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Stress Urinary Incontinence in Collegiate Female Athletes: Prevalence and Impact

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by

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Abstract

Introduction, definition: Urinary incontinence is the involuntary leaking of urine (a few drops to a few milliliters). It can happen while exercising with no urge to urinate (stress urinary incontinence), with a sudden urge to urinate (overactive bladder or urgency urinary incontinence), or a combination of the two (mixed urinary incontinence). This issue is very common among female athletes. However, because of the reluctance to discuss this problem, it remains underdiagnosed and undertreated.

Methods: An anonymous and confidential survey was distributed to the 90 University of San Francisco female student athletes from seven different varsity sports in December 2017.

Results: The results obtained showed that 50% of the women surveyed had experienced leaking of urine while exercising due to stress urinary incontinence or mixed urinary incontinence. Fourteen out of the 63 women who had experienced symptoms in the past reported an impact on their performance at training or while competing, at least once. Only 14 women had heard about stress urinary incontinence, and only three had discussed the issue with a coach or a healthcare professional.

Pilot project: In order to reduce the stigma around stress urinary incontinence, spread knowledge of the condition, and propose prevention and rehabilitation exercises, small posters were hung in the women's restrooms and locker rooms in the athletic facility of the University of San Francisco. Subsequently, a public Facebook page was created to reach a larger population with the same messages.

Keywords: Stress Urinary Incontinence, Female Athletes, Rehabilitation, Prevention, Pelvic Floor Muscles, Collegiate, University, Sport, Stigma, Nulliparous

Executive Summary

Stress urinary incontinence (SUI) is the involuntary leaking of urine (a few drops to a few milliliters) that happen while exercising. Because the pressure in the abdominal cage increases when exercising, and because of specific characteristics of the female anatomy, female athletes are particularly at risk for SUI. Research on nulliparous women (women who have not given birth) shows a higher prevalence (up to 67% depending on the sports played) among female athletes compared to a non-athlete population. The condition confers stigma and shame, thus only a minority of women athletes are willing to share their health condition with a healthcare practitioner or with a coach. Besides that quality of life being impacted by SUI, the taboo around urinary incontinence, particularly among a young and otherwise healthy population of women, keeps the condition hidden, and therefore underdiagnosed and undertreated. However, prevention and rehabilitation solutions exist, and research is slowly increasing, bringing to light the effectiveness of pelvic floor muscles exercises and other strengthening techniques.

This project aims to reduce the stigma of SUI by improving the general knowledge of the issue, not only among athletes, but also among athletic trainers, coaches and other healthcare practitioners. It also aims to propose solutions to decrease the incidence and the severity of symptoms.

Ninety anonymous and confidential surveys were distributed to the seven women's varsity, Division 1, athletic teams at the University of San Francisco. Eighty-eight responses were collected and analyzed. The survey included a validated questionnaire as well as open-ended questions which enabled the researcher to assess the needs of this collegiate population. The results show the symptoms experienced by the women and the impact they had on the quality of life of the athletes; it also indicated the possible impact on performance and illustrated the stigma around urinary incontinence. The results match the published literature which reports a prevalence of 50% of the female athletes reporting having had UI symptoms while exercising at least once in their athletic career.

Results were shared with the athletic trainers at the University of San Francisco's Sports Medicine department. A poster was then designed for the female athletes and placed in each of the women's locker room and toilets of the USF athletic facility. Coaches were also informed, and encouraged to learn more about this common, but little-known condition.

Soon after, a public Facebook page was created with the same goals of reducing the stigma around stress urinary incontinence, increasing the knowledge about this health problem, and proposing some prevention and rehabilitation exercises. This time, the population targeted was a larger sample of women athletes, but the information is available to anyone interested in the topic. Articles and videos were shared on the site, encouraging people to comment, "like" or even share materials. Facebook analytics were used to measure the effectiveness of the page, materials, and engagement with the audience.

Future recommendations encourage additional scientific research on alternative core exercises that could be done to prevent or reduce the severity of symptoms of stress urinary incontinence and urinary incontinence in general. The questions raised after this project are as follow:

- How do urinary incontinence (UI) symptoms impact athletic performance during practice and while competing?
- Would a twelve-week rehabilitation protocol based on deeper abdominal muscles training and respiration control be effective in reducing the severity of symptoms among nulliparous female athletes?
- Is there a relationship between the women's menstrual cycle and the symptoms of UI?
- Would the same protocol used to treat symptoms of SUI also have a beneficial impact on lower back pain?

Introduction

In 2016 at the Rio Olympic Games, the French women's gymnastics team encountered an unexpected problem. Because the women's team was competing during lunchtime, the medical staff prepared some highly nutritious drinks, so the athletes could get all their necessary nutrients through easily digestible liquids instead of solid food. However, very few of the gymnasts agreed to drink the beverages. After this failure, the team members were interviewed to understand why they would not consume their liquid lunch. The interviews revealed that 100% of the French 2016 gymnastics Olympic team had experienced stress urinary incontinence symptoms while competing. Avoiding drinks as much as possible was one strategy the gymnasts used to ovoid incontinence and its impact on their performances. But none of the gymnasts had discussed this problem with either their health practitioner or a coach. After the Rio Olympics, the National Institute of Sport, Expertise and Performance (INSEP) in Paris, France, organized some information sessions and training for coaches and medical professionals to increase their knowledge and help them address the issue.

The condition of stress urinary incontinence (SUI) and the stigma it carries are slowly emerging in France as a sport-related health issue worthy of concern and treatment. But the condition and its impact on athletes' quality of life and performance appear to have been overlooked or ignored by the athletes themselves, coaches, and athletic trainers beyond the reach of INSEP's message. A common perception among female athletes is that stress urinary incontinence is a normal sign of good, hard training; others believe that nothing can be done to help them reduce the severity their symptoms. SUI is a health problem the women are ashamed to talk about with their coaches or health practitioners, resulting in an underdiagnosed and undertreated condition.

Literature Review

Definition

Incontinence is the uncontrollable leaking of urine. There are three types of urinary incontinence (UI): stress urinary incontinence (SUI); overactive bladder (OB) also called "urgency" urinary incontinence; and mixed urinary incontinence which combines the two previous ones. The leaking can be anything between a few drops to a few milliliters ("Get the facts about SUI", n.d.). SUI comes from weak or damaged pelvic floor muscles.

A sudden urge to urinate is the most common symptom of an overactive bladder, as well as a need to go to the toilet very frequently during the day and the night. It can happen at any time and can be triggered by some external factors such as the sound of water, the thought of going to the restroom, or taking a shower. It can also happen without any obvious reasons. When SUI occurs, it is then extremely difficult for a woman to concentrate and activate the proper muscles to prevent the leaking of urine.

Mild SUI may also occur during physical activities, when lifting, laughing, coughing or even sneezing. Moderate to severe SUI can occur with any type of small movements like standing up, walking or even bending over. In other words, each time the pressure is too high in the abdomen, and if the pelvic floor muscles are not strong enough, it can trigger the leaking of urine. Because the pressure increases when exercising, female athletes are particularly at risk to experience more severe symptoms of UI ("Types of Urinary Incontinence," 2014).

Prevalence among female athletes from different sports and levels

SUI is a common issue among female athletes. Although one study (Bø, and Borgen, 2001), did not show a significant difference in the prevalence of SUI in elite athletes and a non-athlete control group, other studies have shown that SUI is more prevalent among female athletes than non-athletes. Carls (2007) found that 28% of 156 nulliparous college athletes had experienced SUI. Nygaard, Thompson, Swengalis, and Albright (1994) showed disparities in prevalence depending on the sport: 67% among gymnasts, 66% among basketball players, 50% among tennis players, 42% among field-hockey players, 29% among track athletes, 10% among swimmers, 9% among volleyball players, 6%

among softball players, and 0% among golfers. In their study, Thyssen, Clevin, Olesen, and Lose (2002) found a 52% prevalence of SUI in 291 high-level female athletes. Of those who experienced SUI, 95% had symptoms during training and 51% in competition. The more at-risk athletes were gymnasts (56%), dancers (43%), aerobic athletes (40%), badminton players (31%), volleyball players (31%), track and field athletes (25%), handball players (21%) and basketball players (17%). More recently, Carvalhais, Natal, and Bø (2017) showed a prevalence of 30% of urinary incontinence among Portuguese female athletes in a cross-sectional study and concluded that the odds of urinary incontinence were three times higher among Portuguese female athletes than among the control group. Research on professional trampolinists also highlighted the close association between the severity of the incontinence and the training volume (i.e., amount and intensity) (Da Roza, Brandão, Mascarenhas, Jorge, & Duarte, 2015).

