the Journal of Strength and Conditioning Research™

OPEN

Urinary Incontinence in Competitive Women Weightlifters

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Abstract

Wikander, L, Kirshbaum, MN, Waheed, N, and Gahreman, DE. Urinary incontinence in competitive women weightlifters. *J Strength Cond Res* 36(11): 3130–3135, 2022—Urinary incontinence has the potential to diminish athletic performance and discourage women from participating in sport and exercise. This study determined the prevalence and possible risk factors for urinary incontinence in competitive women weightlifters. This research was a cross-sectional, survey-based study completed by 191 competitive women weightlifters. The frequency and severity of urinary incontinence was determined using the Incontinence Severity Index. Urinary incontinence was defined as an Incontinence Severity Index score >0. The survey questions focused on risk factors, the context and triggers for urinary incontinence, and self-care strategies. Approximately, 31.9% of subjects experienced urinary incontinence within 3 months of completing the survey. Incontinence Severity Index scores were significantly correlated with parity ($r = 0.283$, $p = 0.01$) and age ($r = 0.216$, $p = 0.01$). There was no significant correlation between the Incontinence Severity Index score and the number of years participating in any form of resistance training ($r = -0.010$, $p = 0.886$) or weightlifting ($r = -0.045$, $p = 0.534$), body mass index ($r = 0.058$, $p = 0.422$), or competition total ($r = -0.114$, $p = 0.115$). The squat was the most likely exercise to provoke urinary incontinence. Although the number of repetitions, weight lifted, body position, and ground impact may increase the likelihood of urinary incontinence occurring during a lift, it is difficult to determine which factor has the greatest influence. Some self-care strategies used by competitive women weightlifters who experience urinary incontinence, such as training while dehydrated, have the potential to diminish athletic performance.

Key Words: resistance training, pelvic floor strength, athletic incontinence

Introduction

Urinary incontinence (UI) is defined as a complaint of involuntary loss of urine (13). The prevalence of UI in women athletes is believed to range between 5.56% for low impact activities and 80% for high impact activities such as trampolining (16). Approximately, 23% of incontinent women do not exercise because of their incontinence, and 60% of women with severe incontinence are likely to be underactive (4,19). Experiencing UI during physical activity can discourage participation in physical exercise and may have a negative impact on a woman's quality of life (5,19). The effect of UI on a woman's quality of life increases with severity of symptoms and is likely to negatively impact home and work activities, personal relationships, social life, and mental well-being (1). Over time, low to moderate levels of physical activity seem to have a protective effect on UI; however, the effect of strenuous physical exercise is not as clear (3).

Exercise-related UI is likely to occur when intra-abdominal pressure surpasses an individual's continence threshold (15). Evidence shows that athletes such as rhythmic gymnasts, who experience UI during training or competition, are fearful of visible leakage, and this affects their performance (11,14). In weightlifting, the intra-abdominal pressure generated during a lift is likely to be increased by bracing, breath holding, wearing a belt, the impact experienced when landing on a platform after the triple extension and feet displacement, or a combination of these factors (2,12,25). Common risk factors for UI, such as parity, mode of delivery, age, and obesity may further increase the risk of UI in competitive women weightlifters (7). Incorporating weightlifting exercises into strength and conditioning programs, while ignoring the negative effects of UI on performance, may be counterproductive.

Weightlifting consists of 2 competition lifts: the snatch and the clean and jerk. In addition to the competition lifts, weightlifters practice other lifts such as squats and pulls during training. The snatch and the clean and jerk differ from commonly executed lifts in other strength-based sports as the athlete's feet are likely to lose contact with the platform; this often occurs after the triple extension and before the catch phase. During this flight time, athletes displace their feet from the pull position, to the receive position, in preparation to receive the barbell. This small jump like movement may increase the amount of stress on the bladder, urethra, and other pelvic organs as the athlete lands the jump (31). The resulting increase in intra-abdominal pressure on landing may be greater in the clean and jerk because of a heavier load. Collectively, the heavy lifts and ground impact may impose a greater risk for UI in women weightlifters than in nonimpact strength-based sports such as powerlifting.

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Supplemental digital content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Web site (http://journals.lww.com/nsca-jscr).

