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Review

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Exploring Gender Differences in Sports Participation: Biological and Behavioral Perspectives

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Abstract: This paper examines persistent gender disparities in sports participation in the United States, evaluating whether these differences primarily reflect social and cultural constraints or are better explained by intrinsic biological and behavioral factors. Drawing on decades of participation data, scholarship allocation patterns, and survey evidence, the analysis demonstrates that despite substantial investments and policy interventions such as Title IX, male participation in sports consistently exceeds female participation by significant margins. While cultural factors and historical discrimination have influenced opportunities, evidence suggests that enduring sex differences in interest and motivation contribute substantially to the participation gap. The paper reviews research in evolutionary psychology and endocrinology, highlighting the role of prenatal and pubertal hormone exposure in shaping sex-typical behaviors, preferences for competition, and risk-taking tendencies. These biological influences manifest in consistent cross-cultural patterns of sports engagement and in observed differences in athletic performance and interest. The analysis concludes that the prevailing "substantially proportionate" compliance standard under Title IX is conceptually flawed because it presumes that participation disparities necessarily result from discrimination rather than reflecting natural differences in preferences and aptitudes. Policies prioritizing strict numerical parity risk unintended consequences, including reduced opportunities for male athletes and misallocation of resources. A more effective approach would recognize that genuine equality of opportunity does not require equality of outcomes and that enduring biological and behavioral differences between men and women play a central role in shaping sports participation.

Keywords: Male discrimination; Title IX; Equality of outcomes; Substantially proportionate; Gender sports participation

1. Introduction and Context

Gender disparities in sports participation have persisted despite decades of policy interventions aimed at achieving parity. Title IX, enacted in 1972, was designed to promote equity by eliminating barriers to participation in educational programs, including athletics (although Title IX does **not** mention sports or athletes explicitly). Since its passage, female participation in collegiate sports has increased dramatically – from just 7% in 1972 (Deaner,

et al., 2012) to approximately 44% of all collegiate athletes by 2023 (**Figure 1a**). Khan (Khan, 2021) argues that despite growing opportunities and visibility, athletics is still widely perceived as a masculine domain, discouraging many women from engaging fully. This claim merits further scrutiny.

Men still substantially outnumber women in college sports, despite higher female college enrollment. This persistent gap raises a critical question: Do these disparities result primarily from discrimination and cultural biases, or are they shaped by intrinsic biological and behavioral factors affecting interest and engagement? Clarifying this question is essential for evaluating the effectiveness of equity policies and ensuring that resource allocation reflects genuine preferences rather than assumptions. Misinterpreting the causes of participation gaps risks unintended consequences, such as reducing men's sports opportunities to enforce numerical parity or overlooking women's authentic interests.

As shown in **Figure 1a**, the gender gap in collegiate sports participation stabilized by 1998, with approximately 60,000 more male athletes than female athletes. Even when football[1] athletes are excluded, there remain about 30,000 additional male athletes compared to women – a notable finding given that the number of women's sports has exceeded the number of men's sports since 1997 (**Figure 1b**). Title IX has driven sustained growth in female participation, with collegiate opportunities rising from 16,000 women in 1971-1972 (Acosta, & Carpenter, 2014) to over 230,000 by 2023 (NCAA, 2023). Similarly, girls' high school sports participation increased from 294,015 (boys = 3,666,917) to more than 3,423,517 (boys = 4,638,785) in 2023-2024 (National Federation of State High School Associations, 2024). Despite these gains, participation differences appear to have plateaued, suggesting that structural equality of opportunity does not necessarily translate to numerical equality of participation.

Many authors and advocacy groups attribute persistent disparities primarily to cultural and environmental barriers. For example, the Government Accountability Office (GAO) argued in 2024 that unequal participation must be due to inadequate enforcement of Title IX [3]. Studies by Bowes et al. (Bowes, Lomax, & Piasecki, 2021), Fang et al. (Fang, Sun, Shi, Laar, & Lu, 2022), Torkfar et al. (Torkfar, Shirazinejad, & Jahromi, 2017), Yu et al. (Yu, Liaw, & Barnd, 2004), and Hopkins et al. (Hopkins, Hopkins, Kanny, & Watson, 2022) contend that societal expectations, limited resources, and traditional gender norms remain the dominant factors limiting women's engagement. While these factors may influence participation to some extent, this perspective is overly narrow and fails to account for substantial biological evidence to the contrary. Women's sports participation is not as limited as these papers suggest, and alternative factors, including personal interest and intrinsic motivation, offer a more nuanced explanation for observed trends.

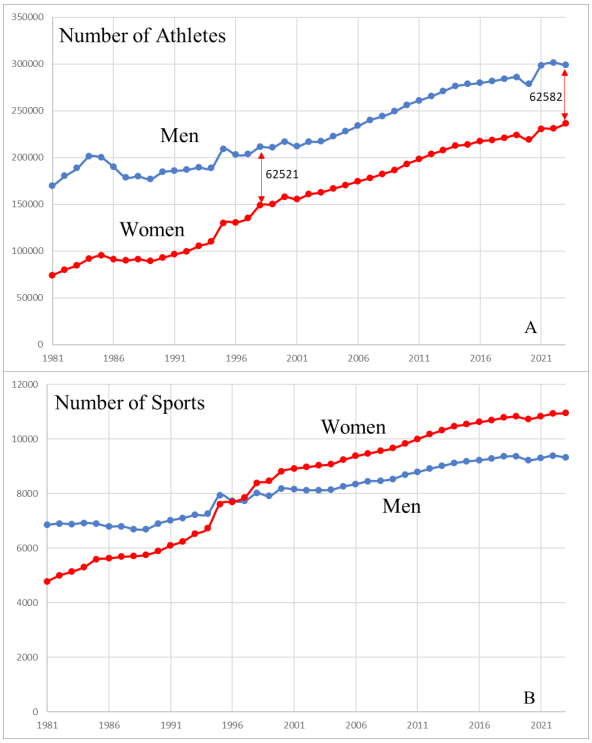

Figure 1. A graph by year of the number of men and women participating in college sports (A) and the number of sports by gender (B) – data from (National Collegiate Athletic Association, 2024). Note the consistent difference beginning about 1998.