Consequences of stress urinary incontinence

Because of the stigma around SUI, quality of life (QoL) is often impacted. Indeed, it is estimated that 12% to 52% of women who have experienced SUI report a negative impact on their QoL (Jean-Baptiste & Hermieu, 2010). A study by Wan, et al. (2014) showed a strong relationship between the severity of the symptoms and QoL, stating that the more severe the symptoms of SUI were, the more stigmatized people were, and the more negative impact SUI had on their QoL. The same study showed a significant close correlation between internal shame and its negative impact on QoL.

However, SUI is a "taboo" topic. Jean-Baptiste & Hermieu (2010) found that only 5% of these women had informed their physician about this health concern.

Shame and embarrassment are the most expressed feelings reported by patients with urinary incontinence (UI) when the symptoms (urine leakage, odor…) are perceptible to others (Elstad, Taubenberger, Botelho, & Tennstedt, 2010). Moreover, humiliation and guilt were expressed by patients suffering from UI, along with fear of letting their health practitioner know about this condition (Elenskaia, et al., 2011), leading to delayed diagnoses and a worsened condition at time of treatment.

A study by Bø and Sundgot-Borgen (2010) found that the prevalence of UI does not seem to be higher in former athletes than in a control group. However, the research revealed that UI at a young age, as reported among elite athletes, is a strong predictor of UI later in life.

A review of the literature yielded no published research on the impact of SUI on athletic performance.

Prevention and rehabilitation of SUI

Action can be taken to reduce the severity of the symptoms and improve the QoL of women experiencing UI. A variety of treatments have been developed and tested with varying success, but the Society of Obstetricians and Gynecologists of Canada first recommends the use of pelvic floor exercises, also known as Kegel's exercises (by the name of their creator, Kegel, A.).

Physical training focused on pelvic floor muscle (PFM) has positive effects on urinary incontinence (Garcia Sanchez, Rubio Arias, Avila Gandia, Ramos Campo, Lopez Roman, 2016; Castro, et al. 2008; McIntosh, Andersen, Reekie, 2015). These muscle-strengthening exercises, with or without devices (Ong, at al. 2015), have been shown to be effective for treating UI, especially SUI, by increasing the PFM strength. Aukee, Immonen, Laaksonen, Airaksinen, (2004) and Bø, (2004a) showed that PFM exercise can increase the strength of pelvic floor contractions and, as a result, decrease the leaking of urine. To visualize the contraction of PFM and increase the perception of control, visual or auditory biofeedback can be set up with an electrode placed inside the vagina, the rectum or on the skin (McIntosh, Andersen, Reekie, 2015). In 1999, Bø, et al. showed the superiority of PFM training versus electrical stimulation, biofeedback, vaginal cones and no treatment.

Research suggests that these exercises should be conducted in a way that activates both the abdominal and the pelvic floor muscles. In 2002, Neumann, and Gill, described the interaction of the pelvic floor muscles (PFM) with the transversus abdominis, and the obliquus internus, which are the two main muscles of the abdominal wall engaged by each exercise. The research highlighted that abdominal activity and pelvic floor muscle contraction are work together and respond to each other. With relaxed abdominal muscles, the PFM were contracted to 26% of their maximal strength; during common abdominal exercises (e.g., planks, "belly in" and forced expiration), this contraction

increased to 44%; coughing increased the PFM contraction to 64% of maximal strength. This research suggests that PFM contractions (like Kegel exercises), should be done while engaging the inner core. However, Thomson, O'Sullivan, Briffa, Neuman, (2006) showed a higher activation of the abdominal muscles compared to the pelvic floor muscles among symptomatic women, which is why women should be taught how to perform abdominal exercises that minimize abdominal pressure in order to reduce the risk of UI. Also, inappropriately performed PFM exercises might contribute to the severity of symptoms. Thomson et al., (2006), Neumann, and Gill (2002), and Sapsford, et al. (2001) recommend the co-activation of both abdominal and pelvic floor muscles. To be more effective, Key (2013) proposed a training based on core control, which she defines as the ability to generate optimal internal abdominal pressure to support breathing, the posture, and movement control. Similar to the observed relation between core, PFM and breathing, retraining diaphragmatic, deep abdominal and pelvic floor muscle coordinated function has shown positive results (Hung, Hsiao, Chih, Lin, Tsauo, 2010).

Presently, evidence is lacking to prove the efficacy of alternative rehabilitation and prevention exercises such as Pilates, Taï-Chi, breathing exercises, yoga or posture correction (BØ, Herbert, 2013). But research is advancing slowly, and a protocol has been written to show the benefit of yoga on UI among females (Wieland, 2017). At this time, pelvic floor muscles training exercises seem to be the best solution for treating SUI among female athletes. Attention should be paid to alternative measures such as yoga or pilates, for their potential positive impact on the management of SUI.

Because PFM training requires long-term commitment from the athletes, attention needs to be focused on behavioral change strategies to increase the self-efficacy of each woman and maintain the benefits of a regular training habit (Sacomori, Berghmans, Mesters, de Bie, Cardoso, 2015). However, the study led by Sacomori, et al. (2015) did not show increased adherence to protocols among women who were exposed to higher self-efficacy enhancement strategies such as a behavioral change discussion (accomplishments and goals), a 9-minute video with testimonials, and a reminder. A solution might come from the mobile applications. In fact, Asklund, at al., (2016) demonstrated notable improvement of adherence from the group using a reminder and/or tracking app, and as a result, decreased severity of symptoms in that group.

Agency Profile

The University of San Francisco (USF), founded by the Jesuits in 1855, was the city of San Francisco's first university. In 1893, the college played its first game (rugby) against another school. This was the beginning of the Athletic department, which presently includes Sports Medicine.

The mission and vision of the athletic department is summarized by four pillars of success:

- Excel in the classroom
- Win at the highest level of competition
- Engage in the community
- Become leaders in the world

These pillars are part of the larger commitment of USF to educate students in the Jesuit Catholic tradition. The intellectual growth, as well as the social, moral, spiritual, and emotional development of each student is important for USF and for its athletic department. The mission of the Sports Medicine department in particular is to provide the highest level of care to USF athletes in order for them to perform at their highest potential and represent the university and its Jesuit Catholic tradition on and off campus.

The Sports Medicine department provides healthcare to all Division 1 student-athletes. From prevention to rehabilitation and healing care, athletic trainers work hand-in-hand with coaches and other health specialists from the San Francisco Orthopedic Surgeons, the Savant Medical Group, Injury & Sports Medicine Center at Kaiser Permanente, and the Division of Sports Medicine at the University of California, San Francisco. In order to provide holistic care, the department also works closely with chiropractors, physical therapists, massage therapists, active release technique specialists (active release is a specific technique that presses specific trigger points while doing a passive or active movement), a mental performance coach, and a nutritionist.

Target population

The primary target audience for the survey research consists of members of the seven Division 1 women's varsity teams at the University of San Francisco, as well as their coaches and athletic trainers.

The target population was then extended to nulliparous (women who have never given birth) female athletes engaged in any kind of physical activities, from walking and playing golf, to running, lifting and jumping; their coaches; and any health practitioner in contact with female athletes.

Problem Statement

The issue of SUI, particularly among female athletes, is generally either unknown or stigmatized. As a result, this medical problem is under-diagnosed and undertreated. The first aim of this project is to reduce the stigma around SUI by improving the general knowledge of the issue, not only among athletes, but also among athletic trainers, coaches and other healthcare practitioners. The second aim is to propose solutions to decrease the incidence and the severity of symptoms.

Methods

Unstructured data collection

To understand the reasons and the importance of the stigma among a population of female athletes at the University of San Francisco, informal data was collected during seven months prior to a survey that was administered in December 2017 (see below). The information was gathered during friendly conversations and/or unstructured interviews with a mix of athletes, athletic trainers and coaches. Additional information was gathered by shadowing and interviewing two physiotherapists who specialize in pelvic floor muscle rehabilitation and prevention of urinary incontinence/lower back pain, as well as a gynecologist who specializes in sport-related issues.

The data collected was consistent with the results found in the literature, highlighting the existence of stress urinary incontinence among female athletes, the lack of knowledge about the issue, and the significant issue of stigma around the problem.

Survey Research

Participants

The population who participated in the project was composed of collegiate female athletes from seven different varsity sports (basketball, cross country, golf, soccer, tennis, track and field, and indoor volleyball). The female athletes were students at the University of San Francisco, and aged 18 to 25 years. No varsity female athlete was excluded from the data collection. A total of 90 female athletes received the survey (Table 1). Nineteen different nationalities were represented. Eighty-eight answers were collected and analyzed.