Journal of Strength and Conditioning Research 36(11)/3130–3135

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There is currently sparse information regarding the prevalence of and risk factors associated with UI in weightlifters. This study aimed to build on a previous pilot study designed to determine the prevalence and risk factors of UI in competitive powerlifters. We aimed to explore the multifactorial issue of UI in competitive women weightlifters focusing on prevalence, risk factors, and activities that provoke UI. In addition, the study identified self-care strategies used by incontinent competitive women weightlifters. Finally, the level of confidence in performing pelvic floor exercises and utilization of women's health professionals was determined.

Methods

Experimental Approach to the Problem

This study was an international cross-sectional survey designed to investigate the prevalence of UI and identify risk factors that correlate with the Incontinence Severity Index (ISI) score (23) in competitive women weightlifters. The previously validated ISI (22) was used to determine the frequency (0 = never, 1 = less than once a month, 2 = 1 to several times a month, 3 = 1 to several times a week, and 4 = every day or night) and severity (1 = a few drops, 2 = a little, and 3 = more) of UI. A subject's ISI score was determined by multiplying their frequency score by their severity score. Subjects were divided into the following categories based on their ISI score (0 = continent, 1–2 = slight, 3–6 = moderate, 8–9 = severe, and 12 = very severe). When determining the lifetime prevalence of UI, all women who had experienced leakage of urine, regardless of context, were considered incontinent. When determining the prevalence of UI in the last 3 months, all women who had an ISI score >0 were classified as incontinent. All women, continent and incontinent, were included when determining the correlation between ISI scores and risk factors. Athletic incontinence in this study was defined as UI during training or competition in otherwise continent women of any age or parity. In this study, parity was determined by the number of births a woman had experienced (1–4 or more).

The survey was based on a pilot survey (29), which investigated the prevalence of UI in competitive women powerlifters. The pilot survey included an open-ended question where some subjects chose to include feedback. This current survey has been modified in response to the feedback obtained from pilot study subjects and reviewers of the pilot study article. Modifications include identifying actions and events associated with UI, self-care strategies used by incontinent subjects and questions pertaining to body mass index (BMI), parity, and mode of delivery. In addition, the survey was amended to be weightlifting specific. The questions in this study focused on the context of UI, rather than the mechanism-based classifications of stress (complaint of involuntary loss of urine on effort or physical exertion including sporting activities, or on sneezing or coughing (13)), urgency (complaint of involuntary loss of urine associated with urgency (13)), and mixed UI (complaint of both stress and urgency urinary incontinence, i.e., involuntary loss of urine associated with urgency and also with effort or physical exertion including sporting activities or on sneezing or coughing (13)).

Subjects

Subjects were deemed eligible to participate if they were competitive women weightlifters at a local, national, or international level and aged between 20 and 89 years. The minimum age for recruitment was 20 rather than 18 to enable the comparison of our results with previous studies. The survey (see Supplementary Digital Content 1, http://links.lww.com/JSCR/A262) was prefaced by a plain language statement explaining that participation was voluntary, and the survey could be exited at any time by closing the browser. By submitting the survey, subjects consented to participation in the study. Ethics approval was obtained from the Charles Darwin University Human Research Ethics Committee, approval number H18106.

Procedures

Data were collected using the Qualtrics (Qualtrics, Provo, Utah & Seattle, WA) platform, an online survey tool that can be accessed using computers or mobile phones. The survey was distributed between 13 February 2019 and 27 August 2019. Subjects were recruited from English-speaking countries by email through intermediates such as weightlifting clubs and Facebook. A list of native English-speaking countries was obtained through a Google search using the term "English speaking countries." Each country on this list was then put into a second Google search with the term "weightlifting." If this second search generated a contact for a weightlifting club or association, then a recruitment email was sent to that contact. Facebook was searched for weightlifting groups and pages. These groups and pages were then messaged and requested to circulate the link to the survey. A dedicated Facebook page was also created to facilitate the circulation of paid advertisements containing the survey link.

Statistical Analyses

Data were analyzed using Statistical Package for the Social Sciences (SPSS 26.0 Inc, Chicago, IL), and the central tendency and dispersion were reported as means ± *SD*. Descriptive data were calculated from subjects' responses and were presented in percentages and the number of responders. The relationship between common risk factors (age, BMI, and parity) and exercise-specific risk factors (competition total and years participating in resistance training and weightlifting) and ISI score was investigated using Pearson's correlations. The level of significance was set at $p \leq 0.05$ for all analyses.

