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Is your system fit for purpose? Female athlete health considerations for rugby injury and illness surveillance systems

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Abstract

This review discusses female-specific health considerations in injury and illness surveillance and provides rugby-specific recommendations for future surveillance. Identifying priority injury and illness problems by determining those problems with the highest rates within women's rugby may highlight different priorities than sex comparisons between men's and women's rugby. Whilst sports exposure is the primary risk for health problems in sports injury and illness surveillance, female athletes have health domains that should also be considered. Alongside female athlete health domains, studies investigating rugby injuries and illnesses highlight the need to broaden the health problem definition typically used in rugby injury and illness surveillance. Using a non-time-loss health problem definition, recording female-specific population characteristics, embedding female athlete health domains and having up-to-date injury and illness coding systems should be prioritized within surveillance systems to begin to shed light on potential interactions between sports exposure, health domains and, injuries and illnesses. We call for a collaborative approach across women's rugby to facilitate large injury and illness datasets to be generated and enable granular level categorization and analysis, which may be necessary for certain female athlete health domains. Applying these recommendations will ensure injury and illness surveillance systems improve risk identification and better inform injury and illness prevention strategies in women's rugby.

KEYWORDS

health problems, injury prevention, sports exposure

Highlights

- Few studies report injury rates in women's rugby and, to date, prevention initiatives have focused on addressing injury risks identified from studies in the men's game. Even fewer studies have included illness reporting

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- Female health domains may influence sports participation and or health outcomes, even though the athlete is considered 'healthy'
- Theoretical relationships between health domains and health problems within rugby can be drawn from studies investigating specific health problems (e.g., pelvic floor health and stress urinary incontinence) rather than undertaking traditional rugby injury and illness surveillance
- Five recommendations are made to make injury and illness surveillance systems within women's rugby fit for purpose, which may improve risk identification and better inform injury and illness prevention strategies

1 | INTRODUCTION

Women's rugby is one of the fastest-growing sports, with injury and illness reporting prioritized to establish what health problems occur and by what mechanism (Heyward et al., 2022). Injury and illness surveillance is a fundamental part of player welfare, which refers to the physical, mental and social health, holistic development, safety and rights of players. Surveillance enables evidence-informed decisions regarding injury and illness prevention strategies (Finch, 2006). Injury and illness surveillance systems are routinely used in male rugby, particularly at the professional level (Bailey et al., 2023; Bitchell et al., 2020; Fuller et al., 2014; Moore et al., 2015; Toohey et al., 2019; Usman et al., 2015; West et al., 2020) but also several exist at youth (Burger et al., 2016; Cruz-Ferreira et al., 2018; Orr et al., 2021; Palmer-Green et al., 2013) and community levels (Baker et al., 2013; King et al., 2009; Murray-Smith et al., 2022; Roberts et al., 2013). Such systems have enabled large-scale, prospective studies to identify priority injuries and risk factors, although less is known regarding priority illnesses. Further, injury rates can be compared across levels, nations and over time (Moore et al., 2022; West et al., 2023; Williams et al., 2022) due to consistent recording and reporting procedures used by researchers and implemented in injury surveillance systems. Unfortunately, women's rugby injury and illness data is limited across playing levels, leading to prevention strategies informed by men's data being advocated for the women's game.

In rugby, two international consensus statements have been produced that provide recommendations for recording and reporting injuries (Brown et al., 2019; Fuller et al., 2007). While these statements are Rugby Union specific, many recommendations overlap with other rugby codes (e.g., Rugby League). The original consensus (Fuller et al., 2007) is considered the standard methodology for rugby injury surveillance, but operationalizing it in a non-elite context can be problematic, and in 2019 it was adapted for the community setting (Brown et al., 2019). Whilst the professionalization of women's rugby has occurred in certain countries, predominantly at the National level, most of the female rugby playing population is non-elite, and injury surveillance systems must be adapted accordingly. Further, the rugby-specific injury surveillance consensus statements suffer from a similar issue to the recent general International Olympic Committee injury and illness surveillance consensus (Bahr et al., 2020), lacking female-specific recommendations.

