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Disentangling assistive technology: exploring the experiences of athletes with physical impairments in disability sport

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ABSTRACT

The use of assistive technology (AT) in sport raises critical questions about disability, access, equity, and embodiment in culture and society. In this paper, we seek to provide some clarity on the various ways that disabled people use, interact with, and experience AT through engagement in disability sport. Using semi-structured interviews, this paper centralises the experiences of twelve athletes with different physical impairments as they use AT for sports participation. We highlight a diverse range of experiences, illustrating how ATs function to provide athletes with a sense of embodied freedom and (im)possibilities, as well as exploring the influence of AT on athletes' construction of self and other. Finally, we provide some insight into the dimensions of access that are required to fully utilise AT in sport, specifically focusing on the process of learning to use and respond to AT. We envisage this paper may inform disability and AT scholars, advocates, and sports sociologists as they build on and extend empirical work and advocacy at the intersection of AT, disability, and sport.

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Introduction

The World Health Organisation (WHO) estimates while one billion disabled people¹ currently depend on assistive technology (AT) in their day-to-day lives, about 2.5 billion disabled people will require AT by 2050 but only 10% will have access to it (WHO 2020). Given that access to AT is a widely accepted measure of the social living standards of disabled people (Nind and Seale 2009), this prediction raises critical questions about the intersection of disability and AT.

'Assistive Technology' is a broad term for systems and products for disabled people where systems represent 'the development and application of organised knowledge, skills, procedures and policies relevant to the provision, use and assessment of assistive products' (Khasnabis, Mirza, and MacLachlan 2015, 2229). Assistive products are devices specially designed or are commonly available (e.g. wheelchairs, prosthetics) to enhance the functioning and independence of disabled people (Khasnabis, Mirza, and MacLachlan 2015).

Disability is generally understood in two, often opposing, ways, each of which has implications for the study of disability and AT. The medical model has historically been dominant in understanding disability and informing research activity (Brighton James et al. 2021), positioning disability as directly resulting from limitations of impairment. From a medical model perspective, AT has a restorative or rehabilitative function to restore loss of body function or to enhance active participation (Borg, Larsson, and Olof Östergren 2011). A criticism of this perspective perpetuates the ableist assumption that disabled people require 'fixing', and are dependent on

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assistive devices to approximate an able-bodied ideal (Sparkes, Brighton, and Inckle 2018). In contrast, while the social model retains an understanding of the rehabilitative function of AT, it directs attention to social exclusion, institutional discrimination and inaccessible structures (Oliver 2013) that constitute disability. As such, the social model positions AT as a social and material resource to improve the everyday life chances and affordances of disabled people, improving access to social services including employment, education, health and, in the context of this research, sport.

The nuances evident in the medical and social model approaches to understanding AT illustrate a level of complexity in conceptualising disabled peoples' uses of AT. For example, AT is undoubtedly 'good' for many disabled people; the daily use of AT helps to navigate barriers to participation in activities, promoting inclusion and independence (Ripat and Woodgate 2011). Furthermore, AT is not culturally neutral, and while research illustrates the use of AT might help to challenge often negative cultural perceptions and resist the stigma associated with disability (Ravneberg and Söderström 2017), it also functions as a cultural reference point for individual ableist values of autonomy, self-determination, and independence (Ripat and Woodgate 2011). AT, then, is closely entangled in and with the disability experience, raising critical questions about how disabled people are shaped by, and shape the meanings attached to, assistive devices across various aspects of social life (cf. Ravneberg and Söderström 2017).

These shifting and at times contradictory meanings associated with disabled peoples' use of AT are magnified in sport. In this context, sport AT generally refers to specialised devices designed to enhance sports performance (Burkett 2010). While 'everyday' assistive devices can be used for sports participation (Burkett 2010), they can be uncomfortable, inefficient or expensive to maintain, thus limiting access or compromising sports performance. As such, it is common for disabled athletes to seek out specialised ancillary devices for a specific sport – blurring the lines between what Butryn (2003) has previously termed *self*, *rehabilitative* and *implement* technologies. For example, a carbon fibre 'blade' prosthetic becomes a *self-tech* when infused into the physical body, a *rehabilitative tech* when administered by a specialist for athletic training and an *implement tech* when used as sporting equipment.

