

Factors influencing stress urinary incontinence in elite female athletes

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Abstract

Introduction. Practising high-impact sports, especially on a competitive level, has been identified nowadays as one of the risk factors of stress urinary incontinence (SUI). The purpose of our study was to verify the effect of selected factors, like age, parity, the intensity of trainings, achieved sports level, type of discipline, or the duration of sports experience, on SUI symptoms in a group of elite female athletes.

Methods. The study involved 112 elite women athletes: 55 practising running and 57 practising cross-country skiing. A combined questionnaire, which included Urogenital Distress Inventory, Incontinence Impact Questionnaire, King's Health Questionnaire, and own career development questionnaire, was used as a research tool.

Results. The prevalence of SUI in the studied female elite athletes was high (62.5%). No statistically significant differences regarding SUI symptoms were found between the group of skiers and the group of runners. A relationship between SUI occurrence and childbirth, but not age, was observed. A statistically significant relationship was revealed between the duration of sports practice and SUI occurrence (higher occurrence in the less experienced group). However, SUI occurrence did not correlate with the achieved sports level. A higher subjective assessment of the trainings intensity was correlated with a higher occurrence of SUI symptoms.

Conclusions. The occurrence of SUI in female runners and skiers depends on a history of giving birth, length of practising sports, and training intensity; it does not depend on age or the sports class.

Key words: stress urinary incontinence, female endurance athletes, running, cross-country skiing

Introduction

Symptoms of urinary incontinence (UI) cause hygienic, psychologic, and social problems. UI is a condition that affects not only elderly or obese women. Mota [1] maintains that UI is a common problem among women and it is estimated that 15–55% of them complain about lower urinary symptoms. According to Kulpa [2], almost half of all women who exercise regularly experience some degree of stress urinary incontinence (SUI). The cause is often multifactorial, but physical activity often aggravates the condition.

As indicated by Jean-Baptiste and Hermieu [3], competitive sport is one of the main risk factors associated with SUI. Thyssen et al. [4] demonstrate that urinary leakage is common among elite athletes and dancers, particularly during training, but also during daily life activities. A high prevalence of UI, mainly SUI, has been observed in young nulliparous female athletes [5, 6]. In young nulliparous women with symptoms of mild SUI, intense physical exercises (squats, jumping, running, weightlifting) result in lower maximal voluntary vaginal contraction pressure, indicating pelvic floor muscle fatigue [7]. Bø [5] states that women who want to be physically active either for fitness or for competitive sport are frequently exposed to much higher and more repetitive increases in abdominal pressures than are observed during a single cough.

Many studies have shown that SUI prevalence is correlated with the type of discipline practised. Females engaged in high-impact sports are exposed to a higher risk of SUI [4, 5,

8, 9]. Eliasson et al. [6] reported that trampolinists with SUI were significantly older and had been training longer and more often than the group without symptoms of SUI; they were also less able to interrupt the urine flow stream by voluntarily contracting the pelvic floor muscles than the non-leaking group. Da Roza et al. [10] identified the athletes' ranking and the training volume as risk factors to develop and worsen urine loss.

In our first publication, we presented the prevalence of SUI in a group of female athletes practising sport on the highest competitive level [9]. The purpose of the second report was to verify if selected factors might correlate with the occurrence of SUI symptoms.

Subjects and methods

Participants

A total of 112 women practising sport at the competitive level were included in 2 research groups: 55 of them practised running and 57 were cross-country skiers. The group of runners mostly participated in medium and long distance races, from 800 m to ultra-long distances (i.e. 12- and 24-hour runs), or practised race walking at the 20-km distance. Short distance runners were not included in the study. The group of cross-country skiers involved athletes practising 1.4–30-km runs and biathletes competing on 1–15-km distances. All women represented the highest levels of sports participation. The inclusion criteria were at least 18 years of

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age and having practised sport for at least 3 years. The exclusion criteria comprised pregnancy and other conditions that could affect the bladder function, like disorders of the nervous system. The average age in both groups was 28.03 ± 5.44 years: 26.61 ± 4.42 years in the group practising cross-country skiing and 29.49 ± 6.03 years in the group practising running. The general comparison of the research groups characteristics was presented in the first report [9].