Table 1. Number of athletes included per team

Sport	Basket-ball	Cross-country	Golf	Soccer	Tennis	Track and Field	Volleyball	Total
N	10	16	8	23	11	7	13	88

Measures

To have a better understanding of the prevalence of Stress Urinary Incontinence among female athletes at the University of San Francisco (USF) and their knowledge about this medical condition, a survey was administered to the cross country and track team first, which incorporated two different tools. The first was the Questionnaire for Female Urinary Incontinence Diagnoses (QUID), a six-item scale that enables a researcher to distinguish the type of incontinence experienced by concerned athletes (Bradley, et al. 2010). The first three questions refer to stress urinary incontinence (SUI), while the last three questions refer to overactive bladder (OB). If both symptoms are indicated, it shows the presence of a mixed urinary incontinence. For each item, six frequency-based response options are presented, ranging from “none of the time” to “all of the time.” This questionnaire showed good internal consistency of 0.85 and a Cronbach’s value of 0.87. Selected questions from the Incontinence – Quality of Life questionnaire (I-QOL) (Patrick, Martin, Bushnell, Yalcin, Wagner, Buesching, 1999) were also included for a better understanding of the impact incontinence has on this

population. The I-QOL has been shown to be valid, consistent and reproducible. It is composed of three subscales scores (avoidance and limiting behaviors, psychosocial impacts, and social embarrassment), with Cronbach's alpha between 0.87 and 0.93, and good internal consistency range between 0.87 and 0.91. Three items were removed from the survey for formatting reasons and in hopes of improving the response rate. To learn about the impact incontinence can have on athletic performance and determine the percentage of women who have already discussed this issue with a coach or a healthcare practitioner, four questions, written by the researcher, were added to the survey. In addition, open-ended questions were also inserted to learn how the athletes would want further information to be transmitted and to know what specific knowledge interested them. These answers were beneficial towards the next step of the project. The survey had not been pre-tested before it was distributed to the USF female athletes in December 2017. The survey is included in Appendix A.

Procedures

The process used to distribute and collect this survey was designed to maintain the confidentiality of the athletes and place a minimal burden on the students and staff. This survey was anonymous and confidential, and participation was, of course, completely voluntary. The researcher, with the approval of the head coaches and athletic trainers, personally distributed copies of the survey to each of the USF varsity women's teams. White envelopes were provided with the survey so that the completed surveys could be submitted in sealed envelopes. Respondents were told not to write on the envelopes to keep the process anonymous. Different processes were used to collect the surveys: a box was left in the cross country and track and field locker room; the basketball athletic trainer collected the surveys in a box for her team; and surveys were collected directly by the investigator in a box after or before practice with the tennis, soccer, and golf teams. For more confidentiality, the box's location was not printed on the questionnaire, and the box was emptied regularly. Student athletes were able to submit completed questionnaires for at least two weeks after surveys were first distributed. No incentive was given to any of the participants for their involvement.

Findings

After the surveys were collected, answers were recorded manually in tables using Microsoft Word. None of the surveys collected were eliminated because of incomplete information.

Out of the ninety surveys handed, eighty-eight responses were collected (table 2).

Table 2. Sample size

Surveys distributed	90
Surveys collected and used in the data analysis	88 (98%)
Respondents who had heard about SUI	14 (16%)
Respondents who were interested in learning more about the condition	26 (29.5%)

Of the 88 women who responded to the survey, only fourteen (16%) had heard about stress urinary incontinence. Respondents had learned about SUI from websites, magazines, newspapers, and online research; through friends, teammates, family members; in class; or from a doctor.

Figure 1 shows the prevalence of UI among the USF female athletes surveyed. Seven women expressed having had SUI symptoms while exercising at least once in their career (8%); thirty-eight expressed having had mixed UI symptoms (42%); eighteen expressed having had UUI symptoms (20%); twenty-five female athletes never had symptoms prior to that survey (28%). In other words, that means fifty percent of the female athletes surveyed had already experienced the leaking of urine while exercising at least once before the beginning of the project.

Figure 1. Prevalence of Urinary Incontinence (UI) Among USF Female Athletes (n=88)

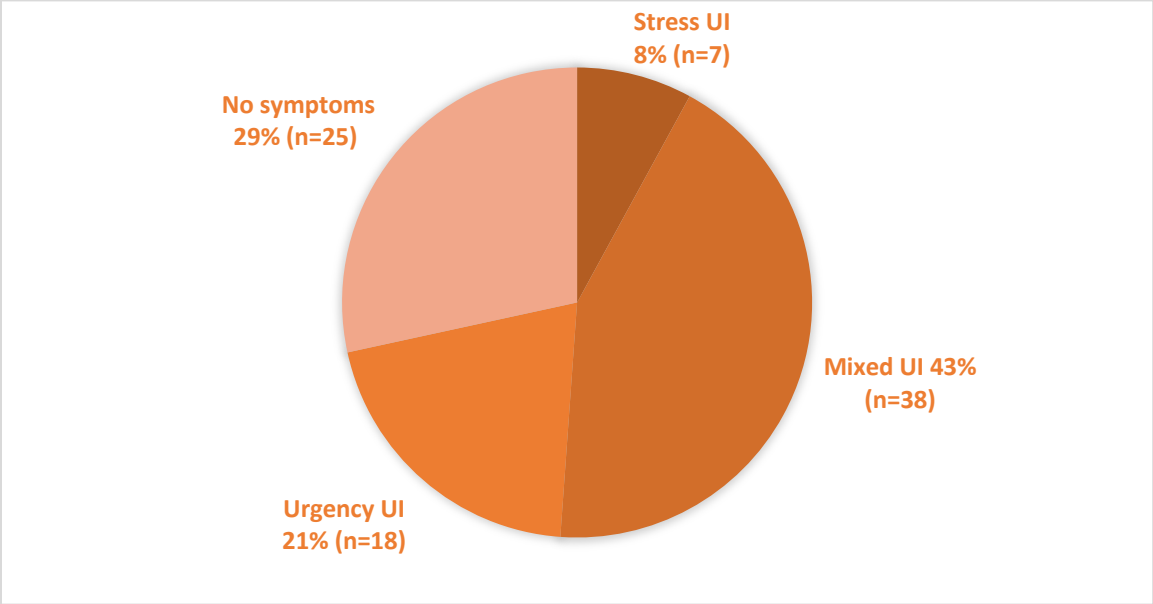
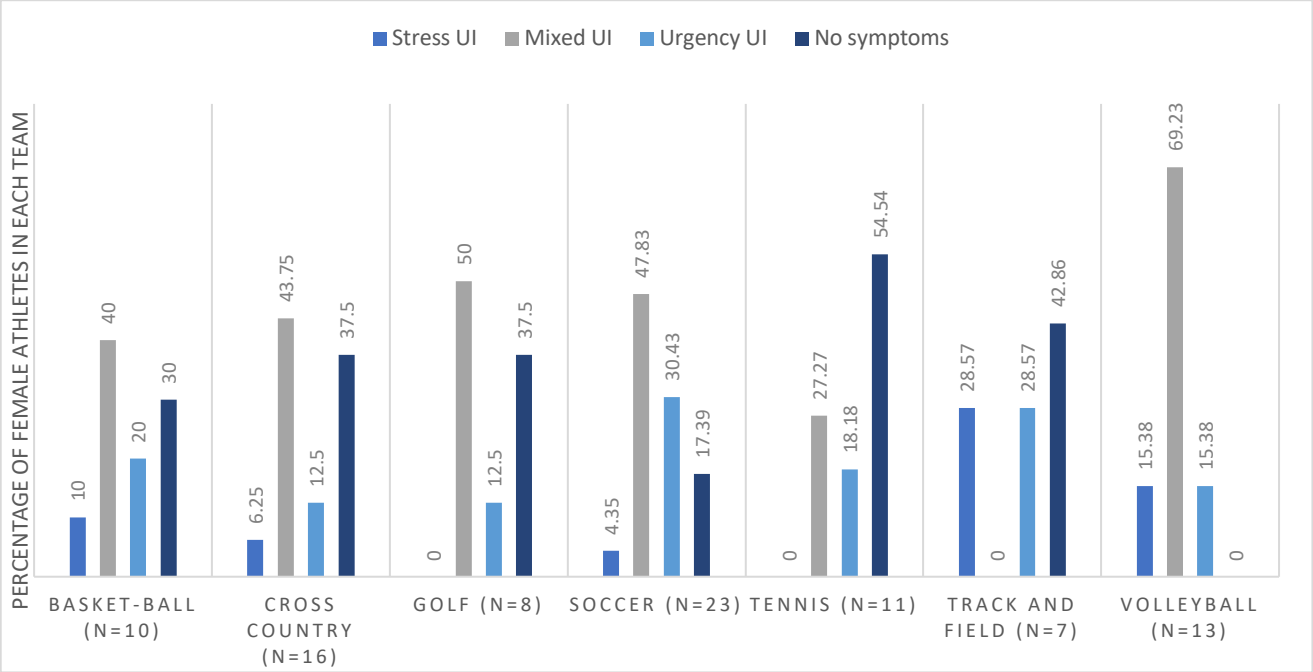


Figure 2 illustrates the prevalence of SUI, overactive bladder (OB) and mixed UI (MUI) in each of the seven teams surveyed.

