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Impact of Customised Bicycles on People's Participation in Sport and Recreation

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Background

Cycling is in the top five most popular forms of physical recreation in Australia (Australian Sports Commission, 2022). Meaningful engagement in cultural life, including sports, recreation, and leisure, is a fundamental right for people with a disability protected by Article 30 of the United Nations Convention on the Rights of Persons with Disabilities (United Nations, 2007). However, current research suggests that the rates of participation in sport and recreation, including cycling are significantly lower for people who live with disability (Australian Institute of Health and Welfare, 2022). Reasons underlying lower participation rates include a lack of access to appropriate equipment or assistive technology (Darcy et al., 2017). To address this need, there are a growing number of adaptive bicycles available, including handcycles, recumbent trikes, and tandem bicycles (National Equipment Database (NED), 2023). Freedom Wheels is a national Australian program that customises bicycles to meet the needs of individuals with a range of physical impairments. Available features include tricycle frames, outriggers and postural supports that can be modified to suit an individual's needs (Freedom Wheels, 2023).

Adaptive cycling provides people with disabilities a means to engage in this popular activity and experience numerous potential positive outcomes (Angsupaisal et al., 2015; Armstrong et al., 2022; Martinez-Millana et al., 2022; Pickering et al., 2013; Ringenbach et al., 2020). The benefits of adaptive cycling are clear, with research demonstrating opportunity for improvements in functional ability (Armstrong et al., 2022) and fine and gross motor skills (Fletcher et al., 2022). Experiences of improved independence are also commonly reported (Armstrong et al., 2022; Fletcher et al., 2022; Martinez-Millana et al., 2022; Pickering et al., 2013), for example when children with disability are able to ride independently with their peers and family, or adults experience increased independence in community activities, such as shopping (Fletcher et al., 2022).

Despite these benefits, a review of research literature revealed a gap in existing knowledge about how users of adaptive bicycles engage in sports and recreation using their bike, and what factors act as facilitators and barriers to people's use of customised bicycles. Our research contributes toward this identified evidence gap.

What we did

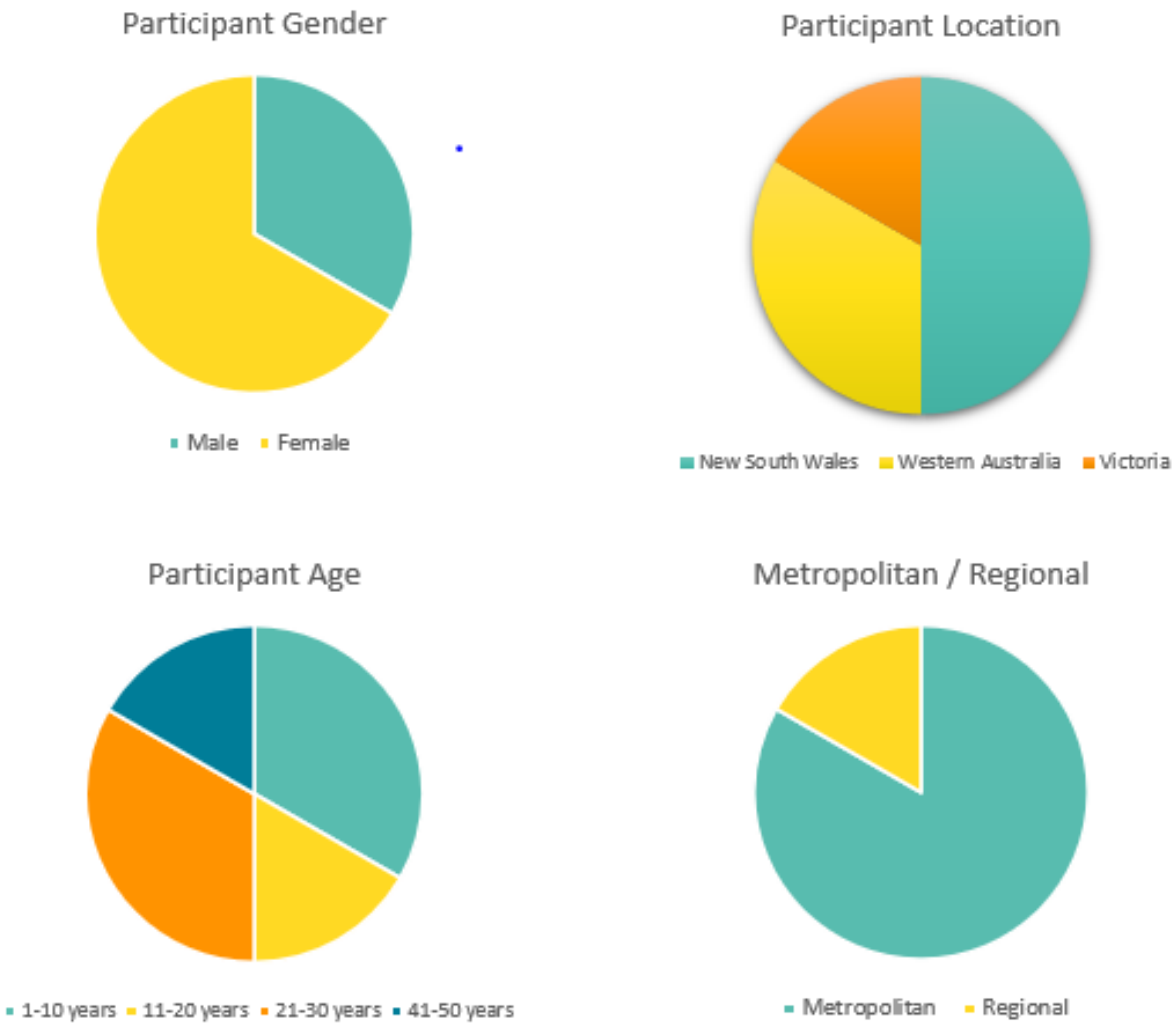
This research aimed to explore people's experiences of engaging with the Freedom Wheels service, how Freedom Wheels bicycles impact participation in sports and recreation, and what factors impact people's use of Freedom Wheels bicycles.

