Breaking Barriers:
Inequities in Female Athlete Sports Injury Research and Treatment in the U.S.

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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The History of Women's Fitness

"Then when they had had their joy of food, she and her handmaids, [100] they threw off their head-gear and fell to playing at ball… then the princess tossed the ball to one of her maidens; the maiden … missed, but cast it into a deep eddy …" (Homer, p. 100, 115).

The passage above is an excerpt from Homer's *The Odyssey*, believed to have been written in the late 8th or 7th century BC (Dunn, 2020). It represents one of the earliest depictions of women participating in a sport-related recreational activity. While women did have some levels of equality when it came to physical activity at this time, it was limited, and the purposes were to benefit society. Spartan women, for example, were allowed to exercise compared to other women in Ancient Greece, due to the belief that a physically fit woman would bear stronger offspring. One of the earliest accounts of an official women's athletic competition at the time was with the hosting of the Heraean Games, a foot race involving 16 women that took place every 4 years to honor the goddess Hera (Dasgupta, 2016).

In the late 1700s and 1800s, former Ancient Greek practices of gymnastics and competitive sports influenced the development of exercise programs in European countries, which in turn influenced Americans to construct the first commercial gymnasiums (Barrow & Brown, 1988, p. 72-78). After the collapse of the ancient civilizations, however, the already limited freedom women experienced diminished, giving way to prevailing societal expectations. Women were discouraged from engaging in physical activities considered strenuous, which aligned with the deep-rooted belief that a woman's primary duties revolved around domestic tasks and childcare. As a result, women participated in sports later than men, with their involvement in American culture not beginning until the late 1800s and 1900s. This delay attributed to the accumulation of stigmas, biases, and stereotypes over the years, reinforcing the

belief that women's roles was restricted to the home. Moreover, such misogynistic perspectives, alongside others, contribute to the existing gaps in research and treatment concerning women's health today. At the time, the menstrual cycle and general female physiology was misunderstood and often overlooked, where many bold and incorrect assumptions were made, often labeling women as "unfit" for athletic competitions. The topic of menstruation was referred to as "tedious and annoying conditions for the physician to treat," and on a cycle, a woman was seen as "physically 'unwell' and psychologically vulnerable." This belief stemmed from the misconception that women should avoid strenuous physical activity due to concerns about the menstrual cycle, and a historically predominant patriarchal system. Consequently, women were limited to recreational activities, so long as they were carried out in a "fashionable" manner (Strange, 2000). Examples of such activities included horseback riding, showboating, and swimming, and ensured that women could not engage in activities that involved being "competitive" or involving "overexertion" and "strenuous activity." It was not until the development of exclusive women's athletic clubs in New York and New Orleans which allowed females to engage in competitive environments. The clubs featured a wider range of sports such as croquet, tennis, archery, and badminton (Gerber, 1974). Such activities, however, continued to be looked down upon as women in athletics continued to be seen as 'un-feminine.' This idea was clearly exemplified in the exclusion of women from the first modern 1896 Olympic Games, where Baron Pierre de Coubertin (founder of the International Olympic Committee or IOC) was a major contributor to the bias against women. He said that female participants would be "impractical, uninteresting, unaesthetic and indecent" (Rasheed, 2016). It was not until the 1900s Games that women could participate, but even so, the sports were limited to those "compatible with a woman's femininity and fragility" (Yannick, 2020). Out of the 975 male athletes who had

a wide selection of sports to choose from, the only sports available to the 22 female athletes were tennis, sailing, croquet, horseback riding, and figure skating. By the 1940s, there was growing acceptance of women to exercise outside of the home and engage in physical activity at public spaces such as gyms. Intercollegiate organizations were more prevalent, as well, as the idea of a woman not allowed to be competitive slowly became outdated. It was not until the emergence of the women's rights movement in the 1970s and 80s that challenged the stereotypes, leading to a shift in societal expectations. Specifically, the enactment of Title IX[1] in 1972 played a pivotal role in eliminating must of the sexual discrimination prevalent in sports. Over the years, women have gradually gained access to more sports at the Olympics and been able to play at the collegiate level, where college women's athletic participation rose from 15% in 1972, and up to 43% in 2001. For high school girls, an increase of over 840% occurred with 295,000 participants in 1971, and 2.8 million athletes in 2002-2003 (Carpenter & Acosta, 2005). With these successes, however, biases still remain, and require attention to ensure fair opportunities exist for female athletes in sports (Bell, 2008).

