often in athletes engaged in intense physical activity than in untrained populations [8–10]. Recent studies suggest that SUI is observed more often in females who regularly train in high-intensity sports than in those who do not train at all or engage in moderate physical activity [6, 8–11]. However, the exact relationships, contributing factors, and sports disciplines with the most harmful effects on SUI are still unknown and need further clarification.

The primary aim of the study is to determine the domain of physical activity whose regular practice most often contributes to the occurrence of SUI in females. The secondary aim is to determine the impact of discipline, duration, and weekly volume of physical activity on the frequency of SUI.

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Received: 05.03.2024

Accepted: 23.07.2024

Citation: Kopyra K, Chomiuk T, Kasiak P, Mamcarz A, Śliż D. Evaluation of stress urinary incontinence in physically active and childless Polish females: a cross-sectional study. *Physiother Quart.* 2024;32(3):80–85; doi: <https://doi.org/10.5114/pq/191514>.

Subjects and methods

Study design

The study was conducted online using an author-developed questionnaire. The survey was distributed via forums focused on physical activity and sport. Recruitment of participants lasted from October 1, 2021, to March 31, 2022. The inclusion criteria were female sex, childlessness, regular physical activity (> 2 weekly training sessions), and ongoing or past history of SUI. The survey was completely anonymous and voluntary.

Characteristics of the survey tool

The questionnaire consisted of 20 multiple-choice questions. It was divided into three sections: socio-demographic information, characteristics of preferred physical activity, and specifics of SUI. Questions about socio-demographic data included age, height, weight, and number of offspring. Questions about the characteristics of preferred physical activity included type of activity (strength sports, endurance sports, or yoga), training frequency, training experience, duration of a single training session, and participation in more sports disciplines than the preferred one. Questions about SUI included the frequency of symptoms during everyday activities, the frequency of symptoms during physical activity, the impact of training on the frequency of symptoms, and the forms of treatment undertaken when symptoms appear. The full transcription of the questionnaire is presented in Supplement 1.

Statistical analysis

The Shapiro–Wilk test was used to assess data distribution. Continuous data are presented as median (Mdn) with interquartile range (IQR). Categorical data are presented as numbers and percentages. Due to the non-parametric distribution, the statistical tests used were the Kruskal–Wallis *H*-test, Spearman’s Rho Rank Correlation Coefficient (*R*), and the Mann–Whitney *U* test. The level of significance was set at *p* < 0.05. Statistical analyses were performed using SPSS Statistics (version 25.0; IBM Corporation, Armonk, NY, USA) and GraphPad Prism (version 10.2.0; GraphPad Software Inc., Boston, MA, USA).

Results

Sample characteristics

Seventy-three females (aged 18–35 years) fulfilled the inclusion criteria. The majority of participants had a normal BMI (*n* = 58, 79.5%) and had ongoing SUI (*n* = 69, 94.5%). Most participants reported practicing endurance disciplines (*n* = 34, 46.6%). The second most preferred type of sport was strength exercises (*n* = 32, 43.8%). The least popular type of physical activity was yoga (*n* = 7, 9.6%). Females who regularly practiced more than one type of physical activity accounted for 18.0% (*n* = 13) of the study group. The majority of participants (*n* = 51, 69.9%) reported regular training more than 2 times a week, most often lasting 30 min (*n* = 25, 34.2%) or 1–1.5 h (*n* = 29, 39.7%). A detailed sample description is presented in Table 1.

The study population consisted of 73 females. The age of all participants was between 18–35 years.

Table 1. Characteristics of the study population

Variable	Number of participants <i>n</i> (%)	
BMI	underweight (< 18.5 kg · m ⁻²)	7 (9.6)
	normal weight (18.5–24.99 kg · m ⁻²)	58 (79.5)
	overweight (≥ 25.0 kg · m ⁻²)	8 (11.0)
Type of sport	strength training	32 (43.8)
	endurance training	34 (46.6)
	yoga	7 (9.6)
Weekly training volume	2–3 training sessions	51 (69.9)
	4–7 training sessions	15 (20.5)
	> 7 training sessions	7 (9.6)
Training experience	< 3 months	8 (11.0)
	3–6 months	6 (8.2)
	6 months–2 years	11 (15.1)
	2–3 years	20 (27.4)
	> 3 years	28 (38.4)
Average duration of a single training session	30 min–1 h	25 (34.2)
	1–1.5 h	29 (39.7)
	1.5–3 h	14 (19.2)
	> 3 h	5 (6.8)
Frequency of stress urinary incontinence (SUI)	< 1 per month	31 (42.5)
	several times per month	21 (28.8)
	several times per week	15 (20.5)
	several times per day	6 (8.2)
Frequency of SUI during physical activity compared to during everyday activities	lower	8 (10.9)
	the same	24 (32.9)
	higher	41 (56.2)
Treatment of SUI	urologic physiotherapy	1 (1.4)
	pharmacologic treatment	1 (1.4)

SUI – stress urinary incontinence

Relationship between physical activity and SUI

The type of physical activity did not have a significant impact on the frequency of SUI (*H* = 1.96, *p* = 0.38). However, there was a significant difference in the frequency of SUI during physical training and everyday activities (*H* = 11.91, *p* = 0.003), with females more often suffering from SUI during training. It is worth noting that the duration of a single training session was significantly correlated with a higher frequency of SUI in females (*R* = 0.28, *p* = 0.02).

