Gender Disparities in Sport Science: A Research Gap Analysis of Female Athletes

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Abstract

In recent decades, women's participation in sports has grown significantly, reaching near parity with men in major competitions such as the 2024 Paris Olympics. However, this progress has not been mirrored in sports science research, where women remain underrepresented both as research subjects and academic leaders. This study aims to analyze the gender gap in sports science research, particularly regarding female athletes, by conducting a descriptive qualitative study using a literature review approach. Data were collected from reputable academic journals indexed in Scopus, Web of Science, and Google Scholar, as well as official reports from international sports organizations. Thematic analysis was used to categorize findings into key themes, including injury risks, nutritional disparities, and scientific leadership. The results show that only 6% to 9% of sports science studies exclusively focus on female athletes, while female participation in mixed studies ranges from 35% to 39%. Furthermore, female leadership in scientific publications remains below 30%. This underrepresentation creates a significant knowledge gap, leading to biased recommendations in training, nutrition, and injury prevention, as most guidelines are based on male physiology. The study also highlights the higher risk of injuries, such as anterior cruciate ligament (ACL) tears, among female athletes, often overlooked in research that ignores hormonal fluctuations like the menstrual cycle. Initiatives such as the Female Athlete Science and Translational Research (FASTR) and the Global Alliance for Female Athletes (GAFA) have been launched to address these disparities, yet broader support is needed. In conclusion, increasing women's representation in research and leadership is crucial to developing inclusive, evidence-based practices that better support female athletes' health and performance.

Keywords: Female athletes, gender gap, sports science, injury risk, nutritional disparities

1. Introduction

In recent decades, women's participation in sport has increased significantly, as evidenced by the almost equal number of female athletes as men in events such as the 2024 Paris Olympics (Schut et al., 2024). However, this progress has not been matched by equal representation in sports science research. To date, only around 8% of sports research focuses exclusively on women, creating a significant knowledge gap regarding the physiological and psychological needs of female athletes (Baker et al., 2020).

The majority of research in sports science is still based on data from male athletes. This is concerning because biological and hormonal differences between men and women can affect responses to training, nutrition, and recovery (Hunter et al., 2023). For example, hormonal fluctuations during the menstrual cycle can affect performance and injury risk in female athletes, yet this aspect is often overlooked in research design (Legerlotz and Nobis, 2022).

Research conducted by Mancini et al. (2021), showed that female athletes have a higher risk of injury compared to men, especially related to anterior cruciate ligament (ACL) injuries. Hormonal factors, such as increased estrogen levels during the luteal phase of the menstrual cycle, can affect joint stability and increase the risk of injury.

The aspect of sports nutrition also shows gender disparities. Most nutritional recommendations are based on studies involving men, without considering the specific needs of women. Differences in metabolism, body composition, and energy requirements between men and women require a tailored nutritional approach, but research in this area is still limited.

Gender disparities are not only evident in research participation, but also in scientific leadership. A study by Martínez-Rosales et al. (2021), showed that women are underrepresented in academic leadership positions and as lead authors in scientific publications in the field of sports science. This can affect the focus and priorities of research, and slow down efforts to address the gender gap in sports science.

Several initiatives have been launched to address this disparity. Programs such as the Female Athlete Science and Translational Research (FASTR) at Stanford Medicine Children's Health aim to improve understanding of female athlete health and performance through research focused on aspects such as menstrual cycles, bone health, and body image (Onks, 2024).

Countries such as Australia, the United States, the United Kingdom, and New Zealand have formed the Global Alliance for Female Athletes (GAFA) to support female athlete health and performance. The alliance aims to provide access to research and best practice information, as well as improve health literacy among female athletes and their support staff (Dankwa, 2022).

In addition to biological and scientific factors, social and cultural barriers also impact female participation in sport. Traditional gender norms, lack of social support, and negative stereotypes can prevent women from actively participating in sport, as well as limit their access to adequate training and facilities (Peng et al., 2023).

Much of the research in sports science focuses on quantitative data, such as physical performance and injury statistics (Sainani et al., 2021). However, the subjective experiences of female athletes, including their perceptions of training, competition, and life balance, are often overlooked. A more holistic research approach is needed to understand the unique needs and challenges faced by female athletes. Given the significant gap in sports science research on female athletes, this study aims to comprehensively analyze this gap. By reviewing the existing literature, evaluating ongoing initiatives, and identifying areas that require further attention, this study aims to provide strategic recommendations to improve the representation and understanding of female athletes in sports science.