2. Data and Methodological Approach

The impetus for this analysis builds partly on the work of Deaner et al. [12], who argued from an evolutionary perspective that men and women differ in their baseline interest and motivation toward sports. This paper

[1] To avoid confusion, whenever I use the term football it will refer to American football not soccer.

affirms their conclusion, but advances the discussion in three key ways: first, by updating the relevant empirical trends through 2024 (adding almost a decade of new data), second, by drawing out the policy consequences that have emerged from institutions pursuing equality of outcomes despite persistent "evolutionary" differences in interest, and third by emphasizing that the US government continues to view the disparities between men and women athletes as resulting from discrimination with dire consequences for male athletes.

While Deaner et al. (Deaner, Balish, & Lombardo, 2016) focused on documenting psychological and evolutionary underpinnings of sex differences in sports motivation, this paper examines how those enduring differences have interacted with legal mandates – especially Title IX – to shape participation trends, resource allocation, and opportunities for male and female athletes. Using Olympic medal data, NCAA scholarship figures, and participation rates at both the collegiate and high school levels, this paper shows that although female participation remains consistently below male participation, women have increasingly secured a larger proportion of sports medals and funding than their participation rates justify. These outcomes raise serious questions about whether rigid compliance models based on numerical parity – rather than actual interest – have led to unintended discrimination, against male athletes.

Rather than revisiting the question of whether sex differences in sports interest exist, this paper takes their persistence as a starting point and asks a new, policy-relevant question: What are the consequences of ignoring those differences in the design and enforcement of equity rules? The paper documents that the difference in participation rates men and women plateaued decades ago (**Figure 1**) and have shown no meaningful convergence since, even as regulatory frameworks continue to mandate parity. The result has been a measurable reallocation of athletic opportunities and resources – from male athletes to female programs – despite unequal levels of interest or demand. This dynamic was largely absent from Deaner et al.'s (Deaner, Balish, & Lombardo, 2016) review and deserves renewed attention now, especially as institutions face ongoing pressure to meet proportionality benchmarks that do not align with behavioral realities. In this way, the paper updates the empirical landscape and extends the discussion into the legal and policy domain, offering a complementary but distinctly new contribution to the literature on sex differences in sports.

3. Evidence for Intrinsic Differences in Interest and Motivation

The view that cultural constraints are the sole cause of disparity overlooks substantial evidence indicating enduring differences in interest and motivation. Deaner et al. (Deaner, et al., 2012) conducted an examination across three studies showing that women consistently comprise a minority of sports participants – even in less-structured contexts. The first study utilized the American Time Use Survey, analyzing data from 112,000 individuals aged 15 and older. The analysis revealed that women made up only 24% of participants in individual sports and 20% in team sports. The second study involved direct observation of 2,879 individuals engaged in exercise and sports activities at public parks in four U.S. cities. They found that women represented 19% of participants in individual sports and merely 10% in team sports. The third study examined intramural sports registrations at 34 colleges and universities across the United States, where women accounted for only 26% of registrants.

Additional research underscores this gap. For example, surveys indicate only 19% of U.S. women identify as avid sports fans compared to 48% of men (Gavora J. , 2002). A 2023 Pew Research study reported that men are about three times as likely to describe themselves as "superfans," (Hatfield & van Green, 2023) while an AP survey found about two-thirds of male fans frequently or occasionally attend sporting events in person, compared to about roughly half of female fans (Sweedler, 2025).

Recent campus studies confirm similar trends. At SUNY Cortland, over 66% of intramural participants were male (D'Alessandro, 2021); at Western Oregon University, the figure was over 68% (Wong , 2018); and at Oklahoma State University, 59% (Linsenmeyer, 2017). Even efforts to mandate gender balance have not fully closed the gap: some universities, like Yale, had difficulty in finding enough women to satisfy the quotas implemented to boost female intramural participation, reportedly leading to peer pressure on

women to join teams despite lack of interest (Hopson, 2022). Nationally, a 2020 study involving over 3,000 children and adolescents found that 43.1% of girls had never participated in sports, compared to 34.5% of boys (Bifulco, 2020). Together, these findings suggest that intrinsic preferences, not simply external constraints, play a substantial role in shaping sports participation.

4. Resource Allocation, Scholarship Patterns, and Participation

Financial data consistently demonstrate that nearly all market-driven revenue in college athletics is overwhelmingly concentrated in men's sports, especially football and men's basketball. According to the Knight Commission on Intercollegiate Athletics, approximately 75% of all athletic revenue comes solely from football and another 15% from men's basketball, leaving only about 10% combined for all other sports, including women's programs (D'Addona, 2025). This finding is reinforced by the National Bureau of Economic Research, which reported that most generated income flows directly from football and men's basketball and that these sports effectively subsidize nearly every other athletic program on campus (Garthwaite, Keener, Notowidigdo, & Ozminkoski, 2020). The USA Today NCAA Finances Database, which compiles financial disclosures from hundreds of public universities, shows that the majority of women's teams and non-revenue men's sports operate at a financial deficit (Ordway, 2020). The lack of funding helps explain why some universities cut men's sports to decrease the gender gap. Even in NCAA Division I as a whole, only a small subset of men's sports (primarily football and men's basketball) consistently produce substantial market-driven revenue, while most women's sports generate relatively modest income despite the expansion of opportunities under Title IX (Ordway, 2020). This pattern underscores the structural reality that the financial engine of college athletics remains deeply rooted in a handful of men's revenue sports, which in turn shapes how resources are distributed. The substantial differences in revenue generation also suggest comparatively lower levels of consumer demand for women's sports, which may, at least in part, reflect the differing levels of interest in sports participation and viewership between men and women.

Disparities in funding have also fueled debate. Some argue that unequal scholarship distribution contributes to participation gaps. For example, the Women's Sports Foundation reports that "NCAA institutions across all divisions continue to offer higher rates of athletic opportunities to male athletes" (Women's Sports Foundation, 2022). This claim is accurate if football is included. As shown in Table 1, when football is counted, men receive more scholarships and funding. However, this is misleading without context: football alone accounts for a large share of men's scholarships. When football is excluded, women actually receive substantially more scholarships – 74,500 compared to 50,500 for men – to maintain proportionality with participation rates. Many institutions have added women's teams specifically to balance large football rosters (**Figure 1b**). Critics argue that requiring equal scholarship distribution regardless of demand effectively penalizes men for participating in football, as schools must potentially eliminate male sports or create additional women's programs even when comparable interest does not exist (Anderson & Cheslock, 2004).

Table 1. NCAA athletic scholarships and funding by gender (2019–2020 and 2021–2022 academic years) (U.S. Government Accountability Office (GAO), 2024) (NCAA, 2022) (Women's Sports Foundation, 2022) (NCAA, 2022).