Results

A total of 527 responses were received. Two hundred fourteen responders were removed because they were not competitive women weightlifters or did not complete the survey. A further 62 responders were removed because they provided their total amount lifted in pounds rather than kilograms; a measurement associated with powerlifting. Sixty-one subjects were removed because their competition total was greater than world and Olympics records, and consequently, those respondents were also believed to be powerlifters. Powerlifting, like weightlifting, is a strength-based sport where the objective is to lift the maximum amount of weight across 3 lifts: the squat, bench-press, and deadlift. The term weightlifting is sometimes used as a generic term to encompass any lifting activity involving weights and may have confused some respondents.

The remaining 191 subjects of this study were competitive women weightlifters (age: 35.92 ± 12 years, height: 1.64 ± 0.08 m, body mass: 70.09 ± 14.51 kg, and BMI: 25.93 ± 4.75 $kg \cdot m^{-2}$). In this cohort, 37.7% ($N = 72$) of women had given birth. In the group of 72 women who had given birth, 76.4% ($N = 55$) of births were vaginal, 12.5% ($N = 9$) were caesarean, and

11.1% ($N = 8$) of women had given both vaginal and caesarean births. The women in our study had been engaged in some form of strength training for 6.31 ± 4.43 years and practiced weightlifting for 3.63 ± 2.99 years.

In this cohort, 36.6% ($N = 70$) of women had experienced UI at some point in their life, and 31.9% ($N = 61$) reported having experienced UI during the 3 months before completing the survey. The prevalence of athletic incontinence in this cohort was 16.2% ($N = 31$). The prevalence of type one athletic incontinence (29), described as UI experienced only during exercise by subjects who were continent before commencing weightlifting, was 8.4% ($N = 16$). The prevalence of type 2 athletic incontinence, described as UI experienced only during exercise by subjects who were incontinent before commencing weightlifting was 7.9% ($N = 15$). Figure 1 shows ISI categories and the context in which subjects reported experiencing UI.

Approximately, 57.1% ($N = 40$) of women who had experienced UI at some point in their life, experienced urinary leakage during high repetition sets. However, 67.5% ($N = 27$) of these women indicated that leakage was only an issue, if the sets were heavy. Half of the women who experienced leakage during high repetition sets stated that the leakage was more likely to occur at the end of the set ($N = 20$). Wearing a belt provoked leakage in 3.7% ($N = 7$) of women. A maximum effort lift in competition (16.8%, $N = 32$) was less likely to cause leakage than a maximum effort lift in training (24.6%, $N = 47$). Likewise, the prevalence of UI in competition (17.8%, $N = 34$) was less than that experienced by the women in training (25.7%, $N = 49$).

Only 24.3% ($N = 17$) of incontinent subjects had undergone a pelvic floor assessment. However, 77.1% ($N = 54$) of incontinent subjects stated that they were either confident or very confident in their ability to perform pelvic floor exercises.

Only parity ($r = 0.283$, $p = 0.01$) and age ($r = 0.216$, $p = 0.01$) were significantly correlated with ISI scores. The relationship between ISI score and the number of years participating in any form of resistance training ($r = -0.010$, $p = 0.886$) or weightlifting ($r = -0.045$, $p = 0.534$), BMI ($r = 0.058$, $p = 0.422$) or competition total ($r = -0.114$, $p = 0.115$) was not statistically significant.

In comparison with the snatch, clean and jerk, or pulls, squats were more likely to provoke leakage of urine in competitive women weightlifters. Figure 2 illustrates the percentage and severity of leakage reported for each of the 4 common competition and training lifts.

Table 1 summarizes the self-care strategies used by incontinent subjects. Table 2 summarizes the reported activities, in addition to lifting heavy weights, wearing a belt, and high repetition sets, that were associated with UI.

Discussion

The prevalence of UI in this cohort of competitive women weightlifters (31.9%) fell in the lower midrange (5.56–80%) of UI