Research has also highlighted how access to AT is not always equitably distributed (see Smith and Thomas 2012) and its use in elite sport can lead to suggestions of unfair advantages and assumptions of 'techno-doping' (Wolbring and Tynedal 2013) together with debates around fairness and ethics (Burkett, Mcnamee, and Potthast 2011). Additionally, media representations of disabled athletes are often problematic, fostering 'established hierarchies of disability acceptance' (Pullen and Silk 2020, 467) and an elevated focus on technologically-enhanced para-athletes – those described as 'supercrips' (Howe 2011). The 'supercrip' notion, while seemingly empowering, is underpinned by a dominant able-bodied value system and further reinforces the medicalised view of disability (Silva and David Howe 2012), generating critical questions about the extent to which disabled athletes' experiences of AT can be considered empowering. Perhaps most significantly, AT has significant implications for disabled people's constructions of self; it has been suggested in using AT, disabled athletes incorporate assistive devices into their embodied sense of self and subjectivity (Apelmo 2012), demonstrating considerable agency and resistance to negative disability-specific associations.

Further muddying the waters is the connection between disability, AT and posthumanism (cf. Braidotti 2013). For example, it has been suggested disabled athletes have an 'intense experience of complex hybridisation' (Haraway 1991, 178) with their assistive sporting devices, a process described through the posthumanist notion of 'cyborgification' (see Howe 2011). As Butryn (2003) suggested, the notion of cyborg was introduced in Haraway's (1987) 'Cyborg Manifesto' to critique the boundaries between humans and technology. This is echoed by Reeve (2012) who argued technology has considerable potential to unsettle the categories of able-bodied/disabled, where cyborg theory provides a useful platform to explore 'embodiment and subjectivity in new and productive ways' (108).

Thus, disability sport, is, in the words of Butryn (2003), a ‘major battleground’ (18) for controversies and debates surrounding the use of AT. What is commonly missing from such debates is the centralisation of disabled athletes themselves, attending to the biological, material, social, *and* embodied dimensions of the disability experience (Wolbring 2008). Little is known about how disabled athletes negotiate their athletic body citizenship as it intersects with AT (cf. Butryn 2003; Sparkes, Brighton, and Inckle 2018). Indeed, as Brighton James et al. (2021) argued, there remain few in-depth empirical accounts of how disabled athletes relate to AT (see Sparkes, Brighton, and Inckle 2018; deBono 2017), with even less research focusing on embodiment as object of inquiry (cf. Butryn 2003). Such a focus on embodiment is important, illustrating the processes through which the self, identity and the technology-mediated sporting body are intertwined (cf. Merleau-Ponty 2004) as disabled people navigate disability sport. Despite the importance of embodiment, less is known about how technology amplifies issues of bodily agency and subjectivity in the lives of disabled people (Moser 2006). As such, this paper modestly addresses this gap by illustrating through athletes’ voices how ATs amplify and constrain embodied practices in disability sport.

Aims and purpose

The purpose of this paper is to explore AT in sport participation for disabled athletes. We do this by centralising a range of physically impaired athletes’ experiences of using ATs to train and compete in a cross-section of sports. We aim to bring clarity to the sports experience of disabled athletes as it intersects with AT. The goal is to explore the complex hybridisation between disabled athletes and AT, highlighting how AT (re)shapes disabled athletes’ everyday engagement in sports, contouring issues of access, identity and embodiment.

Materials and methods

This study sits broadly in the interpretive paradigm. Interpretivism is a set of paradigmatic assumptions contoured by the intellectual traditions of phenomenology (e.g. Merleau-Ponty 2004), symbolic interactionism (e.g. Goffman 1959) and ethnomethodology (e.g. Garfinkel 1967) and as such positions knowledge as constructed and reality as inter-subjectively perceived. In locating our work in interpretivism, our focus is on exploring and interpreting how disability and AT interaction influences embodied experiences of disabled athletes in sport.

Semi-structured interviews were conducted with twelve physically impaired athletes who used AT to participate, train and compete in sport. Our intent was to understand the interaction between disabled athletes and their assistive devices while participating, training and competing in sport. The interview guide was generated bearing in mind existing literature on disability, sport and AT and incorporating open rather than closed questions. Questions were sequenced in thematic sections relating to participants’ use of AT in sport, the process of learning to use AT and the ‘felt’ experience of using AT in sport. For example, we asked participants ‘describe your first-time experience of using your sport AT’ and ‘how does your AT help you to participate and play your sport’? This resulted in rich, detailed descriptions of participants’ use of AT over time. The interviews took place at each participant’s selected accessible location (i.e. home, sport gyms and public cafes). The first author conducted the interviews. Interviews lasted on average one hour and audio-recorded with the consent of athletes and were transcribed verbatim with transcription software.