Figure 2. Percentage of urinary incontinence in USF's women's varsity teams



There was at least one athlete on each varsity team that had experienced urinary incontinence. One hundred percent of the volleyball team members reported having already experienced some

symptoms of UI and 85% reported having symptoms while exercising. Fifty percent of the basketball, 50% of the cross country, 50% of the golf and 52% of the soccer team had symptoms during exercise at least once prior to the survey (SUI and MUI added), whereas 28% of the track and field and tennis team reported SUI or MUI. The level of severity of the incontinence was different depending on the sport played. Cross country, soccer and volleyball seem to be the sports where the severity of the symptoms was the highest, whereas golfers and tennis players reported fewer severe symptoms. Table 3 shows the severity of symptoms expressed, as well as the type of symptoms, in all the teams combined.

Table 3. QUID test, all teams combined

Do you leak urine (even small drops), wet yourself, or wet your pads or underwear…?							
	None of the time	**Rarely**	**Once in a while**	**Often**	**Most of the time**	**All of the time**	Total (n)
When you cough or sneeze?	55	13	17	2	1		88
When you bend down or lift something up?	77	6	5				88
When you walk quickly, jog or exercise?	56	13	11	5	2	1	88
While you are undressing in order to use the toilet?	55	19	11		1	2	88
Do you get such a strong and uncomfortable need to urinate that you leak urine (even small drops) or wet yourself before reaching the toilet?	49	22	12	2	1	2	88
Do you have to rush to the bathroom because you get a sudden, strong need to urinate?	34	20	22	9	1	2	88

It appears that most women expressed experiencing symptoms none of the time, rarely or once in a while. Fewer women reported experiencing some type of symptoms often, most of the time or all of the time. The most commonly reported symptoms are the strong need to urinate and the rush to go

to the toilets, which are symptoms of overactive bladder. The next most common symptom is the leaking of urine that happens while coughing or sneezing and which is a symptom of stress urinary incontinence.

Only three women who had experienced UI symptoms had consulted a health professional or talked about the issue to a coach before this survey.

Fourteen women out of the sixty-three female athletes (23%) who had experienced urinary incontinence symptoms before the beginning of the project reported UI had had an impact on their performances during training or during a competition (Table 4). One woman reported an extremely high impact, one "quite a bit", two women reported a moderate impact and ten women reported a little impact on their performances, related to UI symptoms.

Table 4. Severity of the impact of UI reported during training or while competing

Has your Stress Urinary Incontinence ever impacted your performance when training and/or competing? If yes, how?		
Rating	n	%
Extremely	1	1.14%
Quite a bit	1	1.14%
Moderately	2	2.27%
A little	10	11.36%
Not at all	46	52.27%
N/A	28	31.82%
Total	88	

In the same way, the impact on the quality of life (QoL) was significant for many of the 88 female athletes surveyed who agreed to answer the modified I-QOL questionnaire included in the

survey (Table 5). For a matter of easier reading, the answers "extremely," and "quite a bit," were combined in the same column.

Table 5. Impact of UI on quality of life

	Extremely or Quite a bit	Moderately	A little	Not at all	**Total (n)**
You worry about not being able to get to the toilet on time	4	4	14	34	**56**
You worry about coughing and sneezing	1	1	5	49	**56**
You have to be careful about standing up after sitting down	1		6	49	**56**
You worry where the toilets are in new places	1	2	13	41	**57**
You feel depressed		1	4	52	**57**
You feel frustrated because your Urinary incontinence prevents you from doing what you want	2	1	4	50	**57**
You worry about others smelling urine on you	5	1	1	50	**57**
Incontinence is always on your mind	2	1	3	51	**57**
It's important for you to make frequent trips to the toilet	5	4	18	30	**57**
Because of your incontinence, it is important to plan every detail in advance	2		5	50	**57**
You worry about your incontinence getting worse as you grow older	3	4	9	41	**57**
You worry about being embarrassed or humiliated because of your incontinence	4	2	4	47	**57**

	Extremely or Quite a bit	Moderately	A little	Not at all	**Total (n)**
Your incontinence makes you feel like you're not a healthy person	1	2	4	50	**57**
Your UI makes you feel helpless	1	1		55	**57**
You get less enjoyment out of life because of your UI	1	1	1	54	**57**
You worry about wetting myself	3	2	7	45	**57**
You feel like you have no control over your bladder	3	1	11	42	**57**
You have to watch what you drink	2	2	5	48	**57**
Your Urinary Incontinence limits your choice of clothing	1	3		53	**57**
You worry about having sex	2		4	51	**57**

It appears that the psychosocial impacts, the social embarrassment and the limiting behaviors were experienced by female athletes for each item, with more or less severity. The main impacts were the worry of not being able to get to the toilet on time, the frequent need to go to the toilet, the worry of the symptoms getting worse with age, the feeling of not being able to control the bladder, the worry of wetting themselves, the need to pay attention to their drinks, the feeling of a lack of control over their bladder and the worry of social humiliation.

Surprisingly, athletes who did not have any symptoms were the most curious about getting more information about the issue. Twenty-six of the eighty-eight athletes were interested in receiving more information about urinary incontinence in general. Of these 26 women, nine (35%) were female athletes who were currently asymptomatic. They were interested about rehabilitation and prevention exercises, general knowledge (what/ why/ who/ how), the possible link of SUI with menstrual cycles, their future health, the effectiveness of treatments, the prevalence among women and female athletes.

Discussion and limitations of methods

The confidentiality was preserved for the cross-country team by providing a box in the locker room to collect the surveys. However, the feeling of confidentiality might have been reduced by the presence of coaches and of the researcher while the other teams were completing the surveys, even though it was done by a mutual agreement.

The survey had a very high response rate (88/90). The tennis, soccer, and golf teams agreed to answer the survey while the researcher and the coaches were in the room, before or after team meetings, which is probably one of the reason the response rate was very high. A second reason for the high response rate may be due to the fact that researcher was part of the same community. A third reason may be that these female athletes were interested about this little-known topic.

Because the surveys were anonymous, the researcher was unable to follow up to explore why most of the women with symptoms did not want to receive further information and why women who did not express any symptoms were more interested and curious about the problem of stress urinary incontinence.

As reported previously, three items were removed from the I-QOL questionnaire; therefore, even if the results show an impact on performances, we were not able to use this validated scale as it was designed. However, as questions were not correlated with each other, the answers collected still illustrated well the substantial impact UI had on the QoL of a young athletic population of female student athletes on a daily basis and the need to develop further prevention and rehabilitation protocols. If this study were to be repeated at another university, the researcher recommends including all of the scale questions.

The number of women who responded having heard about the condition would probably be lower if the researcher had assessed the needs before having informal interviews and conversation with some athletes about this health problem.

The prevalence of urinary incontinence symptoms among this collegiate female-athlete population matches the findings reported by other researchers and are on the higher range of prevalence. However, the prevalence among the Volleyball team was surprisingly much higher than the prevalence found in the study led by Nygaard, Thompson, Swengalis, and Albright (1994). A rate

of 85% was found among the USF female Volleyball players compared to a prevalence of 9% in the study led in 1994. The number of women who had consulted a health practitioner for this condition matches previous findings and highlight the stigma around urinary incontinence and the need to spread the knowledge among athletes, coaches, athletic trainers, and sports medicine practitioners.

Pilot project

Presentation

Step 1: Sharing the results with athletic trainers

The researcher presented the findings and recommendations to all the University of San Francisco's athletic trainers during a staff meeting. A definition of urinary incontinence was given, as well as a brief explanation of the anatomy of the pelvic area (Appendix B). This background lecture was followed by a summary on the results of the survey data. The presentation concluded with an overview of possible rehabilitation and prevention exercises that could be implemented within the next weeks or months.

Step 2: Creating a poster to combat stigma

As a next step, a visual (Appendix C) was designed based on the results of the survey. The purpose of this poster was to reduce the stigma associated with the topic of stress urinary incontinence and improve the diagnosis and follow-up with the medical professionals. The poster was created using Canva. A draft was presented to a group of health-care professionals and students, who gave feedback that was used to inform the final poster wording and design. Six posters were printed then laminated and hung in each of the USF women's locker room, in a place where athletes would have a high likelihood of reading it. Other posters were printed on paper and hung in the restrooms, behind each toilet's door at eye level while seated. In addition, emails were sent to each of the USF women's head coaches, with the same poster and another visual that showed specific results for their team. Results had already been shared with athletic trainers, so that the coaches were able to question them if necessary for further information and to request help if some of their athletes needed extra attention on this issue.