A qualitative participatory research approach was co-designed with the MAL National Project Managers and a Lived Experience Advisory Group (LEAG) comprised of people with lived experience of disability and supporters / carers of people with disabilities. Freedom Wheels users of all ages were invited to participate in this study via semi-structured interviews, photo-voice interviews, the submission of drawings, or via a written questionnaire. This range of options helped to accommodate all Freedom Wheels, users including children, people with intellectual disability, people with lower levels of English literacy and those with digital accessibility restrictions, in the study. Such approaches to data collection have been previously established as effective for these groups (Danker et al., 2016; Dunn, 2017; Mulvale et al., 2016; Shumba, & Moodley, 2018).

Data were collected in 2022 and 2023 and a total of six participants took part in interviews. Five participants elected to take part in an online video interview and one participant chose to provide a written response to interview questions. In five instances, a carer or parent made active contributions to the interview. Interview questions were formatted to ensure questions inquired about the participants' lived experience, rather than the supporters'. As shown in Figure 2, participants lived in New South Wales (n=3), Western Australia (n=2) and Victoria (n=1), were mostly female and located within metropolitan areas. Participants' age ranges were: 1-10 years (n=2); 11-20 years (n=1); 21-30 years (n=2) and 41-50 years (n=1).

As part of their demographic questionnaire, participants were asked to share information on sports and recreation activities that they engaged in, and their role within these activities. The most common activities that participants identified were swimming (n=4), bike rides (n=2) and music (n=2). Other activities included long walks, triathlon, calisthenics, visiting local attractions and nights out with friends.

Figure 2: Demographics of Custom AT Interview Participants



What we learnt

This study offered a number of insights into the scope and degree of impact that an adapted bike had on participants' lives, and the factors that impacted their experience of adaptive cycling. These themes are addressed in detail below.

Freedom Wheels bikes can positively influence people's lives

Participants reported that having and using a Freedom Wheels bike impacted them across a range of domains, including their health, fitness, independence, social engagement, and sense of self.

Fun and function

Riding a Freedom Wheels bike, at its heart, was simply an enjoyable experience for participants. While riding at a park, lake or beach was a popular activity for some, others enjoyed being able to now ride in their neighbourhood close to home. A striking similarity across all the interviews was how cycling brought riders and their family and friends together. As stated by one participant, *"We went away on a holiday recently, last school holidays. We're about to go on another next school holidays. Where we went, they had bike paths which were massive, and we rode every day, my daughter loves it".*

At times, a Freedom Wheels bike enhanced functioning in daily activities and even competitive sports, allowing for more meaningful engagement in daily activities. As one participant stated, *"We take it to [our local shops] and I also ride it there".*

When I've been out, I put learner plates on it. People say, 'Oh, I want to have a go, can you take my kids?' I'm like 'Hell no, I'm enjoying myself thanks!' You know, I love it!"