A recent Delphi consensus highlighted that key stakeholders from the women's rugby community (e.g., clinicians, researchers) consider female athlete health in rugby, particularly menstrual health, as a high priority for future research (Heyward et al., 2022). Appropriate data capture systems need to be in place to tackle research problems on topics such as menstrual health. To ensure injury surveillance systems created within women's rugby are fit for purpose, female-specific considerations must be taken into account rather than simply replicating injury surveillance systems used in men's rugby (Moore et al., 2023). Additionally, consideration should be given to changes across the female lifespan (e.g., puberty, pregnancy, postpartum, menopause) and their potential to interact with injury and illness risk (Moore et al., 2023). Health problems in female rugby players have been examined, but usually outside of surveillance systems, and have the potential to affect participation and performance negatively (Brisbine et al., 2019; McCarthy-Ryan et al., 2024). Understanding female-specific health problems in rugby will ensure appropriate prevention and management strategies can be implemented. This review discusses female-specific health considerations in injury and illness surveillance and provides rugby-specific recommendations for future surveillance.

2 | PRIORITY HEALTH PROBLEMS BASED ON TRADITIONAL INJURY AND ILLNESS SURVEILLANCE

The rate and patterns of injuries in Rugby Union vary between different levels of play (e.g., elite vs. amateur), different ages (e.g., youth vs. adult) and by sex (e.g., between male and female players (Freitag et al., 2015; Williams et al., 2022; Yeomans et al., 2021). However, there are far fewer epidemiological studies on women's rugby than men's. For example, between 1990 and 2019, a review in Rugby Union identified seven studies reporting women's injury rates and more than 113 on men's (King et al., 2019). In rugby league between 1990 and 2021, there is a similar picture, with one on women's rugby and 37 on men's (A King et al., 2022). Often sex differences in injury rate and severity are used to identify priority injury problems in women's rugby. Anterior cruciate ligaments are a focus for injury prevention programmes because females have a 3–6 times greater injury rate than males (Peck et al., 2013). In addition,

sex differences in sport-related concussions are present for injury rate and severity, and recovery of cognitive function, which may persist into the chronic phase of injury (Gardner et al., 2014; Sicard et al., 2018). Whilst such comparisons can identify the need for potentially sex-specific injury prevention or management strategies, it is worth noting that in men's rugby, priority injury problems are identified because they have high injury rates relative to other injuries sustained in men's rugby. Further, the level of play may be a confounding factor in studies examining sex differences in injury rates. For example, concussion match incidence is similar between amateur and national level in women but not in men (Moore et al., 2015; Starling et al., 2023; Yeomans et al., 2021). Shifting the focus to identify priorities within women's rugby based on relative comparisons may highlight different injuries that require attention and provide a more meaningful avenue to discuss injury prevention.

More women's specific injury and illness surveillance studies have been conducted in recent years. Most of these studies are conducted in adult, national level cohorts, showing that match injury incidence is higher than training injury incidence across levels and ages for time-loss injuries. A range of match injury incidence has been reported from 22 to 166.7 per 1000 match hours (Armstrong et al., 2018; Bailey et al., 2023; Barden et al., 2021; Fuller et al., 2016, 2021; Ma et al., 2016; Orr et al., 2021; Schick et al., 2008; Shill et al., 2022; Starling et al., 2023; Taylor et al., 2011; West et al., 2023; Yeomans et al., 2021), whilst training injury incidence is lower and ranges from 0.2 to 12.5 injuries per 1000 training hours (Fuller et al., 2016; King et al., 2021; Schick et al., 2008; Shill et al., 2022). The head, knee and ankle are the most commonly injured body regions during matches, with the head, shoulder and lower limb commonly injured during training (Collins et al., 2008; Fuller et al., 2013, 2021; King et al., 2021; Schick et al., 2008; Shill et al., 2022; Taylor et al., 2011; Yeomans et al., 2021). A concussion is one of the most common match injuries in women's rugby, as are ligament sprains, particularly to the ankle (Bailey et al., 2023; Fuller et al., 2016, 2021; Ma et al., 2016; Schick et al., 2008; Shill et al., 2022; Starling et al., 2023; Taylor et al., 2011; West et al., 2023; Yeomans et al., 2021). During training, concussions and ligament sprains are also common (Collins et al., 2008; King et al., 2021; Shill et al., 2022). Whilst for men, shoulder injuries during matches are common, and anterior thigh hematomas and shoulder joint injuries have high match injury rates (Bitchell et al., 2020; Moore et al., 2015; Williams et al., 2022) and muscle strains are common during training (Evans et al., 2022). Within the women's game the tackle event is the most common match injury activity (Fuller et al., 2021; Ma et al., 2016; Orr et al., 2021; Shill et al., 2022; Starling et al., 2023; West et al., 2023; Yeomans et al., 2021), with head impacts from direct body-to-body contact and contact with the ground being most prevalent (West et al., 2022; Williams et al., 2021). Conversely, while injuries frequently occur in tackle events in men, they have a low prevalence of ground contact injuries (Williams et al., 2021). Both contact and non-contact activities are common training injury activities, particularly tackling, collisions and running (Collins et al., 2008; King et al., 2021; Shill et al., 2022), with running injuries also frequently occurring during matches (Bailey et al., 2023).