Procedures

A combined questionnaire, which included Urogenital Distress Inventory (UDI-6), Incontinence Impact Questionnaire (IIQ-7) [11], King's Health Questionnaire (KHQ) [12], and own career development questionnaire (questions concerning sports level, duration of professional sports practice, age, childbirth), was used as a research tools. The prevalence assessment was based on question No. 3 in the UDI-6 questionnaire: 'Do you experience urine leakage related to physical activity, coughing, or sneezing?'; we also looked at the selection of SUI items in the last part of KHQ. The questionnaires were analysed in terms of selected factors which could affect prevalence.

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 Ethics Committee of the Academy of Physical Education in Katowice.

Informed consent

Informed consent has been obtained from all individuals included in this study.

Results

Out of the investigated 112 women, 70 (62.5%) observed symptoms of SUI; among them there were 32 runners and 38 skiers. SUI occurred more often in skiers than in runners (67% and 58%, respectively). The average age in both groups with SUI was 27.54 ± 4.89 years: 28.53 ± 5.62 years in the SUI group among runners and 26.71 ± 4.07 years in the SUI group practising cross-country skiing [9].

A chi-square test showed no statistically significant differences regarding the symptoms of SUI between the group of runners and that of cross-country skiers ($\chi^2 = 0.859798$, $p = 0.35380$). Discriminant function analysis (backward stepwise) results are shown in Figure 1.

The study did not reveal a significant correlation between SUI occurrence and the athletes' age ($p = 0.07607$). There

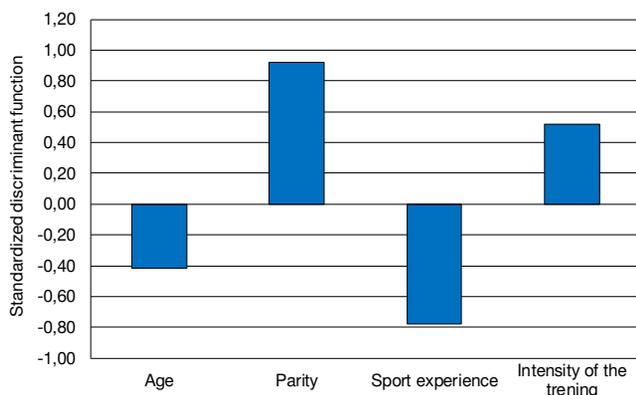


Figure 1. Correlation between selected factors and occurrence of stress urinary incontinence

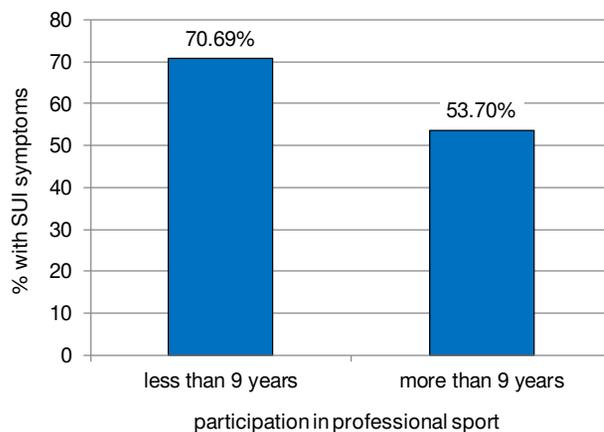


Figure 2. Occurrence of stress urinary incontinence (SUI) depending on length of participation in professional sport

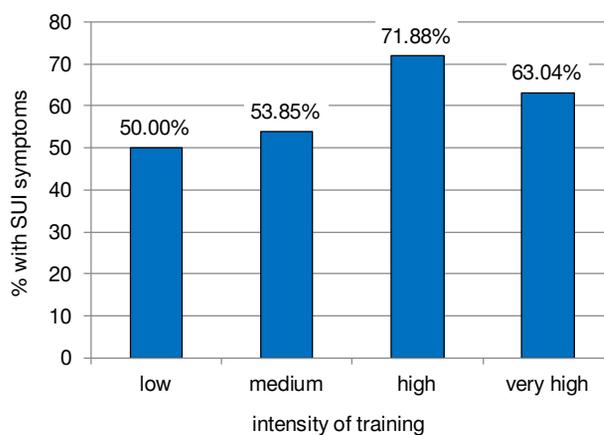


Figure 3. Occurrence of stress urinary incontinence (SUI) depending on subjective assessment of training intensity