The frequency of SUI in females did not differ after implementing regular physical training when compared to earlier periods (*H* = 1.72, *p* = 0.42). The frequency of SUI did not significantly correlate with the weekly training volume (*R* = 0.14, *p* = 0.24). However, the correlation remained slightly positive, and a higher number of weekly training sessions was linked with a higher frequency of SUI. Training experience was cor-

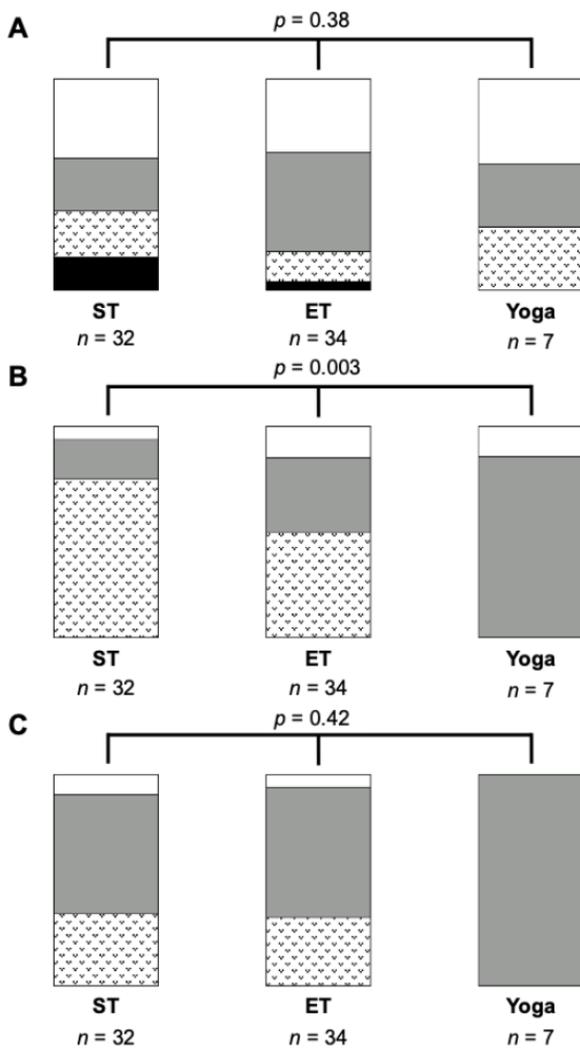


Figure 1. Relationships between preferred sports discipline and frequency of SUI

ST – strength training, ET – endurance training
 The white area indicates < 1 episode of SUI per month.
 The gray area indicates several episodes of SUI per month.
 The dotted area indicates several episodes of SUI per week.
 The black area indicates several episodes of SUI per day.
 Panel A illustrates the frequency of SUI during workouts, stratified by sports discipline.
 Panel B illustrates the frequency of SUI during workouts compared to everyday activities, stratified by sports discipline.
 Panel C illustrates the frequency of SUI after implementing regular physical training compared to the time before starting regular training, stratified by sports discipline.
 The *p*-values were calculated using the Kruskal–Wallis *H*-test.

related with a higher frequency of SUI in females; however, the underlying relationship was not significant ($R = 0.15, p = 0.21$). Finally, the frequency of SUI in females who practiced more than one type of sport did not differ from those who chose only one primary discipline ($p = 0.22$). The precise results of the investigated relationships between physical activity and SUI are presented in Table 2. The interdependencies of the preferred sports discipline and frequency of SUI are shown in Figure 1.

Discussion

The main findings of this study are (I) the type of physical activity does not stratify females by the frequency of SUI, (II) females who prefer strength training but not endurance training more often suffer from SUI during their workouts, (III) weekly training volume, number of trained sports, or training experience do not contribute to the frequency of SUI, and (IV) the duration of a single training session significantly correlates with the frequency of SUI. Finally, this study confirmed that females’ knowledge about treatment options for SUI is strongly limited. Moreover, this study highlights the need for further education of females about SUI.