Given that systematic injury surveillance is a prerequisite for effective injury prevention and there are limited injury surveillance studies in women's rugby, injury prevention initiatives by governing bodies have focused on addressing injury patterns and risks identified from studies in the men's game (e.g., Moore et al., 2022; Preatoni et al., 2015; Rafferty et al., 2019; Ranson et al., 2018; Roberts et al., 2015; Tucker et al., 2017). Hence, rugby injury prevention initiatives are designed for, implemented, and tested in male cohorts. For example, the Activate rugby injury prevention program has shown efficacy in reducing lower limb injuries and concussions in men's senior community Rugby Union (Attwood et al., 2018) and reducing the burden of match injuries and concussions in male youth players (Hislop et al., 2017). However, while efficacy has been shown in the male context, there is currently no knowledge or evidence around its efficacy as an injury prevention program in female Rugby Union players.

We need to move away from a one size fits all approach, ensuring that future women's rugby injury prevention initiatives consider injury risk within the women's game and a female approach to injury prevention that includes player perspectives (Dane et al., 2023; Parsons et al., 2021). More research is needed in women's rugby to better identify female-specific injury risk and direct injury prevention studies. Where evidence exists, this should direct current injury prevention initiatives. In women's rugby, there is a need to focus injury prevention on concussion, ankle sprains and knee injuries, targeting tackle events and body-to-ground impacts and running-related activities.

While the focus is on the known comparative high injury risks within rugby, illness priorities are less well understood as there is no consensus statement on illness in rugby. There is also a lack of available literature on illness rates and risk factors in rugby and no studies to our knowledge, specifically in women's rugby. The potential illness transmission risk in a sport like rugby involving frequent skin-to-skin contact and proximity activities (e.g., scrums, rucks) means illness prevalence is likely to be high. Available data shows the prevalence of upper respiratory illness to be 21%–92% during a study period (ranging from 10 weeks to 11 months) (Cunniffe et al., 2011; Tiernan et al., 2020). Unpublished data has also shown gastro-intestinal illness to be common in men's rugby (Moore et al., 2014). Whilst, COVID-19 rates in rugby are unknown, the global pandemic appears to have increased awareness, and uptake, of illness guidelines (Chesson et al., 2023), indicating now is a critical time to identify priorities and initiate illness prevention strategies and hygiene controls (e.g., avoid sharing drinking bottles and razors (Davies et al., 2017)). From a female health perspective, dysmenorrhea is prevalent amongst rugby players (80%) and can reduce training and playing availability (Bruinvels et al., 2021; Findlay et al., 2020). However, dysmenorrhea is not routinely recorded unless menstrual cycle monitoring (e.g., symptoms) is undertaken. Injury and illness surveillance is a key part of player welfare, but its current implementation in rugby could be enhanced by reporting illness rates and including female-specific health considerations.

3 | FEMALE ATHLETE HEALTH DOMAINS

In traditional injury and illness surveillance, sports participation is considered to be the primary risk exposure for health problems. However, female athletes may have health domains that influence sports participation and or health outcomes, even though the athlete is considered 'healthy' (e.g., pregnancy, postpartum). To this end, Moore et al. (2023) proposed 10 female athlete health domains that can be used to categorize health problems, along with abbreviations that can be used for consistent recording and reporting in injury and illness surveillance systems (Table 1). The 10 domains cover female-specific considerations, mental health, and the sports environment, and we have highlighted the currently available women's rugby literature for each domain (see Table 1).