Social capital

There was improved opportunity for social capital amongst participants who owned a Freedom Wheels bike. At times this could be with family - *"It's always combined with being with family, with being outdoors and fresh air… with accessing the community."* Another participant shared a feeling of belonging with fellow competitors at their sporting event - *"So I had to put them on and get my bike out and ride. And everyone was riding when I was doing the bike riding."* Some shared how the bike intrigues strangers in public and that this created opportunity for more social interactions - "*He gets people saying 'cool bike'…"*

Personal development

These positive experiences seemed to provide a confidence boost in participants which manifested in different forms. For one participant it was a sense of normalcy - *"I think it helps reinforce the fact that they can do what everybody else does.",* while another had developed the confidence to talk with people in public - *"… I feel like she's even more confident in kind of engaging with people as well…".* In other cases, a passion and confidence to exercise had been rekindled once the participant had received their bike.

"Oh! My confidence! I now go and do personal training twice a week. And one day I do with one person and another day, I've increased it now to three times a week, but with a group."

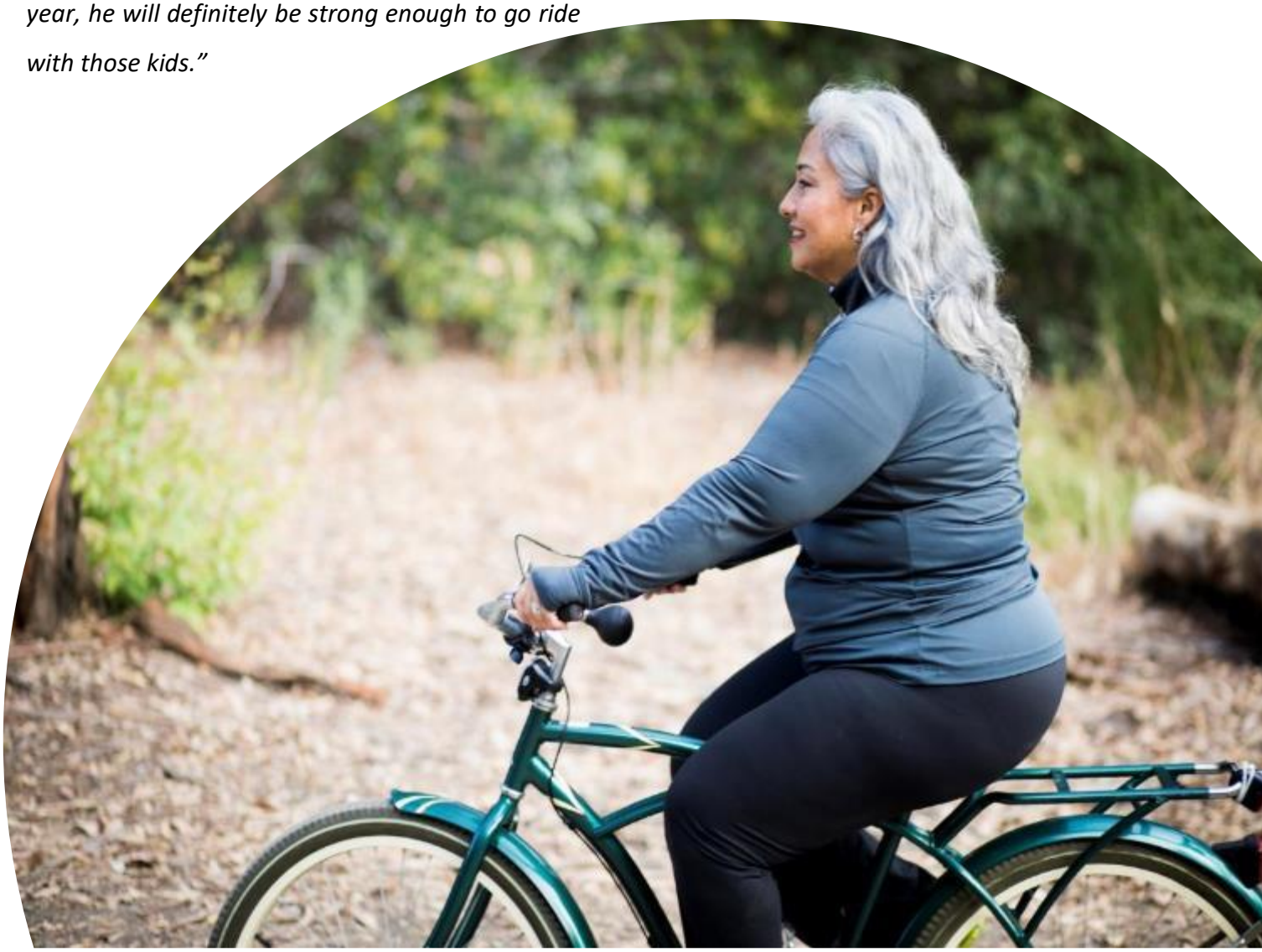
Independence

Participants shared accounts of the bike enhancing their independence. This was summarised as having a way to move on their own and being able to ride when they wanted. This was often linked to a sense of freedom. For one young participant, their Freedom Wheels bike offered a meaningful choice in their mode of transport: *"It's given her so much more freedom and choice, …, even just going, 'do you want to take your wheelchair, or do you want to take your bike?'*

Physical health and fitness

Many participants felt their physical health had improved as a result of riding their bike. For one, the bike provided a means to build their physical capacity, while another incorporated their bike into their exercise, with the goal of building strength, later reflecting, *"My fitness is much better"*. Improvement in strength was reported by numerous participants and was noted to have potential to open doors to new activities: *"… If he continues to … increase his strength, the school has a bike club. And they ride once a week, and they go out through the bush. And we were thinking next year, he will definitely be strong enough to go ride with those kids."*

Some participants were keen to expand the sports and recreation activities they engage in since riding their bike. These activities included horse riding, bush-riding, and gymnastics. There was also a rekindling of past exercise goals: *"I'm swimming, and straight away when I got the bike I started to wonder if I could do a triathlon again. You know, I can't run but maybe someone can help me."*



People's experiences of using Freedom wheels bikes were influenced by a range of factors

Human factors

Freedom Wheels bikes required careful tailoring to riders' physical, cognitive, and other capacities. Participants held valuable lived experience and knowledge of their own needs and valued having their input heard during the bike prescription process.

Activity factors