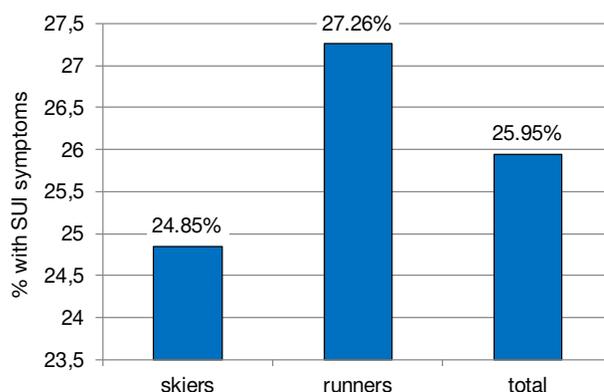


Figure 4. Average score of the Urogenital Distress Inventory (UDI-6) in the stress urinary incontinence (SUI) athletes depending on the sports discipline

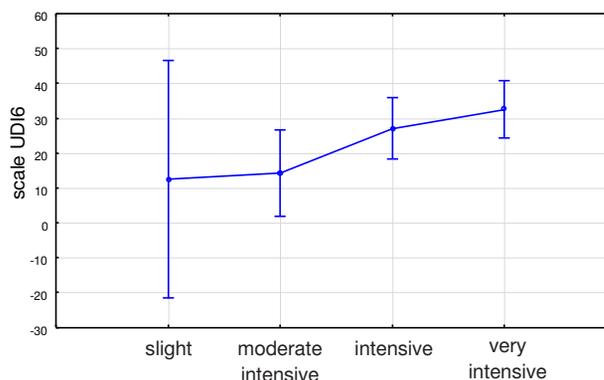


Figure 5. Average score of the Urogenital Distress Inventory (UDI-6) in the stress urinary incontinence athletes depending on training intensity

was, however, a statistically significant correlation between the occurrence of SUI and a history of giving birth ($p = 0.00042$). SUI symptoms were reported by 22 (81.48%) of 27 women who had given birth and by 48 (56.47%) of 85 nulliparous athletes. Another statistically significant correlation applies to the sports experience ($p = 0.00484$). A shorter sports practice correlated with more common SUI (Figure 2).

Subjective assessment of the training intensity also exhibited a statistically significant correlation with the occurrence of SUI ($p = 0.04506$) (Figure 3).

The average score of the UDI-6 questionnaire in the SUI athletes was lower for skiers than for runners and equalled 24.85 and 27.26, respectively (Figure 4). The average score of the UDI-6 questionnaire in the SUI athletes depended on training intensity ($p = 0.04506$) (Figure 5).

Discussion

There was no statistically significant difference in the occurrence of SUI symptoms between the runners and the cross-country skiers. The explanation is that both those disciplines can be classified as high-impact sports, which themselves have been pointed out as a risk factor for SUI [5, 13, 14]. The occurrence of this correlation in our study means that this factor is important among female athletes as well. On the other hand, we found no correlation between SUI and the age of the athletes. A higher correlation of SUI and age occurs later in life, which is linked to the menopausal changes, influencing the pelvic muscle floor. The next correlation that we noticed was that between the sports experience (years of practising sport) and the occurrence of SUI. In the group of athletes who had competed for less than 9 years, the prevalence was 70.69%, as compared with 53.70% in the group who had competed for more than 9 years. Nygaard et al. [8] also did not record a relationship between SUI occurrence and age, but the group was relatively young as well, with the average age of 19.9 ± 3.3 years. One could hypothesize that if incontinence can be an obstacle to continue the sport at the highest level, this would result in lower SUI occurrence among the more experienced group. Nevertheless, according to Bø and Backe-Hansen [15], adequate strategies should be prepared to prevent or cure ailments often observed among athletes, such as UI, to enable them to continue practising the sport at the highest level.

