Why We Should Care About Inclusivity in SportsHCI

Daniel Harrison
Northumbria University
Newcastle upon Tyne, United Kingdom
daniel.b.p.harrison@northumbria.ac.uk

Abstract

Participation and access to sports remains unequally distributed, despite the many benefits for health and wellbeing, with intersecting barriers including age, gender, ability, race, body size, responsibilities, and cultural norms, impacting access. Sports technologies, and the field of SportsHCI more broadly, have the potential to help broaden participation, yet reinforce inequalities by prioritising performance metrics and assuming normative user assumptions. This paper argues for a more inclusive and equitable SportsHCI, foregrounding the "everyday athlete" by examining the benefits and barriers to participation in sports, and how these related to the design of sports technologies. Drawing on lived experience, inclusive design literature, and recent academic work, we identify issues in sports technologies and propose a five-point manifesto outlining actionable commitments, that supports a more inclusive future for SportsHCI. This paper invites researchers, designers, and industry to take up the challenge and responsibility, of shaping sport technologies that empower all.

CCS Concepts

• **Human-centered computing** → Human computer interaction (HCI); HCI theory, concepts and models.

Keywords

SportsHCI, Inclusive Design, Equality Diversity Inclusion, Broadening Participation

ACM Reference Format:
Daniel Harrison. 2025. Why We Should Care About Inclusivity in SportsHCI. In *Annual Conference on Human-Computer Interaction and Sports (SportsHCI 2025), November 17–19, 2025, Enschede, Netherlands*. ACM, New York, NY, USA, 12 pages. https://doi.org/10.1145/3749385.3749388

1 Introduction

SportsHCI explores how interactive digital technologies can help support, encourage, and enhance people's engagement with sports and movement. As a growing and multidisciplinary field, SportsHCI has developed systems to track and measure athletic performance, optimise coaching and training, extend fan experiences, and support entirely new forms of interaction. This work reflects broader trends in digital health, wearables, and personal informatics: areas that traditionally emphasise personal improvement, optimisation, and often, the needs of active, able-bodied, and neurotypical users [14, 64, 90]. While studies and technologies within the space of SportsHCI drive the field forwards, they often have narrow assumptions about who participates in sport, why, and how. As such, many systems designed to support sports and physical activity – including at the everyday, recreational level – focus on performance enhancement, with limited consideration of equality, diversity and inclusion (EDI) issues such as inclusion, representation, and lived experience.

Participating in sport and physical activity not only provides considerable physical health benefits, but also opportunities for enjoyment, social connection, and improved mental wellbeing. Therefore, making these activities more inclusive is not only a matter of fairness or equality, but of public health, community wellbeing, and economic sustainability. Broader participation can reduce the societal burden of lifestyle-related diseases, improve mental health outcomes, and open new markets for technology providers, fitness services, and healthcare systems alike [38, 54, 67, 75]. While sport is often associated with competition, rules, and structured goals, and physical activity to a broader range of movements including completing everyday tasks and recreational exercise, this does not need to be the case. Sport does not need to be competitive in nature, or limited to a select few, but instead "sport should be for every body" – situated within the growing movement towards inclusive sports participation for all, no matter ability or goals, and without prejudice. Given this broader movement and the associated benefits of sport, SportsHCI researchers have an opportunity, and arguably a responsibility, to ensure that these technologies enable broad and varied participation. This means not only designing for those already engaged in structured sports, but also considering how technologies might invite, include, and empower those who may find sport or physical activity unfamiliar, inaccessible, or unwelcoming. To date, there has been relatively little work in SportsHCI focused explicitly on EDI issues, though exceptions are emerging, including those within the space of accessibility (e.g. [37, 79, 95]). This paper contributes to that growing body of work, not by critiquing existing work, but by proposing ways to extend and diversify our ongoing efforts.

In this paper, we make four key contributions. First, we outline the benefits of sport and physical activity (physical, psychological, social, and economic), while critically examining the intersecting barriers that shape unequal access and exclusion. Second, we analyse how existing sports technologies, despite their potential, often reflect and reinforce societal inequalities, particularly when they prioritise performance metrics and normative user profiles. Third, we offer a more inclusive understanding of what constitutes SportsHCI, and who counts as an athlete, highlighting the experiences and motivations of everyday users. Finally, we propose a five-point manifesto for inclusive SportsHCI: a constructive, actionable agenda for researchers, designers, and industry.

SportsHCI 2025, Enschede, Netherlands

ACM ISBN 979-8-4007-1428-3/2025/11
https://doi.org/10.1145/3749385.3749388

While this is a position paper rather than an empirical study or systematic review, our aim is to spark ongoing dialogue within the growing SportsHCI community. By raising critical questions and proposing clear principles, we hope to help shape a research agenda that centres inclusivity, broadens participation, and invites reflection on the social impact of the technologies we build.

2 Framing the Field: Scope, Definitions, and Positionality

This paper focuses on how SportsHCI can better support broadened participation, particularly amongst those we term "everyday athletes" – all those who engage in deliberate sport or exercise, not necessarily professionally, competitively, or even consistently, and regardless of background, skill, ability, or goal. The dictionary of public health defines an athlete as, *"A person who has undertaken training or exercises to become proficient in physical activities such as competitive sports (athletics)"* [53], indicating no particular level of performance beyond "proficiency". By focusing on everyday athletes, we decouple the label "athlete" from any suggestions of elite or specialised skill, while still recognising that feelings of mastery and progression are important sources of motivation for many. We take an inclusive approach to include anyone who moves with intention: whether someone runs marathons, or laps around their back garden; trains in the gym five times a week, or participates in the occasional netball match, all deserve support and recognition. This inclusive framing reflects the reality that people engage with movement for a wide variety of reasons and at differing ability levels. We focus on technologies suited for these everyday athletes: apps, wearables, connected equipment, and online platforms. We do not specifically examine technologies designed for spectators, elite coaching systems, or tools specifically aimed to support those competing in professional sports. While these are all highly relevant within the field of SportsHCI, we instead focus on tools intended for, or with potential to support, everyday movement and engagement. Following in the tradition of inclusive design, we argue that by paying closer attention to issues of inclusivity – from safety concerns and bodily representation to affordability, usability and motivation – that SportsHCI can design technologies that broaden participation while increasing engagement and improving the experiences of all.

The first author has spent the past 10–15 years conducting research at the intersection of health, physical activity, sports, and interactive technologies. He has both observed and lived the journey of an "everyday athlete," experiencing fluctuations in fitness, motivation, body composition, and time availability. He has navigated injuries and rehabilitation, experimented with a wide spectrum of sports technologies – from activity trackers, wearable technologies and cycle computers, to training and social network platforms, while balancing physical activity and sports with multiple other life roles, including caring responsibilities. At the same time, he recognises his privilege as a straight, white, cisgender man with the financial means to procure equipment and gym memberships; access to safe outdoor spaces; and a level of job security that allows for leisure time. He contrasts these advantages with the compound barriers faced by friends and acquaintances: women and non-binary people contending with harassment and dress-code constraints; individuals with disabilities and those whose bodies fall outside normative technological assumptions; minoritised ethnic groups encountering cultural stereotypes; and those experiencing chronic illness or socioeconomic hardship. These comparisons underscore that, while the author has encountered personal obstacles, his lived experience remains limited compared to the intersecting disadvantages endured by many.

Guided by feminist and intersectionality theory, the author insists that responsibility for EDI work should be shared by all, and not placed solely on marginalised communities. As an ally, he endeavours to support under-represented voices, adopt reflexive practice, and leverage academic insights and personal experiences to advance more inclusive design and research in SportsHCI. At a time when institutional support for EDI initiatives faces political and economic barriers, and many groups are less able to engage in this work with reduced funding and the scaling back of diversity programmes, it is more important than ever for allies to step-up and support this work. This paper welcomes ongoing dialogue, ensuring its arguments remain grounded in the complex realities of diverse individuals. The remainder of the paper maps intersecting barriers, then shows how today's sport-tech echoes them, and finally offers a manifesto for future sports technologies.

3 Benefits and Barriers to Participation in Sports

Despite the well-documented benefits of being active, participation in sport and exercise remains unequally distributed. Gender, ethnicity, class, bodily difference, disability, neurodivergence, life-stage, caregiving, culture, religion, and neighbourhood infrastructure all shape who feels welcome, safe, and supported – and who is implicitly or explicitly excluded. These disparities often reflect broader structural, cultural, and environmental barriers, far beyond individual motivation. We examine the benefits and barriers of sport and movement, laying the foundations for a more critical reflection of how sports technologies and SportsHCI can better serve those who are most often left out.

3.1 Why participation in sports matters

National guidelines in the UK and the US recommend that adults complete at least 150 minutes of moderate or 75 minutes of vigorous activity each week, alongside strength-training on at least two days [34, 77]. However, a large portion of the population fails to reach these targets: only around two-thirds of men and just over half of women in England are sufficiently active [66], participation is even lower amongst individuals facing disability, chronic illness, or socioeconomic disadvantage [8, 91]. The financial costs of physical inactivity are considerable: the World Health Organisation projects that, between 2020 and 2030, almost 500 million people will develop diseases attributable to inactivity at an annual cost of $27 billion USD in healthcare expenditure and lost productivity [103]. Conversely, population-wide increases in activity lower the burden of lifestyle diseases, reduce stress on health services, and stimulate local economies by growing the sports and leisure sector [65].