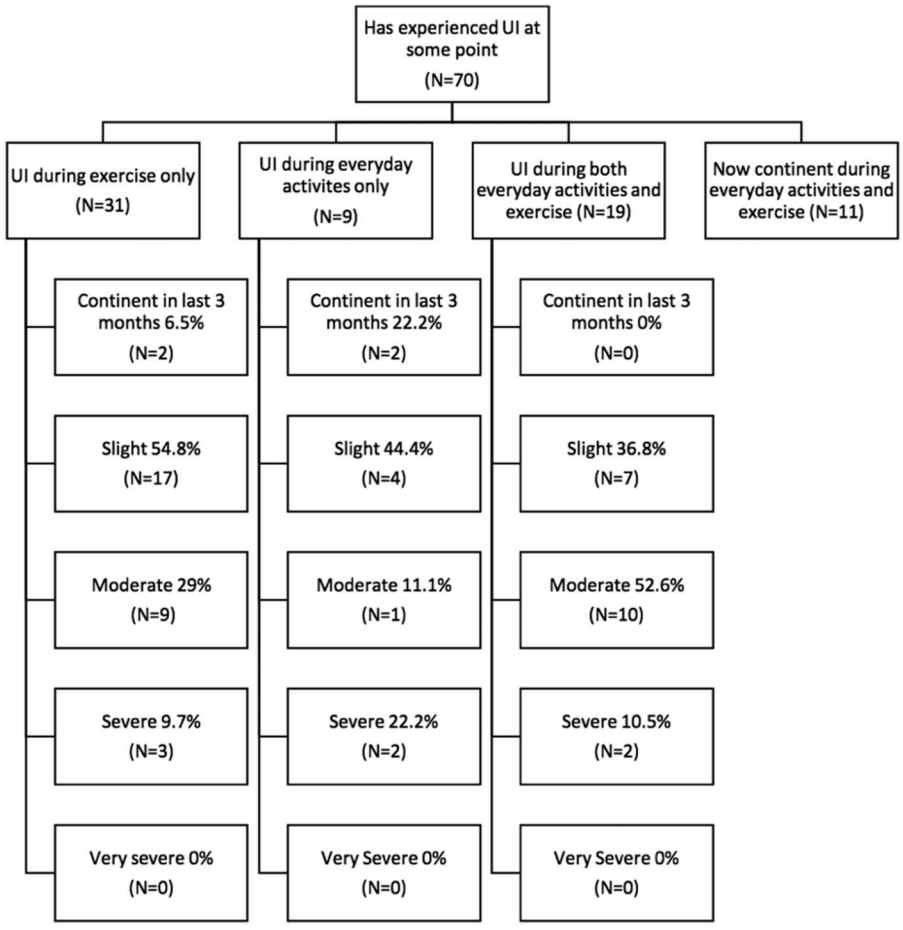

Figure 1. Subjects' Incontinence Severity Index category and the context in which subjects reported experiencing urinary incontinence.

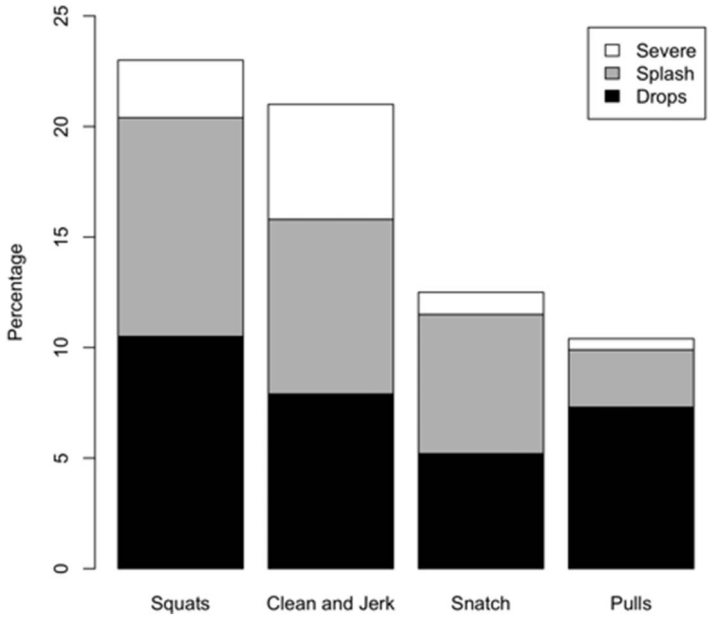

Figure 2. Percentage and severity of leakage for common weightlifting competition and training lifts.

identified in other sports (16,26) and was less than that found in powerlifters (33.58%) (29). The prevalence of athletic incontinence in this cohort was 16.2% and evenly split between women who experienced UI for the first time at some point after commencing weightlifting and women who were already incontinent before commencing weightlifting. It is important to distinguish between women who experience UI for the first time after commencing a new physical activity and women who are already incontinent at the time of commencement. Women who experience UI for the first time when commencing a new sport may become concerned by the leakage of urine and disengage from the sport.