Participants

In this study, participants (i.e. novice, amateur or elite) are provided with sport-specific AT primarily through the Regional Disability Sport Organization (RDSO), funded by Sport New Zealand or private sector sponsors. Under certain conditions, such as participants with severe disabilities who use everyday AT for sport may have access through the Public Health Service.

Table 1. The table shows types of AT participants use.

Participants	Impairment	Gender	Sports	Level	AT Type	Age
Mark	Quadriplegic (C6-C7)	Male	Wheelchair Rugby	Elite	Wheelchair	39 years
Maya	Quadriplegic (C6-C7)	Female	Wheelchair Rugby, Swimming	Elite	Wheelchair	49 years
Giles	Quadriplegic (C6-C7)	Male	Wheelchair Rugby	Elite	Wheelchair	36 years
Ben	Mild Cerebral Palsy (Hypertonia)	Male	Athletics (Track), Wheelchair Rugby	Elite	Wheelchair (only for rugby)	24 years
Oliver	Quadriplegic (C6-C7)	Male	Wheelchair Rugby	Amateur	Wheelchair	26 years
Noah	Leg Amputee	Male	Para-Rowing	Retired Elite	Transtibial Rowing-Prosthetics	75 years
King	Double Leg Amputee	Male	Para-Cycling Road	Retired Elite	Transtibial Cycling Prosthetics	71 years
Leo	Quadriplegic (C5)	Male	Wheelchair Rugby	Beginner	Wheelchair	24 years
Lindsey	Leg Amputee	Female	Alpine Skiing	Retired Elite	Transtibial Ski Prosthetics	58 years
Craig	Leg Amputee	Male	Wheelchair Basketball	Elite	Wheelchair	35 years
Clara	Spastic Paraparesis	Female	Wheelchair Rugby	Beginner	Forearm Crutches/Wheelchair	19 years
Peter	Severe Cerebral Palsy	Male	Boccia	Elite	Electric Wheelchair	21 years

Upon obtaining institutional ethical approval, participants were recruited for face-to-face interviews via the local RDSO. A targeted purposive sampling technique was employed, in which we approached participants with rich experience (Smith and Caddick 2012) of using AT for sport. Participants interviewed were athletes with physical impairments, including 9 males and 3 females who were active in sports at the time of the study. The participants' impairments ranged from severe spinal cord injuries, cerebral palsy, and lower limb amputation to spastic paraparesis. Except for one athlete with severe cerebral palsy who communicated through a caregiver, all participants spoke to the interviewer directly. All participants were over 18 years old and had a range of training and competition experiences; from representing their club in national championships to representing New Zealand at high-performance levels (i.e. international competitions or Paralympic Games). As such, participants brought with them a rich variety of experiences of using AT to engage in sport, which also facilitated the use of informal member reflections (see Brett and McGannon 2018) between the first author and the athletes generating additional insight (Table 1).

Data analysis

To attend to the embodied processes of using AT, we adopted a reflexive thematic analysis that provided helpful anchor points in working with participants' personal experiences and stories (Creswell 2009). In doing this, the first author reflexively drew on his own experiences as an able-bodied researcher training and competing with some of the athletes. This allowed the first author to '*put himself in place*' of the athletes to cautiously challenge his normative, able-bodied views of the world (Brighton 2015, 173).

As the first step of analysis, we conducted multiple readings of each transcript to familiarise ourselves with the data and consider potential meanings and patterns while making individual reflective notes. The initial immersion was valuable in making sense of the data, before moving into the second step of analysis to construct the 'initial blocks' of the analysis (Braun and Clarke 2013, 206) by coding and using colour shades to organise each athlete's response. This informed the basis for the third step of the analysis; generating themes using the codes across each interview while scouting for connections between the themes. This initial construction of themes was iterative,

involving primary data-driven (inductive) approach with theory-driven reasoning (deductive) to group semantic patterns of data with latent meanings derived through engagement with theory. For example, the second and third authors acted as critical colleagues, reflexively comparing and contrasting initial themes generated by the lead author. This activity further provided a collective reflexive opportunity to re-examine themes, generating five superordinate themes. As a next step of analysis, the first author reviewed the five superordinate themes, summarising individual descriptions, going back and forth with the themes to detail the 'taken for granted', athletes' embodied aspects of using AT to train, compete and perform, alongside an examination of the pragmatic features of AT as it intersects with sport. In doing this, three superordinate themes which represent the essential aspects of the data frame this paper; 1) freedoms and (im)possibilities, 2) constructions of self and other and, 3) access to knowledge and of others. We unpack each of these in what follows.