For many people participation in sport becomes harder over time: most children take part in sport, but engagement tends to decline during adolescence and into early adulthood [91]. Many

adults transition into more utilitarian activity (e.g. walking for transport, or taking the stairs) which can become habitual, but is often low in intensity, and can still be disrupted during periods of life transition [41, 91]. Sports, by contrast, can deliver joy, identity, mastery, and social belonging [26], and to provide opportunities for feelings of mastery and progression – elements that technologies might amplify if designed inclusively.

3.1.1 Physical health. The physical health benefits are among the most well-documented: moderate-to-vigorous exercise reduces the risk of chronic diseases including type-2 diabetes, cardiovascular disease, and some forms of cancer, alongside improving cardiorespiratory fitness, mobility and strength [11, 101]. The health benefits of being active persist regardless of body size: those who are active, but categorised as overweight or obese, have comparable mortality risks to those who are lean and fit, whereas unfit individuals face higher risks regardless of weight [7]. This reinforces the importance of being physically active at any weight, particularly in the design of inclusive and supportive interventions.

3.1.2 Mental and emotional wellbeing. Physical activity is associated with reductions in anxiety and depression, improvements in mood, and positive cognitive outcomes across age groups [73]. This does not require vigorous activity or high-intensity training: low-intensity and leisure activities such as community sports have been linked to greater psychological resilience and improved life satisfaction [26, 76]. Being physically active has also been shown to support better sleep quality and higher daily energy levels, further reinforcing its role in supporting mental wellbeing and overall quality of life [5, 25].

3.1.3 Social connectedness and community. Group-based sport mitigates loneliness, expands social networks, and fosters a sense of place – especially valuable during life transitions, such as parenthood, retirement, or relocation [26, 44, 51]. For example Parkrun, a free weekly 5 km running event, promotes sustained engagement through an inclusive ethos, volunteer culture and a collective identity: attracting those who are underrepresented in more structured sporting settings (including those who are less active, and report lower health levels) with inclusivity and psychological wellbeing found to be core reasons for higher engagement [19, 36]. Such community scaffolding is central to long-term engagement, creating a sense of place, routine, and identity. However, these benefits also set the foundation for understanding the systemic barriers we explore next.

3.2 Barriers to sports participation

Many believe that the primary reason diverse individuals do not participate in sports is due to a lack of intrinsic motivation, but evidence suggests structural and social constraints play a larger role [105]. Further evidence shows that when barriers, such as inaccessible facilities or discrimination, are removed or mitigated, participation rates improve, further showing that interest and awareness are rarely the primary obstacles [82]. Indeed, drawing on Crenshaw's concept of intersectionality [22], we observe that diverse populations face barriers related to complex, intersecting factors including: age, gender, body size, ability, health conditions, socioeconomic status, culture, and other personal challenges; revealing that exclusion in sport emerges from the interplay of diverse attributes, producing patterns of disadvantage greater than the sum of their parts [58]. Recognising these layered realities requires that we move beyond "ideal users", towards inclusive design practices that engage participants from diverse communities in co-design, employ flexible technologies and accommodate varied needs [13, 87]. While some groups have easy access to sport, others are routinely excluded or discouraged, resulting in sport being a privilege for some, rather than a right for all.

3.2.1 Bodily differences and people with disabilities. Individuals with disabilities often encounter significant obstacles in accessing and participating in mainstream sports. These barriers include inaccessible facilities, lack of adaptive equipment, and ableist attitudes amongst coaches and peers, which limits opportunities, discourage continued engagement from athletes with disabilities, and undermines confidence which leads to a sense of exclusion from mainstream sport [30, 61, 82]. Chronic conditions such as diabetes can be managed through activity, yet these so-called "lifestyle" conditions are often accompanied by stigma and self-doubt [60]. Similarly, diversity in bodies also leads to exclusion: Athletes with limb differences face further challenges, as sports equipment, prosthetics, and interfaces often fail to accommodate or adequately support their specific requirements, undermining performance, comfort, and participation [12]. Similarly, individuals with differences in mobility often experience exclusion from physical activities due to the lack of universally designed sporting environments, restrictive assumptions embedded in sport rules, and inaccessible training methods [81]. Furthermore, sports clothing and equipment sizing rarely accommodates diverse shapes [96], and optical heart-rate sensors misread darker skin tones [52]. When considered from an intersectional perspective, the consequences of this can be serious – as detailed in [47], *"people with darker skin tones (example, Black and Hispanic ethnic backgrounds) are at higher risk of cardiovascular diseases, and inaccurate HR measurements using PPG-based devices would result in potential health disparities with exercise safety and treatment efficacy in this clinical population"* (p.3).

Societal narratives that associate "fitness" with thinness, whiteness and affluence creates additional barriers for those who do not fit within this description, and do not see themselves represented or welcomed in sporting spaces such as gyms [98]. Similarly, 'Fitspiration' imagery on social media has been shown to increase appearance comparison and can heighten body dissatisfaction, particularly among women from lower-income groups [2, 48], and weight stigma in gym cultures manifests as unsolicited comments and surveillance of appearance, prompting many individuals with larger bodies to avoid fitness settings altogether [96, 100].

3.2.2 Gender and sexuality. Gendered experiences profoundly influence who feels safe and welcomed in sport. Harassment profoundly shapes where and when women exercise: a 2024 survey of runners in north-west England reported that more than two-thirds had experienced verbal abuse, intimidation, or stalking, prompting route changes or cessation of outdoor running [62] – concerns that have resulted in broad-brush changes to privacy defaults in some GPS tracking platforms (e.g. [78]). In indoor fitness environments, commercial research in the UK [4] suggests that more than half of gym-goers have witnessed or experienced harassment, with

women disproportionately targeted – these hostile atmospheres often resulting in reduced attendance or complete withdrawal from gym attendance. Beyond safety concerns, women's participation is further limited by societal expectations around caregiving responsibilities: UK women perform an extra hour of daily unpaid care compared with men [69], significantly restricting available leisure time and opportunities for sports participation. Campaigns such as "This Girl Can" have challenged stereotypes to reframing what an athlete looks like, and why women exercise (for enjoyment and confidence, not to achieve a certain physique), and have *"inspired millions"* while demonstrably closing the gender activity gap [9, 46, 92]. Taken together, these factors highlight how structural inequalities continue to constrain women's participation in sports, underscoring the importance of ongoing efforts to create safe, inclusive, and supportive sporting environments.

LGBTQ+ populations similarly face multiple barriers in sports participation. A systematic review highlights that these individuals often encounter discrimination, misgendering, and lack of inclusive facilities, which undermine both participation and leadership in sport [23]. Transgender athletes may also be explicitly prevented from competing in gender-aligned categories, exacerbating feelings of alienation and discouraging ongoing involvement [39, 57].

3.2.3 Race, culture and religion. Participation in sport is far from evenly distributed across racial, cultural, and religious identities: ethnic minority adults in England, particularly South Asian and Black communities, are less active than White British peers, with structural racism, lack of culturally appropriate programming and absence of representative role models acting as core barriers [91]. Racialised assumptions about athleticism, for example, the stereotyping of Black athletes as "naturally gifted", constrains participation and undermines their achievements [2]. Religious practice introduces further complexities. Dress codes, prayer schedules, and gender-segregated spaces are rarely accommodated, forcing individuals to choose between faith observance and physical activity. Bans on religious garments like hijabs, in certain countries exclude Muslim women from competition, making them less visible to others, and, in some cases, exposing them to public scrutiny [1]. Muslim women in particular face intersecting cultural and financial obstacles, including societal expectations around gender roles and limited provision of women-only spaces [97].

Uniform and equipment expectations can also marginalise athletes, as can requirements related to hair – standard swim caps compress and damage Afro-textured hair, deterring participation [45], leading to products such as the "SOUL CAP", designed to accommodate thicker textured hair. However, the governing body for aquatic sports initially prevented athletes from using the SOUL CAP, on the grounds that they *"did not follow the natural form of the head"* – a decision widely criticised as discouraging Black swimmers [27]. The governing body later approved the cap in September 2022, explicitly citing its commitment to diversity and inclusion [93]. Nonetheless, Black hair remains a "safe sport issue", a 2024 study shows how hair-related equipment mandates continue to pose both environmental and relational safety risks, deterring participation long after the rule change [49].

The compounded effect of multiple disadvantages can be profound; for instance, women with disabilities from ethnic minorities face higher rates of inactivity than their non-disabled or white counterparts, reflecting the intersectional impact of ableism, sexism and racism on access to sport [50, 59].

3.2.4 Mental health and neurodivergence. While exercise can alleviate depression and anxiety [102], these same conditions can decrease motivation while exacerbating fears of social judgement. Neurodivergent individuals may face sensory and social challenges in group sport settings: children and adolescents with autism are significantly less likely to engage in physical activity, due to sensory overload, rigid rule structures and limited instructor awareness of neurodiverse needs [85]. This gap often widens with age [43, 68]. Individuals with attention-deficit hyperactivity disorder (ADHD) report frustration in environments that lack flexibility, fail to provide adequate stimulation, or rely on unstructured feedback [71]. Inclusive design must therefore be attentive to diverse cognitive and sensory processing styles, to support all.