There was some concern noted for personal and public safety when riding a Freedom Wheels bike and it was suggested that 1:1 safety and riding training could be beneficial. *"We tried originally her going around the main track. That was too difficult to try and that's one thing, it really would have been useful to have somebody who could teach me or teach her directly how to navigate using the bike because being on the main track meant that she could easily swerve into traffic… Or she could go into a normal, you know regular cyclist…, so we then went to the kids' bike track area and that's where she uses it".* One participant felt a tailored tutorial, or instruction manual on how to use the bikes features would have provided a boost in riding confidence.

"Totally! It [a tutorial] totally would have helped me, because I had no confidence and even now, it took me a little bit to go out, every day I want to go out, but I wouldn't go unless my husband was here."

Assistive technology factors

Some participants and their supporters commented that the bike was quite heavy and was difficult for them to move independently without support. Both supporters and riders commented that the bike's weight was a factor to consider when transporting it in a vehicle.

Riders and their supporters commented on numerous features of the bike which they appreciated. Some identified that the adjustability of training wheels lent itself to a longer use of the bike as they could be removed once ready. Other items, such as the basket and the bell, were identified as highly valuable. Younger riders especially loved to keep their belongings in the basket and many also enjoyed the bell as they could *"ring it when people are in [the] way".* Bikes could also be fitted with a push-handle at the rear of the bike and supporters appreciated this as it helped with pushing a bike when it became stuck. Another supporter felt the push-handle gave them control when needed: *"… at the back of the bike a kind of frame where a person can hold on to the back of the bike in order to steer the person".*

Participants did share a desire to have further customisation options for their bike, whether that be a choice in colour, some stickers, or some streamers. One supporter stated that this could help to empower the rider further during the process of receiving a bike, while an adult rider wished for more agency in the positioning of key features on their bike: *"… I held on to the handlebars here, right, and down in the middle is where you press the button for electric. I would have probably had it up here next to my hand… Because when I was in there, when I was in the place, the office at Freedom Wheels, they had it like that."*

"It is heavy. It'd be better if it was lighter because it is quite difficult to get into the back of a car, or even having something that is a bit more collapsible, because not everybody has a ute or a four-wheel drive"

One participant described how their bike provides them with stability, allowing them to overcome challenges of balance and feel a sense of security. The bike's design allowed another participant to overcome environmental barriers and access new areas of recreation. *"… 'Let's take the kids out for a bike ride' - there's going to be a bit of rough terrain, taking her bike means it can go up curbs, it can go onto sand, it can go onto grass, when her wheelchair can't".*

Contextual factors

Initial assessment and trial typically occurred in a purpose-designed Freedom Wheels trial space, and these environments seemed to instil a sense of confidence and excitement in first-time riders. Notably, the younger participants were drawn to the murals on the facility walls.