Key Topics for Preventing Sports Injuries in Female Athletes

The evolving landscape of women's engagement in sports and exercise has gradually increased over the years since the women's rights movement and passing of Title IX. With the Olympic Games consisting of 48.8% women in 2021, the likes of Serena Williams, Simone Biles, Mikaela Shiffrin, and Chloe Kim have represented female athletes being as successful as

[1] "Prohibits sex (including pregnancy, sexual orientation, and gender identity) discrimination in any education program or activity." Office for Civil Rights (OCR). (2021). Title IX of the Education Amendments of 1972. *Sex Discrimination*. https://www.hhs.gov/civil-rights/for-individuals/sex-discrimination/title-ix-education-amendments/index.html#:~:text=Title%20IX%20of%20the%20Education%20Amendments%20of%201972%20(Title%20IX,activity%20receiving%20federal%20financial%20assistance.

males in their respective sports (Rasheed, 2016). Yet, these wins have come at a great cost and limitations of being female in a male-dominated industry. Female athletes have not faced the best or healthiest environments when training and competing and that has been due to gaps in knowledge, literature, and research. It is important to understand that this type of research did not begin until the civil and women's rights movements in the 1960s. Thus, there has been a lack of female representation in research for many years. Studies in sports medicine, for example, were found to have more research on male athletes at 70.7% in what is considered 'male-dominant sports' such as baseball, soccer, American football, basketball, and rugby. In comparison, only 8.8% included females, which frequently looked at softball and volleyball (Paul et al., 2022). In another study, an "imbalance of female-specific sports science and sports medicine (SSSM) research" was evident with only 39% women contributing to the participant pool of explored papers and journals (Smith et al., 2022). Given the limited data available in this field, the sports science and medical communities face challenges in developing tailored treatment and management protocols aimed at reducing and preventing injuries, as well as enhancing the well-being of female athletes. This has led to sports injuries that could have been prevented through more knowledge and education, where female athletes are more prone to specific injuries than men, such as experiencing more ACL injuries (Silvers-Granell, 2021). A closer examination of women's health research topics is essential to prevent sports injuries and other discomforts female athletes face. The following topics focus on women's health topics to consider, particularly for athletes: **A.** the menstrual cycle and hormonal effects, **B.** iron deficiency and low energy levels, **C.** nutritional needs, **D.** reproductive health and contraception, **E.** existing stigmas in treatment and **F.** mental health issues.

Part I: Physical Health

A. The Menstrual Cycle and Hormonal Effects

The menstrual cycle is a natural period where a healthy female undergoes the shedding of their uterine lining every month in the absence of pregnancy. It is known that different phases of the cycle affect physical performance, although research remains limited as "much of the research in the field of sports science has been conducted on males and the findings of this research have been inappropriately applied to female athletes." This includes not only studies conducted with humans, but also for animal models, most notably mice. The literature says that the changes in physical performance for a woman on her cycle is "postulated" to change over time, further indicating the need for more studies and understanding of the menstrual cycle. Such changes are significant to females such as affecting muscle activation, substrate metabolism, thermoregulation, and body composition. Three naturally occurring sex hormones fluctuate in the female body based on cycle stage: progesterone, estrogen, and testosterone, where the latter is produced in lower concentrations for normal, healthy women. The production of progesterone reduces muscular "strength and power," while estrogen has the opposite effect and improves it. Estrogen has "anabolic effects, including improving muscle strength and bone mineral density (BMD)."[2] Increased estrogen concentration may also "reduce stiffness by decreasing collagen synthesis and therefore collagen density in muscle and connective tissues," however, more research needs to be performed to confirm these claims. Lastly, testosterone enhances physical performance "via improved neural activation, muscle electrophysiological and contractile properties, and motor system function." This hormone is increased in the ovulatory phase and

[2] BMD test measures calcium and other bone minerals so denser bones have more minerals and are stronger and less easy to break. NIH. (2023). Bone Mineral Density Tests: NIH. What the Numbers Mean. *NIH* 2023. https://www.niams.nih.gov/health-topics/bone-mineral-density-tests-what-numbers-mean#:~:text=A%20bone%20mineral%20density%20(BMD,is%20lost%2C%20osteoporosis%20can%20develop.

mid luteal phases of the menstrual cycle, but in comparison to other phases, research is lacking (Carmichael, 2021).