Category	Including Football	Excluding Football
Men's Scholarships	77,500	50,500
Women's Scholarships	74,500	74,500
Men's Funding ($ Million)	2,226	1,450
Women's Funding ($ Million)	1,974	1,974

A further counterpoint to the cultural-barrier explanation comes from evidence that schools frequently struggle to fill women's rosters. Investigations by the *New York Times* revealed cases where more than half of listed athletes never participated (New York Times, 2011). At the University of South Florida, over half of

the 71 women listed on the cross-country roster never ran a single race. Some women didn't even realize they were officially on the team, indicating they were included just to pad numbers. Marshall University's tennis team recruited unskilled players purely to boost numbers, and Texas A&M's women's basketball roster included 14 male practice players (Graney, 2011) (Women in Academia Report, 2022). These practices, often exploiting regulatory loopholes, suggest that interest is not sufficient to sustain rosters without artificial inflation.

Other examples further illustrate the challenge. Averett University suspended its women's lacrosse program in 2025 due to lack of players, having previously shut it down for the same reason in 2007 through 2017 (Averett University Athletics Press Release, 2025). Women's rowing teams often recruit novice athletes to meet participation targets; the University of Wisconsin's roster reportedly reached 170 women, many without prior experience (Steinbach, 2002) (Women in Academia Report, 2022). Similarly, approximately 200 women's golf scholarships remain unclaimed each year simply because too few qualified female golfers exist (Talarico, 2017).

Hopkins et al. (Hopkins, Hopkins, Kanny, & Watson, 2022) reviewed 36 peer-reviewed, quantitative studies from 1976 to 2020, focusing on adolescent girls across diverse regions (e.g., Europe, North America, Asia, Australia), finding that girls drop out of sports at higher rates and earlier ages than boys, often by age 11. Retention hinges on personal factors like enjoyment, perceived competence, and social support, suggesting intrinsic preferences significantly influence participation beyond external barriers.

One key observation made by Anderson and Cheslock (Anderson & Cheslock, 2004) was that some institutions were willing and financially able to add women's teams but nonetheless found it impossible to fill roster slots due to insufficient interest among undergraduate women. In these circumstances, if an institution felt compelled to pursue compliance via proportionality rather than demonstrating accommodation of female interest, it was effectively forced to reduce opportunities for men in order to narrow the proportionality gap. The authors conclude that, while expanding women's participation has been the primary mechanism for compliance, the combination of fixed budgets, limited female interest in certain sports, and proportionality enforcement has resulted in unintended cuts to men's teams in some cases.

Schools are allowed by the Department of Education to count an athlete multiple times if they play more than one sport. Many universities exploit this by encouraging women to join multiple teams or by simply reporting multi-sport athletes in each sport's tally. Analysis of 107 schools showed that colleges "created" 2,252 women's roster spots by double- or triple-counting athletes in 2018–19 (Antonucci, 2022). A common example is in cross-country/track: the same female runner is counted separately for cross-country, indoor track, and outdoor track – yielding three participation credits for one woman. This inflates the female athlete count (helping meet proportionality) without actually increasing the number of individual women playing. The result is a paper compliance that doesn't reflect true expansion of opportunities.

Although not always publicized, another technique is to set maximum roster sizes for men's teams (particularly walk-ons) to prevent men's participation from exceeding the proportionality target. For example, a university might limit its baseball or cross-country team to a certain number of athletes even if more men are willing to participate, solely to keep the gender ratio in line. The University of Maryland's wrestling roster scenario (limiting walk-ons) is a case in point (Leung, 2003). Likewise, some football programs that could carry 120+ players (when including walk-ons) have been known to cap their roster around 100. Each man not on the roster is one less number counting against Title IX proportionality. The harm to male athletes here is that some are denied even the chance to be an unfunded walk-on if the roster is artificially capped. In essence, opportunities for men are quietly curtailed to avoid more drastic cuts.

A 1997 NCAA gender equity study showed that more than 200 men's teams and 20,000 male athletes disappeared from the ranks of America's colleges between 1992 and 1997. A 1999 study by the GAO found that men's opportunities had declined by 12% since 1985. Meanwhile, during the same period, the number of boys playing high school sports increased by about 400,000 (Gavora J. , 2002) (Gavora J. , 2001)." In other words, universities reduced opportunities

for male athletes and discontinued certain sports programs to achieve gender parity while avoiding increases in tuition and expenses – an unintended but obvious consequence of efforts to promote equity. An interesting question for further research arises: how many more male than female athletes would be participating in sports today if universities would not have made financial cuts to male sports?

These findings collectively underscore substantial sex differences in sports participation, suggesting that organized collegiate sports data may not fully reflect broader trends – that is, female interest in sports is significantly lower than male interest. Deaner et al. (Deaner, et al., 2012) concluded as far back as 2012 that "…our results do suggest that it may be a mistake to base Title IX implementation on the assumption that males and females have, or soon will have, generally equal sports interest." **Figure 1a** emphasizes that the disparity continues through 2024.

5. Broader International Comparisons U.S. Investment

While some argue that gender disparities in collegiate sports participation are primarily due to cultural sexism, broader international performance trends complicate this narrative. For example, since the 2004 Olympics, U.S. women have consistently matched or surpassed men in medal counts (**Table 2**)[2]. Although Olympic results are influenced by multiple pathways – collegiate athletics, club systems, and professional training – data show that approximately 75% of Team USA athletes have competed collegiately at some point (McGuire, 2024). This sustained international success suggests that when structured developmental opportunities exist and cultural acceptance of women's sport is high, female athletes can achieve parity or even superiority in competitive outcomes[3].

Table 2. Number of medals won by US men and women and the total participation by men and women in the summer Olympics since 1936[4].

	Total medals			Participation	
	Men	Women	Percent difference (women)	Men	Women
1936	54	12	18.2	277	52
1948	61	27	30.7	270	65
1952	64	26	28.9	255	111
1956	59	30	33.7	218	63
1960	58	30	34.1	246	87
1964	66	43	39.4	255	82
1968	80	45	36.0	297	96
1972	69	53	43.4	309	107
1976	35	37	51.4	262	120
1980	0 (Boycotted)	0 (Boycotted)		0 (Boycotted)	0 (Boycotted)
1984	105	84	44.4	340	213
1988	51	40	44.0	341	233
1992	71	54	43.2	355	259
1996	65	60	48.0	419	291
2000	64	63	49.6	381	257
2004	57	64	52.9	311	276
2008	56	59	51.3	302	286

[2] The medal counts prior to 2024 were skewed toward men because there were more men's sports. However, in the 2024 Olympics equity in the number of sports was achieved demonstrating that women won 53.6 percent of an equal number of medals awarded. In fact, in 2024 there were more women participants in the Olympics than men.

