

**The electric mountain bike as pharmakon: examining the problems and possibilities of an emerging technology.**

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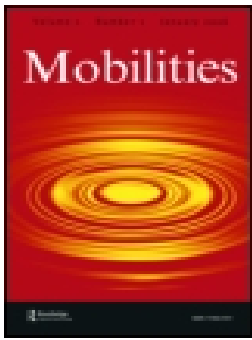
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# The electric mountain bike as pharmakon: examining the problems and possibilities of an emerging technology

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## ABSTRACT

In the last decade there has been an upsurge in the popularity of electric mountain bikes. However, opinion is divided regarding the implications of this emerging technology. Critics warn of the dangers they pose to landscapes, habitats, and ecological diversity, whilst advocates highlight their potential in increasing the accessibility of the outdoors for riders who would otherwise be socially and/or physically excluded. Drawing on interview data with 30 electric mountain bike users in England, this paper represents one of the first attempts to explore empirically the experiential, ecological and socio-cultural implications of this activity. Utilising Stiegler's account of the pharmakon, in which technology is positioned as both remedy and poison, we suggest that the e-mountain bike's role in the promotion of social and environmental responsibility is both complex and contradictory. Specifically, findings indicate that while this assistive technology can play a key role in facilitating deeper connections between riders as well as an ethic of care towards others, it can, at the same time, generate more individualised and automated experiences of recreational mobility in outdoor environments.

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## Introduction

Following a century that was dominated by the combustion engine, the bicycle is enjoying something of a renaissance (Rerat 2021a). As notions of sustainability, health, and the cost of living have captured the public's attention, cycling has attracted attention from governments, policy makers, technological companies, and activists around the world (Zhang 2022). Streets are being closed off to motorised vehicles, financial aid is being offered for the purchase of utility bicycles, and temporary bike lanes are being put in place in many major cities to enhance and expand existing infrastructure. The rise in popularity of cycling, as a form of recreation and a mode of transport, thus reflects both the complexity of contemporary mobility practices, and the need for realistic solutions to some of the world's most pressing social, political and environmental problems (Cooper and Leahy 2017).

As a novel version of the bicycle, the electric bike (hereafter referred to as the 'e-bike' or 'e-mountain bike'), can further extend the possibilities of the bicycle as an accessible and sustainable form of transport. Defined as 'a bike with a battery-powered motor assisting the rider's pedal power' (Rerat 2021b, 423), e-bikes allow riders to choose the level of assistance by

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switching between various ‘modes’, which are actuated by the user’s pedalling. Benefits of this new technology include both the convenience of motorised assistance, and the ability to go further and faster, especially when the topography is steep and hilly. Furthermore, e-bikes can increase the accessibility of cycling for riders who would otherwise be socially or physically excluded, whilst acting as an equaliser between the cycling competencies of different individuals (Marincek and Rerat 2021). For this reason, the stakeholders involved in e-bike use are multiple and varied, ranging from commuters to police or law enforcement officers, tourists and delivery workers, and people with health (i.e. chronic/injury) issues.

Yet, in theorising e-velomobility, Rerat (2021b) contends that it is wrong to assume that e-bikes can unproblematically extend or expand the possibilities for mobility, since the level of assistance provided, and potential benefits to the user, depend on the user’s attitude and skills, their social and collective attitudes towards e-bike use, and the affordances provided by the physical and built environment (which can include topography, weather conditions, but also the attractiveness and perceived functionality of the landscape). To this, we might also add the importance of power relations in space, which determine whether such technologies and forms of mobility are embraced or excluded.

In this paper, we examine the potential benefits and challenges of e-bike utilisation in England by focussing on one specific derivative of the e-bike—the e-mountain bike. As with urban e-bikes, e-mountain bikes can increase the accessibility of natural, ‘outdoor’ spaces, allowing riders to cycle greater distances, whilst presenting an opportunity for a larger proportion of people to enjoy the health benefits of the activity (Chaney et al. 2019). However, e-mountain bikes also antagonise ideological notions of ‘nature’; challenging commonplace notions of what it means to move, and to leisure in the countryside. Specifically, the introduction of a motor on an already contested mode of transport exacerbates existing tensions between different user groups regarding the social, physical, aesthetic, and environmental qualities of off-road riding (Mitterwallner et al. 2021). Despite the recurrent nature of these tensions and conflicts, little is known about peoples’ reasons for buying e-mountain bikes or the impact that such technologies may have on cultures of off-road cycling.

