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'I can't imagine me without a bike' The lived experience of deaf countryside cyclists

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ABSTRACT

Exercise and physical activity (EPA) conducted while in nature has been demonstrated to have a significantly stronger impact on wellbeing when compared to EPA in other environments. Participation rates of deaf people in any form of EPA have consistently demonstrated to be below that of non-deaf people. Through the use of semistructured interviews, this study examined a group of four young deaf males that regularly took part in green cycling (cycling in the countryside). IPA analysis revealed two main Group Experiential Themes (GETS), adapting to deafness and nature connectedness. Results support the idea that nature connectedness was influenced by nature-based exercise and that nature connectedness enhanced wellbeing. Adapting to deafness provides a new understanding to how green cycling is experienced and the mechanisms by which this impacts the cyclist. Practical implications from the research are further discussed.

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Introduction

The benefits of exercise and physical activity (EPA) are well established from physical and psychological perspectives. In an umbrella review, Singh et al. (2023) concluded that EPA has a positive impact on mental health and was highly effective at alleviating the symptoms of depression and anxiety, and they further suggested that EPA was effective at controlling and avoiding a series of chronic physical disorders.



EPA has been linked to physical health improvements such as better blood pressure control (Pagonas et al., 2014), type 2 diabetes (Amanat, Ghahri, Dianatinasab, Fararouei, & Dianatinasab, 2020), enhanced sleep (Wang & Boros, 2021) and many other areas. Further to this, Ruegsegger and Booth (2018) point to regular EPA delaying the onset of 40 chronic conditions.

Despite these benefits, evidence does exist to show that deaf people are less likely to take part in EPA than their non-deaf counterparts. This evidence appears to hold true in each region where it is measured. Studies demonstrating the EPA uptake discrepancy between deaf and non-deaf populations have examined older adults from the USA (Kuo, Di, Ferrucci, & Lin, 2021), women (Curhan, Eavey, Wang, Stampfer, & Curhan, 2013), leisure time physical activity in a Japanese population (Kawakami et al., 2022) and Chinese adolescents (Li, Haegele, & Wu, 2019). Kurková (2016) further examined barriers and facilitators to EPA participation within a deaf sample from the Czech Republic concluding that a positive message, training

for exercise professionals and co-operation between exercise providers and deaf organizations were all necessary to increase EPA participation levels of older deaf populations.

Studies examining the wellbeing impact of EPA within deaf populations have been sparse and inconclusive. The challenges faced by deaf people have been suggested as a reason why within the deaf community consistently demonstrate poor psychosocial wellbeing outcomes (Dammeyer, 2010). A recent review paper (Goodwin, Hogervorst, & Maidment, 2024) concluded that there was no robust evidence to suggest that EPA influences psychosocial wellbeing in deaf people. This was based on two studies that met the inclusion criteria. While this is the current position, this may be down to a lack of investigation as opposed to EPA not impacting the wellbeing of deaf people. Other disabled groups have shown significant positive links between EPA and wellbeing. In a review of the impact of physical activity and sport on those with visual impairments, Alcaraz-Rodríguez, Medina-Rebollo, Muñoz-Llerena, and Fernández-Gavira (2022) concluded that sports activities have favourable outcomes on all the subcomponents of quality of life. Further investigation into the wellbeing effects of EPA on deaf people would be useful to tease out the nuanced differences and commonalities experienced by the deaf community.

Research has consistently shown that EPA while carried out simultaneously with exposure to nature¹

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has an enhanced wellbeing effect when compared to exercise in non-nature-based conditions. A number of different terms have been used within the literature, e.g., green exercise (Pretty, Peacock, Sellens, & Griffin, 2005), blue exercise (White et al., 2016), nature-based outdoor activities (Coventry et al., 2021) and nature-based exercise (Bishop, Beale, & Bruce-Low, 2023). This study will use the term nature-based exercise (NBEX). Considerable research has gone into NBEX with studies focusing on the difference between outdoor and indoor exercise and the difference between rural and urban conditions (Barton, Wood, Pretty, & Rogerson, 2016). Reviews have shown large or moderate effect sizes in favour of exercise while carried out in nature compared to exercise in urban environments for anxiety, fatigue, positive affect and vigour, and small effect sizes for depression (Wicks, Barton, Orbell, & Andrews, 2022). When examining the difference between indoor and outdoor EPA reviews point to a favourable difference in valence and enjoyment in the outdoor conditions but no differences in either direction for emotion, perceived exertion, exercise intensity and biological markers (Lahart, Darcy, Gidlow, & Calogiuri, 2019). Meta-analysis and systematic review of nature-based outdoor activities in adults within community settings revealed significant improvements in depressed mood, anxiety reduction, positive affect and reduced negative affect (Coventry et al., 2021). Several theories have been proposed to explain why nature provides added benefits. Attention Restoration Theory (ART) (Kaplan, 1995) proposes that NBEX could well provide the four elements required to achieve soft fascination, a state of involuntary attention where the body restores itself from psychological fatigue. Being away from the stressors, the environment being of suitable extent, the individual being inherently fascinated by the environment and having personal compatibility with the nature-based activity are the key elements required for attention restoration according to ART. Psycho evolutionary theory (PET) (Ulrich et al., 1991) has been used to explain the difference between conditions suggesting there is an inherent stress reduction when surrounded by pleasant nature scenery which in turn creates a sense of calm and promotes positive emotions. Ecological Dynamics Approach (EDA) (Brymer, Davids, & Mallabon, 2014) suggests that NBEX offers *affordances*, described as opportunities that allow the individual to experience a greater sense of achievement, more focused concentration and a stronger likelihood of being immersed into the activity. In whatever form, NBEX would appear to force the exerciser into more challenging terrain where a stronger awareness and engagement is necessary, e.g., a cyclist who is riding through a country lane will need to attend to the gear requirement, the type of surface that they are cycling on, oncoming distractions and many other aspects.