Results and discussion

The following analysis focuses on embodied experiences of disabled athletes using AT to participate, train and compete in sport. First, we explore how AT materially shapes the participants bodies, highlighting the intimate relationships with ATs. Next, our attention turns to how AT mediates the participants self. Finally, we describe how participants navigate knowledge and learning of AT use. Together, these paint a picture of the embodiment relations of how ATs are central to disabled athletes' participation in sport.

Freedoms and (im)possibilities

In understanding how technology shapes the lives of disabled athletes, it is necessary to recognise for disabled people, the effects of impairment can limit and reduce opportunities available day-to-day (cf. Thomas 1999) such that the use of general assistive devices to navigate their daily environment is not uncommon. In Aotearoa New Zealand, disabled people are situated within a complex healthcare system facilitating access to AT directly through the District Health Board (DHB), via an insurance provider (e.g. Accident Compensation Corporation, ACC), or, on certain occasions, from the Ministry of Social Development via community health care providers (e.g. New Zealand Artificial Limb Centre). The system creates inequity and cost for disabled people to access both daily and sports ATs. For example, only people experiencing disability through accident or injury have access to ATs from ACC while individuals with congenital disabilities receive AT from the DHB. In most cases, the DHB is slow to provide ATs compared to ACC. Additionally, disabled people turn to health centres under the social development system for maintenance, training, and servicing at a high cost. For example:

I have had this Botox sedation treatment for this stump in the last two years and it is just awesome, it just gives me much more stability and I can do more on the bike. It all helps you know, and I am fortunate that ACC recognizes the procedure otherwise it is very difficult. They are expensive. The average person could not afford them and that is about it
(Lindsey).

In the context of sport, all the participants utilised assistive devices that were specialised, or bespoke. These technologies often come at considerable expense, and are not easily acquired, relying on either funding support or discretionary income, directly impacting what types of sport an individual can participate and compete in:

There is a hope that in the future, I would get a chair that is more ideally suited to me. However, I know, that is up to whoever makes the decisions and whether I want to invest in one for myself. Obviously, as I said it is quite an expensive piece of equipment to try to fund myself
(Leo).

Sport-specific ATs were therefore crucial in enhancing participants' access to a range of sporting opportunities. Not only that, but in using their ATs, the athletes were able to demonstrate a level of

athletic control and agency over their bodies. For example, Craig's Rugby wheelchair enabled him to engage in sport and accomplish athletic movements that would otherwise be impossible:

I had the freedom in a sporting context. For once, I could do the things I would want to do that I previously could not because of a lack of agility. Now, I am able to move my body around much better. So, it has really opened up that door, giving me the freedom to express myself and my physical abilities in a sporting context (Craig).

The use of AT was instrumental in facilitating removal of the 'felt' barriers to participating in sport (Kath, Coelho Guimarães Neto, and El Khouri Buzato 2019), and culminated in a sense of freedom. The sense of freedom expressed by athletes, however, at times reflected conformity to ableist hegemony and a value system that encouraged approximation to able-bodied norms and structures in sport. Noah's story is illustrative:

I wouldn't be able to row without the single adaptability of the leg ... when I've got my prosthetics on, I can go out in a normal boat and race against able-bodied rowers. That's because I've adapted that leg so that I get into a boat and row normally. The Limb Centre has done a really good job, to help me and I can sit in the boat, and really, people wouldn't realise that I had a prosthetic on (Noah).

The sense of freedom and removal of felt barriers reflects an embodied relationship with technology, involving an expanded set of possibilities for participation and competition. This is reinforced by some participants who positioned their AT as central to athletic performance, a signifier of what Butryn (2003) described as *implement technologies*:

The wheelchair is just a flash pair of rugby boots. Trying to jump in my rugby chair is the same as putting on my rugby boots and getting ready to play. It helps me get around the court just as getting around the field (Giles).