[3] It should be noted that some may argue the US women's medal count simply reflects limited opportunities for female athletes in other countries. However, the participation figures in **Table 2** increase alongside the rising medal counts, suggesting that women's involvement has reached parity with men—or even surpassed it in some cases.

[4] Data gathered from Wikipedia.

Continuation Table:

	Total medals			Participation	
	Men	Women	Percent difference (women)	Men	Women
2012	46	58	55.8	261	268
2016	46	61	57.0	264	294
2021	47	66	58.4	284	329
2024	58	67	53.6	284	300

Soccer offers an unusually clear lens for evaluating the effects of Title IX because it is one of the few globally contested sports where both men and women have widespread participation opportunities, but only the women's program in the U.S. has achieved sustained international dominance. Unlike niche Olympic events or less globally popular sports, soccer's universality and visibility make its divergence across genders particularly striking. The contrasting outcomes of the U.S. men's and women's national teams – despite access to the same sport and governing body – highlight how structural investment and institutional priorities can shape long-term competitive trajectories. As such, soccer is not an outlier but a telling case study of what happens when policy-driven opportunity meets unequal interest and strategic support.

In soccer, the U.S. Women's National Team (USWNT) has consistently ranked among the world's best, winning four of nine FIFA Women's World Cups, while the men have never finished in the top five. By contrast, the U.S. Men's National Team (USMNT) has had limited success on the global stage (**Table 3**). In fact, the men have never placed in the top five (**Table 3**), and the men have never advanced beyond the quarterfinals of a World Cup in the modern era (their last and only semifinal appearance was in the inaugural 1930 tournament). This divergence in success offers a compelling example-case study of how deliberate investment in women's sports, driven by Title IX, helped create a powerhouse program on the women's side even as the men's program lagged. This disparity in outcomes between the women's and men's programs is striking, and it prompts an examination of the structural factors – particularly investment and support – that have enabled the women's team to excel while leaving the men's team to compete in relative obscurity.

Table 3. Top five countries in each FIFA World Cup for both men and women since 1990[5].

Men	First	Second	Third	Fourth	Fifth^
2022	Argentina	France	Croatia	Morocco	Brazil
2018	France	Croatia	Belgium	England	Brazil
2014	Germany	Argentina	Netherlands	Brazil	Columbia
2010	Spain	Netherlands	Germany	Uruguay	Argentina
2006	Italy	France	Germany	Portugal	Brazil
2002	Brazil	Germany	Turkey	South Korea	Spain
1998	France	Brazil	Netherlands	Croatia	Italy
1994	Brazil	Italy	Sweden	Bulgaria	Germany
1990	West Germany	Argentina	Italy	England	Brazil

Women	First	Second	Third	Fourth	Fifth^
2023	Spain	England	Sweden	Australia	Japan
2019	United States	Netherlands	Sweden	England	Germany
2015	United States	Japan	England	Germany	France
2011	Japan	United States	Sweden	France	Brazil
2007	Germany	Brazil	United States	Norway	China

[5] Data gathered from Wikipedia

Continuation Table:

Women	First	Second	Third	Fourth	Fifth^
2003	Germany	Sweden	United States	Canada	Brazil
1999	United States	China	Brazil	Norway	Germany
1995	Norway	Germany	United States	China	Sweden
1991*	United States	Norway	Sweden	Germany	China

^Fifth place is not officially recognized
*Women's World Cup began in 1991

Women's soccer is a major beneficiary of Title IX, rapidly growing in the collegiate system. For example, the NCAA held its first women's soccer championship in 1982 (a 12-team tournament), which was won by the University of North Carolina; UNC's program went on to dominate, winning 16 of the first 19 national titles. Such collegiate powerhouses became the pipeline for the national team: indeed, the first U.S. Women's World Cup squad in 1991 was essentially an all-star college lineup, heavily drawn from UNC and other Title IX-fueled programs.

The impact of this investment is evident in participation numbers. Female involvement in American soccer exploded after Title IX. In 1971, only a few hundred girls played high school soccer, but by 2019 there were nearly 400,000 girls competing in high school soccer – a meteoric rise in the talent pool (Fayaz, 2023). This boom in girls' and women's participation, backed by funding and institutional support, gave the U.S. a competitive advantage in assembling a deep roster of elite female players. In short, Title IX created a virtuous cycle: more opportunities and resources for girls led to greater participation, which in turn produced more top-tier athletes for collegiate and national teams.

The enormous size of college football rosters (with 85 scholarships) historically skewed scholarship distributions, forcing many schools to scale back smaller men's sports to comply with Title IX mandates. Men's soccer in particular was sometimes a casualty of these adjustments – for instance, the University of New Mexico's athletic director acknowledged Title IX as a "driving force" when the school eliminated its men's soccer program (along with some other sports) in 2018. From 1990 to 2020, the seven sports with the highest growth in participation have all been women's sports, whereas the six sports showing the least growth were all men's. Such reallocation of resources was a conscious strategy to expand women's athletics (Dellenger & Forde , 2023). The result was that women's soccer received robust support in the U.S., even as the men's soccer program remained an afterthought in many institutions.

Although Lowen et al. (Lowen, Deaner, & Schmitt, 2014) have been cited as evidence that women's empowerment explains women's Olympic success, their own statistical results actually complicate the claim. In their linear Tobit regressions (Table 5), the coefficient linking the Gender Inequality Index (GII) to medal counts is nearly identical for men (−0.116, $t = -3.03$ $p < 0.01$) and women (−0.136, $t = -3.54$ $p < 0.01$). If gender inequality were a uniquely female constraint, we would expect a much steeper negative slope for women and little or no effect for men[6]. The fact that both sexes show the same pattern implies that GII captures broad national development – income, health, education, and institutional quality – rather than women's empowerment per se. In other words, GII functions largely as a proxy for overall modernization: richer, better-governed countries win more medals across the board. Consequently, Lowen et al.'s interpretation – that their findings demonstrate a causal link between female empowerment and female athletic success – rests on an index that is confounded with general prosperity and cannot isolate the independent effect of gender equity.