More recently, the idea that NBEX facilitates flourishing has been proposed, where the five components, positive emotions, engagement, positive relationships, meaning and accomplishments cited within wellbeing theory (Seligman, 2011) are suggested to be evident within NBEX (Geddes & Passmore, 2021). NBEX is suggested to facilitate positive emotions, immersion into the activity to the point where it is the only focus, better relationships, more perspective on life and facilitates a perception of accomplishment.

A recent perspective essay (Bamberg, Hitchings, & Latham, 2018) on NBEX called for a more nuanced understanding of NBEX in three key ways: first, literature has tended to examine the topic during the summer period only; second, there is little on the nuanced differences between the relative impact of different forms of exercise and finally they point to a lack of qualitative naturalistic studies where an understanding from the participants perspective of their authentic behaviour is considered (that which is controlled by the exerciser and not the researcher). We consider intergroup differences such as gender, age, ethnicity and disability to be a fourth important aspect that is often not considered within the literature on NBEX.

Despite these comments, there have now been a series of studies examining different groups within specific exercise domains from a qualitative perspective. Research has considered, combat veterans with PTSD and the impact of surfing (Caddick, Smith, & Phoenix, 2015); Scuba diving (Walker & Kampman, 2022); Mountain climbing and desert trekking have both been examined in multiple sclerosis sufferers (Calsius et al., 2015; Calsius, Van Den Noortgate, Roncada, Van Asch, & D'hooghe, 2019); Parkrun with those that had previously suffered mental health issues (Morris & Scott, 2019); middle aged, middle class male cyclists (Glackin & Beale, 2018); autistic males that engage in NBEX (Bishop et al., 2023) and other areas. These studies have provided a deeper insight into the benefits of NBEX, e.g., Bishop et al. (2023) point to the importance of the introduction to NBEX and the need for a practical purpose for autistic individuals, while Walker and Kampman (2022) pointed towards scuba diving influencing proenvironmental attitudes and behaviours within combat veterans.

Cycling is a form of exercise that can be carried out in different environments, nature-based environments, urban environments, indoor environments and the track all lend themselves to cycling. Cycling can be a form of active travel, a form of exercise and a competitive sport. Cycling participation rates have risen dramatically in recent years with 42.4 million people in the USA taking part at least once in cycling in 2010 compared to 51.4 million taking part at least once in 2021 (Statistica, 2023a) a rise of over 20%. Within the UK, this figure is more pronounced with an increase of over 28% over the same period (Statistica, 2023b).

Cycling UK report on cycling statistics (Cycling UK, 2023) shows demographic differences in cycling uptake, with males making more than 3.6 times the number of cycling trips than females in England. In Scotland, people that identified as disabled do considerably fewer cycling trips than their nondisabled peers 8% compared to 11% of all surveyed. The main reason cited for cycling was leisure, 46% of all cycle trips in England were carried out for leisure purposes in 2021. Statistics and information on deaf cyclists are not available.

Glackin and Beale (2018) are to the authors knowledge the only study to have examined the wellbeing effects of countryside cycling, a process they termed, *green cycling*. The study examined the lived experience of 11 serious cyclists from a professional background aged between 34 and 52 with no reported disabilities. Three key superordinate themes of, mastery and uncomplicated joys, my place to escape and rejuvenate and alone but connected were all proposed to be related to enhanced wellbeing as a result of green cycling. The lived experience of green cycling for deaf cyclists may well be different to that of non-deaf cyclists. Intuitively, it could be considered a more dangerous activity without hearing, it may also be more difficult to carry out green cycling in groups so be 'alone but connected' in the way described in Glackin and Beale (2018). In addition to this it may well present different pathways to wellbeing or not lead to wellbeing at all. Currently to the authors' knowledge, no literature exists that examines the intersection of physical activity in nature-based environments on deaf people, including on green cycling. The challenges faced by deaf individuals, such as increased levels of mental health issues (Kvam, Loeb, & Tambs, 2006), higher prevalence rates of depression and anxiety (Fellinger, Holzinger, & Pollard, 2012) lower levels of self-esteem (Cornell & Lyness, 2005) and less favourable levels of positive and negative emotions (Hintermair, 2006), may well be positively impacted by green cycling, as was the case when the lived experience of NBEX was examined in an autistic group (Bishop et al., 2023). The current study therefore seeks to explore the lived experience of green cycling of deaf males. It will look to gain a deeper insight into the personal impact of the activity in the hope that we can cautiously generalize the findings to the deaf community. The study aims to provide a stronger evidence-based approach into why and how a deaf person should engage in green cycling.