3.2.5 Life Stage and ageing. Life stage significantly influences patterns of sports participation, with distinct barriers emerging across the lifespan. Sports participation tends to peak during childhood, with a significant drop during adolescence, often as a result of bullying, harassment, inappropriate comments, and body image concerns which not only discourages participation but also affects mental health. Women and girls are particularly impacted, due to persistent gendered stereotypes and violence (including body shaming and sexual harassment), sexualised commentary and stereotypes (e.g., "sport isn't feminine"), contributing to the 64% drop-out by age 17 [104].

In older adulthood, barriers to physical activity shift but remain significant. Common obstacles include fear of falling, chronic pain, and environmental factors like poorly lit routes [16]. Such concerns can lead to reduced activity levels, further decreasing physical function and thus increasing the risk of falls.

3.2.6 Socioeconomic and environmental context. Beyond the individual factors laid out so far, structural and environmental factors significantly influence access to sport, often reinforcing existing social inequalities. Individuals from lower-income households face disproportionate barriers, including equipment costs, membership fees, and transportation to facilities – limiting opportunities for participation and contributing to lower activity levels among disadvantaged groups [91]. Access to sports facilities is unevenly distributed: affluent neighbourhoods typically boast a higher density of well-maintained gyms, leisure centres, and public parks, whereas deprived communities often lack safe, high-quality spaces for outdoor training and organised sport [55, 70]. Furthermore, funding policies often prioritise competitive, performance-oriented activities, which may not align with the interests or needs of all individuals. This can marginalise those who seek recreational or social sports, particularly in communities where mainstream sports lack cultural relevance, and other activities such as traditional dance or walking groups might be better suited [35].

Media coverage that presents a narrow view of the "ideal" athlete as lean, young, white, and affluent not only limits role models for underrepresented groups, but also sustains internalised barriers among those who do not see themselves represented. Longitudinal analyses of televised sports news reveal that women's events receive

only a fraction of the coverage afforded to men's, reinforcing the perception that sport is primarily a male domain [20]. This list of barriers is by no means exhaustive – factors such as linguistic differences, immigration status, or geographic isolation can also shape access to sport, and together these intersecting obstacles demonstrate why SportsHCI must move beyond idealised users towards genuinely inclusive design practices.

4 Inclusivity in Sports Technology and SportsHCI

Sports technologies provide potential to support and engage with diverse everyday athletes, but mirroring the barriers laid out in the previous section, they frequently embody narrow assumptions about bodies, goals, and contexts. These challenges have been relatively underexplored within SportsHCI, despite growing recognition of EDI concerns within sports, and elsewhere in HCI. There are some notable exceptions to this, particularly within the context of disability. For example, Strobel and Gerling's excellent review paper focused on the intersection of HCI, Disability and Sport [95], shows that a narrow, medicalised approach can miss the broader human experience. Similarly to the arguments we make in this paper, the authors also call for *"placing a stronger emphasis on sport as leisure"*. However, this focus on "everyday athletes" is not the norm within sports technologies, which in many cases can perpetuate or even exacerbate inclusivity issues, despite the opportunities to help.

It is important to note that the intention of this work is not to suggest that technology and SportsHCI can provide solutions to all the broad, varied and deeply ingrained-in-society challenges and barriers outlined in the previous section. However, equipping SportsHCI researchers with a better understanding of these issues can only go to serve their awareness, consideration and potential inclusion within SportsHCI work, ultimately improving inclusion for all. There are many opportunities for SportsHCI to begin challenging the status quo and support broadened participation – taken together, the following examples show how technology is not a neutral layer on top of sport; but constitutive of who feels entitled to move.

4.1 Designing for bodily diversity and ability

Sports technologies often embed assumptions of a "normative" athletes body, and similarly to the bodily norms highlighted within embodied interaction (centred on white, cisgender, slim bodies), diverse body types can be treated as in need of "correction" [88]. This exclusionary framing manifests in practical issues, such as heart-rate sensors that do not fit [42] or misread on darker skin tones [52], inadequate sizing of sports clothing and equipment for larger bodies, and assumptions within gait analyses that exclude prosthetic users or those with limb differences [18]. Such oversights systematically marginalise athletes whose bodies differ from these implicit norms, reinforcing exclusion, rather than supporting broad participation.

Including more diverse athletes within co-design practices can help mitigate biases and result in more accessible and widely usable sports technologies. Strobel and Gerling's 2025 literature review concludes that disability-centred sport tech shifts design values from performance to flourishing [95], a framing that benefits all. Prior research demonstrates the efficacy of this approach; for example, "Eyes-Free Yoga" employed auditory feedback enabling visually impaired users to self-correct their postures independently [79]. Such inclusive innovations illustrate the critical need for embedding adjustability and adaptability at the core of sports technology design. However, some requirements may demand customisation: motion-tracking systems for prosthetic users often need calibration to each user's limb geometry to ensure accurate analysis [18]; and, wearables for wheelchair athletes often use adjustable straps and modular sensors [14].

In addition, sports technologies often implicitly assume a baseline level of physical fitness or bodily capability, potentially alienating beginners or users with limited physical literacy. Without appropriate scaffolding, novice athletes risk injury due to overly strenuous activities driven by the technology [99], but when used responsibly technology can provide otherwise invisible insights to help mitigate against the potential risks of overtraining and injury [21]. SportsHCI research thus needs to incorporate progressive affordances and adaptive coaching, offering users the ability to select and incrementally build upon appropriate starting points, enhancing confidence and sustainable engagement over time.

4.2 Supporting mental health and neurodivergent participation

Neurodivergent athletes – including those with autism spectrum conditions or attention-deficit hyperactivity disorder (ADHD) – experience unique challenges when interacting with sports and sports technologies. These can include: sensory overload from excessive stimuli; difficulties navigating rigid or unpredictable interfaces; and unclear or overly complex instructions, as well as social anxiety and low motivation, resulting in lower participation or abandonment [43, 71]. Emerging research underscores the need to better consider neurodivergent populations and the challenges they may face [89], along with leveraging the "mood-boosting" effects of activity for those experiencing mental-health challenges such as anxiety and depression [74].

Addressing these challenges requires sports technologies to involve neurodivergent participants in design, integrate feedback, adjustable controls, and clear, predictable user flows that accommodate varied cognitive and sensory processing styles. Low-stimulus modes with minimal animations and mutable sounds, structured step-by-step prompts, and individual or small-group social features can reduce overload and social anxiety. Engaging these athletes in iterative co-design ensures that features align with lived experiences and effectively accommodate diverse cognitive styles and sensitivities [68, 85].

4.3 Beyond performance: aligning experiences with diverse goals

As with self-tracking technologies that support one in being *"Fitter, Happier,* [and] *More Productive"* [28], sports technologies often prioritise improvements to performance metrics such as speed, power, and endurance: sidelining users whose primary motivations include social connection, enjoyment, mental health improvement, or

chronic health management. This narrow focus potentially alienates significant portions of the "everyday athlete" population who may find competitive or performance-oriented goals demotivating [95]. Similar to work within the broader area of personal informatics (which applies to broader behaviours such as sleep, food, finance, productivity, and many others), tracking is often built on a foundation of self-improvement, but factors such as ageing and health conditions mean not all individuals are likely to seek improvement and may be using technologies for other reasons [3, 40, 41].

Broadening metrics to include qualitative dimensions such as enjoyment, community participation, and consistency, can engage users motivated by non-competitive goals. Emergent research into recreational cycling has shown users can reject technologies that impose performance-centric goals, instead preferring platforms that allow personal, qualitative goal-setting [40]. Moreover, technology must acknowledge non-linear progression, particularly relevant for older adults or individuals managing chronic health conditions, for whom maintaining functional ability or symptom management constitutes success rather than continuous performance improvement. Embedding socio-cognitive elements such as framing personal aspirations, sharing community stories, and scaffolding expectations, can shift toward more socially enabled, motivation-supportive designs, offering a clear roadmap for broadening metrics beyond performance alone [84].

4.4 Using inclusive language, imagery and narratives

Language, imagery, and narratives in sports technologies significantly influence who feels included or excluded from participation. Terms such as 'athlete' can unintentionally alienate individuals who do not identify with traditional athletic norms – hence our addition of "everyday", into the definition in this paper. Initiatives like the "This Girl Can" campaign mentioned earlier explicitly used inclusive language to close the gender activity gap [9, 46, 92], yet technical jargon and aggressive motivational narratives (e.g., "no pain, no gain") remain prevalent in sports technologies: risking intimidating or excluding casual or novice users.

Online virtual exercise platforms such as Peloton or Zwift have potential to make sport more accessible to those who face barriers to accessing traditional sports settings (e.g. those with caring responsibilities) by, for example, allowing users to participate in an engaging without leaving the house. However, such "home gym" setups are often accompanied by non-inclusive language – in social media and online marketing these are often mockingly named "pain caves". While the glorification and celebration of suffering and pain are prevalent within certain sports such as cycling and running [29, 94], this language can be intimidating and "othering", itself acting as a barrier to more diverse participation [17, 72, 83]. Additionally, these platforms exemplify environments where the steep learning curve and specialist terminology can create entry barriers, as users apparently need to adopt a new "specialist language" in order to engage. Adopting clearer language, contextual glossaries, and supportive narratives celebrating consistency and personal achievement rather than pain and competition can significantly enhance inclusivity.