Figure 2 in Lowen et al. (Lowen, Deaner, & Schmitt, 2014) shows each nation's percentage of Olympic athletes who are female against its Gender Inequality Index (GII) for the 1996–2012 Summer Games. Most countries cluster along a weak downward-sloping line: as gender inequality rises, the proportion of female athletes falls. The hollow square representing the United States stands well above that line, indicating

[6] If gender inequality were uniquely harmful to women, we'd expect the line for women to fall much faster – that is, to have a much larger negative coefficient – than the line for men.

thatAmerican women won medals and participated atrates far higher than thecountry's GII score would predict. In other words, U.S. women outperformed nearly every other nation's female athletes during that period. Updated medal data presented in **Table 2** show that this advantage has only widened in recent Olympics – women's medal totals have continued to rise while men's have declined slightly. In fact, in the Olympics since Lowen et al. did their work (2016, 2020, and 2024), US women have won 56% of the medals compared with men (even in years prior to 2024 when there were less women sports). This trend is particularly striking given that women still participate in organized college athletics at substantially lower rates than men. That disparity means the United States now produces disproportionately more female medalists from a smaller pool of participants – a pattern best explained by Title IX's institutional incentives and concentrated resource investment rather than by general "women's empowerment." Rather than showing that gender equality universally boosts women's performance, the evidence suggests that targeted policy and funding shifts can reallocate competitive success toward women while leaving men's outcomes stagnant or diminished. The details related to the disparities between men's and women's soccer substantiate this conclusion, as the United States' deliberate investment in women's programs has created sustained female dominance internationally while its men's program has lagged.

Collectively, these findings indicate that while discrimination and cultural barriers have historically shaped sports access, intrinsic differences in interest and motivation also substantially contribute to persistent disparities. Decades of robust policy interventions and significant resource allocation have closed much, if not all of the opportunity gap. Yet participation has stabilized well below parity (**Figure 1a**), suggesting limits to how much policy alone can drive equality in outcomes. Moreover, maintaining proportionality requirements in the face of unequal demand has produced unintended effects: unfilled rosters, the cutting of men's teams, and large-scale resource redistribution away from popular men's sports. To ensure fairness and sustainability, future policies should recognize both structural and personal factors that shape athletic engagement.

6. Biological and Behavioral Differences in Sports Participation: An Evolutionary and Hormonal Perspective

Social constructionist theorists argue that gender disparities in sports participation stem largely from socialization, cultural norms, and expectations rather than innate differences. They argue that historically, sports have been framed as a male domain, leading men to perceive greater aptitude for athletics and to attach higher importance to sporting pursuits than women (Mahfuzur & Khan, 2021). From childhood, boys often receive more encouragement to engage in competitive physical activity, whereas girls frequently encounter stereotypes (e.g., that females are "weak-minded" or "not fit" for athletics) that can dampen their sports interest. When individuals defy traditional gender norms – for example, when women excel in sports culturally labeled as masculine – they may face ridicule or social sanctions (Mahfuzur & Khan, 2021). Over time, such gendered socialization and media messaging can foster internalized beliefs that sports "are not meant" for women or gender-nonconforming individuals, contributing to lower female participation rates as many are dissuaded from athletic involvement (Gender Marginalization in Sports Participation through Advertising: The Case of Nike, 2021). In this view, observed sex differences in sports are a byproduct of persistent gender-role stereotypes and inequitable opportunities, not biological traits (Defant, The biological reality of sex and gender: Challenging social constructionism, 2026).

Critics from philosophy and psychology note that if "gender is only a product of society," this may imply there are no objective truths about gender at all – only culturally contingent views. Boghossian (Boghossian, 2006) argues that extreme constructivist stances make it impossible to say any claim about gender is more factually correct than another. He agrees with Hacking's (Hacking, 1999) observation that many scholars embrace "gender is a social construct" for its liberating political promise – if society created gender differences, society can change them – but warns that this stance taken too far "is essentially similar to cultural relativism" about truth. In the context of gender studies, such relativism might manifest as denying any biological or cross-cultural patterns without replacement criteria for truth, leaving research

conclusions in question (Boghossian, 2006).

The central issue is that social construction appears to have been introduced as a counter to evolutionary psychology, which is often viewed as deterministic (Defant, Evolutionary Psychology and the Crisis of Empirical Rigor in Feminist Studies, 2025). However, describing human evolution as deterministic is only true if we allow it to be[7]. Upon reviewing the literature, I find very little empirical support for social construction that evolutionary psychology does not explain more effectively. If society wields such a profound influence on our behavior, why do men and women develop same-sex attractions? Historically, being gay has resulted in societal ostracism or even imprisonment. In this sense, homosexuality seems to run counter to the idea of social construction. Additionally, why did experiments in the 1960s fail to convert gay men and women into heterosexuals (Defant, Evolutionary Basis of Gender Dynamics: Understanding Patriarchy, the Pay Gap, and the Glass Ceiling, 2025)? While the origin of homosexual behavior is not fully understood, most scholars believe it is partly genetic and arises from biological processes in the brain and during prenatal development (genetic (Kendler, Thornton, Gilman, & Kessler, 2000) (Ganna, Verweij, Nivard, Maier, & al., 2019); brain structure (LeVay, 2017) (Savic & Lindström, 2008); prenatal hormonal and developmental factors (Meyer-Bahlburg, Dolezal, Baker, & New, 2008) (Bogaert & Skorska, 2011)). The major challenge to social constructionism is the undeniable impact of hormones on behavior. No one has yet been able to explain how societal influence could regulate hormone levels during fetal development or throughout puberty. In stark contrast, evolutionary psychology explains the impact and development of hormones exceptionally well.