There are potentially multiple ways that health domains can interact with the relationship between sports exposure and health problems (1) a causal relationship; (2) mediation; (3) confounding, and; (4) effect modification (Moore et al., 2023). A hypothetical example of an effect modifier could be the menstrual cycle and gynecological domain, with injury risk increasing or decreasing during different phases of the menstrual cycle. Previous work in football has suggested muscle and tendon injuries have a greater injury incidence in the late follicular phase than in the early follicular or luteal phase (Martin

et al., 2021). However, such a finding was non-significant given the overlap in 95% confidence intervals (late follicular vs. early follicular: 95% CIs 0.90–5.12; late follicular vs. luteal: 95% CIs 0.96–5.16; calculated by ISM, not present within the publication). The small injury numbers in certain menstrual cycle phases may indicate the study lacked the appropriate power to consider such a detailed analysis. To enable granular level interrogation of relationships between female health domains, sports exposure and health problems, we advocate for and encourage a collaborative approach when undertaking women's rugby injury surveillance. Such an approach will enable large datasets to be established allowing advanced statistical analysis to be used.

4 | APPLYING FEMALE HEALTH DOMAINS TO ASSOCIATED HEALTH PROBLEMS IN RUGBY

To date, traditional injury and illness surveillance has focused on the male athlete demographic, preventing the translation of traditional surveillance into female athletic settings due to the lack of consideration for female-specific health problems. We outline several theoretical relationships between health domains and health problems within rugby, with some health problems not routinely identified in traditional women's rugby injury and illness surveillance.

TABLE 1 Female health domains, their abbreviations and definitions, and the current evidence in women's rugby.

Health domain	Domain abbreviation ^a	Definition	Women's rugby and current evidence available
Menstrual and other gynecological health	D-MG	The health of the menstrual cycle and female reproductive organs and tract	Lacking data, but identified as a priority research area
Preconception/Assisted reproduction	D-AR	Undergoing treatments to assist in becoming pregnant without sexual intercourse	Lacking data
Pregnancy	D-PR	The condition of being pregnant	Lacking data
Postpartum	D-PO	Immediately follows childbirth until 2 years post childbirth	Lacking data
Menopause	D-ME	The transitional time between peri- and post-menopause, when menstruation surceases	Lacking data
Breast health	D-BH	The health of the mammary glands	Preliminary data from surveys rather than injury surveillance systems
Pelvic floor health	D-PF	The physical and functional integrity of the pelvic floor unit through the life stages of an individual (male or female)	Preliminary data from surveys rather than injury surveillance systems
Breastfeeding, parenting and caregiving	D-BP	Providing direct care for another individual who needs help taking care of themselves (e.g., a baby, child, the elderly, chronically ill), including suckling milk from a mother's breast	Lacking data
Mental health ^b	D-MH	The psychological, emotional and social well-being of an athlete	Lacking female data, but identified as a priority research area
Sport environment ^b	D-SE	The physical and social context within which athletes train and compete	Lacking data

Note: Table adapted from Moore and colleagues (Moore et al., 2023).

^aWe encourage using the Domain abbreviations in addition to injury and illness coding systems.

^bThis Health Domain is particularly prevalent in female athletes, but also occurs in male athletes.

4.1 | Pelvic floor health and stress urinary incontinence

Donnelly and colleagues in this special issue (Donnelly, Bø, et al., 2024) cover this pelvic floor health domain in detail and it may have a mediating relationship with stress urinary incontinence (SUI). As a high-impact sport, rugby places players at risk of experiencing SUI (Johnston et al., 2023; McCarthy-Ryan et al., 2024; Sandwith et al., 2021). This type of pelvic floor dysfunction refers to leaking urine during exertion or effort. Rugby activities vary in the types of loads players are exposed to, such as those which produce sudden and transient forces to be transmitted to the body (e.g., tackling, landing from a line out) and those that produce sustained forces transmitted to the body (e.g., scrums, rucks (McCarthy-Ryan et al., 2024). These activities will likely increase a player's intra-abdominal pressure. The high forces and potentially high intra-abdominal pressures, likely increase the load the pelvic floor muscles are exposed to which may exceed the load tolerance of the muscles and increase a player's susceptibility to SUI (Bø et al., 2020; Donnelly et al., 2023).