The squat was the lift most likely to provoke leakage despite zero impact (Figure 2). Previous studies have found that activities, such as jumping rope or box jumps that involve impact with the ground, are more likely to provoke UI than weighted squats or body mass squats (30). Our results, however, do not support the hypothesis that weightlifting lifts are more likely to provoke UI than powerlifting lifts executed without the athlete's feet leaving the ground. In fact, the findings suggested that high repetition sets were likely to provoke UI in many subjects (57.1%) who had experienced incontinence at some point in their life. Furthermore, heavy sets were a contributing factor in over half (67.5%) of the subjects who experienced UI during high repetition sets. Therefore, we suspect that squats are more likely to provoke UI than weightlifting lifts because squats are usually performed in higher repetitions and heavier sets than the snatch and clean and jerk.

Pulls were found to be the least likely lift to provoke UI in women weightlifters. Pulls are generally performed with lighter weights than the squat but with heavier weights than the snatch and clean and jerk. In addition, pulls do not incorporate a full squat, and the athlete's feet do not leave the platform. The absence

Table 1

Self-care strategies used by competitive women weightlifters who experience urinary incontinence.

Taking antibiotics for recurring urinary tract infections
Engaging in practices such as yoga and Pilates outside weightlifting
Emptying bladder before training and frequent urination during training sessions and competitions
Consciously engaging pelvic floor before lifting
Focusing on breathing or nasal breathing
Bracing core before lifts
Trying to not over brace core
Wearing a pad or 2
Using a tampon or avoiding the use of tampons
Practicing pelvic floor exercises outside training
Engaging in release work and massage, stretching the lower back and hips, and focusing on pelvic mobility
Strengthening deep muscles and core training
Not overtightening belt
Wearing dark colored clothing so leaks cannot be seen
Reducing fluid intake
Maintaining a low body mass
Crossing legs before sneezing

Table 2

Reported actions and events associated with urinary incontinence (in addition to lifting heavy weights, wearing a belt, and high repetition sets).

Urinary tract infections
Increased fluid intake
Skipping, jumping, sit ups, Russian twists, seated (on the floor) shoulder press, double unders, front squats, star jumps, box jumps, running, playing hockey, plyometrics, and hammer throwing
Reracking the bar between the clean and jerk
Certain times of the menstrual cycle
High-intensity training sessions
A full bladder
Overbracing
Thinking about urinary incontinence and stress relating to urinary incontinence
Performing an anterior tilt with tight hips
Drinking coffee
Cold
Being tired
Laughing, coughing, sneezing, or vomiting

of ground impact, a lighter load than the squat and the difference in body position, may reduce the likelihood of UI. Performing a squat to lift a weight has been found to increase intra-abdominal pressure more than lifting the same weight from a higher starting point such as a counter (10). It therefore seems that triggers for UI during resistance training are multifactorial and may vary between individuals.

Although it seems that lifting a heavy weight, especially multiple times, may provoke UI, it is less clear if long-term heavy lifting damages the pelvic floor. The concern that lifting heavy weights may damage the pelvic floor and increase the risk of UI comes from 3 main bodies of research which examined the effects of heavy physical work (24), increases in intra-abdominal pressure when lifting a weight (10), and the effect of increases in intra-abdominal pressure on the urethra (9,17). Repeated high-impact activities are likely to further contribute to fatigue of the pelvic floor and increase the odds of UI (27,30). Lifting heavy weights during sporting activities may therefore be discouraged in favor of "pelvic floor safe" exercises such as low impact activities that do not place downward pressure on the pelvic floor (8). Currently, there is a knowledge gap regarding the role of strenuous physical activity in the incidence of pelvic floor disorders (3). In this study, the number of years that subjects had engaged in some form of resistance training or weightlifting, and the amount of weight lifted, did not significantly correlate with their ISI score. The risk factors that affirmatively correlated with ISI scores were those commonly found in the general population such as parity and age (7). The findings of this study, therefore, do not support the concern that lifting a heavy weight will, over time, exacerbate UI.

It is not just high repetitions and heavy weights that can challenge a woman's continence threshold. The competitive women weightlifters in this study provided an extensive list of activities and situations they felt exacerbated their UI (Table 1). Similar activities such as skipping and box jumps have been noted by previous authors (21,30) to provoke UI. It is important that coaches are aware of individual triggers for UI in their athletes as UI may cause distress and hamper performance. In a study on high-level rhythmic gymnasts, for example, 70.6% of incontinent subjects reported that their UI influenced their sports performance (11). Although the cited research did not specifically investigate if UI influenced the sport performance of incontinent competitive women weightlifters, there is a strong possibility that UI does influence the athletic performance of weightlifters. A likely scenario being that women weightlifters, who experience leakage or are afraid of experiencing leakage during a lift, become distracted and fail the lift.