Step 3: Spreading the knowledge through social media

The third step of the pilot project was to spread information about UI and continue to reduce the stigma around this medical condition. To achieve this objective, a Facebook page (Appendix E) was created (@stressurinaryincontinence). This page is a public page and therefore, open and available at any time for every person interested in the subject. The site also allows people to share the page, "like" the page or even post comments and materials if they are comfortable talking about the topic. Using social media also enables people to read and seek information anonymously if they prefer. Articles, videos and visual facts have been posted on the page to describe the issues, share some interesting facts related to stress urinary incontinence and pelvic floor rehabilitation, and provide information about possible rehabilitation or prevention exercises that can be done to reduce symptoms. A YouTube Channel was also created to support videos that were and will be shared on the Facebook page to complete the information available. This page was advertised using a second poster (Appendix D) that was hung next to the first poster in the locker rooms and next to the sink in the restrooms.

To measure the effectiveness of the Facebook page, the researcher is able to see how many persons are reached by each post. The number of "likes," "shares," "views," and comments also give an overview of the success of this educational approach. The page's number of like was 17 when created and posts reached up to 29 people during the first week of its creation. As more materials are made available on this platform, the researcher hopes that more people will follow the page and participate in breaking the taboo around UI.

Limitations of use of social media

Follow-up research suggested that the name of the Facebook page "Stress Urinary Incontinence" had too much stigma around it, which disincentivized individuals from "liking" the page. An informal focus group with some female athletes was conducted to understand why they did or did not "like" the page or even why they had removed their "like." Participants noted a reluctance to "like" the site because of the stigma around this unknown topic. The student athletes interviewed did not want to answer questions about this topic to their Facebook "friends" and were ashamed of the

outside opinion. Because it is a public page, everyone can have access to it and see their friends' interest in the topic. Some athletes even received messages from friends who were wondering if they had been hacked. The researcher concluded that the name of the page should be changed in order to reach a wider audience.

However, because one of the main goal of this Facebook page was to break the stigma around UI, the more visible the topic appears, the more people might be reached and have a chance to understand the issue better. In the long run, this may reduce the shame among athletes feel about stress urinary incontinence. Eventually, SUI may become a topic that female athletes will feel comfortable discussing with athletic trainers, coaches and healthcare providers. However, due to the high stigma and great need for increased awareness, the researcher decided to create a more 'neutral' name. The page is now called "Pelvic Floor Muscles," which maintains a medical and serious connotation but is not stigmatized. This new name will also allow the page manager to post a larger variety of materials in the future; not only about UI, but also about lower back pain for example, which is linked to weak pelvic floor muscles. Bi, Zhao, J., Zhao, L., Liu, Zhang, Sun, Song, Xia, (2013) showed the benefit of pelvic floor muscle training for chronic lower back pain conditions, reducing not only the pain, but also the disability.

Recommendations

Implications for practice

As stated earlier, the results found among the seven female Division 1 varsity teams at the University of San Francisco show that stress urinary incontinence is a concerning issue. This study suggests that further research is necessary in order to increase scientific knowledge of SUI, alongside general information campaigns in order to increase awareness among nulliparous female athletes.

Admittedly, the results cannot be generalized. The study was conducted among Division 1 collegiate female athletes who regularly train and compete at a high level. Therefore, we cannot conclude whether or not a population with a lower training volume (i.e. intensity and amount of training) would have showed similar results. Furthermore, the research was conducted in a single

university in the United States and therefore should not be extrapolated to other universities in other states and countries, even though 19 different nationalities were represented among the respondents.

The research also highlighted information that can be used to improve female athletes' health and reduce the prevalence and incidence of stress urinary incontinence. In fact, 50% of the respondents expressed having had UI symptoms while exercising; none of the sports was exempt of symptomatic female athletes; 30% of the women surveyed indicated a desire to learn more about the condition; and only 16% had heard about SUI. Beside the high prevalence of SUI, the researcher also discovered that urgency UI was expressed by 62% of the collegiate Division 1 female athletes surveyed. It would be interesting to know if the percentage remain the same among a non-athletic population of nulliparous women, and if the intensity and frequency of training would impact the results.

In the future, the researcher recommends that questions concerning urinary incontinence should be added to the pre-participation questionnaire completed by each nulliparous athlete of collegiate varsity teams at the beginning of each school year. This assessment could simply use the QUID questionnaire developed by Bradley et al. (2010). This data could be used for screening athletes who might be experiencing UI issues or as the basis of additional research, described below.

To continue to increase awareness, posters about SUI should be hung in other settings such as public gyms, in the women's locker rooms, or other universities to continue reducing the stigma around SUI and inform female athletes of all age. The researcher also recommends coaches and healthcare providers to bring up this health issue as a normal part of conversation, during training while explaining core exercises for example, or during rehabilitation. Athletic trainers and coaches should receive training to have a general knowledge about the issue and become able to adapt prevention and rehabilitation exercises to women who are seeking help.

The Facebook page should continue to grow, with additional resources for prevention and rehabilitation exercises, for example, and solution found to spread knowledge. It should become a page were interested people can be referred to if needed.

Future research

Based on the results obtained with the USF female athletes' sample, the next step is to reduce

the gap in the literature concerning alternative core exercises that could be done to prevent the symptoms and reduce the severity of the symptoms of UI. The research questions raised are as follow:

- How do UI symptoms impact athletic performance during practice and while competing?
- Would a twelve-week rehabilitation protocol based on deeper abdominal muscles training and respiration control be effective on reducing the severity of symptoms of UI among nulliparous symptomatic female athletes?
- Is there a relationship between the women's menstrual cycle and the symptoms of UI?
- Would the same protocol used to treat symptoms of SUI have an impact on lower back pain?

Methods

To learn more about the efficacy of rehabilitation exercises on the severity and impact of UI symptoms, female athletes with symptoms could be assigned to participate in a 12-week research protocol including daily exercises based on pelvic floor muscle training and breathing techniques. Depending on the sport played, the exercises could slowly progress into more specific core exercises. Appendix E gives an example of what the first two weeks of this exercise protocol could include. This research would require an IRB approval.

While the research would be voluntary and confidential, in order for the researchers to have a follow up during the protocol, it would not be possible for the surveys to be anonymous. A pre-test survey would be handed before starting the protocol and should include the QUID questionnaire (Bradley et al. 2010), as well as specific questions on the impact UI has on performance, and at what intensity of exercise. A question about the severity of possible lower back pain (from "not at all" to "all of the time") could also be part of the survey, as well as questions about the relationship between symptoms and the women's menstrual cycle and the amount of training done weekly.

The test would then be readministered every two weeks during the protocol to have an overview of the evolution of symptoms and the impact the protocol might be having on these symptoms. A question could also be added to learn about the adherence to the protocol. A post-test survey would be completed at the end of the protocol, after twelve weeks, to have a final picture of the severity of the symptoms, and of the prevalence among the volunteer female athletes.

Sample plan. The sample would include every female athlete aged over 18 years old that agrees to voluntarily participate in the study. Non-nulliparous women (women who have already given birth), would be excluded from the study because of the possible damage a birth can have on pelvic floor muscles and the bias this could have on later results. This study could be done among collegiate athletes, but also among women engaged in club sports or even among professional athletes of any sports. As the study would have a follow-up during the protocol, no comparison group would be needed.

Data would be collected directly by researchers via an online survey. This way, location would not be a problem, and athletes would be able to complete the surveys from any location.

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Appendix A

Health and Division 1 Female Student-Athletes

This is a **confidential and anonymous** survey that will help us take care of sport related issues among female athletes. The topic of the survey is Stress Urinary Incontinence.

This data is being collected by Marie Bouchard, a cross country and track team member, at the University of San Francisco, MSBH'18 and medical student (5th year).

If you have any questions or concerns, please ask her or send her an email (mbouchard@dons.usfca.edu).

You can skip any questions you do not wish to answer. There are no "correct" or "incorrect" answers. It will take about 5 minutes to complete this survey.

Because this survey is anonymous, please seal your answers in the plain white envelope provided to you. Do not mark this survey or envelop with your name or contact information.

By completing and returning this survey, you are indicating that you have voluntarily agreed to participate in this research.

Information from this screening research may be used to develop an awareness program as well as rehabilitation and prevention exercises.

Thanks in advance for your help.