The prevalence of rugby-specific SUI ranges from 30% to 90% in amateur and professional-level women's rugby (Johnston et al., 2023; McCarthy-Ryan et al., 2024; Sandwith et al., 2021). Additionally, since taking up rugby, 24% of female players (all levels) report leaking urine every day compared to only 11% before they took up rugby (McCarthy-Ryan et al., 2024), highlighting that rugby itself may lead to pelvic floor dysfunction in daily living outside of rugby. Regarding the inciting event for rugby-specific SUI, tackling is the most prevalent (66%–88%; McCarthy-Ryan et al., 2024; Sandwith et al., 2021). Since tackling is essential to rugby, prevention and management strategies are required to mitigate this risk. Other identified risk factors for rugby-specific SUI include having a high body mass index (McCarthy-Ryan et al., 2024), playing as a forward (McCarthy-Ryan et al., 2024) and greater volume of training exposure (Sandwith et al., 2021). Whilst there is some evidence relating to SUI in female rugby players, typically, it is not reported in women's rugby injury surveillance as it rarely results in time loss from training. SUI can result in needing to modify training, highlighting it is a health problem that requires consideration (Dakic et al., 2021; McCarthy-Ryan et al., 2024). SUI may also interact with the mental health domain, as urinary incontinence has shown an association with depressive symptoms in weightlifters (Huebner et al., 2022). Research within women's rugby is needed to confirm if a similar association is present. Players and support staff can access rugby-specific pelvic floor health resources to enhance their understanding of this female health domain (RFU, 2023b; WRU, 2024).

4.2 | Breast health and breast injuries

The breast health domain and injuries are covered by Wakefield-Scurr and colleagues (Wakefield-Scurr, 2024), and specific post-partum considerations by Donnelly and colleagues (Donnelly,

Coltman, et al., 2024) in this special issue. From an injury and illness surveillance perspective, unfortunately, until 2021 the breast body region was not part of injury coding systems frequently used in women's rugby. Consequently, there is limited data on breast injuries in rugby (Orchard, 2021) and no breast care injury pathways in place (Wakefield-Scurr et al., 2023). The location of the breast means females are regularly exposed to direct impacts to the breasts during contact events, particularly the tackle. Direct impacts are one of the main injury mechanisms for breast contusions and hematomas (Brisbine et al., 2019, 2020a). Another consideration is mastalgia, breast pain associated with the menstrual cycle, which is experienced by two thirds of female athletes (Brisbine et al., 2020b). Mastalgia can worsen with exercise and be detrimental to sports performance (Brisbine et al., 2020b). Ensuring injury and illness surveillance systems record non-time-loss injuries in women's rugby may be warranted to capture breast injuries and their injury mechanisms as they may not result in time loss but are perceived to impact performance negatively (Brisbine et al., 2019). Further, few athletes report breast injuries to practitioners (Brisbine et al., 2019) and practitioners tend to underestimate the prevalence of such injuries (Brisbine et al., 2020a). Removing the taboo around breasts and educating practitioners on the prevalence of breast injuries and breast health (RFU, 2023a) may help create an environment where rugby players consider reporting breast injuries.

Larger breast size and BMI have been identified as risk factors for breast contact injuries in sports from retrospective survey-based studies, with breast size and BMI being associated with one another (Brisbine et al., 2019; Coltman et al., 2017). In women's rugby, 68% of players are categorized as having a BMI ≥ 25 (McCarthy-Ryan et al., 2024) meaning they potentially have breast volumes two to three times greater than those with a normal BMI (Coltman et al., 2017) and forwards have a higher BMI than backs (Escrivá et al., 2021). Forwards may therefore have a higher risk of sustaining breast injuries due to their BMI and being involved in more contact-related activities (Virr et al., 2014). Applying the breast health domain and characterizing players by bra size will help identify if such risks are evidence-based.