Method

Methodology and philosophical underpinnings

This study uses Interpretative Phenomenological Analysis (IPA) methodology; this was felt appropriate as we were looking at the lived experience of a homogenous

group with the aim of cautious generalization (Smith et al., 2022). IPAs three key features of phenomenology (the philosophy of experience), hermeneutics (interpretation of experience) and ideography (individuality) are all relevant to the current study. IPA has a double hermeneutic whereby the researchers look to understand and interpret the way that the participant has interpreted their experience. Inherent within IPA is an acceptance that getting this completely accurate is unlikely and not the aim of the research.

A transformative worldview approach (Mertens, 2017) was taken, where the researcher looks to focus on those on the margins of society and to include them at every stage of the research process. The transformative world view attempts to allow the participants organic voice to come through within the research. An 'Equitable and Experientially Informed' (Smith, Williams, Bone, & Collective, 2023) type of co-production was utilized within the research whereby the research topic, study design, analysis and write up were all discussed by both authors. The study took an insider perspective, interviews were conducted by the second author who is severely profoundly deaf since birth and relies on lip reading as his main form of communication, is an active cyclist within the countryside, rides regularly both independently and with his deaf peers. The authentic and lived understanding afforded the researcher a privileged position which is suggested to be a significant factor in gaining access to more meaningful information (Perry, Thurston, & Green, 2004). The lived experience of the second author was deemed essential to the full research process. While insider perspectives have been criticized for potential bias because of over familiarity and an unquestioning acceptance of cultural norms, the current study aimed to mitigate this through the co-production process, where the interviews were analysed by both authors and discussion took place where disagreement existed. The first author is familiar with the IPA process and has been involved in several published studies using the IPA methodology. While having more than one author carry out the analysis is unusual within IPA studies, other studies have utilized this process. The co-production approach with complimentary skill sets enabled the complexity and nuances of the activity to be explored in greater depth. Hemming, Pratt, Bhatti, Shaw, and Haddock (2021) provide a guide for involving those with lived experience in the process of qualitative analysis; this study followed the six point process that goes from familiarization with the transcripts to the final report writing. Several authors have discussed the importance of having those with lived experience within the analysis process, e.g., Beresford (2005) states that 'the shorter the distance there is between direct experience and its interpretation (as for example can be offered by user

involvement in research and particularly user controlled research), then the less distorted, inaccurate and damaging resulting knowledge is likely to be'. (p. 7). Several studies have used IPA methodology alongside a joint approach to the analysis process (example studies include Chambers et al., 2015; Martindale, Chambers, & Thompson, 2009). Researchers have further commented that this approach has reduced academic biases beyond the capabilities of the reflexive practice approach (Cotterell, 2008). Smith et al. (2022) endorse this approach when discussing using IPA within co-production and user led approaches stating, 'In projects with the capacity to benefit from an additional layer of dialogue and collaboration, we would expect that this would offer an enriching extra dimension to the work' (p. 132).

Participants

The inclusion criteria of cycling throughout all meteorological seasons, cycling between 70 and 150 miles per week predominately in nature-based spaces, being involved in green cycling for a minimum of 3 years, being deaf since birth and using English as their first language, were met by four participants. Participants were all male, all employed in full time jobs and aged between 24 and 37. The samples were gained using purposive sampling and the participant number was in line with that considered appropriate for the analysis technique (Smith et al., 2022) and in line with other published studies within this subject area that have also used the IPA methodology, e.g., Walker and Kampman (2022) $N=5$ and Bishop et al. (2023) $N=4$. Smith et al. (2022) support this sample size stating 'The issue is quality, not quantity and given the complexity of most human phenomena, IPA studies usually benefit from a concentrated focus on a small number of cases' (p. 46). Each participant was given a pseudonym to maintain confidentiality. See Table 1 for further participant information.

Procedure and data analysis

The BPS code of ethics (BPS, 2018) core principles of respect, competence, responsibility and integrity were adhered to throughout. Due to the tight inclusion criteria, participants were based all over the UK and therefore interviews took place via video conferencing call at a mutually convenient time to the interviewer and participant.

Semistructured interviews were carried out and are the recommended method when using IPA (Smith & Osborn, 2008). A semistructured interview schedule, whereby the researcher has a plan to discuss a series of related topics, was used for each of the interviews. The topics were supported with open-ended probing questions to enable the interviews to stay focussed on the topic at hand. The semistructured interview schedule focussed on the participants experience of riding and on the impact of the natural environment while riding. Significant effort went into ensuring that the participants felt comfortable and were in a position where they were most likely to make sense of their experience of green cycling and provide meaningful and authentic insight. The interviewer is known to each of the participants as a deaf cyclist and had ridden alongside them in the past, the interviewer is fluent in British sign language so could support the interviews using sign language if required. While there were times when this was required both the interviewer and participant spoke aloud at the same time as using sign language, this allowed for the first author to understand the content of the interviews fully. To put the participant at ease and so as not to be rushed the time allotted to the interview was more than that expected (participants were asked to allow 2 hours), and a series of 'warm up' questions were used. Interviews lasted between 45 minutes and 75 minutes, well in excess of the minimum suggestion for interviews that are analysed using IPA. The interviews were then transcribed verbatim.

