

LIFELONG FEMALE FOOTBALL PLAYER HEALTH AND THE IMPORTANCE OF THE ATHLETE VOICE

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INTRODUCTION

Women's football participation is on the rise around the world, and encouragingly, so is research into female athlete health. Astonishingly, this is a relatively recent change, and much of the available evidence is still in its infancy. A key priority of the FIFA Medical Commission is to “protect and improve the health of all who play football, from grassroots to elite level worldwide”. Women have specific health considerations which can shape injury and illness experience, prevention, and treatment. For example, female football players are at higher risk of anterior cruciate ligament (ACL) injury and early knee osteoarthritis (OA) than their male counterparts^{1,2}. Risks of concussion are also higher, potentially increasing the likelihood of adverse cognitive and neuropsychological outcomes³. Recently, attention has been paid to the female athlete sport environment as well, which affects both sport exposure and health outcomes⁴. Clearly, there is more

work to be done and new opportunities to explore.

To tackle the gap in injury prevention research for female football players, we can turn to the well-established theoretical framework outlined by van Mechelen⁵. Injury prevention begins with establishing the extent of the injury problem (step 1), establishing the etiology and mechanism of injury (step 2), introducing preventative measures (step 3) and assessing the effectiveness of repeating step 1 (step 4). Integrating the athlete voice and context into this model⁶ is key to guiding more context-sensitive studies and providing new insights.

When we engage the voices of those most impacted by healthcare, research, policy development and implementation, new insights emerge. Athletes' perspectives are critical as they bring ‘lived expertise’ that complements the scientific and medical expertise of others on the team⁷. This aim of this article is to provide an overview of

female football player health across the lifespan and emphasize the importance and contribution of the athlete voice in bridging the data gap.

FEMALE ATHLETE HEALTH ACROSS THE LIFESPAN

Female athlete injury rates and health outcomes are influenced by biological and sociocultural processes. Circulating endogenous and exogenous concentrations of ovarian hormones influence most systems in the body including metabolism, respiration, the immune response, cognitive, gastrointestinal, and cardiovascular health, autonomic regulation, and genitourinary function⁸. A recent supplement to the International Olympic Committee consensus statement on methods for recording and reporting epidemiological data on injury and illness in sport identified 10 domains of female health for categorising health problems according to biological, life stage or environmental factors that



Image: Illustration.

affect female athletes: menstrual and gynaecological health; preconception and assisted reproduction; pregnancy and perinatal; postpartum; menopause; breast health; pelvic floor health; breastfeeding, parenting and caregiving; mental health; and sport environments⁹ (Moore et al.). While football-specific research is lacking in many of these areas, new insights are emerging in a few key areas that will be highlighted in this paper – namely, musculoskeletal, reproductive, cardiovascular, cognitive, and mental health.

MUSCULOSKELETAL HEALTH

Severe injury is one of the main reasons for an athlete to retire (23-30% of players)^{10,11}. Female football players have 1.5 times greater injury risk compared to males¹², and at least twice the anterior cruciate ligament (ACL) injury risk¹. The main risk for early onset (or post-traumatic) knee osteoarthritis

(OA) is previous sport-related knee injury¹³⁻¹⁸. In studies involving male football players (or where gender was not reported), there is a high prevalence of OA in the hip, knee and/or ankle^{19,20}. Half of retired female football players will develop knee OA by age 50²¹, and earlier in those who have sustained a knee injury²².

The reasons behind these injury rates are multifactorial and include disparities in access to and experiences with sport and training⁴. One example is resistance training: although an important component of prevention and rehabilitation, girls and women participate at a much lower rate than boys and men²³ due to concerns of becoming too 'bulky' and muscular, even with an understanding that it may be performance-enhancing. Female athletes may have different treatment success rates as well: one study demonstrated that women have greater knee laxity, lower patient reported

knee function, less chance of returning to sport, and a more frequent need for revision surgery after ACL reconstruction compared to their male colleagues²⁴. These factors necessitate further investigation into improved prevention and treatment strategies.

REPRODUCTIVE HEALTH

Menstrual cycle and performance

Ovarian hormone profiles influence health and performance across the life span⁸. Athletes are generally able to excel during all phases of their menstrual cycles but there may be subtle changes that occur and/or individual variability. A recent systematic review and meta-analysis indicated that exercise performance might be trivially reduced during the early follicular phase of the menstrual cycle, compared to all other phases²⁵. Authors maintain that as a result of the trivial changes, general guidelines on exercise performance across the menstrual cannot yet be formed. When performance is a priority, an individualised approach might be appropriate.