4.3 | Female health domains and concussion

The menstrual and gynecological health domain may have a confounding or effect modifying relationship with concussion symptoms. In non-rugby populations, concussion symptoms appear to be associated with the menstrual cycle phase. However, findings are equivocal regarding which phase places individuals at the greatest risk, with both the luteal phase and menstruation compared to follicular being indicated (Roby et al., 2023; Wunderle et al., 2014). Other considerations that have been reported are changes to the menstrual cycle post-concussion and abnormal menstrual bleeding patterns (Snook et al., 2017) and oral hormonal contraception users having lower concussion symptom severity than non-users (Gallagher et al., 2018). Rugby-specific studies are required to understand the

potential relationships, if any, between the menstrual cycle and concussion. This may be particularly important when advising players on hormonal contraception and its associated injury risk. Further guidance and education on menstrual health in rugby have been created by the Rugby Football Union (RFU, 2023c).

Concussions may have a mediation relationship with the mental health domain. Yet, current research has focused on short and long-term mental health implications following concussion rather than preceding or interacting with its occurrence (Decq et al., 2016; Du Preez et al., 2017; Hind et al., 2022; Kilic et al., 2019). Unfortunately, the literature is dominated by male data and a limited understanding of mental health implications during a playing career. One study has shown male rugby players who sustained more than two concussions had double the odds of depression than players reporting two or fewer (Du Preez et al., 2017). Another study has shown male rugby players are twice as likely to develop mental health symptoms after sustaining a concussion (Kilic et al., 2019). However, the current mental health state of players as they were exposed to rugby was unknown in previous research. Mental health in women's rugby has been identified as a priority research area (Heyward et al., 2022); examining associations between concussion and the current state of mental health and subsequent mental health implications is an important avenue for future research.

4.4 | Postpartum domain and associated health problems

The postpartum health domain is covered in detail by Donnelly and colleagues in this special issue (Donnelly, Coltman, et al., 2024). From an injury and illness surveillance perspective in women's rugby, the postpartum domain may have different relationships based on the associated health problem, which can be physical or mental. Returning to rugby following childbirth should be viewed as a rehabilitation period. A whole-systems approach to managing postpartum rugby players should be used (Donnelly, Brockwell, et al., 2022; Donnelly, Moore, et al., 2022), as symptoms of pelvic floor dysfunction have been shown to affect an athlete's ability to return to sport (James et al., 2021; Moore et al., 2021) and mental health problems, such as postpartum depression (Horowitz et al., 2004), being prevalent. Breastfeeding rugby players may also increase the risk of relative energy deficiency and bone stress injuries due to the high-caloric cost and reduced calcium levels associated with breastfeeding (Bø et al., 2017). But, this may only be likely in the case of excessive exercise (Kovacs et al., 2015) and limited data exists to date to determine prevalence and risk. Conversely, following a progressive loading return to rugby, without excessive exercise, may offset any potential risk of bone stress injury and breastfeeding by providing appropriate bone stimulus through exercise. A final consideration is mastitis, a breast illness that can occur in breastfeeding women and illicit flu-like symptoms, including fatigue (Wambach, 2003) and increase the risk of postpartum depression (Shen et al., 2023). It is possible that mastitis could have a negative impact on sports

participation based on the symptom profile and reduced daily living activities reported (Wambach, 2003). Incorporating health domains with sports exposure and health problems during postpartum rehabilitation would help answer this and understand the impact of pelvic floor dysfunction and postpartum mental health. Recent guidelines regarding postpartum return to rugby have been published and can be used by rugby support staff and players to inform their rehabilitation (World Rugby, 2024).

5 | APPLYING FEMALE-SPECIFIC CONSIDERATIONS TO POPULATION CHARACTERISTICS RECORDED

Part of an injury and illness surveillance system includes capturing population characteristics (e.g., age, height, mass), typically recorded at the beginning of a season or data collection (baseline). Such characteristics can be reported as the cohort's demographics being studied or used to identify risk factors. A range of female-specific considerations can be applied to the population characteristics recorded. Examples are provided below.

5.1 | Years of exposure

Years of exposure to rugby can indicate rugby experience, which may have implications for training maturity, skill development and associated injury risk. Specifically, male players with greater rugby experience have higher tackling proficiency (Hollander et al., 2021), and a higher tackling proficiency can reduce injury risk (Meintjes et al., 2021). Currently, data is lacking on female rugby players' experience and tackling proficiency, but assuming similar associations are present, recording years of exposure may be useful. Women may be exposed to rugby for the first time toward the end of their teenage years (Williams et al., 2021), emphasizing the need for years exposed to rugby and not just age to be documented in females.