1. Have you heard about Stress Urinary Incontinence?
   ☐Yes ☐No

2. If yes, how?

_____
_____
_____
_____
_____

3.	None of the time	Rarely	Once in a while	Often	Most of the time	All of the time
Do you leak urine (even small drops), wet yourself, or wet your pads or underwear…						
When you cough or sneeze?	☐	☐	☐	☐	☐	☐
When you bend down or lift something up?	☐	☐	☐	☐	☐	☐
When you walk quickly, jog or exercise?	☐	☐	☐	☐	☐	☐
While you are underdressing in order to use the toilet?	☐	☐	☐	☐	☐	☐
Do you get such a strong and uncomfortable need to urinate hat you leak urine (even small drops) or wet yourself before reaching the toilet?	☐	☐	☐	☐	☐	☐
Do you have to rush to the bathroom because you get a sudden, strong need to urinate?	☐	☐	☐	☐	☐	☐

Bradley, C. et al. (2010). The Questionnaire for Urinary Incontinence Diagnosis (QUID)

_____

If you have **not** experienced any of the symptoms listed above, please skip to question 8.

4.	Extremely	Quite a bit	Moderately	A little	Not at all
Because of your Urinary Incontinence (UI) …					
You worry about not being able to get to the toilet on time	☐	☐	☐	☐	☐
You worry about coughing and sneezing	☐	☐	☐	☐	☐
You have to be careful about standing up after sitting down	☐	☐	☐	☐	☐

	Extremely	Quite a bit	Moderately	A little	Not at all
You worry where the toilets are in new places	☐	☐	☐	☐	☐
You feel depressed	☐	☐	☐	☐	☐
You feel frustrated because your Urinary incontinence prevents you from doing what you want	☐	☐	☐	☐	☐
You worry about others smelling urine on you	☐	☐	☐	☐	☐
Incontinence is always on your mind	☐	☐	☐	☐	☐
It's important for you to make frequent trips to the toilet	☐	☐	☐	☐	☐
Because of your incontinence, it is important to plan every detail in advance	☐	☐	☐	☐	☐
You worry about your incontinence getting worse as you grow older	☐	☐	☐	☐	☐
You worry about being embarrassed or humiliated because of your incontinence	☐	☐	☐	☐	☐
Your incontinence makes you feel like you're not a healthy person	☐	☐	☐	☐	☐
Your UI makes you feel helpless	☐	☐	☐	☐	☐
You get less enjoyment out of life because of your UI	☐	☐	☐	☐	☐
You worry about wetting myself	☐	☐	☐	☐	☐
You feel like you have no control over your bladder	☐	☐	☐	☐	☐
You have to watch what you drink	☐	☐	☐	☐	☐
Your Urinary Incontinence limits your choice of clothing	☐	☐	☐	☐	☐
You worry about having sex	☐	☐	☐	☐	☐

Patrick, D. L. et al. (1999). Incontinence-Quality of Life (I-QOL) Questionnaire

5. Has your Stress Urinary Incontinence ever impacted your performance when training and/or competing?

☐ Yes
☐ No

6. If yes, please indicate the impact's level of severity:

1= extremely	2= quite a bit	3= moderately	4= a little	5= not at all
☐	☐	☐	☐	☐

7. Have you ever consulted a trainer, coach or health professional about Stress Urinary Incontinence?
   ☐ Yes
   ☐ No

8. Would you be interested in having more information about Stress Urinary Incontinence?
   ☐ Yes
   ☐ No

9. If yes, what information would you like to receive?

_____
_____
_____
_____
_____
_____

10. How would you like to get this information? (check all the answers that apply)
    ☐ One-on-one sessions
    ☐ Educational booklet
    ☐ Group discussion or class
    ☐ Video
    ☐ Slides

☐ Other :

_____
_____
_____

11. What is your sport?
    ☐ Basketball
    ☐ Soccer
    ☐ Track and field
    ☐ Golf
    ☐ Tennis
    ☐ Volleyball
    ☐ XC
    ☐ Other

Thank you very much for your help!
Please do not hesitate to come and see me (Marie Bouchard) if you have any questions regarding the questions or Stress Urinary Incontinence in general.

Marie Bouchard

Member of the USF cross country and track team
MSBH'18 (USF School of Nursing and Health Profession
French medical student (5th year) at University of Western Brittany (UBO)

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APPENDIX B

Anatomy and physiology of the women' pelvic floor and SUI

In her book, De Gasquet, B. (2009) illustrates the abdominal body part as a box closed by the diaphragm at the top, the abdominal muscles in front and on the sides, the spine at the back and the pelvic floor at the bottom. The increase of the abdominal pressure is caused by the diaphragm moving down when we inhale or the abdominal belt contracting, which leads to an increase in pressure on the pelvic floor. There needs to be good coordination between the diaphragm, the 'core' muscles (transverse and oblique muscles, and rectus abdominal muscle) and the pelvic floor muscles (PFM) to keep an appropriate intra-abdominal pressure (IAP) (Key, J., 2013). A good posture and appropriate breathing helps the PFM to work in conjunction with the dynamic of the abdominal "box" and maintain continence. There is a strong correlation between chronic lower back pain, incontinence and breathing disorders (Smith, M. D., Russell, A., Hodges, P.W., 2009). Voluntary activation of the lower abdominal muscles creates an activation of the PFM before the increase of IAP and vice versa (Sapsford, R.R., 2000).

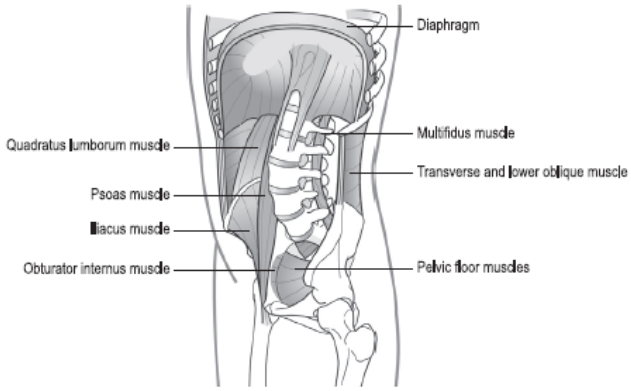
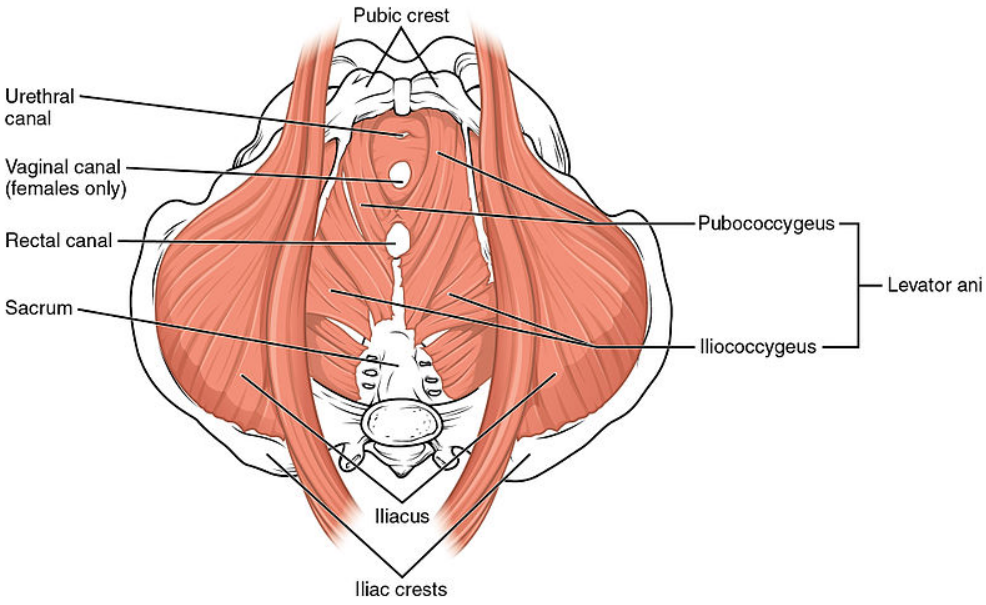


Figure: Schematic depiction of the myofascial elements of the abdominal "box" (Key, J. 2013)

There are two main hypotheses as to why stress urinary incontinence occurs at a higher rate among athletes (Carls, 2007). The first one is that athletes have strong pelvic floor muscles, but the abdominal pressure is higher which can lead to incontinence. The second hypothesis is that female athletes might have weak, stretched or overloaded pelvic floor muscles (BØ, K., 2004b).

Therefore, to better understand the system of Stress Urinary Incontinence (SUI), it is important to first understand the system of continence, which is controlled both by the urethral support system and

the sphincteric closure system (Ashton-Miller, J. A., Howard, D., DeLancey, J. O.L., 2001), as well as the 'core' system.



Pelvic diaphragm (superior view)

The pelvis is composed of a bone and a muscle and tendinous structure. The bones that surround the pelvic area are the two iliac bones, the sacrum and the coccyx. They create four different joints: two sacro-iliac joints, the pubis symphysis and the sacro-coccygeal joint, all of which are necessary in pelvic movement. The musculature of the pelvic area is more complex.