Alterations in menstrual cycle

Menstrual cycles can be altered intentionally (e.g., via exogenous hormones) or secondary to other causes (through low energy availability, other health conditions, or life stage transitions such as pregnancy or menopause). The most comprehensive systematic review to date on hormonal contraception and performance concluded that oral contraceptive pills might minimally decrease athletic performance, however, evidence was not strong enough to draw practical conclusions for the female athlete population²⁶. If there is a secondary disturbance in menstrual function, the causes may be multifactorial. Among Olympic competitors, polycystic ovarian syndrome (PCOS) is the most frequent underlying cause of menstrual dysfunction (due to high circulating androgens)²⁷. Menorrhagia, or heavy menstrual bleeding, is also relatively common²⁸, where optimizing pain relief and identifying sequelae such as iron deficiency are important to ensure physical performance is not compromised. Athletes have higher rates of oligo- and amenorrhea than the general population as well. Functional hypothalamic amenorrhea is a diagnosis of exclusion and may be linked to Relative Energy Deficiency in Sport (RED-S), a consequence of low energy

availability that can impact both male and female athletes' physical and psychological health long-term^{29,30}. Athletes with RED-S can suffer disruptions in cardiovascular, gastrointestinal, musculoskeletal, haematological, metabolic, endocrine, immunological, and psychological function³¹. In female athletes this may result in menstrual dysfunction, with unknown impacts on long-term fertility. Independent of menstrual dysfunction, low energy availability can negatively and irreversibly affect bone mass accrual, leading to premature osteopenia and osteoporosis³².

An estimated 70% of elite athletes suffer with >1 symptom of RED-S³³. A recent study in Polish female football players documented low energy availability in 20 of 31 players³⁴, and 24% of Norwegian elite female football players surveyed met diagnostic criteria for eating disorders³⁹. Importantly, RED-S can go unrecognised, and many athletes do not receive appropriate education or treatment. We do not know if experiencing RED-S increases injury risk, or the effects on BMD, fertility, and mental health long-term.

Pregnancy and Postpartum

Elite female athletes are now becoming pregnant more often during their sporting careers. Two recent reviews^{35,36} suggest that women who do so have healthy pregnancies and babies, but many wait to have children until after they have retired from elite sport. To date, there is no empirical evidence examining the impact of elite sport participation on (in)fertility, pregnancy and postpartum outcomes, postpartum return to sport (RTS) rates, or age at menopause³⁷. The long-term impact of RED-S on reproductive health in elite athletes is unknown. This

lack of knowledge makes it difficult for athletes to make informed decisions about their reproductive health and for healthcare providers to provide meaningful advice.

In general, elite athletes return to physical activity early in the postpartum period and may have an increased risk of injury. Urinary incontinence is also common symptom after childbirth and can impact activity levels. Return to sport and/or activity models have been proposed^{38,39} which generally include advice on graduated return to running after the first 6-12 weeks with sport-specific training to follow. A systematic review involving postpartum elite athletes detected no decreases in postpartum performance in elite athletes, and improved performance in some cases⁴⁰.

CARDIOVASCULAR (CV) HEALTH

Football confers wide-ranging benefits for cardiovascular health. Elite female football players have a superior cardiovascular health profile compared to untrained controls⁴¹. Recreational football training in women aged 18-65 years provides optimal stimuli for cardiovascular, metabolic, and musculoskeletal fitness⁴².

The relationship between the intense training and competition of elite sports like football and the long-term consequences on CV health, however, is not well established. Male endurance athletes have higher rates of atrial fibrillation (AF), arrhythmias and other cardiac findings^{17,43}. In contrast, one study examining sex differences in AF rates in cross-country skiers demonstrated that female skiers had lower incidence of AF and stroke than the general population⁴³. A recent meta-analysis on the long-term health of over 165,000 elite athletes (84.4%

male) concluded there is insufficient data available to delineate cancer and cardiovascular mortality outcomes in elite female athletes⁴⁴. The impact of intense football training on the female athlete heart is currently unknown.