At this point and throughout the analysis, the power imbalance of the relationship whereby the first author is an established academic and this was the first time that the second author had been involved in the research process was discussed to get as close as possible to removing it with the aim of obtaining the most meaningful analysis possible.

Guidelines for analysis of IPA presented in Smith et al. (2022) were followed. Interview recordings were watched by the first author and notes were taken. Both authors read and re-read the transcripts, took exploratory notes, before constructing experiential statements for the transcript deemed the most meaningful. Connections were then sought out prior to labelling personal experiential themes (PETs) within the initial case. This process was then repeated for the remaining three cases after which convergence and divergence were examined across the PETs to create a set of Group Experiential Themes (GETs). In line with

Table 1. Summary of participants.

Participant pseudonym	Age	Occupation	Self-identified as a recreational natural environment road bicyclist (years)	Level of hearing loss	Hearing device used
Harry	25	Telecommunications Installer	15	Profoundly deaf	Cochlear implant
Michael	26	Videographer	11	Profoundly deaf	Cochlear Implant
Tom	24	Teacher	6	Profoundly deaf	Cochlear Implant
James	37	Construction Manager	25	Profoundly deaf	Hearing Aid

the study's methodology, the process was carried out by both authors individually and then discussed at each of these stages. This approach inevitably led to a difference in theme generation. The time taken at the beginning of the study to ensure that any power balance was minimized and that both authors had a mutual respect for each other's complimentary skill set was helpful as we sought meaningful themes. The discussion helped both authors recognize bias, refine themes, get more accurate labels and articulate more effectively. While it was necessary to agree the analysis this came as a by-product of the process which enabled a more meaningful interpretation and analysis.

Quality procedures

To ensure quality, the authors used two approaches. First, Yardley (2017) guidelines for conducting good quality qualitative research where the four criteria (sensitivity to the context, a commitment to rigor, transparency and impact and importance) were met. The research team demonstrated sensitivity to the context of deaf green cycling through the co-production and having an experienced deaf cyclist all the way through the research process. The commitment to rigour was addressed through the efforts to ensure that the participants would feel as comfortable as possible, and that sufficient time was allocated so as not to have to rush the interviews. Further there is a clear transparency above in how we arrived at the themes. Finally, there was a clear need for this study whereby the deaf community has low engagement in EPA and that other vulnerable groups have shown unique insight to their experiences of NBEX (see Bishop et al., 2023) which when applied could lead to a more bespoke offering to that group. Second, and specifically to measure quality within IPA Nizza, Farr, and Smith (2021) four factors of constructing a compelling narrative, developing a vigorous experiential and/or existential account, close analytic reading of participants words and attending to both convergence and divergence were addressed throughout the process. Member checking (Creswell & Poth, 2016) took place once the results were completed, whereby the thematic analysis was sent to all participants to ask if those themes and explanations reflected the interview that they took part in, this was done in writing in the first instance with the option of a follow up with the second author if necessary. All participants stated that this was an accurate reflection of their interview and experience of green cycling.

Results

The final analysis identified two continually recurring Group Experiential Themes (GETs), adapting to

deafness and nature connectedness which were made up of six Personal Experiential Themes (PETs).

Adapting to deafness

This GET encapsulated the various ways that the process of green cycling was used by the sample to adjust to their deafness. This was discussed in some practical ways whereby participants spoke of PETs of having a sixth sense and knowing without hearing that there was danger and a preference to cycle outside of hearing group settings, a PET we have termed as group riding challenges. Adapting to deafness was also discussed in a more in-depth and emotional way where PETs included green cycling influencing coping with deafness and catharsis from the emotional challenges of deafness.

Technological enhancement/cochlear implant use

Participants spoke of the use of cochlear implants while cycling. This technological advancement has allowed deaf cyclists to hear while cycling. A common issue for the participants was the sound of the wind and all participants reported not liking the sound. A number of participants also used the Bluetooth function on the cochlear implants to listen to music while cycling rather than for to enable them to hear the sounds within the natural environment. This was reflected in Tom's comment:

So, I always wear my cochlear implant when I'm cycling. But that being said, I connect it to my Bluetooth whilst I'm cycling. So, I'm always listening to sort of the radio, podcast, music whilst I'm cycling coz I'd rather listen to those more entertaining stuff than actually hearing the wind noise. So, it did take me a while to get that confident to appreciate that I own this much of the road, and I cycle on that sort of area of road and basically the wind noise is just horrendous, so I tend to have my music on max and just trust myself.

This was also the case with Harry who commented:

Like, cycling by myself and I'm on the road bike, chances are I will be listening to music. Yeah, so there's ways around it, I wear something over my hearing aids to get rid of wind noise so, you know a thin bit of fabric or cloth and it just get rid of it all so it's not really a problem.