So, why is it important to understand the menstrual cycle more? Many studies have found that athletes find their perceived or actual training, strength, performance, and competition to be negatively affected in certain phases of the menstrual cycle. This relates to what is believed to be the early follicular and late luteal cycle phases where fatigue and lethargy are common symptoms. In practice, an athlete can avoid certain movements or types of training that increase her risk of injury, which can be enhanced with the implementation of predictive models in technologies. Menstrual cycle tracking on a smartphone app is popular in elite sports teams, today, such as the USA women's soccer team in 2019, helping them win their fourth World cup. Dr. Rashmi Kudesia said how it is "important to realize as women we do have ups and downs and there are hormones that are predominant in our cycles…" (Kindelan, 2019). The purpose of such tracking is commonly used to achieve a pregnancy, but in this case, it is vital to improve everyday life and health when playing sports; athletes themselves can access information to understand changes in their performance, and provide such information to coaches as needed. If more studies were conducted on the menstrual cycle and its associated hormones, better training and injury-prevention plans could come into place, including analysis of data with new technologies.

Iron Deficiency and Low Energy Levels

During the menstrual cycle, females lose 20 to 90ml of blood, and some conditions lead to heavier loss of blood, which can lead to low iron levels (NHS, 2023). This can result in iron deficiency anemia where "the body uses its iron stores to make more hemoglobin so that enough oxygen can be carried to tissues." Side effects from this include headaches, severe pain from

menstrual cramps, fatigue, and low energy levels (Mayo Clinic Staff, 2023). It has been found that around 24-47% of women with iron deficiency do not have anemia, and this deficiency causes low energy which puts the athlete at risk for injury (Holtzman, 2021). Often overlooked aspects in the literature are the effects of iron level deficiency on female athletes' energy. Iron levels are low during menstruation, while elevated estrogen levels increase the likelihood of injuries in physical activity (Martinez-Fortuny, 2023). The ovulatory phase is directly linked to "an increased risk of injury" due to altered "laxity, strength, body temperature, and neuromuscular control." Moreover, when iron levels withing the normal range, levels may be seen as healthy but this does not suffice for athletes (Dole, 2023). Treatment recommendations for iron deficiency often lack depth and may be dismissed. For instance, when diagnosed with anemia, the suggested remedies typically include iron supplements, increased water intake, and reducing physical activity. However, if there is a greater underlying problem, it may go unnoticed, especially since iron deficiency is common among female athletes. This oversight can lead to more injuries in the long run. Additionally, there is a lack of education regarding the crucial role of healthy iron intake in performance among athletes.

B. Nutritional Needs and Hydration,

Athletes, particularly females, face unique nutritional challenges, compounded by factors such as the menstrual cycle and the risk of developing anemia due to nutritional deficiencies, including relative energy deficiency in sport, or RED-S.[3] RED-S can result in various adverse effects, including reduction in muscle strength, glycogen stores, concentration, and endurance performance and training response, as well as, depression, irritability, negative cardiovascular changes, and increased injury risk. Key macronutrients like carbohydrates, proteins[4], and fat are

[3] More contributors to deficiencies include eating disorders such as anorexia nervosa, bulimia, or another underlying mental health issue.

[4] The American College of Sports Medicine (ACSM) recommends 1.2-2 g kg^{-1} day^{-1} protein intake evenly throughout the day..

crucial for endurance athletes. While "carb-loading"[5] is suggested as a nutritional strategy and eating "at least 20% of their calories of fats from diverse sources," data specific to female athletes is limited. Common micronutrient deficiencies in active females include iron, vitamin D, and calcium, thus maintaining a balanced diet that incorporates these nutrients, along with adequate hydration, is essential for sustaining energy availability (EA).[6] Tailoring nutritional plans based on the menstrual cycle's stage regarding micro-and macronutrients can optimize athletic performance for women to the best of current knowledge. However, research in this area remains insufficient, underscoring the importance of staying updated on relevant studies and literature to adjust nutrition plans accordingly. An article discussing nutrition suggests a "holistic view of the female athlete needs to be used when designing a fueling plan." Unfortunately, the RED-S model is the primary framework for understanding low energy availability. The debate persists regarding hydration practices best for female athletes, with recommendations suggesting a fluid intake of 0.4-0.8 L per hour. It is also advised that dehydrated athletes drink fluids slowly following exercise to avoid discomfort and electrolyte imbalances (Holtzman, 2021).