The wheelchair definitely provided me with a bit of ability in my body, a bit of exercise to try to get faster and stronger and increase my actual tactics on the court - how I play and do what my role is within the team (Leo).

Here the athletes reconfigured their assistive devices as *part of them*, inscribing the devices with a level of agency in enhancing the participants' athletic potential and competency. However, while the relationship with AT afforded some level of freedom and opportunity in sport (cf. Apeldoorn 2017; Sparkes, Brighton, and Inckle 2018), at the same time participants described the material restrictions that ATs imposed on their bodily capabilities:

It is quite difficult riding a steep (climb). If I could get more power, if I could rotate, generating power on my prosthetic limb, I can then probably just with an action, I can generate around 20 to 30% more power and drive (King).

The impact of AT on participants' physical competencies were accentuated not only in sport but in their everyday physical activities:

I always wanted to have a crank-wearing stump. I have been over in Rotorua² riding and come down from the top. I always want to do that, but it is too risky. I probably could do it (but) I will probably be in a wheelchair after doing it (Lindsey).

These material restrictions were further compounded for participants that were unable to access bespoke assistive devices. Some wheelchair rugby players described their experiences of using 'hand me down' wheelchairs, which were often heavy, sluggish and unsuited to the dynamic nature of sport:

So, they gave me the number of the Waikato coach, down here, and said when I get back to Hamilton, I should give him a call. It looked like a fun game and something I wanted to be involved. So, I gave him a call when I got back to Hamilton. He came along to team training and had a chair that I could not push around because the chair was twice my size. It was really wide, and hard to push (Mark).

Previous research in wheelchair sport contexts has illustrated the process of 'en-wheelment' (see Papadimitriou 2008; Sparkes, Brighton, and Inckle 2018) that in this context describes athletes negotiating a new sport while at the same time navigating the 'fit' between their wheelchairs and

their bodies. This process is not uncommon as athletes attempt to enter new environments, enmesh with technology and demonstrate athletic competency, resulting in a lack of control and reduced ability to perform. As such, in focusing on embodiment, the analysis highlights a paradox; on the one hand, fusing with technology (Apelmo 2017) opens up opportunities to demonstrate power and agency (Moser 2006). On the other hand, incorporating assistive devices into bodily schema is not always a straightforward process, with a powerful material influence on participants' negotiation of their environment. For example, the everyday disabling barriers experienced by Maya in her day chair rendered her passive and vulnerable. In contrast, sport and her sports chair enabled Maya to challenge her day-to-day subject position, positioning her as strong, invulnerable and capable (cf. Apelmo 2012):

I feel like most of the world is trying to kill me with bumpy roads and really shitty curb cuts and all of the environmental stuff. It is a constant negotiation for a tetraplegic in a manual chair. Where you are always looking at your feet, waiting to see what's in front of you, what you're going to run into. So you don't often get to roll along and just look at the world and be part of it because you're too busy trying to not die by hitting something. In the hall where we play wheelchair rugby. . .there's nothing that's going to go wrong. In the outside world, you are vulnerable, but in the hall, you're not. Yeah, I loved it, the speed and the freedom (Maya).

Butryn (2003) suggested that *self-technologies* do not just alter an athlete's physical makeup but incorporate a psychological dimension. In this case, the athletes' body technologies helped them to develop esteem and self-confidence, which crucially translated into strategies for negotiating everyday life:

. . .because of the dynamic nature of the sport and the way that you learn to move your chair in that sport, it has given me more knowledge and confidence in everyday life (Clara).

Athletes incorporated their assistive devices into their sense of self and bodily schema, 'blurring' the boundaries between their physical bodies and material technologies. For example, Peter – a powerchair user and Boccia player – described how he orients himself in a competitive situation and collapses the distinction between his chair and his body:

You have to be very conscious . . . I am too focused on getting the shot and lining up the shot right. One technicality is I can line up the shot out of the box and then I have to put *myself* back in the box to take it. I can line it up to make sure it's all right, *then move myself back* into the box to push it but that's where sometimes I will leave a wheel still out (Peter).

These data suggest the incorporation of assistive devices into athletic performance varied greatly between participants. Thus, the ways disabled athletes interfaced with their assistive technology to compete and train illustrate the porousness of natural and artificial bodies, as well as having implications for the production of identity (cf. Butryn 2003):

I definitely feel much better (in) the rugby one (chair). I feel like I am a *bloody transformer*. I would not be able to go and play rugby on this one (referring to an everyday wheelchair) (Oliver).