Both Tom and Harry discuss how the cochlear implant is adapted from the technologies original function whereby it no longer used to enable the cyclist to hear but instead leaves the cyclist in the same position prior to using a hearing device, both seem to have used their experiences of deaf cycling to adjust the technology to suit their own experience. The use of technology in this way was not uniform, comment was made about how misguided this process was when James stated:

Oh, I'm lost without my ears (hearing aids). So, when I'm cycling on my bike, I always wear my ears because I need to be attuned to what's going on around me. I totally disagree with listening to music when cycling I think it should be banned. The problem is the traffic, you need to hear if someone was shouting, and the quality suffers.

While the idea of technology was clearly a theme running through the interviews, there was divergence on this point with some participants viewing the technology as a safety enhancing process. All participants saw the use of a hearing device as a mechanism to enhance pleasure in the ride.

Sixth sense

The sixth sense referred to an extra sensory perception and a method of understanding outside of and beyond the usual five senses whereby participants were aware of information and the need to act. Participants discuss being aware of when to look behind for oncoming vehicles. Tom said:

I do feel like I've got a ... sixth sense in a way. Because I've noticed that I always look back when the cars about to overtake. So, I sometimes know when the car's going to overtake which is a really bizarre thing I have to say.

Harry discussed similar experiences saying:

If a car does come up, they are usually slow and they can't really get to you, you can sort of like ... I don't know what is, you sort of get a sixth sense that something is behind you, and you just have a feeling something there and say oh yeah, I'll move over.

The sixth sense was mentioned by three of the participants and was a general theme running through the study where there was no disagreement from those that discussed the area.

Group riding challenges

There was a general feeling that being deaf and group cycling within a hearing group was challenging. All participants discussed this and generally it was felt that participants preferred to cycle either alone or with other deaf cyclists. However, there was divergence within the interviews with the reasons behind those challenges being different across the group.

James also points to the issue of safety when group riding stating:

90% of the time on my own, sometimes I do group cycling but I have to warn people that I am deaf, and I can't multi-task; if I lip-read, I could go into a pole or another car.

While safety was an issue there was some disagreement between participants on this point with Tom appearing to have a confidence in the group environment when he stated:

Once you have been riding long enough you can sort of, you know be comfortable riding in a straight line and looking around taking in the view. If you have someone riding next to you, you can sort of look forward and see out of the side of your eye and you can also use one hand to gesture things as well. I feel like it is perfectly safe to like communicate that way.

Other participants discussed the issue of group riding from the point of view of the effort that is required to ride and talk and how this can sometimes take away from the experience. This is reflected in Michael's comment:

I like my own meditation, you know cos like around here, its full of the countryside and you're by the sea and stuff and you just want to be alone. That is one of the reasons and one about deafness because you know when you ride next to someone and Jesus, the amount of effort when you like talk and listen. It's just too much work, you might as well talk at home.

Here Michael clearly points to additional effort that is required of him as a deaf green cyclist when riding in hearing groups. Each of the participants used lip reading to assist with their communication and this was perhaps why it was so challenging for this group.

Although all participants spoke of the challenges associated with group riding. There were differences of opinion in the way the challenge was taken. Harry was very clear that while it was a challenge it was something to be embraced rather than avoided when he commented:

Well, I got used to it (the challenges of riding in a group of hearing riders) after a while, I just accepted that, you know, you can't always hear everything that is going on. I can imagine a lot of people probably would have a negative view of it, but I always really try to look for what can you do in a situation rather than thinking about what you can't do. You just sort of have to figure out a way for yourself to make things work for you because you have also got to accept that things aren't always going to go in your favour.

The idea of group riding challenges was experienced differently between participants, with all participants discussing the area. The divergence across this PET was a feature of the interviews and is something that is given a lot of consideration, is important and meaningful to the riders regardless of how they chose to act on that diligence.

Coping with and catharsis from deafness

Participants had very strong emotional attachments to riding in the countryside. All participants agreed that cycling acted as a self-healing process. This was sometimes directly related to emotional trauma described by participants as resulting from deafness as in James' case where he said:

... can't imagine me without a bike. I can't imagine. I'm married to my bike; I'm married to my wife second. Bikes make me happy and like I told you earlier on life is harder for deaf people. It gets shit to start. We

get shit, we get poor treatment from people and we get frustrated. So cycling is an outlet. Because I'm deaf I then get frustrated; all deaf people do. When I ride my bike, it improves my temperament.

James went on to refer specifically to green cycling when stating:

It feels like life could be beautiful. We (deaf people) got stress; life can get hard. When going to have a nice ride in the countryside, you are at ease. You see rolling hills and you hear the birds; you see the birds and quiet roads and it's like you got the whole world to yourself.

The significance of green cycling to James goes way beyond that of the physiological benefit of the exercise itself. James clearly has a deep attachment to the process and has found a solace and a reflective space within the activity which is equated to other significant areas in his life.