4.5 Managing privacy, security, safety and risk

Safety, privacy, and risk management are essential inclusivity concerns within sports technologies. Technologies such as Strava's "Flyby" feature and endurance event "dot watching" expose athletes (and their locations), to harassment, stalking, and other safety risks – disproportionally impacting women and minorities [78]. Competitive "adventure" events such as the Trans Continental Race, a long-distance self-supported bicycle race across Europe, are becoming increasingly popular for participants and fans alike, and use GPS tracking for "dot watching"[1], where participants' real-time locations are publicly shared to enable fans to remotely "watch" the race: raising privacy and security concerns, especially when participants rest or sleep in isolated locations. Strava in particular has also been centred in multiple "StravaLeaks" controversies whereby users have unintentionally "leaked" details about sensitive locations or individuals. This includes US Secret Service staff who tracked their runs using the platform, thereby unintentionally revealing the locations of travelling US presidents [10]. Default settings should prioritise privacy, clearly communicate potential risks, and incorporate user-friendly privacy management tools, to ensure that sharing is intentional.

Behaviour change techniques such as gamification and leaderboards can inadvertently encourage overtraining or unsafe practices, leading to increased injury risks [99]. Competitive elements embedded in sports technologies can pressure athletes into excessive training or risk-taking behaviours, as evidenced by reported cases of injury directly linked to these gamified mechanisms (e.g. [6, 86]). Technologies must embed health-oriented feedback mechanisms, clearly highlighting potential risks and integrating evidence-based guidance for safe training practices.

4.6 Designing for experiential and social affordances

Sports technologies frequently undervalue the experiential and social aspects of physical activity, focusing primarily on performance metrics. However, evidence demonstrates that social connectedness and enjoyment are strong predictors of sustained physical activity [26]. For example, community sport programs like walking groups or Zumba classes thrive by providing social support and a non-judgmental atmosphere, further illustrated by activities like Parkrun where collective identities and shared experiences boost retention, particularly among typically underrepresented groups [19]. Technology can amplify these successes, for example, through online platforms (such as Strava or Komoot) where users share stories and tips, or technologies that adapt goals based on an individual's context (had a stressful week? the app might suggest a relaxing walk instead of intense training). Technologies designed to foster inclusive social environments, such as team-based challenges, virtual group events, and online support communities, can significantly enhance user engagement and motivation: this is one of the key motivating factors behind users' strong engagement with activity tracking platforms such as Fitbit, and community-based sports tracking applications such as Strava [21, 32].

As already mentioned, contemporary sports technologies prioritise performance metrics while neglecting qualitative aspects

[1] https://dotwatcher.cc

of movement experience. Few systems incorporate measurements for enjoyment, social engagement, or mental wellbeing despite substantial evidence that these factors strongly predict long-term adherence to physical activity. Furthermore, sports technologies should explicitly design for user experiences, capturing elements such as mood, enjoyment, and social interaction. This can be facilitated by integrating reflective feedback mechanisms (e.g., "Did you enjoy today's activity?") or by developing adaptive goal-setting tools responsive to users' emotional states or stress levels. Systems that combine offline and online interactions, promoting community support and companionship through hybrid digital and physical environments, offer promise in sustaining long-term engagement [40].

4.7 Bridging the digital divide, cost, and literacy barriers

Economic and digital literacy barriers significantly restrict access to sports technologies, often excluding lower-income or digitally marginalised individuals. The cost of devices and subscription fees, on top of necessary sports equipment, can create prohibitive barriers to entry, disproportionately impacting socioeconomically disadvantaged groups [24]. For example, premium running watches or smart treadmills are simply out of reach for many, and even freely available platforms assume access to smartphones and reliable internet connections, and data plans, reinforcing socioeconomic disparities.

Even when cost is not a barrier, design assumptions about tech literacy can be. Technical literacy assumptions embedded in sports technology interfaces, such as specialist jargon and advanced performance metrics (e.g., Watts per Kilogram, "W/kg", or Training Stress Score, "TSS", which are often displayed without explanation), can deter newcomers or those without extensive sports science knowledge, by effectively catering to semi-pro enthusiasts while confusing others. Such designs can make novice users feel unwelcome, and worse still, misunderstandings around these metrics can lead to poor training practices, or injury [33].

Cultural and contextual misalignments further exacerbate exclusion, as technologies frequently lack localisation or adaptation to diverse cultures. Research on the "glocalisation" of sport shows that digital tools lacking adaptation to local cultures frequently fail to engage non-Western communities, undermining both adoption and continued use [56].

4.8 Supporting ageing and chronic conditions with adaptive feedback

The emphasis on continuous improvement that many sports technologies embed can become problematic for ageing individuals or those with chronic health conditions, for whom maintaining function or effectively managing symptoms represents meaningful success, rather than continual performance gains [63, 80]. To better support this non-linear progression, sports technologies can integrate adaptive, personalised feedback based on real-time physiological data. For example, biofeedback of heart-rate variability has been shown to guide pacing and reduce flare-ups and adaptively adjust activity recommendations [31]. Similarly, HRV-guided adaptive training strategies can result in sustained participation along with fitness and quality-of-life improvements [15]. Additionally, designing technologies that recognise rest and recovery as integral elements of a healthy and sustainable active lifestyle, rather than signs of failure, can significantly enhance user well-being and long-term adherence to physical activity. Consequently, these adaptive design strategies pave the way for our five-point manifesto in Section 5.

5 A Five-Point Manifesto for Inclusive SportsHCI

To support broader and more equitable participation in sport, we propose a five-point manifesto for inclusive SportsHCI. These principles build upon the themes presented throughout this paper, providing a clear framework for researchers, designers, and practitioners. While this manifesto cannot address all structural inequalities, and nor should it aim to, it provides a starting point for embedding inclusivity into the design, development, and evaluation of sports technologies. As technologists and researchers, we have the ability to design technologies that do not further perpetuate existing inequalities, and we argue that it is our responsibility to do so. That said, we do not suggest that everything we work on should be accessible to all – clearly a coaching system for elite-level figure skaters should not be designed for all – but there are clear opportunities that should not be ignored. These principles are not exhaustive solutions to complex societal challenges but actionable starting points to ensure inclusivity remains central throughout the design and evaluation of SportsHCI systems.

5.1 Design for diverse bodies and abilities

Inclusive sports technology should move beyond assumptions of a "default" user – typically young, able-bodied, slim, and male. Inclusive design involves recognising the full range of human bodies, and ensuring that technologies are accessible, adaptable, and affirming to users of all shapes, sizes, abilities, and identities. This involves addressing practical challenges, such as ensuring that technologies can support diverse and intersectional characteristics, and requires designers to challenge normative assumptions about who sports technologies are for, and whose needs are considered.

Central to this is participatory and intersectional co-design. Inclusive systems are best shaped *with*, not just *for*, people with lived experience of exclusion. Technologies should accommodate multiple, overlapping needs, not just single categories like "women" or "disabled users", and avoid one-size-fits-all solutions that overlook how different user groups can be excluded. For example, a "female-friendly" design should not simply be a pink version of a product: it must account for women's distinct physiology; consider safety concerns; factor in hormonal cycles that affect performance and comfort; respect cultural and societal norms; and, embrace the diverse lived experiences of womanhood – spanning trans and intersex identities, to menopausal transitions, to specific medical needs. By treating inclusive design as the default standard, SportsHCI can begin to dismantle the structural biases embedded in many existing systems, and support more meaningful, joyful participation for all.

5.2 Consider diverse and non-linear goals

Much of SportsHCI has centred on performance: speed, power, distance, repetition. But for many, goals are personal, contextual, and non-linear. Success might mean completing a gentle walk without pain, joining a community class after a period of isolation, or simply enjoying movement again. Designing for diverse motivations requires us to move beyond 'faster, stronger, better' to also support joy, consistency, confidence, and recovery. This means offering users the ability to set meaningful personal goals, whether that's training for an event or managing a chronic health condition, and valuing those goals equally.

This principle also invites designers to question what metrics are highlighted. Can we visualise mood, recovery, or social connection as clearly as cycling cadence or wattage? Can platforms support reflection, rest, and self-care as well as progress towards athletic goals? By broadening how success is defined and rewarded, SportsHCI can better serve those whose relationships with sport and exercise are complex, evolving, or precarious. This does not mean abandoning performance-oriented goals, but creating space for different forms of achievement to exist alongside. A practical tactic is to ship selectable goal templates – maintenance, enjoyment, community – mirroring the adaptive dashboards used in Trackly's custom self-tracking panes [3] to surface only relevant metrics.

5.3 Reduce complexity and assume no expertise

Sports technologies often assume familiarity with technical sports metrics and concepts, or advanced training methods. But for many everyday athletes, particularly those returning to sport, exploring movement for the first time, or managing a health condition, these systems can be confusing or overwhelming. Inclusive technologies should have more clarity, and data metrics should be accompanied by plain-language explanations and contextualised within personal goals. Where possible, alternate representations of these data metrics should be explored, and ultimately designs should enable safe, informed participation regardless of prior knowledge – decreasing the chances of risks related to misuse or misunderstanding.

Similarly, privacy and safety settings should be intuitive, respectful, and protective by default. For example, location tracking should not be opt-out or hidden behind obscure menus, but instead clearly displayed to users and initially alerting them to the information they are sharing with others. Simple onboarding techniques such as guided starts can be utilised to support new users in avoiding confusing jargon and setting safe settings – as successfully used to decrease drop-outs in novice runners [84]. Furthermore, guided by Data Feminism and feminist HCI [24], we argue that technologies should expose the assumptions behind their metrics: who they are designed for, what behaviours they prioritise, and what trade-offs they involve. Transparency supports user agency, and agency is core to both safety and inclusion.