A growing body of research in evolutionary psychology and endocrinology offers a biologically grounded explanation for why sex differences in sports interest and participation persist. A significant amount of research has been done on biological and behavioral differences between males and females. A brief review of the literature is important to establish these differences. To summarize, Deaner et al. (Deaner, Balish, & Lombardo, 2016) conducted a comprehensive review of scientific literature and concluded that men and boys exhibit significantly greater interest in sports than women and girls, "both in terms of participation and spectating" as noted in studies referenced earlier. Men are also more inclined to engage in high-risk sports such as rock climbing, skiing, and snowboarding (Llewellyn & Sanchez, 2008) (Ružic & Tudor, 2011) (Thomson & Carlson, 2015). Beyond heightened interest, males generally show greater motivation and competitiveness than females in both sports and other domains (e.g., (Croson & Gneezy, 2009) (Gill & Kamphoff, 2010)), particularly in efforts to improve athletic performance (Deaner R. , Distance running as an ideal domain for showing a sex difference in competitiveness, 2006) (Deaner R. , More males run fast: A stable sex difference in competitiveness in U.S. distance runners, 2013). Evolutionary psychologists support these findings by demonstrating consistent sex differences across diverse cultural contexts, indicating that these patterns are not solely products of societal or cultural influences. Indeed, significant sex differences were observed in all 50 countries included in studies (Apostolou, The athlete and the spectator inside the man: A cross-cultural investigation of the evolutionary origins of athletic behavior, 2014) (Apostolou, The evolution of sports: Age-cohort effects in sports participation, 2015) (Deaner & Smith, Sex differences in sports across 50 societies, 2013). If gender is constructed by society and culture, why do all cultures consistently show similar sex differences between men and women? This question is rhetorical. The answer lies in hormones, which underpin these behavioral differences, showing that biology, not society, is the ultimate arbiter of gendered behavior. Most of us recognize that there are physical differences between men and women. Why has it become so controversial in the social sciences to assume there are also behavioral differences? These physical and behavioral differences are what attract us to the opposite sex – nature's way of ensuring reproduction.

Over recent decades, scientists have gained significant insight into fetal development, particularly the role of sex-determining genes and hormones. Around the sixth week of pregnancy, the presence of the SRY gene on

[7] For example, while physical differences have evolved between men and women via sexual selection, society has increasingly removed barriers that once discouraged women from entering many occupations. Police and fire departments are prime examples of fields that were largely closed to women throughout the last century.

the Y-chromosome initiates the formation of testicles in males (XY), while in females (XX), the absence of this gene leads to the development of ovaries. Between weeks 6 and 12, the production of testosterone and its conversion into dihydrotestosterone are critical for forming male reproductive organs, including the penis, prostate, and scrotum. In contrast, female reproductive organs develop in the absence of androgens – male sex hormones. Following the formation of genitalia, sex hormones such as testosterone, estrogen, and progesterone, under the direction of specific genes, begin to differentiate the developing brain. Changes occurring at this stage are permanent, establishing structural and functional foundations that remain throughout life [30].

Two critical periods further influence this process, during which testosterone levels in boys reach notable peaks. The first surge occurs in mid-pregnancy, peaking between weeks 12 and 18 and again between weeks 34 and 41, when testosterone levels in boys are roughly ten times those in girls. The second surge takes place within the first three months after birth, when testosterone levels in boys reach adult-like concentrations. These surges of testosterone, coupled with active steroid receptors, are thought to shape and organize brain structures and circuits in enduring ways, producing lasting effects that are reactivated by sex hormones during puberty (Garcia-Falgueras & Swaab, 2010). In fact, testosterone and its derivative hormones generally impact the structure of the mammalian brain (Hines, Neuroscience and Sex/Gender: Looking Back and Forward, 2020). Garcia-Falgueras and Swaab (Garcia-Falgueras & Swaab, 2010) specifically emphasizes that social construction has no impact on these results: “there is no evidence that external or social events might modify these processes.”

These surges not only begin to create the physical differences between men and women but also the behavioral differences – i.e., hormones are one of the primary biological influences that impact behavior and preferences, particularly regarding career decisions and workplace dynamics (i.e., gender traits). Testosterone and other androgens have been linked to behaviors associated with competitiveness, assertiveness, and risk-taking. Research by Archer (Archer, 2006) showed that testosterone levels are strongly correlated with a willingness to engage in competitive and high-stress situations such as sports, which aligns with men’s greater likelihood of participating in sports and pursuing careers in fields such as finance, engineering, and technology. Evidence from economists and psychologists, including many women, supports the observation that women tend to choose less high-risk competitive fields in these disciplines (e.g., (Eagly & Wood, 1999) (Stoet & Geary, 2018) (Blau & Kahn, 2017) (Goldin, 2014)).

On the other hand, estrogen and oxytocin, which are present in higher levels in women, have been associated with nurturing behaviors, social bonding, and a preference for cooperative environments. This hormonal profile aligns with women’s tendency to gravitate toward careers that emphasize collaboration and caregiving, such as education, healthcare, and social work (Wood & Eagly, 2002). These fields often provide work environments that value empathy, patience, and interpersonal skills – traits that have historically supported child-rearing and community cohesion.

Masculinity and femininity are the results of the existence or absence (respectively) in androgens (e.g., testosterone) after fetal genital development and again at puberty (LeVay, 2017). Men have about 10 to 20 times more testosterone in their bodies than women. For the same reasons men are larger and stronger than women on average, men are also more competitive and aggressive (i.e., masculine). The fact that men, in general, are exceedingly more violent and commit more violent crimes than women emphasizes these gender behavioral differences (Daly & Wilson, 1988). Likewise, femininity affects the behavior of women. Extensive economic research, including studies conducted by female economists, indicates that the gender pay gap largely stems from women's higher risk aversion and preference for occupations offering flexible hours, often to accommodate family responsibilities. This tendency leads many women to opt out of highly competitive job environments, contributing to observed wage disparities (Blau & Kahn, 2017) (Goldin, 2014) (Oberlin, 2023).

A substantial body of research has established that sex hormones play a critical role in shaping male- and female-typical behaviors across development and adulthood. Testosterone is consistently linked to dominance, competition, and aggression, particularly

in social contexts where status is contested (Wingfield, Hegner, Dufty Jr., & Ball, 1990) (Archer, 2006) (Mazur & Booth, 1998) (Sapolsky, 1997). Higher testosterone levels are also associated with risk-taking, assertiveness, and greater sexual motivation (Dabbs & Dabbs, 2000). These influences begin early: prenatal testosterone exposure has been shown to predict male-typical interests and lower empathy (Auyeung, Lombardo, & Baron-Cohen, 2013). In contrast, estrogen contributes to traits more often characterized as feminine, such as enhanced verbal memory, emotional regulation, and affiliative behavior (Sherwin, 2012) (Hampson, 1990) (Nelson, 2011). Fluctuations in estrogen across the menstrual cycle can further influence cognitive performance and mood (Hampson, 1990). Together, these hormonal effects help explain why, on average, men tend to exhibit higher motivation for competitive and physically aggressive pursuits, while women more frequently display social and verbal competencies – differences that may contribute to sex disparities observed in sport participation and related domains.