Tom then spoke of how he gets feelings of joy from green cycling:

It makes me happy because I'm getting the fresh air, the seeing the clean environment and just being outdoor which is my element I'm always feeling happy (in the outdoors). Even though a bad day like cycling in the rain I'm sort of like yes this is a bit crap but I'm always happy. I enjoy it.

Michael examines this from a different perspective and refers to the lone experience of countryside cycling and how he can put the stress he experiences of being deaf aside for the period of the ride.

Even though I'm deaf I would say I don't ever feel like it holds me back when I'm cycling away from roads or anywhere humans might be. It's sort of like just feeling it's me by myself, I don't have to worry about what I can hear and that definitely motivates me to go out especially when the weather is good. Literally every single time I get on my bike, I feel happy instantly.

Michael appears to view green cycling as a reflective and helpful space where positive emotions are experienced.

Participants clearly aligned the process of green cycling as helpful to coping with and putting aside the issues that they experience as a result of their deafness.

Nature connectedness

Constantly discussed by the group were a recognition of and a connection to the environment. This was formed of two PETs, an inherent interest in nature's aesthetic a PET described here as 'Pleasure in Exploring Nature's Beauty'. Second the immersive experience of green cycling was discussed as 'Freedom and Escape Through Nature' Participants referred to being absorbed in the activity to such a degree that everything else was put to the side for the duration of the ride. Each of these PETs is discussed.

Pleasure in exploring nature's beauty

The participants spoke of how green cycling specifically afforded them the opportunity to connect with nature through a natural inquisitiveness to explore the beauty that nature presents. Participants noted how green cycling above and beyond that of other forms of exercise was the ideal way to explore this area. James stated:

You could go walking but it would take forever to walk through the countryside. If you drive a car, you are going too fast, you can't absorb what's around you. But on the bike, you can absorb what you see, what you smell, what you hear. Cycling is perfect.

Harry spoke of the unpredictability of green cycling in a positive way when he said:

In the Southdown's way, it's sort of like rolling hills and the sea in the distance sort of like sometimes you see the wind-swept trees. You never know what to expect and you never know when you are having to just turn around and try to find a different route.

All participants spoke of powerful positive experiences when green cycling. This was also reflected in the way that they spoke where all participants appeared excited to give their view of the positive side of green cycling. Interestingly Harry discussed how this exploration helped him during the pandemic and how he linked green cycling with camping and sustainability. When discussing the COVID 19 outbreak, he said:

As soon as May hit, I was out like 10 hours a day, I was going out in the morning and then making sure I had enough food with me to last the day and I would just stay out until it starts getting dark. That's how I did it to start with and then eventually I took a hammock and started camping and just staying out there because it's just such a beautiful place to be and I think that if you can be there and be like sustainably and not litter, I think everyone should experience it.

There were several references from the participants where the sheer joy of exploring what nature had to offer became a feature of their experience of countryside cycling.

Freedom and escape through nature

This refers to how nature enables a sense of openness where it is possible to leave behind any life concerns. Michael discusses openness within green cycling where he refers to pleasure in riding quickly within that environment specifically:

where I live, it is so windy and I love it cos you go out with the head wind all the way, you are like oh for god sake and cos I live near Lands' End so when you ride you have to go out one way So, you go out and then with a head wind to St Ives or somewhere, you know 50 miles away, then you turn around and come back you get tail wind, and you go fast, like

yeah, I'm loving it so that's the beauty of like living in the countryside, you know open, next to the coast.

Tom spoke of recognition of and being a part of the environment during his riding in the North of England when he said:

A nice ride would be in the North Yorkshire moors. Just the whole road was clean, no potholes going up a hill which was really nice, and the sun was out, and you could just see everything around you, sheep on the field, trees, woodlands and then just the whole Yorkshire walls and it was just in my little element, I absolutely loved it. I knew that I could go as fast as possible and go round this bend and go up as quick as possible because there was hardly anyone there.

The idea that green cycling afforded a sense of freedom, and an escape was evident throughout the interviews. Participants frequently discussed how this freedom was connected to connecting with nature while cycling.

Discussion

This study examined the lived experience of deaf countryside cyclists, specifically examining how it impacted wellbeing. The study built on the previous literature that examined the wellbeing impact of NBEX including the single available study looking at green cycling. Deaf countryside cyclists reported a positive and wellbeing enhancing experience, this was in line with other literature examining the area and provided new insight that has not been discussed within the academic literature that is specific to the deaf community.

The group theme 'nature connectedness' has been widely reported in qualitative studies that examined the wellbeing impact of NBEX. Bell-Williams, Irvine, Reeves, and Warber (2021) discussed the human nature relationship as a central theme within their study examining the wellbeing impact of gardening. Bishop et al. (2023) reported positive associations with NBEX as a superordinate theme while examining autistic person's experiences. Within the current study, nature connectedness was epitomized by a general pleasure experienced through being within nature while simultaneously cycling. The only qualitative study to date on green cycling Glackin and Beale (2018) discussed nature connectedness in the form of 'my place to escape and rejuvenate'. The findings from the current study are aligned suggesting that green cycling is experienced similarly in non-deaf and deaf green cyclists within this aspect.