C. Reproductive Health and Contraception

Insufficient research exists on the relationship between reproductive health, contraceptive use, and sports injuries in female athletes, highlighting the need for a more comprehensive understanding in this area. Among 29 studies on female patients experiencing musculoskeletal injuries, only two were deemed high quality and robust. With the information presented, it was suggested that oral contraceptives (i.e. birth control) may reduce the risk of ACL injuries and laxity, potentially serving as a therapeutic option for women to improve hormone regulation

[5] Eating many carbohydrates before a competition but research is limited.

[6] The suggested EA for optimal health and performance is 45 kcal*kg^{-1} fat-free mass day^{-1}. Holtzman, Bryan and Ackerman, E., Kathryn. Recommendations and Nutritional Considerations for Female Athletes: Health and Performance. *Sports Med*. 2021. 43-57https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8566643/.

(Konopka, 2019). In terms of reproductive health, obstetrics research is similarly sparse. A study observed a significant decrease in running volume during the third trimester compared to the first among elite runners, with recovery six weeks postpartum noted to be satisfactory. It is important to note, however, the study focused on "elite" and "world-class" runners which may limit broader applications (Darroch, 2023). Conflicting views regarding the appropriate level of physical activity that can be exerted during pregnancy exist, although research suggests that was exercise is preferable to sedentary behavior to mitigate risks such as deep venous thrombosis and development of diabetes, for example (Cooper, 2023). Additionally, female athletes that put high stress on their bodies from overtraining on their bodies can lose their period, known as menstrual dysfunction, which is not healthy and can be concerning for the athlete (Helping Hand, 2024).[7]

Theoretical Framework: Beneficence

The main theoretical framework of beneficence will be defined and serve as the main framework to target female sports-related injury disparities. Consideration of ethics can address the issue of underrepresentation and lack of research in the female population which directly burdens female athletes at the cost of their mental and physical health. It is important to explore the concept of beneficence, an important principle in bioethics, to achieve a greater outcome in women's health by mitigating existing inequities. Beneficence is defined as "an act of charity, mercy, and kindness with a strong connotation of doing good to others including moral obligation."[8] The application of this principle will focus on maximizing benefits for female athletes while minimizing their harm. How can we achieve such thinking and carry it out? This

[7] Primary amenorrhea is not having a period by age 15. Secondary is not having cycle for 3 months in a row. Oligomenorrhea is when cycles occur more than 45 days apart.

[8] Health professionals are obligated to act in a beneficent manner with a duty of care that extends to the patient, professional colleagues, and to society as a whole. Kinsinger F. S. (2009). Beneficence and the professional's moral imperative. *Journal of chiropractic humanities*, *16*(1), 44–46. https://doi.org/10.1016/j.echu.2010.02.006.

can be achieved by the communities that influence and are directly involved with female athletes, so including medical practitioners, researchers, and the team/coaches.

It is important to discuss what is considered a benefit for athletes when maximizing such benefits. In an ideal world, they would include tangible things such as access to certain resources such as well-adjusted training and nutritional plans. The intangible benefits would be reducing unbiased medical care including mitigating overlooking of female pain and tolerance, higher acceptance of the need for a female's representation in research and voicing their concerns in the media. To maximize such benefits, it is important to accept that at this time, there are inequities in terms of the gender gap in women's sports injury research and treatment and they must be addressed to improve overall athlete health and well-being. What has currently been achieved to reduce such disparities in research related to female athletes' health and treatment with the information we know today? The answer lies with the help of women's health advocates, researchers, and medical professionals.

Part II: Mental Health

D. Stigmas and Biases in Treatment

Women's experiences and treatments have their disparities where practitioners need to better practice beneficence as it is lacking for women. A systematic review by the American Orthopaedic Society for Sports Medicine found that sports medicine research favored the evaluation of male athletes in most sports, including co-ed sports due to the high percentage of male sports, medical practitioners and researchers, as well as sex biases that exist in sports. Health care providers need to adjust their treatment approach for a male versus female athlete in terms of physiology, and this is often overlooked due to lack of education and advocacy. To be clearer, studies have found that pain is overlooked and "often abruptly dismissed as

psychological," where women experiencing pain are treated with prescriptions for sedatives more than men.[9] For female athletes in particular, the disparity is an issue, as more practitioners are male and women's pain levels are often underestimated than men's. Providers have been known to misinterpret complaints from female athletes, due to systemic issues in research and societal thinking. Adjusting treatment plans based on these will allow athletes to perform to the best of their ability while improving their quality of life, both physically, and mentally.