2. Literature Review

Although female participation in sports has increased significantly over the past decades, gender disparities in sport science research remain a persistent issue. Several studies have shown that the majority of research in this field is still dominated by male participants, resulting in a data foundation biased toward male physiology and needs (Costello et al., 2014; Cowley et al., 2021).

One of the main reasons behind this disparity is the outdated assumption that physiological data from men can be generalized to women. However, recent research highlights that the menstrual cycle, hormonal fluctuations, and differences in body composition significantly influence performance and training adaptations in female athletes (McNulty et al., 2020). Despite this, only about 6% of sports and exercise studies exclusively focus on women (Cowley et al., 2021), and women are often excluded from studies due to the "complexity" of hormonal variation.

This gap extends beyond physiological considerations to psychosocial dimensions. Female athletes often face additional barriers in the form of gender stereotypes, limited media representation, and lack of support in professional sports development (LaVoi, 2016). These factors underscore the need for sport science research on female athletes to account for social and structural challenges unique to women.

Moreover, training policies and guidelines are often based on male-centric data. This creates challenges in designing effective training interventions and injury prevention strategies for female athletes (Bruinvels et al., 2017). The lack of data not only hinders the athletic development of women but also raises long-term health risks.

Overall, the literature indicates a pressing need to increase the inclusion of women in sport science research and to develop methodologies specifically tailored to their biological and social characteristics. Addressing gender disparities in this field is not only a matter of scientific equity but is also essential to improving the effectiveness and safety of athletic programs for all.

3. Methods

3.1. Research Approach

This study uses a descriptive qualitative approach with a literature review method as the main method. This approach was chosen to provide an in-depth and comprehensive picture of the phenomenon of gender inequality in sports science research, especially for female athletes. According to Lim (2024), a qualitative approach allows researchers to explore social phenomena through interpretation of data obtained from literature and secondary sources. Thus, this approach is relevant to explore and map various findings, facts, and gaps that have been identified by previous research in the scope of sports science.

3.2. Data Sources

The data sources in this study come from secondary data collected through various scientific publications and relevant documents. Data were obtained from international journal articles indexed in Scopus, Web of Science, and Google Scholar, as well as official reports from international sports organizations such as the International Olympic Committee (IOC), FIFA, and World Athletics. In addition, data was also obtained from sports health policies and guidelines related to women, as well as the latest scientific news from credible media portals such as The Guardian, Reuters, and Frontiers in Sports and Active Living. The inclusion criteria applied in the selection of literature are articles published in the last 10 years (2014–2024), focused on sports research on female athletes, written in English or Indonesian, and have gone through a peer-review process. Meanwhile, literature that is not relevant to the topic of gender gaps, or is only an opinion without empirical data, is excluded from this study.

3.3. Data Collection Process

The data collection process was carried out through a systematic search using specific keywords such as "gender gap in sports science", "female athletes research", "sports medicine women", and "underrepresentation of women in sports studies" in a predetermined scientific journal database. After the search was carried out, the next stage was screening the title and abstract to ensure the relevance of the article to the research topic. Articles that met the criteria were then extracted for information, including the purpose of the study, the methods used, the main findings, and the implications for understanding female athletes in the context of sports science. This process was carried out carefully to ensure that all data collected supported the research gap analysis which was the main focus of this study.

3.4. Data Analysis

The data that had been collected was analyzed using the thematic analysis method. This analysis was conducted through three main stages, namely open coding, axial coding, and selective coding. In the open coding stage, researchers identified various initial themes that emerged from the reviewed articles, such as health issues, nutrition, performance, injury risk, and sports policies related to female athletes. Furthermore, in the axial coding stage, the themes that had been found were grouped into main categories to find patterns of relationships between themes. The last stage is selective coding, where researchers compile narratives that explain the relationships between themes and draw conclusions based on the data that has been analyzed. This analysis follows the Miles and Huberman (1994) model which includes data reduction, data presentation, and drawing conclusions/verification, so that it can produce a systematic mapping of existing research gaps (Mansyur et al., 2024).

3.5. Data Validity

To ensure the validity and reliability of the data, this study applies the source triangulation technique, namely comparing the findings from various literatures and different types of publications. This technique aims to strengthen the accuracy of the findings by looking at the consistency of information between sources. In addition, the coding process and theme analysis were carried out through a peer debriefing mechanism involving experts in the fields of sports science and gender studies to minimize interpretation bias that may arise during the analysis process. With this step, it is hoped that the research results have a high level of trust and can be scientifically accounted for.

4. Results and Discussion

4.1. Results

4.1.1. Female Representation in Sport Science Research

Analysis of the reviewed literature shows that women are still significantly underrepresented in sport science research. Despite the increasing participation of women in competitive sports, only about 6% to 9% of sport studies have exclusively studied female athletes. Most studies still focus on male athletes, which can lead to bias in understanding the physiological and psychological needs and responses of female athletes (Riley, 2023).