COGNITIVE HEALTH

Female athletes are more susceptible to concussion and report more symptoms when they are concussed than male athletes^{45,46,47}. Female football players outperform the general population in cognitive testing^{48,49}, yet retired players with a history of multiple concussions and frequent heading have lower verbal memory and fluency performance than age-matched controls³. Current RTS guidelines may not adequately consider sex and gender differences⁵⁰. Women may also be at higher risk of neurocognitive disease than men⁵¹. Further studies are required to assess short and long-term risks of concussion and evaluate the need for specific RTS guidelines.

MENTAL HEALTH

The prevalence and associations of depression and anxiety in female players is largely unknown^{22,52}, but one study reported a similar prevalence to the age- and sex-matched general population⁵³. The prevalence of depressive symptoms is influenced by personal and sport-specific variables. Mental health may be influenced by playing position, level of play, and experience of conflict²². Half of the players attributed 'conflicts with coach/management' as an important reason for their low moods, followed by 'low in performance/injury' and 'too little support/acknowledgement by the coach'. In line



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with experiences of people who have lived in conflict, abuse and harassment and poor mental health are inextricably linked⁵³⁻⁵⁵. When former international level female rowers and rugby players were asked about harassment and abuse in their sports, 79% recalled witnessing or experiencing at least one form during their career. We do not yet have similar data on female football players. Eating disorders⁵⁶ and addictions are common in elite sport, yet little is known about the long-term rates and their effects. Transition out of sport may be accompanied by a profound loss of identity and self-efficacy; when it comes to mental health, a career/lifespan approach should be adopted so that players can thrive.

THE ATHLETE VOICE

Through the voices of the female athletes themselves we can appreciate how best to prioritize injury and illness prevention research and optimize health and performance. It is important to incorporate athlete context into injury and health assessments as it affects all aspects of an athlete's career as well as prevention and treatment outcomes.

Athletes report that their environments make a large impact on their health, particularly the amount of support they are likely to receive. Qualitative work conducted with male and female rowers showed that their lived experience of low back pain was influenced by a pervasive culture of secrecy around symptoms as they didn't want to be viewed as a "weakness"⁵⁷. In environments where openness was encouraged by support staff, rowers reported better outcomes.

Female athletes can provide insights into essential types of support across the athlete lifespan. For athlete mothers, they report needing more support for breastfeeding, parenting and caregiving. They highlight the many significant decisions athletes must make as they navigate pregnancy alongside elite sport participation, including lack of time, training "new" bodies, injuries and a safe RTS, breastfeeding while training and navigating motherhood and sport⁵⁸. Athlete-mothers can also provide clear recommendations for policy and research to better support following generations⁵⁹.

This is also the case regarding transition out of elite sport. Athletes provide learned expertise for injury prevention even after their careers are over³⁶ and context as to how they reframe their injury experiences.

In one survey of retired female rowers and rugby players, most rated their current health as above average or excellent and would compete at the same level again if given the choice³⁶.

Given the complex nature of sports injuries and illnesses, additional qualitative research methodologies are recommended to gain insight into the 'ecological system' of the athlete and a more comprehensive understanding of the many aspects of health⁵. This has yet to be investigated in many of the key areas listed above.

FUTURE RESEARCH

The field of women's health and sport and exercise medicine is ripe with opportunity. In MSK health, key research gaps include the impact of elite football participation on long term outcomes including OA, and improved ACL prevention and treatment strategies. The association between elite football participation, concussion history and cognitive function is a critical area to study. Furthermore, key research gaps in mental health for female athletes include the impact of football participation on mental health outcomes, the prevalence of eating disorders and addictions, and mediators of these relationships (e.g., physical activity, experiences of abuse and harassment, relationship with coaches/teammates/support staff). The prevalence of cardiac conditions such as atrial fibrillation, cardiomyopathies, and heart disease warrants further attention. Finally, key research gaps in reproductive health for female athletes include the effect of elite football participation on the prevalence of RED-S, and the long-term effects of RED-S on fertility rates and bone health.

CONCLUSION

We should do our best to protect the health of our female athletes and bridge the female athlete data gap. Our female athletes of today deserve our attention, our scientific rigor, data, support to achieve their goals. There is so much powerful physiology to study, so many strengths of the female athlete and no more time to waste. By improving the quality and quantity of female football player health data, we can better focus our preventative efforts, so that more current, former, and future female football players can more fully experience the positive outcomes associated with sport and make football a lifelong joy.

References

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