Males have physical advantages in sports and benefit from hormonally influenced brain differences that enhance athletic performance through traits like motivation and competitiveness (Clark, et al., 2019) (Hilton & Lundberg, 2020) (Handelsman, Hirschberg, & Bermon, 2018) (Handelsman D. , 2024). For example, Hines (Hines, Human gender developmen, 2020) concludes: "There is consistent evidence that early testosterone exposure influences childhood gender role behavior, including sex-typical toy play, as well as gender identity and sexual orientation." Clearly, hormones are biological, not social. Therefore, the hormonal differences observed between genders must have evolved, driven by natural selection. These characteristics evolved because masculine and feminine behaviors were attractive to the opposite sex, thereby increasing reproductive success and promoting the propagation of our species.

Research consistently finds that individuals exposed to unusual prenatal levels of testosterone or other androgens – whether due to genetic conditions or maternal hormone prescriptions during pregnancy – are more likely to exhibit male-typical play behaviors in childhood, shifts in sexual orientation and gender identity, and a greater propensity for physical aggression (Hines, Constantinescu, & Spencer, Early androgen exposure and human gender development, 2015) (Hines, Neuroscience and Sex/Gender: Looking Back and Forward, 2020). One of the most compelling lines of evidence for the influence of prenatal androgen exposure on human gender development comes from studies of gender-typical play behaviors in children. Girls with congenital adrenal hyperplasia (CAH), a genetic condition that leads to higher androgen levels before birth, tend to show stronger preferences for male toys (e.g., trucks, soldiers, etc.), male peers, and other activities typically associated with boys (Hines, Gender development and the human brain, 2011) (Hines, Constantinescu, & Spencer, Early androgen exposure and human gender development, 2015) (Hines, Neuroscience and Sex/Gender: Looking Back and Forward, 2020) – that is, masculine characteristics and behaviors. Research also shows that when mothers were given androgenic progestins during pregnancy, their healthy female children displayed more behaviors typical of male play patterns. Conversely, female children whose mothers received antiandrogenic hormones tended to engage less in these male-associated play activities (Ehrhardt & Money, Progestin-induced hermaphroditism: IQ and psychosexual identity in a study of ten girls, 1967) (Ehrhardt, Meyer-Bahlburg, Feldman, & Ince , 1984) (Ehrhardt, Grisanti, & Meyer-Bahlburg, Prenatal exposure to medroxyprogesterone acetate (MPA) in girls, 1977) (Meyer-Bahlburg, Grisanti, & Ehrhardt, 1977) (Hines, Constantinescu, & Spencer, Early androgen exposure and human gender development, 2015) (Hines, Neuroscience and Sex/Gender: Looking Back and Forward, 2020).

The impact of androgens on performance is so pronounced that athletes have misused them to enhance their performance since the 1950s. In fact, exogenous androgen has been banned in most competitive sports (Ruth & Stanton , 2012). The misuse of these substances has been shown to boost athletic abilities in both men and women, with some cases documented as part of systematic programs, as evidenced by disclosed records from studies conducted by sports scientists in the former East Germany (Bermon & Garnier, 2017) (Franke & Berendonk, 1997). After the 1972 Olympics, the East German scientists concluded that "the effects of the treatment with androgenic hormones were so

spectacular, *particular in female athletes* in strength dependent events, that few competitors not using the drugs had a chance of winning". Illegal androgen doping among male and female athletes continues to be a problem in various sporting events (Bermon & Garnier, 2017).

Some research indicates that elevated natural androgen levels, such as testosterone, confer substantial advantages to elite female athletes. For instance, studies reveal that female athletes with higher levels of free testosterone (fT) significantly outperform those with lower levels in events like the 400-meter dash, 400-meter hurdles, 800-meter run, hammer throw, and pole vault (Bermon & Garnier, 2017). Further studies have linked serum testosterone levels, an inherited characteristic, to competitive advantage in female sprinters, supporting the idea that testosterone levels play a decisive role in athletic performance (Ahmetov, et al., 2020). Additionally, comparisons of free testosterone and cortisol concentrations between elite and non-elite female athletes found that elite performers typically have higher levels of both. These elevated hormone levels are believed to enhance physical performance and endurance (higher work rates), aligning with the high demands of competitive sports (Cook, Crewther, & Smith, Comparison of Baseline Free Testosterone and Cortisol Concentrations Between Elite and Non-Elite Female Athletes, 2012). Moreover, research by Wood and Stanton (Wood & Stanton, 2012) emphasizes that testosterone provides competitive advantages in women not only through its "long-term anabolic actions" such as muscle-building effects but also by impacting behavior and drive in a short timeframe. Higher levels of dihydrotestosterone, a potent testosterone derivative, have also been correlated with greater training volume among female athletes, reflecting an increased capacity to train intensively (Cook, et al., 2021). Other studies found that salivary testosterone (sal-T) is strongly linked to competitiveness, especially in high-performing female athletes, further highlighting the hormone's influence on athletic success (Crewther & Cook, 2019)[8].

[8] It is interesting to note that women's sports have a higher visibility of openly LGBTQ+ athletes compared with men's sports (e.g., Willis et al. (Willis, Awrang Zeb, Haydel, & etc., 2022)). The differences may be related to elevated free testosterone in some female athletes (e.g., (Harris, Bewley, & Mead, 2020).

In evolutionary psychology, there is broad consensus that physical and psychological differences between males and females evolved over time in hunter gatherer societies (e.g., (Buss, 2025)). These evolutionary distinctions have led to two major hypotheses that aim to explain behavioral differences between men and women in sports (Deaner, Balish, & Lombardo, 2016).

The first functional hypothesis is called courtship display. In the same way that male peacocks display their extravagant tail feathers to discerning peahens, men display their athletic abilities to females in sports (Petrie, Halliday, & Sanders, 1991) (De Block & Dewitte, 2009) (Deaner, Balish, & Lombardo, 2016). Sports serve as a powerful means of distinguishing individual abilities for females to make choices (i.e., sexual selection) (Tucker & Collins, 2012). And many athletic traits linked to various 'good genes' traits, suggest potential benefits for the offspring of selected individuals (e.g., (Manning & Pickup, 1998) (Park, Buunk, & Wieling, 2007)).