> *"… they open these doors and you're like in this magical painted - you know what I'm talking about? All the walls have got these sort of cartoon murals on them and then, the floor is customised design… And it was just an incredibly inclusive and positive and fun experience. And it sort of instantly gave her a sense of confidence on the bike." (Supporter 1)*

Supporters and carers were often relied on to provide training and bike maintenance when ongoing services could not be provided. As one supporter recommended: *"In an ideal world if they could send somebody out to help train the person on the bike that would be brilliant, because otherwise it's left to the family to do that, or to source somebody who can do that."* Riders and supporters commented on how staff involved in the Freedom Wheels service delivery led to a pleasant trial experience and ultimately a bike that was fit for purpose. Other facilitators relating to staff included their honesty and transparency, and their willingness to go '*out of their way*' to meet each participant/family's needs.

The built environment was an important consideration for several riders. One supporter commented on how their area is "*hilly*" and not an ideal environment for their child to ride a bike around. Conversely, the bike of another participant had an optional electric motor which helped navigate their hilly location. Another supporter commented how footpath width and street furniture in their local community can act as a barrier to the bike's wider training wheels. However, as per the previous section, bikes could also help overcome previous environmental barriers, such as sand or grass, which previously had prevented access to parks.

Conclusion

As a form of customised assistive technology, Freedom Wheels bicycles offer vast potential to enhance people's participation in sport and recreation, social inclusion, and quality of life. The Human Activity Assistive Technology (HAAT) model is a theoretical model designed to contextualise the many factors that influence people's selection and use of assistive technology (Cook & Polgar, 2020). The HAAT model emphasises that assistive technology solutions are unique to each individual and that the effectiveness of each solution is influenced by a range of human (personal), activity, assistive technology and contextual (environmental) factors (Cook & Polgar, 2020). Findings from this study can be seen to reflect the complexity of assistive technology solutions and that careful assessment of each person's unique needs is essential. Findings also highlight the influence of contextual factors such as service delivery, support, and training as being integral to a person receiving a bicycle that provides real opportunity to enhance their participation in sport and recreation.

Vignette of Freedom Wheels User - Drew

Drew is 10 years old and lives in regional Australia. The past year has been very exciting for them as they have been riding their new Freedom Wheels bike. Drew's bike has so many features they love. It has adjustable wheels to help them balance, a bucket to keep their drink bottle in, a bell to ring and the bike can go very fast.

Drew's parents found it hard to find a bike that could support their feet and balance. Because of this, Drew has had to watch from the sidelines, or have limited involvement in activities their family and friends were engaging in. One of their biggest pet peeves was when their cousins would come over to play. They could play together on the trampoline, but when everyone decided it was time for a bike ride, Drew would be left out. Well, that is not the case anymore!

Drew has spent the past year riding their Freedom Wheels bike at the local park's bike track with their parents, riding on their large property with their sister and cousins and taking part in a competitive sporting event.

Drew's parents feel the bike provides many benefits. They can see an increase in strength and fitness, which will allow Drew to engage in their school's bush bike rides with their friends. It has given them a boost in confidence to try new activities that they never considered before. It has allowed Drew and their family to experience activities in a completely new way with a focus on their independence and inclusion.

Vignette of Freedom Wheels User - Charlie

Charlie is 35 years old and has always enjoyed an active lifestyle, engaging in sports and exercise. However a recent illness meant Charlie could no longer engage in sports or even daily activities like picking up their child from school. Charlie then found out about Freedom Wheels bikes from their Allied Health Professional when asking about different mobility aids. When trialling bikes with Freedom Wheels, Charlie felt the staff were very accommodating and tried their best to understand their needs to customise the bike to be fit for purpose.

Charlie has now been riding their Freedom Wheels bike for a year and has found the bike to be a positive addition to their life. They have now been able to adapt the bike into exercise routines, which in turn has built their physical strength. While the bike has brought a return to familiar exercise, they can now use their bike to ride with their child to and from school.

Previously, the desire to go out into their local community was hindered by pain from walking which turned into a mindset of '*I can't*'. Their Freedom Wheels bike has given them a boost in independence and motivation, where they can go out and explore their local community whenever they please.

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