Performance may not just be hampered by triggers for UI. Strategies some women used to prevent UI such as reduced fluid intake has the potential to negatively affect athletic performance. Although a limited number of studies have examined the effect of fluid intake on intermittent, resistance, and sport-specific exercise performance, there is strong evidence supporting the beneficial effect of fluid intake during continuous exercise (18). At the end of our survey, subjects were given an opportunity to leave a comment. One subject took the opportunity to summarize the effect UI had on her performance as a weightlifter saying, "it sucks having this issue, it effects my confidence, security, and potential of missing or making lifts."

A small number ($N = 9$) of women reported being continent during competition and training but experienced UI during everyday activities (Figure 1). Furthermore, fewer subjects reported experiencing UI during competition ($N = 34$) than in training ($N = 49$) despite being more likely to lift heavier weights in competition; a similar scenario has been found in powerlifters (29). A possible explanation is that higher levels of catecholamine during competition and in some women during training act on receptors in the urethra keeping it closed (28). In practice, this means that a small number of women may be incontinent during everyday activities but continent during training because of increased stress levels. Furthermore, the stress of competing is likely to reduce the chance of leakage in some women who experience UI during training.

Having a well-functioning pelvic floor can be of great benefit to an athlete as it can better withstand increases in intra-abdominal pressure generated by lifting a heavy weight in training or competition. A dysfunctional pelvic floor may leak or be unable to adequately support pelvic organs (6). In this study, 75.7% of women with UI had not had a pelvic floor examination, and 22.9% of the women were not confident in their ability to perform pelvic floor exercises. Leaking urine during training or competition is a sign that the pelvic floor is challenged beyond capacity. If athletes can improve their ability to better prevent, minimize, conceal, or contain leakage of urine during training and competition, they may be more likely to continue in their chosen sport and improve athletic performance. Unfortunately, athletes and coaches are unlikely to discuss UI or the function and training of the pelvic floor (20). On a practical level, we strongly agree with Bo and Nygaard (3) who maintain that education directed at coaches has the potential to improve UI in athletes. It is essential that this education includes strategies to help coaches to appropriately broach the topic of UI and the importance of their athletes maintaining an optimally functioning pelvic floor.

This study identified important risk factors for UI and common strategies that women weightlifters use to reduce the risk of UI. However, this study had some limitations; for example, it relied on subjects' ability to recall information. In addition, subjects were recruited by targeted emails through intermediates and Facebook. There is a possibility that subjects who experienced UI were more likely to be interested in and respond to a link pertaining to UI and weightlifting than those who did not experience UI. Alternatively, women who participate in strength-based sports may be women who are less likely to experience UI or incontinent women may have left the sport leading to survivor bias. Our recruitment methods also resulted in the recruitment of many powerlifters and weightlifters; it is believed that this is due to the generic meaning of the word "weightlifting." In future studies, it is recommended the term "Olympic style weightlifting" be used when recruiting subjects, to differentiate between weightlifting and powerlifting.

Practical Applications

The prevalence of UI in competitive women weightlifters was found to be in the lower to midrange identified in other sports, and the risk factors (i.e., age and parity) are similar to those found in the general population. The squat is more likely to provoke UI in competitive women weightlifters than the snatch, clean and jerk, or pulls. Numerous self-care strategies such as performing pelvic floor exercises, focusing on activating their core and pelvic floor during lifts, wearing dark clothing, or a pad were used by incontinent subjects to prevent, minimize, conceal, or contain leakage of urine during training and competition. Coaches should be aware that some self-care strategies, such as training dehydrated, may diminish athletic performance and pose health risks. The possibility of

UI occurring during competition or training is likely to be determined by a variety of factors including the weight lifted, ground impact, the number of repetitions, body position, and the athlete's personal triggers for UI.

Acknowledgments

The authors thank all the intermediates who assisted with circulating the questionnaire for this study. The authors also thank Donelle Cross for her work on the original pilot survey and assistance with editing the document. The results do not constitute endorsement by NSCA. There are no competing interests for any author. This study was funded by a regional Charles Darwin University.

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