5.4 Cultivate inclusive communities and narratives

Many people do not engage with sport because they feel like they do not belong or identify with dominant sports narratives. Inclusive sports technologies should go beyond individual usability to actively foster a sense of community, connection, and support. This involves designing platforms that enable users to share experiences, celebrate diverse forms of success, and build confidence through positive social reinforcement. Technologies can amplify support and community by encouraging mutual motivation, shared storytelling, and collective celebration. Rather than only relying on competitive structures like leaderboards that reward top performers and can demotivate others, designers should consider alternatives, such as collaborative challenges, opt-in support networks, or peer mentorship systems that recognise effort, progress, and persistence. These approaches can be particularly valuable for those who are new to sport, returning after injury or illness, or navigating exclusion in other areas of their lives.

Language, imagery, and interface design also matter. They should support diversity, representing varied identities, abilities, and experiences, to disrupt exclusionary norms and stereotypes of who sport is "for". SportsHCI can take inspiration from initiatives such as *"this girl can"*, by embedding community storytelling features, local connection tools, and moderated social spaces that encourage safe and meaningful interaction. Fostering community also requires ensuring safety and privacy. This includes moderation of online groups to prevent harassment, protective privacy defaults with clear settings (such as restricting visibility), and features that celebrate effort and personal progress for all. By designing with belonging in mind, SportsHCI can help users not only stay engaged, but feel seen, supported, and part of something bigger.

5.5 Commit to intersectional co-design & long-term evaluation

Inclusivity in SportsHCI should be embedded not just in the outcomes of design, but in the design process itself. This means involving diverse users, including those from marginalised or underrepresented communities, as co-designers, shaping the tools and systems intended to support them. Drawing on insights from disability studies, feminist HCI, and other fields, intersectional co-design surfaces complex needs, challenges normative assumptions, and helps anticipate exclusion before it occurs. This approach requires ongoing reflexivity, interdisciplinary collaboration, and a willingness to question defaults from start to finish.

Equally important is longitudinal evaluation. Inclusion is not static; users' needs evolve with time, context, and life circumstances. Inclusion evolves over time with users' lives, contexts, and goals. Technologies that perform well initially may exclude or alienate over longer periods, particularly as motivations change or unforeseen consequences arise. As such, we advocate for long-term studies, regular feedback loops, and sustained engagement with diverse users – not just early adopters or dominant user groups. Designers and developers have an ethical responsibility to act when features harm or exclude. As emerging technologies like AI, VR and biosensing reshape the field, the questions of "who is this for?", "who might this exclude?", and "how can we do better?" should remain central. Inclusion is not a feature to be added, but a commitment to be sustained.

6 Conclusion

Inclusivity is not simply desirable for SportsHCI, but fundamental. As sports technologies are increasingly embedded into our everyday

lives, there is a growing need to ensure that they serve the many, and not just the few. This paper has examined how the benefits of sports and physical activity are unevenly distributed, shaped by intersecting barriers related to gender, race, health, ability, socioeconomic status and cultural norms. While current sports technologies are designed with good intentions, they frequently mirror and even exacerbate broader societal exclusions, by following in pervasive ideals of performance, fitness, and bodily normality, with conventional metrics of success related to performance improvement.

Through our five-point manifesto, we have proposed constructive and actionable principles, intended to foster a more inclusive and equitable future for SportsHCI. This manifesto advocates for bodily and cognitive diversity, respecting diverse goals, simplifying technology interactions, cultivating supportive communities, and committing to ongoing, intersectional co-design and evaluation. These principles can shift SportsHCI from being largely oriented around performance metrics and normative bodies, to actively inviting broader, more joyful participation. Embedding inclusivity at the centre of our research will not only lead to more ethical and equitable designs, but also result in improved experiences for users across a wide spectrum of life contexts.

We offer this paper not as a comprehensive review or final word, but as a call to reflection and collaboration. As a position piece, it aims to spark conversation rather than resolve it - inviting deeper, broader, and more sustained engagement with inclusivity across the growing SportsHCI community. By contributing to this first SportsHCI conference, we hope to help shape a field that is interdisciplinary, reflexive, and committed to equity, not only in what we study, but in how we design, evaluate, and implement. Technologies should be judged not only by how they improve performance, but also by how they support belonging, joy, and long-term engagement. Inclusivity in SportsHCI is not a limitation on ambition, it is what allows us to imagine broader futures for sport and physical activity. The challenge now is to carry this work forward – transforming these broad principles into heuristics and design guidelines that can guide practitioners across diverse contexts and applications, and engaging with other researchers to take an inclusive, and broad perspective, when working with such technologies. The opportunity is to create technologies that not only track or optimise, but uplift, connect, and invite.

Acknowledgments

This paper was prepared with limited assistance from generative AI tools (OpenAI's ChatGPT), which were used to support initial section structuring and light copy-editing. All substantive review of literature, narrative framing, and argumentation are the work of the author.

References

[1] Amnesty International. 2024. "Excellence, respect, friendship": Why hijab bans in French sports defy Olympic values and human rights Why hijab bans in French sports defy Olympic values and human rights. *Amnesty International*. Retrieved April 20, 2025 from https://www.amnesty.org/en/latest/campaigns/2024/07/why-hijab-bans-in-french-sports-defy-olympic-values-and-human-rights/

[2] Allison Anders, James DeVita, Leslee Fisher, Chris Corr, and Christina Myers. 2023. Looking Back to Look Forward: Exploring Crenshaw's Political, Structural, and Representational Intersectionality in Sport. *Culture Studies ↔ Critical Methodologies* 24. https://doi.org/10.1177/15327086231207825

[3] A. Ayobi, P. Marshall, and A. L. Cox. 2020. Trackly: A Customisable and Pictorial Self-Tracking App to Support Agency in Multiple Sclerosis Self-Care. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems (CHI '20)*. Retrieved April 22, 2025 from https://doi.org/10.1145/3313831.3376809

[4] Tim Bailey. 2025. Over Half of UK Gym-Goers Have Witnessed or Experienced Harassment. *TRAINFITNESS*. Retrieved April 20, 2025 from https://train.fitness/personal-trainer-blogs/over-half-of-uk-gym-goers-have-witnessed-or-experienced-harassment

[5] Masahiro Banno, Yudai Harada, Masashi Taniguchi, Ryo Tobita, Hiraku Tsujimoto, Yasushi Tsujimoto, Yuki Kataoka, and Akiko Noda. 2018. Exercise can improve sleep quality: a systematic review and meta-analysis. *PeerJ* 6: e5172. https://doi.org/10.7717/peerj.5172

[6] Paul Barratt. 2017. Healthy competition: A qualitative study investigating persuasive technologies and the gamification of cycling. *Health & Place* 46: 328–336. https://doi.org/10.1016/j.healthplace.2016.09.009

[7] Vaughn W. Barry, Meghan Baruth, Michael W. Beets, J. Larry Durstine, Jihong Liu, and Steven N. Blair. 2014. Fitness vs. fatness on all-cause mortality: a meta-analysis. *Progress in Cardiovascular Diseases* 56, 4: 382–390. https://doi.org/10.1016/j.pcad.2013.09.002

[8] Adrian E Bauman, Rodrigo S Reis, James F Sallis, Jonathan C Wells, Ruth JF Loos, and Brian W Martin. 2012. Correlates of physical activity: why are some people physically active and others not? *The Lancet* 380, 9838: 258–271. https://doi.org/10.1016/S0140-6736(12)60735-1

[9] Adrian Bauman, Nicola McNeil, Matthew Nicholson, Paul O'Halloran, Emma Seal, Erica Randle, and Arthur Stukas. 2023. Impact of the first year of the "This Girl Can" physical activity and sport mass media campaign in Australia. *BMC Public Health* 23, 1: 333. https://doi.org/10.1186/s12889-023-15091-2

[10] Sébastien Bourdon, Antoine Schirer, and Sinead McCausland. 2024. Biden and Trump put in danger by Secret Service agents: Watch the second episode of StravaLeaks. *Le Monde*. Retrieved April 22, 2025 from https://www.lemonde.fr/en/united-states/article/2024/10/28/biden-and-trump-put-in-danger-by-secret-service-agents-watch-the-second-episode-of-stravaleaks_6730825_133.html

[11] Fiona C. Bull, Salih S. Al-Ansari, Stuart Biddle, Katja Borodulin, Matthew P. Buman, Greet Cardon, Catherine Carty, Jean-Philippe Chaput, Sebastien Chastin, Roger Chou, Paddy C. Dempsey, Loretta DiPietro, Ulf Ekelund, Joseph Firth, Christine M. Friedenreich, Leandro Garcia, Muthoni Gichu, Russell Jago, Peter T. Katzmarzyk, Estelle Lambert, Michael Leitzmann, Karen Milton, Francisco B. Ortega, Chathuranga Ranasinghe, Emmanuel Stamatakis, Anne Tiedemann, Richard P. Troiano, Hidde P. van der Ploeg, Vicky Wari, and Juana F. Willumsen. 2020. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *British Journal of Sports Medicine* 54, 24: 1451–1462. https://doi.org/10.1136/bjsports-2020-102955

[12] Andrea Bundon and Laura Hurd Clarke. 2015. Honey or Vinegar? Athletes With Disabilities Discuss Strategies for Advocacy Within the Paralympic Movement. *Journal of Sport and Social Issues* 39, 5: 351–370. https://doi.org/10.1177/0193723514557823