5.2 | Bra size

Players can self-report their bra size. However, women often wear the wrong size bra for their breast size (McGhee et al., 2010), with over half of players in contact sports such as rugby wearing an ill-fitting bra (Brisbine et al., 2020c). If possible, to improve the quality of the self-reported data, players should undergo a professional bra fit to correctly identify bra size and provide players with correctly fitted and supportive sports bras.

5.3 | Pelvic health

For practitioners to understand the consequences and prevalence of SUI, it may be advantageous to use a validated questionnaire (e.g.,

International Consultation on Incontinence Questionnaire short form (Moore et al., 2023)). However, such questionnaires are not sport-specific and may underestimate the prevalence of rugby SUI (Donnelly et al., 2023), which may be the main inciting event (Culleton-Quinn et al., 2022; McCarthy-Ryan et al., 2024; Sandwith et al., 2021). Therefore, asking specifically about leaking urine whilst playing rugby is recommended to identify rugby SUI prevalence. Stress urinary incontinence is only one type of pelvic floor dysfunction, and multiple types may be present concurrently (Donnelly et al., 2023). It is therefore important that other types of pelvic floor dysfunction questions (e.g., the Australian Pelvic Floor Questionnaire (Baessler et al., 2010)) are included targeting symptoms of pelvic organ prolapse, mixed urinary incontinence and sexual dysfunction.

5.4 | Menstrual cycle

Currently, no validated questionnaires exist for menstrual cycle health. Therefore, researchers must identify what factors they believe are important for their research question. Suggestions were provided by Moore and colleagues (Moore et al., 2023), such as the age of menarche, average cycle length, frequency of bleeding per year and ovulation status if known. At the time of injury, it was also recommended that the day of the current menstrual cycle is reported (Moore et al., 2023).

Reporting contraceptive use and type has been recommended (Moore et al., 2023), with just over half of female rugby players taking contraception (Nolan et al., 2023). From a research perspective, with the number of contraceptives available (Moore et al., 2023) investigating the type of contraception as a risk factor within women's rugby will require a large dataset. At the point of injury, it would be useful to record the timing of hormonal contraception usage for those taking monophasic combined contraceptive pills (e.g., pill-free or pill-taking day).

Monitoring a player's menstrual cycle, including a menstrual bleed and ovulation, are important health indicators unless influenced by pregnancy and contraception. For example, the absence of a menstrual bleed may indicate health problems, such as low energy availability (Nattiv et al., 2007), or a life event (e.g., pregnancy) or stage (e.g., peri-menopause). Researchers and clinicians may decide it would also be beneficial to monitor menstrual cycle health symptoms (e.g., cramping, headaches/migraines, fatigue and mood changes (Nolan et al., 2023)). Female rugby players, both those who do and do not use hormonal contraception, experience menstrual-cycle-related symptoms (Nolan et al., 2023) and the perceived impact of such symptoms on performance is a dominant theme reported by players (Findlay et al., 2020). However, no validated questionnaires exist for monitoring the menstrual cycle at present. Many menstrual-cycle-related symptoms can be debilitating for women, requiring modifications to training (Bruinvels et al., 2021) and could be reported in a rugby injury and illness surveillance system when using a non-time-loss health problem definition. For example, clinicians may consider recording significant dysmenorrhea or vomiting which may serve as

endometriosis indicators warranting further investigation or referral. Similarly secondary amenorrhea (absence of periods for 3 months or more) should be recorded, as it can serve as a potential indicator of problematic low energy availability or relative energy deficiency (Mountjoy et al., 2023) allowing early detection and management. Using this approach may reduce the burden of daily monitoring and remove the need for a validated monitoring questionnaire.

5.5 | Pregnancy and postpartum

Parity status should be recorded (Moore et al., 2023), including pregnancies that have resulted in a loss and the delivery mode (vaginal or caesarean) of any pregnancies. Additionally, recording any associated pregnancy and postpartum complications such as SUI, perineal tears, diastasis rectus abdominis, prolapse symptoms such as vaginal bulging or heaviness and pelvic or low back pain is encouraged, as these may impact a player's ability to train effectively (Moore et al., 2021). Pregnancy and postpartum status can also change throughout a surveillance period. Therefore at the time of injury, it is necessary to document if a player is pregnant or postpartum, which may also include breastfeeding status (Moore et al., 2023).