E. Mental Health Issues

The problems previously discussed focus on the biological aspects ingrained in a woman's makeup and physiology. It is important to approach the gender gap holistically, by addressing not only the physical aspects of an athlete, but also by analyzing their mental health. As a result of improving physical health, quality of life of athletes will increase, however, this may not happen naturally for everyone without the help of an informative support system. Is it clear who athletes can turn to apart from their coaches and team when dealing with medical and mental issues? Are medical practitioners considering the mental health of athletes or are some things overlooked? Empowerment of female athletes is critical to carry out the beneficence mindset to elevate awareness of inequities.

Female athletes may experience body dysmorphia, disordered eating, lack of motivation after injury, lack of energy from RED-S, and overall depression from burnout and stress (van Niekerk, 2023). Many factors contribute to mental health issues an athlete might face, so it is important to recognize it and develop strategies to reduce it. This comes first with increased research and advocacy. For example, former members from the Nike Oregon Project spoke out in 2019 about

[9]Women with chronic pain suffer more and longer than men; women wait on average 65 minutes while men have been found to wait less at 49 minutes in the ER before receiving treatment for abdominal pain in the U.S. Harvard Health Blog. Women and pain: Disparities in experience and treatment. *Harvard Health Publishing*. https://www.health.harvard.edu/blog/women-and-pain-disparities-in-experience-and-treatment-2017100912562.

the body image issues they had for themselves and by the public, including nutritional issues such as eating disorders experienced.[10] Additionally, knowledge of the MC and its effects on performance can improve athletes' mood if they know what to avoid in training. The impact of psychosocial stressors on mental health of female athletes has not been explored heavily, in research, however (Pascoe, N/A).

Research on Female Athletes

The lack of research in many aspects of women's health, particularly that affecting female athletes, clearly indicates why female athletes are having more sports injuries: there are not enough representative studies of female athletes in the topic areas. Not having enough research, a multi-faceted issue, and addressing the increased risk that women face with sports injury is difficult to address. It was discouraging to note that at the end of the research articles regarding women's health, the same message is written of how "more research is needed" in these topic areas. Why has the current state of research on female athletes limited? Firstly, the history of women's exclusion from sporting events and being competitive for centuries means that research was nonexistent until several women's rights movements pushed for equality and fairness in all aspects of life. Unfortunately, biases remain today because a large part of women not being allowed to exercise was from them having a menstrual cycle and from misogynistic views. It was not until the twentieth century that "the notion that inactivity intensified menstrual discomfort slowly gained credibility." It was believed that overexertion of certain activities by a woman would lead to damage of the organs (Strange, 2000). By the time women started to participate in sports, men had many years of being examined and studied in this topic area, thus

[10] Chavez, Chris (2019). Inside the Toxic Culture of the Nike Oregon Project 'Cult.' *Sports Illustrated*. https://www.si.com/track-and-field/2019/11/13/mary-cain-nike-oregon-project-toxic-culture-alberto-salazar-abuse-investigation.

contributing to the gap in research for males versus females. Secondly, the human body is complex, and the addition of a menstrual cycle for women makes it so that studies must be curated well enough to address specific issues associated with it. The studies are not easy to conduct as cycles vary between individuals, and in addition, sufficient funding is necessary to conduct such studies. What specifically is needed to lower injury risk in female athletes is more research that quantifies the impact of menstrual cycle phases on perceived and physical performance and finding solutions or improvements that can be made well-known for athletes. Thirdly, the lack of studies and information makes it difficult for coaches, trainers, and physicians to provide the best advice to athletes. The low accessibility to quality research most of which does not exist yet leads to guesses being made by coaches and their athletes. These assumptions or possible ignorance on the topic apply to training where if a female athlete is on a certain phase of their menstrual cycle, they are at risk for certain injuries and should avoid certain types of training and movements.