[13] Emma Calow. 2022. Activism for intersectional justice in sport sociology: Using intersectionality in research and in the classroom. *Frontiers in Sports and Active Living* 4. https://doi.org/10.3389/fspor.2022.920806

[14] Patrick Carrington, Kevin Chang, Helena Mentis, and Amy Hurst. 2015. "But, I don't take steps": Examining the Inaccessibility of Fitness Trackers for Wheelchair Athletes. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility* (ASSETS '15), 193–201. https://doi.org/10.1145/2700648.2809845

[15] Antonio Casanova-Lizón, Agustín Manresa-Rocamora, José Manuel Sarabia, Diego Pastor, Alejandro Javaloyes, Iván Peña-González, and Manuel Moya-Ramón. 2025. Impact of heart rate variability-based exercise prescription: self-guided by technology and trainer-guided exercise in sedentary adults. *Frontiers in Sports and Active Living* 7. https://doi.org/10.3389/fspor.2025.1578478

[16] Nick A. Cavill and Charlie E.M. Foster. 2018. Enablers and barriers to older people's participation in strength and balance activities: A review of reviews. *Journal of Frailty, Sarcopenia and Falls* 3, 2: 105–113. https://doi.org/10.22540/JFSF-03-105

[17] Haiyan Chen, Klaus Schoefer, Danae Manika, and Effy Tzemou. 2024. The "Dark Side" of General Health and Fitness-Related Self-Service Technologies: A Systematic Review of the Literature and Directions for Future Research. *Journal of Public Policy & Marketing* 43, 2: 151–170. https://doi.org/10.1177/07439156231224731

[18] Anthony Cimorelli, Ankit Patel, Tasos Karakostas, and R. James Cotton. 2024. Validation of portable in-clinic video-based gait analysis for prosthesis users. *Scientific Reports* 14, 1: 3840. https://doi.org/10.1038/s41598-024-53217-7

[19] Verity Cleland, Meredith Nash, Melanie J. Sharman, and Suzi Claflin. 2019. Exploring the Health-Promoting Potential of the "parkrun" Phenomenon: What Factors are Associated With Higher Levels of Participation? *American journal of health promotion: AJHP* 33, 1: 13–23. https://doi.org/10.1177/0890117118770106

[20] Cheryl Cooky, Michael A. Messner, and Michela Musto. 2015. "It's Dude Time!": A Quarter Century of Excluding Women's Sports in Televised News and Highlight Shows. *Communication & Sport* 3, 3: 261–287. https://doi.org/10.1177/2167479515588761

[21] Jesse Couture. 2020. Reflections from the "Strava-sphere": Kudos, community, and (self)-surveillance on a social network for athletes. *Qualitative Research in Sport and Exercise*. https://doi.org/10.1080/2159676X.2020.1836514

[22] Kimberle Crenshaw. Demarginalizing the Intersection of Race and Sex: A Black Feminist Critique of Antidiscrimination Doctrine, Feminist Theory and Antiracist Politics.

[23] Erik Denison, Bevan ,Nadia, and Ruth and Jeanes. 2021. Reviewing evidence of LGBTQ+ discrimination and exclusion in sport. *Sport Management Review* 24, 3: 389–409. https://doi.org/10.1016/j.smr.2020.09.003

[24] Catherine D'Ignazio and Lauren F. Klein. 2023. *Data Feminism.* MIT Press.

[25] Brett A. Dolezal, Eric V. Neufeld, David M. Boland, Jennifer L. Martin, and Christopher B. Cooper. 2017. Interrelationship between Sleep and Exercise: A Systematic Review. *Advances in Preventive Medicine* 2017: 1364387. https://doi.org/10.1155/2017/1364387

[26] Rochelle M. Eime, Janet A. Young, Jack T. Harvey, Melanie J. Charity, and Warren R. Payne. 2013. A systematic review of the psychological and social benefits of participation in sport for adults: informing development of a conceptual model of health through sport. *International Journal of Behavioral Nutrition and Physical Activity* 10, 1: 135. https://doi.org/10.1186/1479-5868-10-135

[27] Priya Elan. 2021. Swimming caps for natural black hair ruled out of Olympic Games. *The Guardian*. Retrieved July 25, 2025 from https://www.theguardian.com/sport/2021/jul/02/swimming-caps-for-natural-black-hair-ruled-out-of-olympic-games-alice-dearing

[28] Chris Elsden, Mark Selby, Abigail Durrant, and David Kirk. 2016. Fitter, happier, more productive: what to ask of a data-driven life. *interactions* 23, 5: 45. https://doi.org/10.1145/2975388

[29] Lloyd Emeka and Carla Meijen. 2024. "Pushing through the pain cave": Lived experiences of pain tolerance in male ultra-marathon runners. *Sport & Exercise Psychology Review* 18: 40–54. https://doi.org/10.53841/bpssepr.2023.18.2.40

[30] Linn Engdahl-Høgåsen and Marte and Bentzen. How is the participation of individuals with disabilities studied and understood in current research within the sport context? A systematic literature review. *International Review of Sport and Exercise Psychology* 0, 0: 1–33. https://doi.org/10.1080/1750984X.2023.2261115

[31] Claire Fournié, Florian Chouchou, Georges Dalleau, Teddy Caderby, Quentin Cabrera, and Chantal Verkindt. 2021. Heart rate variability biofeedback in chronic disease management: A systematic review. *Complementary Therapies in Medicine* 60: 102750. https://doi.org/10.1016/j.ctim.2021.102750

[32] Rob Franken, H. Bekhuis, and Jochem Tolsma. 2023. Kudos make you run! How runners influence each other on the online social network Strava. *Social Networks* 72: 151–164. https://doi.org/10.1016/j.socnet.2022.10.001

[33] Anny Fredette, Jean-Sébastien Roy, Kadija Perreault, Frédérique Dupuis, Christopher Napier, and Jean-Francois Esculier. 2022. The Association Between Running Injuries and Training Parameters: A Systematic Review. *Journal of Athletic Training* 57, 7: 650–671. https://doi.org/10.4085/1062-6050-0195.21

[34] H. Gibson-Moore. 2019. UK Chief Medical Officers' physical activity guidelines 2019: What's new and how can we get people more active? *Nutrition Bulletin* 44, 4: 320–328. https://doi.org/10.1111/nbu.12409

[35] Gov.uk. *Get Active: a strategy for the future of sport and physical activity*. Retrieved April 22, 2025 from https://www.gov.uk/government/publications/get-active-a-strategy-for-the-future-of-sport-and-physical-activity/get-active-a-strategy-for-the-future-of-sport-and-physical-activity

[36] Steve Haake, Helen Quirk, and Alice Bullas. 2024. The impact of parkrun on life satisfaction and its cost-effectiveness: A six-month study of parkrunners in the United Kingdom. *PLOS Global Public Health* 4, 10: e0003580. https://doi.org/10.1371/journal.pgph.0003580

[37] Juan Haladjian, Maximilian Reif, and Bernd Brügge. 2017. VIHapp: a wearable system to support blind skiing. In *Proceedings of the 2017 ACM International Joint Conference on Pervasive and Ubiquitous Computing and Proceedings of the 2017 ACM International Symposium on Wearable Computers* (UbiComp '17), 1033–1037. https://doi.org/10.1145/3123024.3124443

[38] Pedro C. Hallal and Michael Pratt. 2020. Physical activity: moving from words to action. *The Lancet Global Health* 8, 7: e867–e868. https://doi.org/10.1016/S2214-109X(20)30256-4

[39] Jessica L. Hamdan, Andrea Goldstein Shipper, Stephanie Roth, and Yaara Zisman-Ilani. 2023. Disparities in sport participation of transgender women: a systematic and scoping review protocol. *BMJ open* 13, 7: e074054. https://doi.org/10.1136/bmjopen-2023-074054

[40] Daniel Harrison. 2024. Cycling for Fun, Not Fitness: Sports Tracking Is Not All About Performance. In *CyclingHCI: Learning from Cycling, Discovering Lessons Learned from CyclingHCI. A CHI 2024 Workshop*, 5.

[41] Daniel Bryan Peter Harrison. 2020. The Self-Tracker's Journey: situated engagement and non-engagement with personal informatics systems over time. UCL (University College London). Retrieved April 11, 2025 from https://discovery.ucl.ac.uk/id/eprint/10094630/

[42] Daniel Harrison and Faye Green. 2024. Skipping a Beat: Inclusion in Sports Technology, The Case of Heart Rate Monitoring. In *CyclingHCI: Learning from Cycling, Discovering Lessons Learned from CyclingHCI. A CHI 2024 Workshop*, 4.