Jácôme et al. [16] studied a group of 106 female athletes (athletics, basketball, and indoor football) with the mean age of 23.0 ± 4.4 years. UI was experienced by 41.5% of the participants. Its prevalence across the 3 types of sport was similar and was not affected by age. However, athletes who experienced UI had a lower body weight ($p = 0.011$) and a lower body mass index ($p = 0.035$).

In our study, there was no correlation between SUI occurrence and the achieved sports level (National Class I, National Champion, or International Champion Class). In turn, Simeone et al. [17], who also focused on factors related with SUI occurrence in a group of women athletes, observed a relationship with the sports level. The examined group was, however, divided into different subgroups: women practising sport on an amateur level, participating in competitions, or engaged in professional sports. A higher sports level was correlated with a higher occurrence of UI. It was assumed that a higher level of sport was associated with more time spent on the trainings and a more intense effort, which correlate with UI symptoms. In our study, all the athletes were engaged in professional sport, which means that the effort was very intense and there was no further gradation of SUI

occurrence in this group depending on the achieved sports level. On the other hand, there was a relationship between the subjective feeling of workout intensity and SUI prevalence. The more intense the defined efforts was, the more women experienced symptoms of SUI.

In a study by Bø et al. [18], the prevalence of UI in nulliparous women and in female elite athletes was high. The rates ranged between 28% and 80% during sporting activities among female elite athletes. The activities most likely to provoke incontinence included jumping, high-impact landings, and running. UI occurs most commonly in sports involving high-impact activities, such as trampolining and gymnastics. While athletes report that they feel embarrassed about the condition and that it may affect performance, in one study, 84% had never spoken with their coaches or healthcare providers about UI [19]. In a retrospective study among Norwegian elite athletes who had given birth, 12.9% reported SUI during the year before the childbirth and 18.5% during pregnancy. These prevalence rates did not differ from those in a matched control group [15].

Carvalhais et al. [20] published results of a comparative study among 372 elite female athletes and 372 controls on performing high-level sport in association with UI. The prevalence of UI was 29.6% and 13.4%, respectively ($p < 0.001$). The authors concluded that the prevalence of UI among Portuguese female elite athletes was high and the odds of UI were 3 times higher than in the controls. Also, constipation, family history of UI, and history of urinary infections were significantly associated with UI. To compare the reports, one can say that in our study the prevalence of SUI among elite women athletes (62.5%) was high.

Lousquy et al. [21], in a large review article, stressed that sport might be the cause of various diseases when poorly chosen or improperly performed. Intensive exercise is a risk factor for UI, defined as a complaint of any involuntary leakage of urine. It is essentially SUI, occurring because of the phenomenon of intraabdominal hyperpressure, inherent with certain activities and excess capacity of sphincters. Some sports are more risky than others, and high-level sports-women are the most exposed. The authors stated that health professionals must invest in information, screening, prevention, counselling, and treatment among track athletes. So, the general practitioner and the sports physician play a vital role in managing SUI among sportswomen.

Fernandes et al. [22] evaluated UI symptoms incidence, severity, and impact on the quality of life of young football players. The research group consisted of 35 amateur football players aged 12–19 years (15.6 ± 2.0). The control group involved 24 women who did not practise any sport at the age of 11–19 years (14.8 ± 2.4). The International Consultation on Incontinence Questionnaire Short Form (ICIQ-SF) and KHQ were used as inpatient tests. The results were positive in 62.8% of the study group participants and in 25% of the control group subjects. Soccer players achieved the highest scores in the areas of health perception (35.2/100), emotions (37.3/100), sleep/energy (26.5/100). In our study, the elite women athletes achieved the following results: 27.14/100 for health perception, 15.14/100 for emotions, 12.62/100 for sleep/energy. This means that their quality of life was assessed better than in the case of the younger football players who practised amateur sport.