The second functional hypothesis suggests that sports act as structured physical competitions for social status. Unlike unregulated combat or warfare, sports minimize the risk of injury to participants while publicly and effectively showcasing essential traits, such as strength, endurance, bravery, and combat skills (Faurie, Pontier, & Raymond, 2004) (Deaner, Balish, & Lombardo, 2016). Similar to mate choice leks for sexual selection observed in some bird species, boys and men gather in designated areas to compete in sports as a means of displaying their attributes to girls and women and attaining social status. At the same time, both participating and nonparticipating males observe these performances to assess potential rivals and allies.

7. Harms to Male Athletes Under Title IX Proportionality

Adherence to Title IX's "substantial proportionality" standard has often translated into fewer opportunities for male athletes, as many colleges have opted to cut men's varsity teams to align participation ratios with undergraduate enrollment. For example, James Madison University eliminated ten teams (seven men's and three women's) in 2007 to raise the female share of varsity athletes to about 61%, matching the student body's 61% female enrollment (Gillis,

2006). This move alone removed 144 roster spots (predominantly from men's programs) and saved the university approximately $548,000, funds that were subsequently redirected to scholarships for the remaining teams. Similarly, the University of Delaware in 2011 reclassified its men's outdoor track and cross-country teams to club status – effectively cutting two varsity sports – reportedly to maintain Title IX proportionality compliance, thereby eliminating those athletes' scholarship opportunities and competitive slots (Mile Split DE, 2011). Collectively, these cases reflect a broader trend of "equalizing down," in which institutions reduce men's athletic slots and even entire teams as a quick route to compliance when expanding women's programs or rosters is not feasible within budget constraints.

Such cuts have cascading effects on scholarships, funding, and athletic resources available to men. Eliminating men's teams inherently means the loss of scholarship slots and operating budgets for those sports, often prompting athletic departments to redistribute those resources to women's programs to meet gender equity mandates. Temple University's 2013 decision to cut seven sports (including five men's teams) exemplifies this dynamic: officials justified the cuts in part by citing Title IX spending imbalances and inadequate facilities for certain teams, highlighting that the university lacked resources to properly support 24 varsity teams at equal levels [39]. Approximately 150 male athletes (and 9 coaches) were affected by Temple's cuts, and while the university pledged to honor existing scholarships for those athletes, the long-term result was fewer scholarship opportunities for future male recruits in those sports (Leung, 2003). The financial savings from such cuts are frequently used to bolster women's scholarships and upgrade facilities for women's or remaining coed teams, as seen at Temple where funds were redirected to fully fund NCAA-allowed scholarships in women's programs and to improve athletic facilities and locker rooms. In practice, therefore, enforcing proportionality can lead schools to scale back men's athletics infrastructure – from coaching positions to training resources – to ensure that women's teams receive equal treatment, illustrating an unintended inequitable impact on male athletes' collegiate sports experience.

8. Rethinking Parity in Sports: Insights from Scientific Evidence

Efforts to achieve parity in sports participation must grapple with the reality that biological, behavioral, and psychological differences between men and women inherently influence athletic interests and engagement. These differences do not appear to be the product of social constructs but are deeply rooted in evolutionary, hormonal, and neurological factors. By relying on the "substantially proportionate" standard to measure equity, policies such as Title IX often misinterpret disparities in participation as evidence of discrimination, failing to acknowledge that women may simply choose not to pursue athletics at the same rates as men.

In addition to the domestic enforcement of Title IX, a broader international movement is now advancing the push for gender parity in sports, often with goals that go beyond equal opportunity to emphasize equal outcomes. The International Olympic Committee (IOC), for example, has aggressively pursued a gender equality agenda, aiming not only for 50/50 participation but also equal representation in leadership roles and media coverage. The IOC's recent Olympic Games have featured an equal number of events for men and women, and countries are now encouraged – or even pressured – to send gender-balanced delegations. Complementing these top-down efforts are grassroots organizations like the Women's Sports Foundation, which advocate for increased funding, policy reform, and social support for girls' and women's athletics. Media campaigns have also become central to this push, with initiatives aimed at breaking down gender stereotypes and demanding equal visibility for female athletes in broadcasting, sponsorships, and marketing. Yet these campaigns often overlook a core economic reality: men's sports generate substantially more revenue, attendance, and media engagement than women's sports at nearly every level. Despite this disparity, advocacy groups continue to push for equal representation in funding, airtime, and participation quotas, even when audience demand and financial viability do not align. This creates mounting pressure on institutions to prioritize numerical parity over organic interest and market performance, reinforcing the very distortions in opportunity and resource

allocation that have already contributed to widespread cuts in men's non-revenue sports.

Research has shown that men's higher levels of competitiveness, risk-taking, and motivation are significantly influenced by testosterone and other biological factors that align closely with athletic performance. Women, on the other hand, often gravitate toward roles and activities that emphasize collaboration and caregiving – preferences shaped by distinct hormonal and psychological profiles. These natural inclinations make strict numerical parity in sports participation an unrealistic and ultimately misguided goal. There is a clear unintended consequence of forcing proportional representation through rigid standards. Not addressing these intrinsic differences creates collateral damage by reducing opportunities for male athletes who are penalized for their higher rates of interest and participation. As we have seen, schools are willing to eliminate male sports (and male athletes) in order to achieve closer parity under the guise of eliminating discrimination.

Rather than focusing on artificial metrics of equity, such as proportionality, a more effective and equitable approach would involve respecting individual choices and fostering environments that encourage voluntary participation. Disparity in numbers does not inherently equate to discrimination. Indeed, the insistence on numerical equality risks introducing new forms of inequity, where male athletes are sidelined to meet quotas, and resources are disproportionately allocated to programs with limited demand. Recognizing that parity is neither a realistic nor necessary goal for fairness allows for a shift in focus – from forced equality to fostering an athletic culture that values opportunity, merit, and the genuine interests of all participants.

In this paper, I have highlighted three critical aspects regarding gender and sports. First, despite decades of efforts under policies like Title IX to achieve parity, male participation in sports consistently surpasses female participation. Second, a review of the literature reveals that men and women differ not only physically but also behaviorally, with these differences rooted in biological and evolutionary factors. These findings suggest that current disparities in sports participation are not the result of discrimination but are instead a reflection of inherent biological and behavioral differences between the sexes. Finally, I have argued that the substantially proportionate equity standard used to enforce gender parity in sports is fundamentally flawed. This approach not only fails to account for these natural disparities but also through unintended consequences of government influence, unfairly discriminates against male athletes, contradicting the very principles of fairness and opportunity that Title IX was designed to uphold.

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