The pelvic floor muscles can be separated in two groups: the superficial layer, known as the perineal muscles and the pelvic diaphragm which is the deepest muscle layer. These two layers support the guts in orthostatic positions.

The perineal area can be separated into two different areas, divided by a line that would join both ischial tuberosity. The anterior part, the uro-genital area and the posterior part, the anal area. The uro-genital perinea is composed of two layers of muscles; the most superficial layer groups together the ischiocavernosus muscle, the bulbospongiosus muscle and the transversal perineal muscle:

- The ischiocavernosus muscle is attached to the posterior side of the pubic ramus and the clitoris. The distal part of the urethra is attached on the inside of this muscle.
- The bulbospongiosus muscle is attached on the posterior part of the perineal body, surrounds the vulva and ends on the clitoris.

- The transversal perineal muscle connects the perineal body to the pubic ramus.
- The constrictor muscle of the vulva is an inconsistant muscle which surrounds the vulva on the inside of the bulbospongiosus and which is attached to the perineal body.

The layer underneath is composed of two muscles:

- The external urethra sphincter which surrounds the urethra except the bottom part which is linked to the vagina. Its superficial fibers are attached to the vagina and the perineal body.
- The deep transversal muscle goes from the external pubic ramus to the perineal body.

The posterior part of the perineum or anal area is composed of the external anal sphincter; it surrounds the inferior section of the anal canal and is divided in three parts:

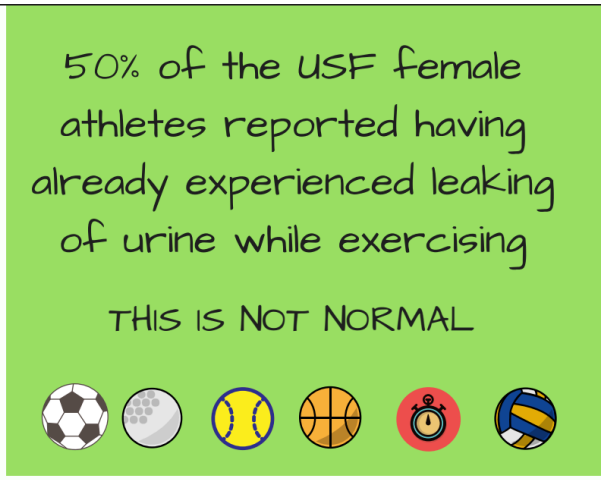
- The subcutaneous part surrounds the anus
- The superficial part surrounds the anal canal, is attached on the ano-coccygeus ligament and the perineal body.
- The deepest part is the pubo-rectal muscle

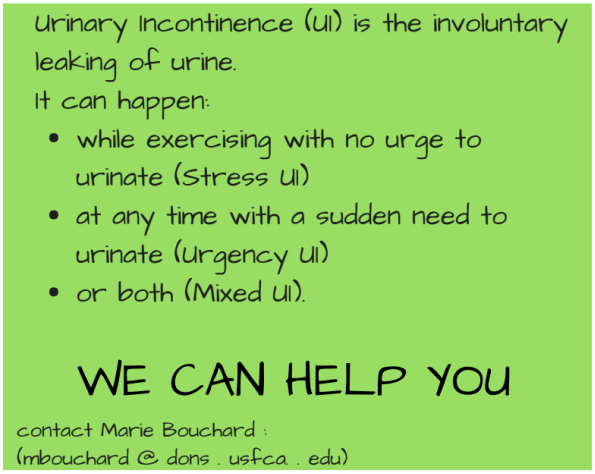
The pelvic diaphragm, situated at the top of the perineum muscles is the deepest layer of the pelvic floor muscles. The levator ani is the only muscle of this layer but is divided into small muscles:

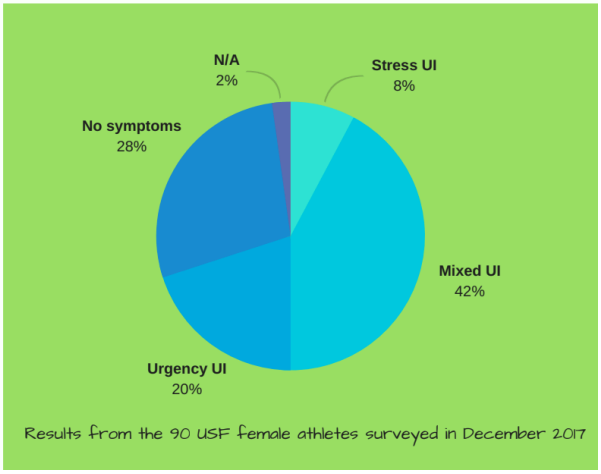
- The ilio-coccygeus muscle: essentially static, is attached to the posterior part of the pubic bone, the internal part of the ischiatic spine, the ano-coccygeus ligament and the lateral coccygeal parts
- The pubo-coccygeus muscle: essentially dynamic contrary to the ilio-coccygeus muscle. Is attached to the posterior part of the pubic bone, and ends above the ilio-coccygeus muscle into two smaller muscles:
    - The pubo-rectal muscle: which divides itself in 3 parts ending on the lateral part of the rectum
    - The pubo-vaginal muscle
- The coccygeus muscle: is adherent to the sacro-spinal ligament. It is attached to the ischitical spine and the lateral parts of the coccyx and S4 and S5 vertebras

In other words, the urethral support system is composed of the anterior vagina, the endopelvic fascia, the arcus tendinous fasciae pelvis and the levator-ani muscles, which surrounds and hold the urethra. The pubococcygeus and the pubo-rectalis muscles are two of the three muscles that compose the levator-ani muscles group. They are attached on the pubic zone, pass behind the rectum and form a U-shape. This shape and the constant tone of the type 1 striated muscle fibers they are composed of, keeps closed the urogenital hiatus, but also enables control of the contraction if needed. They are part of a system which also includes the endopelvic fascia and the urethra muscular system. The sphincteric closure system includes the urethral striated muscles that we can control; the urethral smooth muscles that we cannot control intentionally; and vascular elements within the submucosa.

Appendix C







Appendix D

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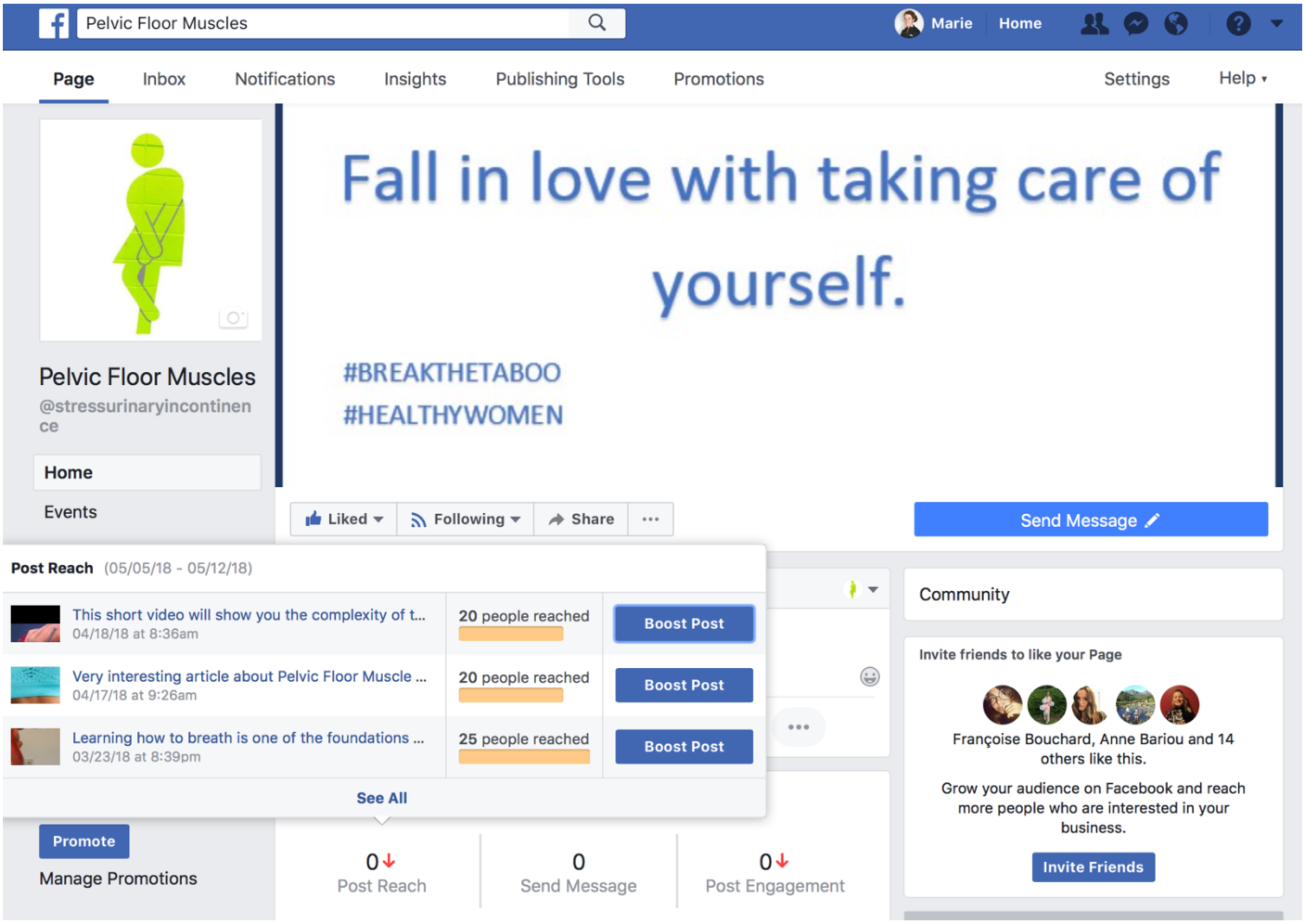
Appendix E