The biometeorological factor may be an additional element affecting the quality of life of patients with SUI. Bidzan et al. [23] performed a study with 55 perimenopausal SUI patients using an own questionnaire and the Quality of Life Questionnaire (QLQ C30). The biometeorological stimuli re-

vealed in the study as related to the assessment of the quality of life in patients with SUI were hotness and humidity. Under hot and humid conditions, the patients were better physically, emotionally, and socially. As the discomfort of cold increased, the pain and the need for rest raised, while heat was less conducive to pain. Under hot conditions, patients with SUI who consumed drinks and, in addition, lost their fluids by sweating and ventilation, had lower diuresis and thus lower probability of urine loss episodes; they rarely felt the need to rest. This minimizes stress and, consequently, on hot days, women with SUI may feel better and less tired. Taking into account the abovementioned, one could explain why in our study SUI occurred more often in skiers, the athletes who are exposed to low temperatures and often quite high humidity. In addition, they have technical difficulties associated with undressing from the multi-layered clothing.

Hagovska et al. [24] published the results of a cross-sectional study on UI prevalence in 503 sportswomen with a mean age of 21.1 ± 3.6 years performing high-impact exercises. The response rate was 71.15%. The ICIQ-SF scores confirmed mild difficulties with urine leakage in 72 (14.3%) sportswomen. The Overactive Bladder Questionnaire (OAB-q) and Incontinence Quality of Life (I-QOL) questionnaire showed a significant difference, with pronounced symptoms of UI and worse quality of life in the group of sportswomen with urine leakage ($p < 0.000$). I-QOL recorded significantly worse parameters in the group of sportswomen with urine leakage ($p < 0.000$). SUI was found in 68 (13.52%) participants. Every 7th sportswoman (14.3%) in the study group reported problems with UI when practising high-impact sporting activities, with a negative impact on life quality.

Rosa Coelho [25] states that we should be more concerned for female athletes in the context of high-impact sports and UI because the condition is fairly common and affects many women globally.

A systematic review by de Mattos Lourenco et al. [26] involved 7507 women aged 12–69 years. Only 5 studies compared physically active women with controls. Each study included high- or moderate-impact activities, e.g. jumping, fast running, and rotational movements. The prevalence of UI varied from 5.56% in low-impact activities to 80% in trampolining. In athletes, UI prevalence ranged from 10.88% to 80%, which shows that the amount of training influences UI symptoms. These data suggest that sports practice increases the prevalence of UI and that the type of activity performed by women also has an influence on the disorder.

Many interesting reports come from the University of Porto, Portugal. Carvalhais et al. [27] investigated the potential impact of physical activity on pelvic floor muscle function. They performed a cross-sectional study to analyse the association between physical activity level and vaginal resting pressure and pelvic floor muscle strength and endurance in 38 continent women and 20 women with SUI aged 19–49 years. There was a weak positive association between physical activity and vaginal resting pressure in the continent ($r = 0.377$) and an inverse association in the incontinent women ($r = -0.458$). No relationships were found between physical activity and pelvic floor muscle strength or endurance.

Dos Santos et al. [28] verified and quantified urine loss in 104 nulliparous athletes during 1 hour of sports training using a modified pad test protocol. Overall, 52% of the athletes self-reported UI; of those who reported SUI or mixed UI, only 43.7% had leakage during the training pad test. In total, 27.9% of athletes presented a positive pad test during the training. Mean urinary loss was 1.57 ± 0.4 g. The authors concluded that the athletes did not seem to have a good

knowledge of UI symptoms. Alves et al. [29] investigated 245 nulliparous, physically active women aged 18–40 years in a cross-sectional survey. Overall, 22.9% of the participants self-reported UI; among them, 60.7% had SUI. Women practising high-impact sports presented a higher frequency of urine loss than those engaged in low-impact sports ($p = 0.004$). Regardless the intensity of the sport, the volume of exercise showed a positive association with the frequency of urine loss ($p = 0.005$, $r = 0.475$). The authors conclude that women who practise high-impact sports or who have a higher volume of training should be aware of the symptoms associated with pelvic floor dysfunction, since they seem to predispose to urine leakage.

Conclusions

1. SUI in female runners depends on the history of giving birth, length of practising sports (the shorter the carrier, the more common SUI), and training intensity.

2. SUI in female runners does not depend on age or the sports class.

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Disclosure statement

No author has any financial interest or received any financial benefit from this research.

Conflict of interest

The authors state no conflict of interest.

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