This 'blurring' of the boundaries between (disabled) humans and technology produced unique effects on the participants' embodied sense of athletic self, where the body-self-object distinction disappeared from conscious awareness and reflection (Leder 1999; Sparkes, Brighton, and Inckle 2018):

It does feel like that when you are playing you do not notice that you are pushing a chair; you just feel you are playing. It feels like that. Once you get the right equipment, and the right chair it does feel like a body part of you (Mark).

As we have already shown, ATs are not passive and immutable as the analysis demonstrates how the AT acted against and with participants' bodies at the same time, shaping the athletes' relationships with their devices over time:

When I returned after my leg amputation, I was in a tight strap on my wheelchair that caused a blood clot. So yes, it felt a bit difficult, it was just a weird feeling, and then I did not feel like one with the chair because I did not use

the strap anymore. I always felt disconnected from the chair. Whereas before that it felt like the chair was part of me because I will be strapped tightly (Craig).

While the athletes used their AT instrumentally, enabling them to be socially active, AT exerted considerable agency, shaping the participants' 'mobility and agility, sensory apprehension, communication, and cognitive action' (Ott 2015, 104). The athletes, therefore, were engaged in an embodied process of negotiating and learning to use their AT in ways that might be considered simultaneously transformative and restrictive. This is illustrative that AT provision alone is of little use as disabled athletes must navigate self-work and process of knowledge for *full* access to AT.

Constructions of self and 'otherness'

In adjusting to AT and enabling technologies to become 'part of them' in a performative sense, the participants were engaged in forms of self and identity work. Indeed, in the process of embodiment, the relationship between technology, impairment, and the body was central to the participants' 'very notions of their selves' (Butryn and Masucci 2009, 288), enabling the production of a particular athletic subjectivity. Mark's experience is illustrative of how technology reshaped his relationship with disability:

I do not realize I am disabled. It is just as if I am just playing a normal sport, it is such a fun game. When you have an accident and you have broken your neck, there is pretty much only one sport that you can play which is wheelchair rugby, but thankfully, it is the best sport in the world (Mark).

Other times ATs are identity markers in people's lives (Ravneberg and Söderström 2017), that – at an aesthetic level – modify or enhance the natural appearance of the disabled individual, but ultimately construct experiences of 'otherness'. Such feelings of 'otherness' are exacerbated by what Garland-Thomson (1997, 26) described as 'the stare' — a 'gesture that creates disability as an oppressive social relationship' through which disabled people are visually othered, stigmatised:

Sometimes (people are) just curious or just look and stare. They wonder how you got into a wheelchair... and think you are not really capable. I am still me. I am still Oliver; you know Oliver just in wheels but other people they are curious. Their question is "ooh what happened to you"? That is always the question (Oliver).

'Otherness' describes the experience of occupying one or more marginalised identity categories (Brighton James et al. 2021, 5); in this case reflecting the participants' experiences of social invalidation (cf. Hughes 2000) in everyday life. Immersion in disability sport, however, accentuated by the use of ATs, alleviated some feelings of internalised 'otherness':

I met the team and I got into the chair for the first time three months after my accident and I loved it, and never looked back and it was the best thing I did in terms of my recovery. Just because you're immersed in this culture where you buggers with legs are the odd ones out because all of us are in wheelchairs and then my family, my kids, got to meet a community where their mum wasn't the only one in a chair; there are other parents there too. It's the community, it's the laughter and it's the camaraderie. You can walk into that space or roll into that space, and no one, no one is gonna go; 'what happened to you'? Because we all know what happened to us (Maya).

... it is one of those things where I could do many able-bodied sports if I wanted to. It is just whether or not I would get the same enjoyment out of it as I do with this sport (referring to wheelchair rugby) where there is that assistive technology that makes it more, or I guess for lack of a better word an even playing field and that everyone is in a chair (Ben).

Here, the data is suggestive of a particular social configuration – disability sport – that is, in many ways 'normalising' of impairment. 'Otherising', however, was still present – in this case manifesting in hierarchies that were structured according to the level of function and use of AT:

All the other players were telling me what to do. I was using one of the other guy's chairs, so he helped me with getting set up. There are also wheelchair rugby players that are a lot weaker than I am because you are graded from 3.5 to 0.5. I'm at 1.5 so there are still all the 1.0 and all the 0.5's that have less function than I do. So, I'm not

the slowest player out there or the weakest player. So, when I was seeing guys who have a lot less function than I do, but they are still playing the game, doing the best they can with the wheelchair, as one-pointer or as point five that inspires me (Mark).