UI is recognized by the WHO as one of the most important current health problems. SUI has a significant impact on

Table 2. Relationships between physical activity and SUI

	Strength training (n = 32)			Endurance training (n = 34)			Yoga (n = 7)			H	p-value	η²
	M _{rang}	Mdn	IQR	M _{rang}	Mdn	IQR	M _{rang}	Mdn	IQR			
A. Relationships between SUI and preferred sports discipline												
Frequency of SUI depending on preferred sports discipline	40.6	2.0	2.0	33.8	2.0	2.0	36.0	2.0	3.0	1.96	0.38	< 0.01
Frequency of SUI during training compared to everyday activities after starting regular physical training	43.9	3.0	0.8	34.4	2.5	3.0	18.2	2.0	2.0	11.91	0.003	0.14
Frequency of SUI during training compared to everyday activities before starting regular physical training	37.8	2.0	1.0	38.0	2.0	3.0	28.5	2.0	2.0	1.72	0.42	< 0.01
B. Relationship between SUI and selected characteristics of the physical activity												
	Spearman's rho		p-value									
Correlation between frequency of SUI and frequency of training sessions	0.14		0.24									
Correlation between training experience and frequency of SUI	0.15		0.21									
Correlation between time of single workout and frequency of SUI	0.28		0.02									

SUI – stress urinary incontinence, M_{rang} – mean rank, Mdn – median, IQR – interquartile range, H – Kruskal–Wallis *H*-test, η² – partial eta-square

social relationships because it occurs widely among young, physically active females [9]. Although SUI may be one of the factors leading to the development of other types of UI later in life, the sports community effectively ignores this problem. This has led to the stigmatization of females with SUI and their withdrawal from many forms of physical activity [12]. To prevent the occurrence of SUI and, if it occurs, to limit its negative impact or reduce its symptoms, females should be able to appropriately modify their activity if it is determined to be the cause of the problem.

Almoussa et al. [13] observed the occurrence of SUI more often in females who exercise intensively than in those who do not exercise at all or only moderately. Fozzatti et al. [6] compared amateur female athletes at the gym with a group of untrained individuals, where the occurrence of SUI was more than 10% frequent in those who exercised.

Females who prefer strength or endurance sports seem to be at risk for SUI. A 2019 study conducted using electromyography on female runners found a significant increase in the maximum contraction of the pelvic floor muscles immediately after heel contact with the ground. This contraction also increased with increasing running speed [14]. In research by Teixeira et al. [8] from 2018 on 1,714 young females (average age of 23.8 years), UI occurred in 36.1% of the participants. Of these, 44% presented symptoms of SUI. When comparing females preferring strength sports and endurance sports, there was no significant difference between the groups [8]. This is confirmed by the results of our research, which show that there were no significant differences between groups of females practicing strength sports and endurance sports in the context of the frequency of existing SUI.

Moreover, we also examined the effect of yoga on the incidence of SUI in females, which is one of the primary novelties of this research. Yoga is considered one of the options for improving the function of the pelvic floor muscles and could reduce the frequency of SUI. Despite this, in our group of females practicing yoga, strength sports, and endurance sports, there was no significant difference in the frequency of SUI episodes.

Although each of the examined sports disciplines seems to have a similar impact on the incidence of SUI in general, the issue of urine loss is slightly different during exercise itself. The results of our research indicate that strength sports are the most common triggers for SUI during exercise compared to yoga. However, the impact of strength training was only slightly higher than endurance sports. Previous research reported similar findings. The research by Davis et al. [15] conducted on female soldiers reported the prevalence of SUI in 31% of the participants during training or duty. SUI most often occurred during aerobic exercise (42%), running (35%), and weightlifting (18%).

Although our study demonstrated a significantly lower incidence of SUI during yoga training compared to strength sports, the current knowledge of females practicing yoga is insufficient to definitively determine the impact of this type of activity on the frequency of SUI. In some studies, yoga was described as a treatment program for already existing SUI, and no studies were found assessing the frequency of SUI episodes while practicing yoga. Previous studies, despite promising results, were conducted in small groups or were too diverse to assess the impact of yoga in SUI therapy. The results of our research seem to confirm this because there was no significant change in the frequency of SUI episodes after the subjects started practicing yoga.

This study also examined whether training experience, the number of training sessions per week, or their duration

correlated with the frequency of SUI. A significant relationship was found only in the case of the duration of a single training session, with an increase resulting in a more frequent occurrence of SUI. It is possible that subjects who choose longer training sessions (> 1.5 h) experience fatigue of the pelvic floor muscles, which, after some time, gradually cease to perform their function. Although training experience and the number of training sessions per week did not show a correlation at the level of statistical significance, the data slightly indicate the possibility of an increase in the frequency of SUI with an increasing number of training sessions per week and with increasing training experience.