6 | RECOMMENDATIONS FOR FEMALE RUGBY INJURY AND ILLNESS SURVEILLANCE

There are five recommendations for how researchers and clinicians working within women's rugby can make their injury and illness surveillance system fit for purpose and better inform injury and illness prevention strategies (Table 2). The first recommendation is broadening the health problem definition to include non-time-loss health problems as a standard approach. This could use either a medical attention or physical complaint health problem definition (Bahr et al., 2020). Within certain systems, a specific focus may be justified based on the research question (e.g., breast health and breast injuries) to reduce the burden of recording all non-time-loss health problems. Our second recommendation is to broaden the number of routine population characteristics recorded to include data relevant for female athlete health domains. For example, pregnancy-related medical history to enable pregnancy and postpartum health domains to be explored. Thirdly, health domains should be recorded within female rugby injury and illness surveillance systems using the definitions and abbreviations provided by Moore and colleagues (Moore et al., 2023) alongside an established injury and illness coding system (e.g., Orchard Sports Injury and Illness Classification System (OSIICS) and Sport Medicine Diagnostic Coding System (SMDCS) (Orchard et al., 2020)). Our fourth recommendation is regarding the injury and illness coding system being used and ensuring recent versions are adopted, which have been updated to include female-specific health problems. Our final recommendation is to re-confirm or record population characteristic

TABLE 2 Recommendations for female rugby injury and illness surveillance.

Recommendation	Justification
Non-time-loss health problem definition (e.g., medical attention or physical complaint)	Female health problems, such as SUI and breast injuries, may not require time loss but may impact rugby performance
A broader number of routine population characteristic (baseline/demographic) data should be recorded	Female-specific population characteristics may be necessary to provide context to relationships explored through the health domains. Examples include: years of exposure, bra size, pelvic health, menstrual cycle and pregnancy and postpartum questions
Health domains should be recorded	To allow relationships between sports exposure, health domains and health problems to be examined.
Ensure an up-to-date injury and illness coding system is being used	Female-specific health problems have been added to common injury and illness coding systems in versions created from 2021 onwards
At the time of injury, it may be relevant to re-confirm or record population characteristic data	The changing status of certain characteristics or the need to identify information for specific health domains. For example, identify the menstrual cycle phase a player is in, breastfeeding status

Abbreviation: SUI, stress urinary incontinence.

data at the time of injury, where appropriate. These recommendations must be viewed whilst considering the available medical provision, funding and resources. For example, adapting systems to accommodate self-reporting for non-time-loss health problems may help reduce the burden on volunteer support staff in amateur settings, as it may not be feasible for such health problems to be recorded reliably through other reporting mechanisms. However, recommendations two to five could be implemented across various playing levels. At a minimum, including the health domains and an updated injury and illness coding system is encouraged.

7 | SUMMARY

We have discussed and provided recommendations for female-specific considerations for rugby injury and illness surveillance, encouraging everyone to make their surveillance system fit for purpose and not simply a duplicate of systems used in men's rugby. Using a non-time-loss health problem definition, recording female-specific population characteristics, embedding female athlete health domains and having up-to-date injury coding systems should be prioritized to begin to shed light on potential interactions between sports exposure, health domains and health problems. We call for a collaborative approach across women's rugby to facilitate large injury and illness datasets to be generated and enable granular level categorization and analysis, which may be necessary for certain female athlete health domains. Applying these recommendations through a collaborative approach will ensure injury and illness surveillance systems improve risk identification and better inform injury and illness prevention strategies in women's rugby.

It is important to note that injury and illness surveillance is one part of player welfare and wider research beyond using an epidemiological approach is needed across the female lifespan (e.g., puberty to menopause) and all levels of play (e.g., amateur to national). Rugby can also be used to educate all involved (e.g., players, match officials, coaches, friends and family members, fans, and clinicians) on

key aspects of women's physical and mental health (RFU, 2023a; RFU, 2023b; RFU, 2023c; WRU, 2024; World Rugby, 2024). Ensuring injury and illness surveillance systems are female-specific in women's rugby will ensure such education is informed by female data.

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