The literature has consistently noted that a connection to nature is a mediator for wellbeing. While there is no single accepted theory that describes this connection, biophilic explanations, whereby humans are suggested to possess an innate tendency to seek out connections with nature. Such explanations would appear to add insight. While this idea has been

criticized for being open to various interpretations and being atheoretically defined (Joye & De Block, 2011), it was a theme reported through the current study in the form of the participants describing internal drives to be actively involved in nature. The ART (Kaplan, 1995) appears to go some way to explaining this, the four features that facilitate soft fascination, (the space where the restoration takes place) of being away, fascination, extent, and compatibility, all appear to be experienced by the participants within the current study.

Adapting to deafness was the main GET. The use of technology in this space is counter intuitive and was not a part of the semi structured interview schedule. While this has been discussed before, Glackin and Beale (2018) report on the use of GPS route mapping enhanced prosocial interactions within green cycling. The samples within the current study generally report using technology in a different way whereby cochlear implants were plugged into a Bluetooth device to listen to music rather than enhance an immersive nature-based experience. The dislike of the wind noise was a consistent theme. This point is worthy of further exploration as the cochlear implant could be used to facilitate the deaf rider to have a more immersive experience, connect socially within group rides and enhanced levels of safety. In 2017, a large-scale study of 2249 Dutch cyclists examined the use of music while cycling and concluded that listening to music negatively impacted perception of traffic sounds (Stelling-Konczak, Van Wee, Commandeur, & Hagenzieker, 2017). There was no reference to deaf cyclists who may be more able to interact without sound while cycling than a hearing cyclist.

The use of technology was perceived as less of a risk as a result of participants believing they have a 'the sixth sense'. The idea that extra sensory perception existed which enabled them to be aware of information and necessary action tendencies beyond that of the other senses (Zahran, 2012). Within this study, participants discussed a type of sixth sense referred to a 'precognition' (Zahran, 2011), where it is possible to sense and predict that something is about to happen. Unpublished research (Bienias, 2005) has examined the sixth sense in relation to deaf people concluding that deaf people believe that they have a sixth sense. However, literature within this area is sparse and worthy of further study to unearth this concept further especially with deaf green cyclists. The social model of disability (Oliver, 1990) has been applied to the deaf community (Ladd, 2003). A key feature of the model is social barriers faced by deaf people. This study referred to this directly. Social connectedness and the availability of social connectedness have been a feature of the NBEX and wellbeing literature within both quantitative and qualitative research. Studies examining subjective wellbeing and

NBEX found the relationship to be significantly serially mediated by social connection (McNeil, Singh, and Chambers, 2022). A main finding when examining the wellbeing impact of green cycling was 'alone but connected' (Glackin & Beale, 2018), referring to having access to a social group while green cycling but also having the option without judgement to opt out and be immersed into the experience while remaining a group insider. The results from the current study suggested that there were challenges associated with group riding and deaf green cyclists adapted their riding activity to avoid those challenges, through activities such as lone cycling and bikepacking (Mulvey, 2021). Le Claire (2012) suggested that most communication is visual for deaf people which may explain why this difference was so pronounced.

The importance of social connectedness as a mediator of wellbeing is consistently recognized. The adaptation of the deaf cyclists within this study to avoid group riding activity would appear to take away from opportunities to socially connect through cycling. Despite this participants still report a wellbeing impact and occasionally discuss riding in deaf specific groups. It would be interesting to investigate deaf group green cycling to establish an understanding how group green cycling influences social connectedness.

Limitations and future directions

There are limitations to the current study. While the study has a clear rationale for the sample and the sample size, it is focussed on a very specific group, making generalization to other groups challenging. Further research on other groups, e.g., female deaf cyclists may well add different insight. More specific research around the meteorological seasons could well be useful to increase the likelihood of policy impact, perhaps there would be a difference in the wellbeing affordances between seasons. It would also be interesting to examine physiological changes that result from green cycling and the impact green cycling has on other health related areas, e.g., nutritional habits, sleep quality and cardiovascular fitness. There are other forms of NBEX that may offer a different route to wellbeing, e.g., open water swimming often creates a social connectedness that happens away from the activity itself (Christie & Elliott, 2023), in that swimmers do not generally engage in the way that cyclists appear to during the event but outside of the swim, before getting in and after the swim. Finally, this paper took an inductive approach and allowed participants to discuss wellbeing from their understanding and took active steps not to bias the participants' opinion on wellbeing. Several models exist that exam flourishing, the highest level of psychological functioning and

wellbeing (Hone, Jarden, Schofield, & Duncan, 2014). These models, e.g., The Conceptual Framework (Huppert & So, 2013) could be researched using a deductive approach to examine how green cycling influences the different components of those models.