APPENDIX F

Example of what the two first weeks of a prevention and rehabilitation protocol could look like:

Position, from beginner to advanced, see description of exercises below:

Day 1, 2, 3:

- Morning, Noon, Evening: Kegels 10X5"-10"/ea
- Ex1: 3 sets, 3 breaths (long)
    - 5 kegel repetitions in between sets; hold 5"
- Ex2: 3 sets, 3 breaths (long)
    - 5 kegel reps between sets; hold 5"

Day 4, 5, 6:

- Morning, Noon, Evening: Kegels 10X5"-10"/ea
- Ex2: 3 sets, 3 breaths (long)
    - 5 kegel reps between sets; hold 5"
- Ex3: Supine, knees bent, feet DF, Arms up, serratus punch
    - 3 sets, 3 breaths + 3" punch hold at bottom of breath
    - 5 kegel reps between sets; hold 5"

Day 7: OFF

- Morning, Noon, Evening: Kegels 10X5"-10"/ea

Day 8, 9, 10:

- Morning, Noon, Evening: Kegels 10X5"-10"/ea

- Ex3: Supine, knees bent, feet DF, Arms up, serratus punch
    - 3 sets, 3 breaths + 3" punch hold at bottom of breath
    - 15 x 2" kegel between set
- Ex4: Supine, knees bent, feet DF, Arms up, Serratus punches + hold
    - 3 sets, 3 breaths (during exhale mini punches, at bottom of breath hold 3")
    - 15 x 2" kegel between set

Day 11, 12, 13:

- Morning, Noon, Evening: Kegels 10X5"-10"/ea

- Ex4: Supine, knees bent, feet DF, Arms up, Serratus punches + hold
    - 3 sets, 3 breaths (during exhale mini punches, at bottom of breath hold 3")
    - Between Sets: Abdominal Brace + Hip Rocks: 12x
- Supine, knees bent, feet DF, shoulder overhead extensions
    - 3 sets, 3 breaths + 1 slow overhead extension at bottom of breath
        - Note: Keep low back pressed into table on arm extension
        - Keep abdominal wall flat
    - Between Sets: Abdominal Brace + Hip Rocks: 12x

Day 14: OFF

- Morning, Noon, Evening: Kegels 10X5"-10"/ea

- **Learn how to breath (water bottle model): see video on Facebook page**

Learning how to breath is one of the foundation of pelvic floor rehab.

When your lungs are full of air, your upper diaphragm comes down, in a horizontal position, pushing on the guts underneath and putting pressure on the pelvic floor muscles, which can trigger the leaking of urine if the pressure is too high.
On the other hand, when you empty your lungs, the diaphragm comes up, creating hypopression in your abdomen that will raise the pelvic diaphragm underneath and, as result, help to close the urethra.

- **Learning how to create hypopression in your abdomen**

It is important to breath properly so that your inner core gets engaged and as a result, strengthen your pelvic floor muscles.
Breath through your nose, fulling your stomach first and then your chest. Then breath out: exhale from your chest first to your stomach through your mouth. When you're comfortable with this, take a pause at the end of your inhale, and at the end of your exhale.
The next step gets a little more tricky. Once you've emptied your lungs completely, engaging your inner core, take a pause, shut your mouth and nose and take a fake inspiration. This should open your chest and you should feel your upper diaphragm and inner core burning.
It is very important to relax your chest before you inhale again. Inhale through your nose, from your belly to your chest second.

- **Ex1: Supine, knees bent: 5 kegels / 5" between each sets**

The first exercises might look very simple, but you'll see that it isn't that easy. Remember that **consistency is the key**. You will have better results by doing the exercises as perfectly as you can, on a regular basis, than by rushing the protocol.

Lie down on a flat surface and bend your knees. Try to pull your heels as close to your glutes as possible, without arching your back. You should already feel your core a little engaged.
Now, take a complete breath through your nose from the stomach first, then draw upwards to the chest.
Then, with the help of a straw or by putting resistance with your lips, exhale slowly from the mouth, pushing air from the chest down to the stomach. Imagine a balloon deflating and be mindful of your inner core that should slowly start to burn. Once you've emptied all your lungs, bringing your belly button as close to your back as possible, take a pause and hold your breath for a few seconds, Take your next breath immediately through your nose and repeat this 3sets of 3 breathing cycles.
Incorporate 5x5" Kegel exercises between each set if you know how to do them correctly. If not, watch the Youtube videos shared on the Facebook page.

- **Ex2: Supine, knees bent, feet DF: 5 kegels / 5" between each set**

You might not feel the difference with the first exercise I showed, but again, we want to progress slowly so that effects last longer. Also, you might have noticed that, as easy as it seems to be, these exercises are tiring when fully engaged.
The difference with this position is that you will dorsiflex your feet.
Again, take a big breath through your nose and exhale slowly through your mouth with resistance and by engaging your inner core gradually until you've emptied your lungs completely. Then take a pause and breath again through your nose, from your belly to your chest.
Repeat this exercise three times with 3 breathing cycles in each set and 5x5" Kegel exercise between each set.

- **Ex3: Supine, knees bent, feet DF, Arms up, serratus punch**

For this exercise, lie down on your back, knees bent, and feet dorsiflexed, as close to your glutes as possible, without arching your back. Once you're in this position, bring your arms straight up in front of you.

Take a full breath through your nose from your stomach to your chest and exhale slowly through your mouth, putting resistance with your lips (you can use a straw to help you or make noise). Once you've exhale all your air, take a pause, use the hypopression technique described in the video "how to breath properly" if you know how to do it, then gently extend your arms up, punching a few times, until you need to breathe again through your nose.

- **Ex4: Supine, knees bent, feet DF, Arms up, Serratus punches + hold**

This exercise is the same as the previous one, except you will hold your arms up a few seconds after having punched up and down a few times.
Breath though your nose from your stomach to your chest.

- **Ex 5: Supine, knees bent, feet DF, arms up, acute>obtuse arm/body angle**

In this exercise, you will keep your knees bent, and your feet dorsiflex, bring your arms straight up in front of you and slowly take your arms straight back during the pause before you inhale again through your nose. You should really feel your inner core working on this one. Focus on your belly, which should stay flat and NOT raise while doing the exercise!

- **Ex 6: Supine, knees bent, feet DF, knees/hip 90/90**

On this one, lie flat on your back, feet dorsiflex, hip and knees at 90°.
Take a full breath through your nose, from your stomach to your chest. And exhale as slowly as you can, from your chest to your belly, putting resistance with your lips or with a straw. Once your lungs are empty and once your belly button is as close to your back as it can be, take a pause and use the hypopression technique if you know how to do it. If not, just engage your inner core and take your breath when you need through your nose, from your stomach to your chest and repeat this 3 sets of three breathing cycles.

- **Ex 7: Supine, knees bent, feet DF, knees/hip 90/90, arms up**

This exercise is a combination of the previous one with the knees and hips bent at 90° and exercise 4 or 5 with arms up straight in front of you, punching the air or slowly going back straight and then back to neutral position in front of you.

Ways to progress exercises:

- Position
  - Examples: Angles, exercises, anatomical start position, pressure positions
- Number of repetitions and sets #:
- Time/Frequency

Activities of Daily Living (ADL):

- Cough, Sneeze, laughter are all examples of ADL's that increase the pressure on our pelvic floor
- Examples of ADL positions: sleeping, reaching, sitting, bicycle, driving, etc.
  → extra-attention paid on the posture during these ADL is encouraged to gain or maintain the good results of the protocol