Current Organizations

Today, prevention and treatment of clinical issues and injuries for female athletes has been examined with the help of the Female Athlete Program, a 501(c)(3) nonprofit group established in 2013, with a mission to "close the disparity in research and treatment of female athletes" recognizing that "females differ from males in many aspects of general health, sport performance, training, and management for sport-related injuries." (Female Athlete Conference, 2023) They have a Biennial International Female Athlete Conference that brings medical professionals and athletes together to discuss research topics including bone health, nutrition, energy deficiency and low energy availability, and sports injury research (Farnsworth et al., 2021). Similarly, the Women's Sports Foundation (WSF), founded in 1974, has a goal to "create

new inroads for all genders, inside and outside of sports" and "inspire generations of female athletes and cultivate paths for women to realize their full potential in life, through sport." They achieve this through research funding, advocacy, education, and leadership. They have partnered with over 1,000 champion athletes across the country to help with their mission (Women's Sports Foundation, 2023). A new research program from 2023 by Stanford called Female Athlete Science and Translational Research (FASTR) (Zimmerman, 2023) has similar goals to innovate "ways to improve the health of female athletes of all abilities through athletic participation and performance." They are "committed to addressing the gender gap in sports science research" while focusing on "early identification and intervention of injury" for female athletes (FASTR, 2023). By working with athletes, coaches, and practitioners, these programs can research and educate female athletes on their health.

Solutions

A. Research and Education

Knowledge is priceless, yet with these topics, research is limited, and it needs to be diversified and more inclusive. Although many women are aware of the list of topics, it is rarely discussed in the research and medical field and being aware is the first step to minimize current gender disparities before acting. Having a better understanding of such issues can help target lack of information and misinformation in research to practice beneficence. For example, female athletes can be better educated of their change in energy and mood levels during different times of their cycle, and more research in this relevant area can bring awareness for the mitigation of the issues iron deficiency has on athlete's performance. Increased diversity in research populations can lead to promotion of gender-responsive research practices which consider a woman's unique physiological, biomechanical, and psychosocial factors that influence sports

injury risk and recovery in athletes. Advocacy of more inclusive research methodologies, as a result, as well as data collection strategies will allow for more tailored research and addressing specific topics.

B. Conferences and Discussion

Having better advertisement of current and new conferences and having them be held more frequently can bring awareness of such important issues for female athletes. Less known issues due to lack of discussion can be brought up or discovered in such meetings with experts to specialize medical care, resources, and allow for support systems for female athletes. It can be frustrating to feel alone in these issues that are not discussed or seemingly nonexistent as a female athlete, so support is critical to mitigate the gender disparity. This can be achieved with more athletes speaking from experience so that other athletes have someone to relate to when facing issues. A support system that can be created in a curated and secure app takes athlete information and is a reliable source of information to discuss health related topics. It can have built in access to resources and helpful articles on relevant topics, along with suggestions on what to do with training, depending on what an athlete inputs into the app. For example, if an athlete plays volleyball and runs track and field, she can choose this information in the app and it will curate highlights to consider in terms of training and other aspects important to being a female athlete related to those sports.

Conclusion

Exploring the relation of beneficence to gender disparities, particularly, to women's health will benefit female athletes and pave the way to a more just world that allows women in sports and around the globe to have a better quality of life, equal opportunities, greater freedoms, and a stronger voice and presence in the athletic, research, and medical communities. By

adopting this mindset, increased support and understanding from coaches, medical practitioners, researchers, other athletes, family and friends will allow for breaking the barriers female athletes face physically, mentally, and bring about more equitable environments through inclusive discussion, research, and stronger support systems. The weak research foundation will become more robust, as a result, as there will be an understanding as to why this research is needed and crucial to their physical performance in sports. Studying sex differences in sports will not only benefit women, but all types of athletes. It can improve research on male athletes in terms of their hormones and energy, and sports injuries in such athletes. Furthermore, as transgender, and non-binary athletes are being included in sports more, such research can help them, as well. As they undergo hormone therapy, which is a newer procedure used on humans to achieve their desired goals, more studies are needed to explore hormone therapy on physical and mental health, in relation to athletic performance. While biases and gender disparities in fitness persist in the U.S., progress toward overcoming these obstacles can be made through increased recognition, advocacy, and the utilization of advanced research technologies. Ultimately, our goal is to foster a more equitable society where views on fitness are not constrained by gender.

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