[43] Seán Healy, Rachel Msetfi, and Stephen Gallagher. 2013. 'Happy and a bit Nervous': the experiences of children with autism in physical education. *British Journal of Learning Disabilities* 41, 3: 222–228. https://doi.org/10.1111/bld.12053

[44] Julianne Holt-Lunstad, Timothy B. Smith, Mark Baker, Tyler Harris, and David Stephenson. 2015. Loneliness and social isolation as risk factors for mortality: a meta-analytic review. *Perspectives on Psychological Science: A Journal of the Association for Psychological Science* 10, 2: 227–237. https://doi.org/10.1177/1745691614568352

[45] Amy G. Huebschmann, Lucille Johnson Campbell, Candace S. Brown, and Andrea L. Dunn. 2016. "My hair or my health": Overcoming Barriers to Physical Activity in African American women with a focus on hairstyle-related factors. *Women & health* 56, 4: 428–447. https://doi.org/10.1080/03630242.2015.1101743

[46] Reisha Hull, Lisa Zaidell, Katya Mileva, and Rita F. de Oliveira. 2021. This Girl Can, can't she? Perspectives from physical activity providers and participants on what factors influence participation. *Psychology of Sport and Exercise* 57: 102043. https://doi.org/10.1016/j.psychsport.2021.102043

[47] Stanley Hughwa Hung, Kelsey Serwa, Gillian Rosenthal, and Janice J. Eng. 2025. Validity of heart rate measurements in wrist-based monitors across skin tones during exercise. *PLOS ONE* 20, 2: e0318724. https://doi.org/10.1371/journal.pone.0318724

[48] Flávio Jerónimo and Eliana Veiga Carraça. 2022. Effects of fitspiration content on body image: a systematic review. *Eating and Weight Disorders* 27, 8: 3017–3035. https://doi.org/10.1007/s40519-022-01505-4

[49] Janelle Joseph, Kaleigh Pennock, and Shalom Brown. 2024. Black Hair Is a Safe Sport Issue!: Black Aesthetics, Access, Inclusion, and Resistance. *Sociology of Sport Journal* 42, 2: 190–198. https://doi.org/10.1123/ssj.2023-0204

[50] Sarah M. Kaja, Samantha E. Lawrence, Kay A. Simon, Mi'Chael N. Wright, and Marla E. Eisenberg. 2024. Who Plays and Who Doesn't? An Intersectional Examination of Disparities in Adolescent Sport and Physical Activity Lesson Participation. *Journal of Adolescent Health* 75, 5: 827–835. https://doi.org/10.1016/j.jadohealth.2024.06.025

[51] Armağan Karahanoğlu, Laia Turmo Vidal, Daniel Harrison, Jamie Steane, Tina Ekhtiar, Teresa Almeida, Anna Vallgårda, and Madeline Balaam. 2024. Life in Transitions: The Role of Technology in Supporting Well-being in the Heart of Change. In *Adjunct Proceedings of the 2024 Nordic Conference on Human-Computer Interaction* (NordiCHI '24 Adjunct), 1–5. https://doi.org/10.1145/3677045.3685470

[52] Daniel Koerber, Shawn Khan, Tahmina Shamsheri, Abirami Kirubarajan, and Sangeeta Mehta. 2023. Accuracy of Heart Rate Measurement with Wrist-Worn Wearable Devices in Various Skin Tones: a Systematic Review. *Journal of Racial and Ethnic Health Disparities* 10, 6: 2676–2684. https://doi.org/10.1007/s40615-022-01446-9

[53] John M. Last (ed.). 2007. A Dictionary of Public Health. In *A Dictionary of Public Health*. Oxford University Press. Retrieved April 9, 2025 from https://www.oxfordreference.com/display/10.1093/acref/9780195160901.001.0001/acref-9780195160901?btog$=$chap&hide$=$true&skipEditions$=$true&source$=$%2F10.1093%2Facref%2F9780195160901.001.0001%2Facref-9780195160901

[54] I.-Min Lee, Eric J. Shiroma, Felipe Lobelo, Pekka Puska, Steven N. Blair, Peter T. Katzmarzyk, and Lancet Physical Activity Series Working Group. 2012. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet (London, England)* 380, 9838: 219–229. https://doi.org/10.1016/S0140-6736(12)61031-9

[55] Sang Ah Lee, Yeong Jun Ju, Joo Eun Lee, In Sun Hyun, Jin Young Nam, Kyu-Tae Han, and Eun-Cheol Park. 2016. The relationship between sports facility accessibility and physical activity among Korean adults. *BMC Public Health* 16, 1: 893. https://doi.org/10.1186/s12889-016-3574-z

[56] Zijing Li, Arnaud Waquet, and Philippe Campillo. 2025. The Glocalization of Sport: A Research Field for Social Innovation. *Social Sciences* 14, 1: 20. https://doi.org/10.3390/socsci14010020

[57] Joseph S. Lightner, Justin Schneider, Amanda Grimes, Melissa Wigginton, Laurel Curran, Tori Gleason, and Tyler Prochnow. 2024. Physical activity among transgender individuals: A systematic review of quantitative and qualitative studies. *PLOS ONE* 19, 2: e0297571. https://doi.org/10.1371/journal.pone.0297571

[58] Heejun Lim, Eun Jung, Kaila Jodoin, XiaoWei Du, Lee Airton, and Eun-Young Lee. 2021. Operationalization of intersectionality in physical activity and sport research: A systematic scoping review. *SSM - Population Health* 14: 100808. https://doi.org/10.1016/j.ssmph.2021.100808

[59] Cecilie Ljungmann, Julie Hellesøe Christensen, Helene Rald Johnsen, Charlotte Demant Klinker, and Charlotte Pawlowski. 2023. O.6.3-3 Gender, ethnicity, and socioeconomic status: intersectoral factors influencing adolescent girls' participation in sport. *The European Journal of Public Health* 33, Suppl 1: ckad133.283. https://doi.org/10.1093/eurpub/ckad133.283

[60] Sarah Manallack, Edith E. Holloway, Frans Pouwer, Jane Speight, and Elizabeth Holmes-Truscott. 2025. Associations between weight self-stigma and healthy diet and physical activity among adults with type 2 diabetes: Cross-sectional results from the second Diabetes MILES – Australia (MILES-2) study. *Diabetic Medicine* 42, 1: e15440. https://doi.org/10.1111/dme.15440

[61] Jeffrey J. Martin. 2013. Benefits and barriers to physical activity for individuals with disabilities: a social-relational model of disability perspective. *Disability and Rehabilitation* 35, 24: 2030–2037. https://doi.org/10.3109/09638288.2013.802377

[62] Caroline Miles, Rose Broad, and Meg Oldham. 2024. *The Abuse of Women Runners: Perceptions, Fears and Experiences*. Manchester. Retrieved April 19, 2025 from https://www.n8prp.org.uk/wp-content/uploads/sites/315/2024/03/Briefing-Report-UoM-N8-Project-Abuse-of-Women-Runners-CM-RB.pdf

[63] Robert W. Motl and Edward McAuley. 2010. Physical activity, disability, and quality of life in older adults. *Physical Medicine and Rehabilitation Clinics of North America* 21, 2: 299–308. https://doi.org/10.1016/j.pmr.2009.12.006

[64] Sean A. Munson. 2017. Rethinking assumptions in the design of health and wellness tracking tools. *interactions* 25, 1: 62–65. https://doi.org/10.1145/3168738

[65] NHS England. 2019. *The NHS Long Term Plan*. NHS.

[66] NHS England. *Adult physical activity*. NHS England. Retrieved April 10, 2025 from https://digital.nhs.uk/data-and-information/publications/statistical/health-survey-for-england/2021-part-2/physical-activity

[67] Michael Noetel, Taren Sanders, Daniel Gallardo-Gómez, Paul Taylor, Borja del Pozo Cruz, Daniel van den Hoek, Jordan J. Smith, John Mahoney, Jemima Spathis, Mark Moresi, Rebecca Pagano, Lisa Pagano, Roberta Vasconcellos, Hugh Arnott, Benjamin Varley, Philip Parker, Stuart Biddle, and Chris Lonsdale. 2024. Effect of exercise for depression: systematic review and network meta-analysis of randomised controlled trials. *BMJ* 384: e075847. https://doi.org/10.1136/bmj-2023-075847

[68] Iva Obrusnikova and Albert R. Cavalier. 2011. Perceived Barriers and Facilitators of Participation in After-School Physical Activity by Children with Autism Spectrum Disorders. *Journal of Developmental and Physical Disabilities* 23, 3: 195–211. https://doi.org/10.1007/s10882-010-9215-z

[69] Office for National Statistics. 2018. Men enjoy five hours more leisure time per week than women - Office for National Statistics. *Office for National Statistics*. Retrieved September 11, 2024 from https://www.ons.gov.uk/peoplepopulationandcommunity/wellbeing/articles/menenjoyfivehoursmoreleisuretimeperweekthanwomen/2018-01-09

[70] Office for National Statistics. More adults are active in areas with a higher number of sports facilities - Office for National Statistics. Retrieved April 22, 2025 from https://www.ons.gov.uk/peoplepopulationandcommunity/wellbeing/articles/moreadultsareactiveinareaswithahighernumberofsportsfacilities/2024-03-07

[71] Michelle Ogrodnik, Sameena Karsan, Brandon Malamis, Matthew Kwan, Barbara Fenesi, and Jennifer J. Heisz. 2023. Exploring Barriers and Facilitators to Physical Activity in Adults with ADHD: A Qualitative Investigation. *Journal of Developmental and Physical Disabilities*: 1–21. https://doi.org/10.1007/s10882-023-09908-6

[72] Fezile Ozdamli and Fulbert Milrich. 2023. Positive and Negative Impacts of Gamification on the Fitness Industry. *European Journal of Investigation in Health, Psychology and Education* 13, 8: 1411–1422. https://doi.org/10.3390/ejihpe13080103

[73] S. A. Paluska and T. L. Schwenk. 2000. Physical activity and mental health: current concepts. *Sports Medicine (Auckland, N.Z.)* 29, 3: 167–180. https://doi.org/10.2165/00007256-200029030-00003