While not overtly oppressive, being ‘othered’ through the perpetuation of hierarchies can encourage internalised ableism (Loja et al. 2013), with athletes generally continuing to seek an able-bodied ideal:

The first time I tried to play, they tried to get me to play the game by throwing the balls. After a while, I had been trying to throw the balls (and) a woman who is an international referee came in and said no, I am a ramp player.³ So, that’s when I started using a ramp and I never tried to throw a ball again. It is a lot easier, there is no way I would or want to use my hands at a competitive level. The ramp has given me everything in Boccia. I would be nothing without a ramp (Peter).

Ben described his frustration with his ability to manoeuvre his wheelchair compared with his teammates with more function:

The only thing really that I noticed was just my speed, just being slow, not as quick as some other people in terms of pushing the chair faster. It can be frustrating, but I’ve progressed over time, almost a year (Ben).

The analysis illustrates the power of body-self-object relationships within disability sport, not only in shaping participants’ orientations towards the self and others but in constructing symbolic boundaries within and between disabled athletes. In this sense, further research is required to explore the entanglement of disability and AT in the production of subjectivities and social relationships, or more broadly as part of material sporting culture (Chamberlain and Lyons 2016). One avenue may be to explore the impact of AT on disabled people participation in sport from a material perspective.

Access to knowledge and knowledgeable others

Previous research has paid minimal attention to the learning process associated with disability, technology and embodiment in sport. In this section, we trace the embodied learning process of the participants as they acquired the knowledge and skills to use their ATs. In so doing we position ‘access’ as a multi-dimensional concept, encompassing issues of physical access, power, relationships and communication, advocacy, participation, quality of life, as well as knowledge. In this context, knowledge – as it links to access – refers not only to athletes’ knowledge about the availability of sport-specific AT but the ongoing process of learning to use AT to train, compete and generally participate (cf. Nind and Seale 2009). Their use of AT involved an accelerated learning process that relied on access to teammates and peers, creating a network of embodied skills and knowledge:

The challenges are there but there are other players trying to help you out and teaching you how to cope. Yeah, just learning, learning especially off teammates you know, if it was not for them, I probably would not have that much knowledge about using the wheelchair and playing (Oliver).

I am always just learning, learning especially from teammates too. If it was not for them, I probably would not have that much knowledge about using the wheelchair and playing (Clara).

These narratives show how, for disabled athletes, the learning process occurs at both social and embodied levels; through teammates and the material-flesh-environment interaction as AT becomes a medium through which the environment was experienced and acted upon. The importance of peer support networks for helping participants understand and negotiate their AT in a sporting context was crucial, particularly for those with acquired impairments; learning the balance of living a ‘new’ life and learning to navigate the material and biological body (cf. Lowry et al. 2022), building new purpose and meaning. Similarly, the data echoes how disabled athletes ‘go through a drastic sensory reorientation process’ (Sparkes, Brighton, and Inckle 2018, 157) to experience oneness with the AT. Importantly, this ‘reorientation’

process was influenced powerfully by the community in which the participants were situated, as Maya states:

So, (being) part of the community is a massive benefit. I mean health and fitness are one thing, but the most important learning comes from the community, learning about your body, learning about how to parent, and learning about how to be
(Maya).

Similarly, the shared experiences of other disabled athletes were pivotal to the participants' capacity to get the most out of their personal AT:

He (another athlete) was a mountain climber; he lost his legs, and he knew how to ski so I looked him up and found him. I sent him an email and asked, "How do you ski with a prosthetic" and he said, "Oh, you need a thigh brace" oh okay good. So once your limb is on you need a thigh brace and so I put a thigh brace on, and I was good, good in saying that I had knee control
(Lindsey).

In learning to function competently with their AT, the sports environment provided a focused community that played a crucial role in the knowledge-sharing process of utilising AT, providing a social framework through which participants could engage in a process of 'trial and error', learning to negotiate and manage their AT:

... with my prosthetics, it is by trial and error. This one I've got it's got a screw on the end, and the screw bolts in there. It's got a cable that runs up inside the socket, screws that onto the socket, which then holds the lid in place. I have got a peg clip that goes straight onto the pad and locks it on, and when it is locked it's perfect. The only disadvantage is I haven't been able to find a way around it to rotate. As you're going around fiddling and when you get to the bottom of the stroke pedalling it straightens up and when it does that it locks ... all the weights are on the other pedal and what happens is that you're normally going quite fast it just scares me. There's no checklist for it I can go to
(King).