The above relationship could also indicate that females with longer training experience choose training sessions lasting over 1.5 h due to their higher fitness level compared to those with less training experience. This is confirmed by the study by Simeon et al., where physical activity performed more than 7 h a week significantly increased the risk of developing UI by weakening the pelvic floor muscles [16]. Moreover, Hagovska et al. [9] observed similar results using the International Physical Activity Questionnaire. Hagovska et al. [9] observed a correlation between SUI and the intensity of physical activity expressed in metabolic equivalent per week. Also, in a study conducted on a group of young females from Brazil, the incidence of SUI increased with the increase in the number of minutes of activity per week [17].

Our research showed no relationship between regularly practicing more than one sports discipline and the frequency of SUI. There are no studies in the available literature that would precisely verify this relationship, but it should be considered that individuals who have been practicing a specific sport for a long time or at a competitive level often undertake additional, complementary activities. Perhaps those additional complementary exercises limit the frequency of SUI.

An additional, interesting strength of this study was asking about the methods of treatment for SUI. Ninety-seven percent of participants declared that they did not use any treatment. One participant indicated taking pharmaceuticals, and another indicated cooperation with a urogynecological physiotherapist. This strongly indicates limited awareness of treatment options among females and suggests that the problem of SUI is socially ignored.

To summarize, it can be stated that the problem of SUI is present in physically active females. Overall frequency of SUI does not depend on the type of preferred sport. There was no influence of training experience, number of training sessions per week, or additional physical activity on the frequency of SUI. However, there was a higher incidence of SUI in females who trained in strength training compared to those practicing yoga, and a positive correlation between the duration of a single training session and the incidence of SUI.

Limitations

This research had some limitations. Firstly, the data were collected via online questionnaires, which could introduce some bias in the answers. Moreover, we cannot be sure that all participants fully understood the study protocol. Secondly, the data were self-reported, and the form consisted of the authors' questions. Thus, we recommend further validation of our survey on other populations. Finally, the sample size was relatively small. We recommend future research using our survey on larger samples. Results should be interpreted carefully, considering all described limitations.

Conclusions

Regular physical training did not stratify the frequency of SUI in females. The frequency of SUI in females depends on the preferred sports discipline. Neither the weekly training volume, training experience, duration of a single training session, nor the number of trained disciplines correlates with the frequency of SUI. Most females do not use any form of treatment for SUI. Physicians and physiotherapists should consider the characteristics of physical activity for female patients when diagnosing SUI. Furthermore, the findings provide important insights into the specific impact of physical activity on SUI and facilitate the proper selection of treatment.

Ethical approval

The research related to human use has complied with all the relevant national regulations and institutional policies, has followed the tenets of the Declaration of Helsinki, and has been approved by the Bioethics Committee of the Medical University of Warsaw. The requirement for approval for the survey study was waived according to local laws and legislation.

Informed consent

Informed consent was obtained from all individuals participating in this study.

Disclosure statement

The authors have no financial interest or received any financial benefits from this research.

Conflict of interest

The authors state no conflicts of interest.

Funding

This research did not receive any external funding.

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Supplement 1. Questionnaire

1. What is your age? ____ (18–35 years old)
2. What is your height? ____ (in cm)
3. What is your weight? ____ (in kg)
4. Do you have children? ____ (yes / no)
5. How often do you train in a week? ____ (< 2 times per week / 2–3 times per week / > 3 times per week)
6. What is your preferred sports discipline (if you train more than one sports discipline, then choose the one you have trained the longest)? ____ (strength training / endurance training / yoga)
7. Do you suffer from stress urinary incontinence (e.g., during exercise, coughing, sneezing, tensing abdominal muscles, jumping, etc.)? ____ (yes, currently / yes, in the past / no)
8. How often do you train in a week? ____ (in number of sessions per week)
9. How long have you been training in your preferred sports discipline? ____ (in years)
10. What is the average duration of your workout? ____ (in hours)
11. Do you train in other sports besides the preferred discipline? ____ (yes / no)
12. If you train in other sports, what is the number of workouts for the additional discipline per week? ____ (in number of sessions per week)
13. If you train in other sports, how long have you been training in the additional discipline? ____ (in years)
14. If you train in other sports, what is the average duration of your workout for the additional discipline? ____ (in hours)
15. How often do you suffer from stress urinary incontinence? ____ (number of episodes per day)
16. What is the frequency of your stress urinary incontinence during exercise compared to everyday activities? ____ (higher / lower / the same)
17. What is the frequency of your current stress urinary incontinence compared to before starting regular physical training in your primary discipline? ____ (higher / lower / the same)
18. What is the frequency of your current stress urinary incontinence compared to before starting regular physical training in your additional discipline (if you train only one discipline, leave this question)? ____ (higher / lower / the same)
19. Do you use any form of treatment for your stress urinary incontinence? ____ (yes / no)
20. If you use treatment for stress urinary incontinence, please specify the form of your treatment. ____ (open question – please write your answer)