[74] Scott A. Paluska and Thomas L. Schwenk. 2000. Physical Activity and Mental Health. *Sports Medicine* 29, 3: 167–180. https://doi.org/10.2165/00007256-200029030-00003

[75] Matthew Pearce, Leandro Garcia, Ali Abbas, Tessa Strain, Felipe Barreto Schuch, Rajna Golubic, Paul Kelly, Saad Khan, Mrudula Utukuri, Yvonne Laird, Alexander Mok, Andrea Smith, Marko Tainio, Søren Brage, and James Woodcock. 2022. Association Between Physical Activity and Risk of Depression: A Systematic Review and Meta-analysis. *JAMA psychiatry* 79, 6: 550–559. https://doi.org/10.1001/jamapsychiatry.2022.0609

[76] Bo Peng, Johan Y. Y. Ng, and Amy S. Ha. 2023. Barriers and facilitators to physical activity for young adult women: a systematic review and thematic synthesis of qualitative literature. *International Journal of Behavioral Nutrition and Physical Activity* 20, 1: 23. https://doi.org/10.1186/s12966-023-01411-7

[77] Katrina L. Piercy, Richard P. Troiano, Rachel M. Ballard, Susan A. Carlson, Janet E. Fulton, Deborah A. Galuska, Stephanie M. George, and Richard D. Olson. 2018. The Physical Activity Guidelines for Americans. *JAMA* 320, 19: 2020–2028. https://doi.org/10.1001/jama.2018.14854

[78] Ray Maker. 2020. Strava Turns Off Flyby Feature For All Users, Have to Opt Back In. *DC Rainmaker*. Retrieved April 22, 2025 from https://www.dcrainmaker.com/2020/10/strava-flyby-feature.html

[79] Kyle Rector, Cynthia L. Bennett, and Julie A. Kientz. 2013. Eyes-free yoga: an exergame using depth cameras for blind & low vision exercise. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*, 1–8. https://doi.org/10.1145/2513383.2513392

[80] W. J. Rejeski and S. L. Mihalko. 2001. Physical activity and quality of life in older adults. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences* 56 Spec No 2: 23–35. https://doi.org/10.1093/gerona/56.suppl_2.23

[81] Emma V. Richardson, Brett Smith, and Anthony Papathomas. 2017. Disability and the gym: experiences, barriers and facilitators of gym use for individuals with physical disabilities. *Disability and Rehabilitation* 39, 19: 1950–1957. https://doi.org/10.1080/09638288.2016.1213893

[82] James H. Rimmer, Barth Riley, Edward Wang, Amy Rauworth, and Janine Jurkowski. 2004. Physical activity participation among persons with disabilities: barriers and facilitators. *American Journal of Preventive Medicine* 26, 5: 419–425. https://doi.org/10.1016/j.amepre.2004.02.002

[83] Ahuitz Rojas-Sánchez, Jenine Harris, Philippe Sarrazin, and Aïna Chalabaev. 2021. *Fat-Burning Or Fat-Shaming? Theme And Community Overlap Between Online Weight-Stigmatizing And Exercise-Promoting Networks*. https://doi.org/10.21203/rs.3.rs-526129/v2

[84] Herman Saksono and Andrea G. Parker. 2024. Socio-Cognitive Framework for Personal Informatics: A Preliminary Framework for Socially-Enabled Health Technologies. *ACM Trans. Comput.-Hum. Interact.* 31, 3: 42:1-42:41. https://doi.org/10.1145/3674504

[85] Sarvin Salar, Bojan M. Jorgić, Mihai Olanescu, and Ilie Danut Popa. 2024. Barriers to Physical Activity Participation in Children and Adolescents with Autism Spectrum Disorder. *Healthcare* 12, 23: 2420. https://doi.org/10.3390/healthcare12232420

[86] Ren-Jay Shei. 2018. Letter to the Editor: Competitive influences of running applications on training habits. *The Physician and sportsmedicine* 46, 4: 414–415. https://doi.org/10.1080/00913847.2018.1483696

[87] Mari Sone, Teatske M. Altenburg, and Mai J. M. ChinAPaw. 2024. Challenges and Future Directions for Promoting Intersectional Quantitative Studies in Physical Activity Research. *Journal of Physical Activity and Health* 21, 12: 1223–1226. https://doi.org/10.1123/jpah.2024-0480

[88] Katta Spiel. The Bodies of TEI – Investigating Norms and Assumptions in the Design of Embodied Interaction | Proceedings of the Fifteenth International Conference on Tangible, Embedded, and Embodied Interaction. Retrieved April 22, 2025 from https://dl.acm.org/doi/abs/10.1145/3430524.3440651

[89] Katta Spiel, Eva Hornecker, Rua Mae Williams, and Judith Good. 2022. ADHD and Technology Research – Investigated by Neurodivergent Readers. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (CHI '22), 1–21. https://doi.org/10.1145/3491102.3517592

[90] Katta Spiel, Fares Kayali, Louise Horvath, Michael Penkler, Sabine Harrer, Miguel Sicart, and Jessica Hammer. 2018. Fitter, Happier, More Productive? The Normative Ontology of Fitness Trackers. In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems* (CHI EA '18), 1–10. https://doi.org/10.1145/3170427.3188401

[91] Sport England. 2024. *Active Lives Adult Survey November 2022-23 Report*. Sport England. Retrieved from https://sportengland-production-files.s3.eu-west-2.amazonaws.com/s3fs-public/2024-04/Active%20Lives%20Adult%20Survey%20November%202022-23%20Report.pdf?VersionId$=$veYJTP_2n55UdOmX3PAXH7dJr1GA24vs

[92] Sport England. This Girl Can delivers results one year on. *Sport England*. Retrieved April 22, 2025 from https://www.sportengland.org/news/thisgirlcanbirthday

[93] Shrivathsa Sridhar and Shrivathsa Sridhar. 2022. FINA approves competition use of caps designed for afro hair. *Reuters*. Retrieved July 25, 2025 from https://www.reuters.com/lifestyle/sports/fina-approves-competition-use-caps-designed-afro-hair-2022-09-02/

[94] Christopher John Stevens, Alexis R. Mauger, Peter Hassmèn, and Lee Taylor. 2018. Endurance Performance is Influenced by Perceptions of Pain and Temperature: Theory, Applications and Safety Considerations. *Sports Medicine* 48, 3: 525–537. https://doi.org/10.1007/s40279-017-0852-6

[95] Lukas Strobel and Kathrin Gerling. 2025. HCI, Disability, and Sport: A Literature Review. *ACM Trans. Comput.-Hum. Interact.* https://doi.org/10.1145/3716136

[96] Hendrik K. Thedinga, Roman Zehl, and Ansgar Thiel. 2021. Weight stigma experiences and self-exclusion from sport and exercise settings among people with obesity. *BMC Public Health* 21, 1: 565. https://doi.org/10.1186/s12889-021-10565-7

[97] Marika Tiggemann and Mia Zaccardo. 2015. "Exercise to be fit, not skinny": The effect of fitspiration imagery on women's body image. *Body Image* 15: 61–67. https://doi.org/10.1016/j.bodyim.2015.06.003

[98] L. A. Turnock. 2021. '*There's a difference between tolerance and acceptance*': Exploring women's experiences of barriers to access in UK gyms. *Wellbeing, Space and Society* 2: 100049. https://doi.org/10.1016/j.wss.2021.100049

[99] Aamir Vaghela, Shilen Patel, and Michael Perry. 2017. Can Health Tracking Apps Spur Risk-Taking Behaviour? A 2-Year Retrospective Review of Strava Related Cycling Injuries Within North-West London. *British Journal of Oral and Maxillofacial Surgery* 55: e144–e145. https://doi.org/10.1016/j.bjoms.2017.08.171

[100] Lenny R. Vartanian and Sarah A. Novak. 2011. Internalized Societal Attitudes Moderate the Impact of Weight Stigma on Avoidance of Exercise. *Obesity* 19, 4: 757–762. https://doi.org/10.1038/oby.2010.234

[101] Darren E. R. Warburton and Shannon S. D. Bredin. 2017. Health benefits of physical activity: a systematic review of current systematic reviews. *Current Opinion in Cardiology* 32, 5: 541–556. https://doi.org/10.1097/HCO.0000000000000437

[102] Rhiannon L. White, Stewart Vella, Stuart Biddle, Jordan Sutcliffe, Justin M. Guagliano, Riaz Uddin, Alice Burgin, Maria Apostolopoulos, Tatiana Nguyen, Carmen Young, Nicole Taylor, Samantha Lilley, and Megan Teychenne. 2024. Physical activity and mental health: a systematic review and best-evidence synthesis of mediation and moderation studies. *The International Journal of Behavioral Nutrition and Physical Activity* 21: 134. https://doi.org/10.1186/s12966-024-01676-6

[103] WHO. 2022. *Global Status Report on Physical Activity 2022*. World Health Organization, Geneva.

[104] Women in Sport. 2022. *REFRAMING SPORT FOR TEENAGE GIRLS: Tackling teenage disengagement*. Women in Sport. Retrieved from https://womeninsport.org/wp-content/uploads/2022/03/2022-Reframing-Sport-for-Teenage-Girls-Tackling-Teenage-Disengagement.pdf

[105] World Health Organization. 2018. *Global action plan on physical activity 2018–2030: more active people for a healthier world*. World Health Organization, Geneva. Retrieved April 19, 2025 from https://iris.who.int/handle/10665/272722