4.1.2. Higher Injury Risk in Female Athletes

Data shows that female athletes are at higher risk of injury compared to male athletes, especially related to anterior cruciate ligament (ACL) injuries. Hormonal factors, such as estrogen fluctuations during the menstrual cycle, can affect joint stability and increase the risk of injury. However, this aspect is often overlooked in study designs, most of which do not consider the menstrual cycle as an important variable (Mancini et al., 2021).

4.1.3. Inequality in Nutritional Recommendations

Most nutritional recommendations in sport are based on studies involving male athletes, without considering the specific needs of women. Differences in metabolism, body composition, and energy requirements between men and women require a tailored nutritional approach. However, research in this area is limited, which can negatively impact the health and performance of female athletes.

4.1.4. Lack of Female Leadership in Exercise Science

Studies show that women are underrepresented in academic leadership positions and as lead authors in scientific publications in the field of exercise science. This can affect the focus and priorities of research, and slow efforts to address gender disparities in exercise science (Deldicque, 2022).

4.1.5. Initiatives to Address Gender Disparities

Several initiatives have been launched to address gender disparities in exercise science. Programs such as the Female Athlete Science and Translational Research (FASTR) at Stanford Medicine Children's Health aim to improve understanding of the health and performance of female athletes through research focused on aspects such as menstrual cycles, bone health, and body image. Additionally, global alliances such as the Global Alliance for Female Athletes (GAFA) have been formed to support the health and performance of female athletes (Goldman, 2023; Dankwa, 2022).

4.2. Discussion

The results of this study highlight significant gaps in the representation of women in sports science research. The lack of data specific to female athletes can lead to inappropriate training, nutrition and recovery recommendations, which can ultimately have a negative impact on their health and performance. The higher risk of injury in female athletes, particularly ACL injuries, highlights the need for more in-depth research into the biological and hormonal factors that influence joint stability. Incorporating variables such as the menstrual cycle into research designs can help develop more effective injury prevention strategies for female athletes.

Inequality in nutritional recommendations is also a major concern. Women have different nutritional needs than men, particularly related to the menstrual cycle and body composition. Therefore, research that focuses on the specific nutritional needs of women is needed to ensure optimal health and performance of female athletes.

The lack of female leadership in sports science can reinforce gender bias in research and decision-making. Increasing the representation of women in leadership positions and as lead authors in scientific publications can help direct the focus of research towards issues relevant to female athletes.

Initiatives such as FASTR and GAFA are positive steps in addressing gender disparities in sports science. However, these efforts need to be supported by the broader scientific community, including adequate funding and cross-disciplinary collaboration, to ensure that research focused on female athletes can thrive and have a real impact.

Table 1: Representation of women in sports science research

Research Aspects	Percentage Focus on Women
Exclusive Study on Female Athletes	6% - 9%
Female Participation in the Study	35% - 39%
Female Leadership in Scientific Publication	< 30%

Source: (Riley, 2023; Sanderson, 2022; Deldicque, 2022)

Table 1 shows that women are still significantly underrepresented in sports science research, both as primary research subjects and in scientific leadership. Only 6% to 9% of studies exclusively study female athletes, while female participation in mixed studies is only 35% to 39%. Furthermore, female leadership in scientific publications is also low, at less than 30%.

These data indicate a significant gender gap in sports science research, which may result in a lack of scientific understanding of women's specific physiological, nutritional, and health risks needs. The lack of female leadership also has the potential to influence the direction and priorities of research, thereby slowing efforts to create evidence-based approaches that are inclusive and responsive to female athletes.

5. Conclussion

The results of this study indicate that gender inequality in sports science research is still very significant, marked by the low representation of women both as primary research subjects and in scientific leadership. Only around 6% to 9% of studies exclusively study female athletes, with the participation rate of women in mixed research only 35% to 39%, and female leadership in scientific publications less than 30%. This inequality has the potential to cause scientific bias that negatively impacts the health, performance, and well-being of female athletes, because recommendations related to training, nutrition, and injury prevention are still largely based on male data. The lack of female leadership can also influence the direction and priorities of research, thus slowing down the creation of an inclusive and gender-sensitive scientific approach. Therefore, strategic and collaborative efforts are needed to increase the representation of women in sports science research, both through increasing the number of women-specific studies, integrating biological variables that are typical of women, and strengthening female leadership in academic fields, so that sports science can develop more equitably and evidence-based for all athletes.

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