If King's experience is any indication, while athletes might have (albeit inequitable) physical access to AT devices for sport and physical activity and their day-to-day lives, the knowledge of how to use and optimise such devices is not always readily available. This generated frustrations for athletes, who had to resort to methods of self-teaching, and active experimentation:

Many people when I see them at the limb centre get quite excited even at their first limb because it is something different. However, they do not realize the amount of work that is involved to get to walking around and where to go or actually, getting out of that wheelchair. A lot of people may never get out of the wheelchair, and I have seen it before because it is difficult
(Lindsey).

For many participants, the data illustrate a constant and shifting process of adjustment, adaptation and integration into individual AT:

I was still experimenting because I was trying to walk in my rowing leg, which was a loose-fitting leg so that when I'm rowing the leg tends to swell up a bit ... I was very uncomfortable at times walking on it. It caused a bit of damage at the bottom of the stump, but I was very apprehensive the first time, the first couple of times out. I still hadn't worked out the good foot arrangement but with the Limb Centre, we're still working on that and experimenting more a bit on that. A couple more or three outings on the boat, two more visits to the Limb Centre and we had it sorted. It was a big relief and like I said it's been going on for about three and half years
(Noah).

The level of adjustment ranged from shaping their bodies to 'fit' the AT, to modifying the design of their AT to suit their needs:

As time goes on, you're still making slight adjustments all the time to your chair, acknowledging that your body's changing ... I have muscular scoliosis, so when I'm sitting flat, I'm perfect, but when I sit in a more active position my left hip drops. I'm stronger on my right side than I am on my left ... In wheelchairs, particularly when you're a tetraplegic you sit with your legs high and your bum down, that set-up gives you more dump... I'm not a paraplegic and I don't have any core so if you sit me on a flat seat, I wobble all over the place ... Our asses are way down, and our knees are higher which makes us more stable. The tighter we're in our chairs, the better we are. So, for me what we've done is put a whole bunch of sponges; tucking underneath one side of my seat so that when my bum drops down, the left side of me is lifted
(Maya).

For some, this process – while frustrating and uncomfortable – culminated in a sense of improvement in their capacity to train and compete:

The basketball chair I use is an adjustable wheelchair that is adjusted to fit me, but it is not customized. They fix belts for starters - so solid there are no flips about in my movement that could happen on impact or whatever. Probably, it should be a bit narrower, so I will fit into the gaps, smaller gaps. That will make me a bit more agile, and it could make me sit up higher so I could be taller and lighter on the court (Craig).

In extending the work of Papadimitriou (2008), we argue the incorporation of material devices into the bodily schema in sport is not a straightforward, individualistic process, but one that occurs over time and is heavily reliant on outside intervention from disabled peers and healthcare professionals. Thus, we raise critical questions on the distribution of knowledge – as a point of access – for disabled athletes, particularly when sport-specific devices are not prioritised within healthcare systems as essential.

Conclusion

This paper illuminated the lived, embodied realities of using AT for a range of athletes with acquired and congenital physical impairments to train, participate and compete in sport. We have contributed to how the use of AT in sport for disabled people is intertwined with issues of access, identity and embodiment. In so doing, we explored the embodied aspects of cyborgification, providing insight into the ‘blurring’ of the boundaries between (disabled) humans, and technology in and through sport. The analysis illustrates the material and affective impact of AT on participants’ engagement in sport, shaping their orientations towards the self and others, and tracing their embodied learning process. We hope that both method and findings in this paper will inform scholars, advocates, and sport sociologists for further research into assistive technology and disability with a focus to bridge the gap between theoretical and embodied realities of AT in disability sports.

Notes

1. Throughout this paper the term ‘disabled people’ is used to reflect the contemporary social model position of disability and also to highlight New Zealand’s cultural and policy position on disability (see McBean, Townsend and Petrie, 2022).
2. Rotorua is a city in the Bay of Plenty region of New Zealand famous for its mountain biking trails.
3. In Boccia, ‘ramp players’ use a ramp to propel the balls to their desired target.

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