Practical implications

The consistent dislike of the wind noise while using hearing enhancing technology such as cochlear implants might suggest that technology is not currently helpful and something that manufacturers could look at in future. However, if technology could be enhanced to avoid wind noise while green cycling it would be interesting to encourage deaf green cyclists to ride in groups using the cochlear implants as a mechanism to cope in that environment to consider if the benefits of social connectedness facilitate a stronger wellbeing impact on deaf cyclists. Audiologists may well wish to take up this challenge to enable group riding. Perhaps cycling bodies could implement a stepping stone system with the aim of enabling deaf cyclists to take part in and feel a part of mainstream cycling club group rides. The Football Association utilized a stepping stone system through inclusion leagues which allow underrepresented groups to play in a single league with a significant proportion of the underrepresented group, e.g., Asian football leagues. Interventions aim to increase participation, talent development and community impact with the ultimate aim of increasing participation within mainstream football of the underrepresented group. Various support systems are in place such as subsidized coaching qualifications for the underrepresented group, financial incentives and partnerships with mainstream clubs. A similar system may act as a pathway to increasing group riding among deaf cyclists. The complexities of this are further discussed within the reflexive analysis section.

The wellbeing impact of green cycling was a consistent theme. The power of the process was evident within the interviews specifically for coping with the issues that were reported from deafness. Self-healing has been a consistent theme reported within the NBEX literature, from disabled (Calsius et al., 2015), nondisabled groups (Rogerson, Brown, Sandercock, Wooller, & Barton, 2016) and vulnerable groups (Calogiuri, Petersen, Rossi, & Terragni, 2023). The current study suggests that the deaf community would have a wellbeing enhancement from green cycling and that in the right circumstances green cycling should be encouraged.

The wellbeing impact could have a policy implication whereby policy makers could use this information to make the case to ensure that cycling infrastructure is usable for the deaf community. Reduced speed zones and visual alerts such as

warning lights as safety measures have been suggested to enhance safety (Grundy et al., 2009). Further, the importance of community engagement and feedback to ensure that the infrastructure is constantly evolving to serve the needs of the deaf community would be of benefit.

Reflexive analysis

This section provides an introspective look at the researchers' roles in shaping this study. The first author is an academic and sport psychologist, a hearing individual with a strong belief in social justice. The second author is a deaf cyclist that has been deaf since birth and cycled in countryside settings throughout his life, his hearing is supported using a cochlear implant. The second author is a football coach for an English premier league football club where he delivers educational programmes alongside football coaching. Initial discussion on the potential issues with co-production were discussed at the start which was helpful in ensuring that there was an intent to ensure that both authors were respected for their complementary strengths within the research process. The issue of power within the relationship was discussed several times, especially through the analysis section whereby the first author was eager not to take over and to ensure that the task-specific and community-specific knowledge that the second author brings was running through the study. Perhaps the best example of this was a discussion around the use cochlear implants to play music rather than to utilize hearing as a safety function. This was initially deemed counter intuitive, dangerous, and perhaps irresponsible of the deaf cyclists by the first author. The second author was very quick to point out that using music in endurance sport is something that has happened for many years and that lots of hearing cyclists now use music simultaneously while green cycling. The point was then made that hearing cyclists using music while cycling who relied on sound to cope with general day-to-day risks were the 'real deaf cyclists' and that those cyclists with hearing devices had developed adaptations to dealing without sound were less at risk. A more neutral stance was taken to the theme after the discussion.

Where the second author carried out the interviews, there was clear evidence that the knowledge of the community and the activity was helpful to ensure meaningful insight was provided through participants feeling safe to use jargon, at ease, not fearing being judged and supported when required through the use of sign language at the same time as speaking. Reflecting on this the depth of insight provided by the participants enabled the study to have real-world meaning that would likely not have happened in the event that the interviews were carried out by an outsider.

The process of co-production faced the challenge that the second author was in full-time employment where there was no time allocation for the research so a lot of the time the research team were working outside of normal working hours. The boundaries that were discussed at the beginning of mutual respect and complimentary skill sets did add to the quality of the work and output and it is hoped that the deaf community will benefit from this process.

Within the discussion section, both authors discussed the issue of using technology (hearing aids or Cochlear implants) as a mechanism to enable social connectedness. While intuitively it makes sense to the first author that the technology should support the process it was not that simple with the second author (deaf cyclist) pointing out that with everything else going on in group cycling that for someone who is unused to relying on hearing it is more complex than initially thought. Further to this, there is an etiquette within the deaf community that even where technology is used one conversation takes place at a time, this etiquette does not hold true within the hearing group riding community. The co-production was a helpful and rewarding feature of the study that enabled more meaningful interviews, and insight into the lived experience of participants and a more detailed, in-depth analysis and understanding of the phenomena which would not have been possible if either author had approached this individually. This additional layer of dialogue and collaboration is unusual within IPA research but consistent with IPA guidance when using a co-production approach (Smith et al., 2022).

Reflexivity was integral to this research allowing for a critical examination of how the positionality of each researcher influenced the whole research process. When examining vulnerable groups, the co-production approach and examining the influence of researcher positionality may well produce more depth of introspection and subsequently more meaningful results than many alternatives.

Note

1. A series of different terms have been used here to describe this form of exercise. The most popular being green exercise which has been criticized for being too generic and not nuanced enough, other terms include but not limited to blue exercise, nature-based physical activity, nature-based leisure and nature-based exercise.

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