In what follows, we address this lacuna by examining the implications of e-mountain biking technology from the perspective of the users themselves. Drawing upon interview data with 30 e-mountain bikers in England, we analyse motivations for purchasing an e-mountain bike, how their relationship with the bike has developed over time, and the implications that such socio-technical relations may have in relation to the political economy of ‘natured’ mobilities. Here, we draw specifically on Stiegler’s (2013) notion of the *pharmakon* to suggest that our orientation towards technology is rarely straightforward, and that our engagement with, and immersion in, technological worlds reveal a fundamental ambiguity in our sense of humanity. Moreover, we work against the tendency to externalise and condemn technological artefacts, by examining the myriad ways—for better or for worse—that technologies such as the e-mountain bike are physically, cognitively, and socially imbricated in our day-to-day lives. Throughout the article, we enquire as to the social benefits that the e-mountain bike might engender, whilst asking how, and in what ways, they might also compromise our capacity to care for people and environments.

## Stiegler’s (post)phenomenology and its relevance to mobility studies

In the last decade, mobilities research has converged around two schools of thought. As a response to causal or representationalist epistemologies, phenomenologists have attempted to reclaim the complexity of corporeality, embodiment and affect, providing rich and detailed descriptions of the ways that things appear through practice and action. As opposed to an approach that sees bodies as passive recipients of their environment, this work refers to the

peculiarities of space and place not only as 'received and felt by human actors, but also as actively constructed, (re)interpreted, made sense of ... and communicated via social interaction' (Allen-Collinson 2018, 69). That is, rather than understanding the 'outer' world and 'inner' world as separate, phenomenological accounts of mobility perceive consciousness and the object of consciousness as coupled.

This is evident in Brown's study of mountain biking (2012), where she illustrates how the specific skills and capabilities associated with off-road cycling on trails are actualised through a sophisticated human-bike hybrid, requiring the enrolment of technology, movements, sensations, and rhythms. Emphasis is given here to 'the stakes of becoming hybrid in particular ways, the myriad forms of body-to-body attunement demanded ... and how that shapes the kinds of public spaces produced' (Brown 2012, 3). According to Holton and Finn (2018), the strength of this approach lies in its ability to explicate subjective, embodied and lived experiences beyond psychological and cultural boundaries, and, in doing so, explore how certain forms of mobility become enlivened through senses, imagination, perception and memory.

The danger with phenomenological accounts, however, is that the focus on the physical, kin-aesthetic, and sensuous qualities of mobility is accepted in uncritical ways, whilst the subjective (i.e. human) experiences and movements that construct our sense of time and place are positioned in such a way as to supersede, and subsequently obfuscate, the 'affects' of other objects, entities, and lifeforms (Merriman and Pearce 2017). As Sparrow (2014) argues, though phenomenologists have attempted to adopt a grounded approach to reflect on social phenomena, the world of things is only important in so far as it supports or disrupts (human) intentionality. Though it addresses fundamental philosophical and theoretical questions about the predicaments of modernity, space, and affect, phenomenology is ill-equipped to explain the way that human intentionality is co-constituted by, and through, the objects of mobility.

By way of a response, mobility scholars are increasingly locating technological relations at the juncture of posthuman or new materialist frameworks, which allow a move away from dualistic understandings of the biological and social, digital, and physical, whilst facilitating a deeper questioning of what it means to be human in the contemporary socio-technical landscape (Cook 2018). Here, Jensen (2016), contends that the growing role of information, capital, good and services in the enactment or restriction of (global) mobilities instigates the problematisation of simplistic distinctions between humans and non-humans, and instead 'retunes attention towards the assemblages of matter that moves' (2016, 588). Furthermore, the exponential rise in technological influence in sports, recreation and assisted mobility has prompted new questions regarding our 'humanness', whilst initiating increased calls to explore alternative ontological conceptualisations that more accurately define the seamless comingling of humans and nonhumans.

In extending this literature, this article takes inspiration from the recently translated works of Bernard Stiegler, who, in attempting to rescue the notion of the human in critical cultural studies, shows how the human species is, and always has been, co-determined by technological supplements. Stiegler's argument is that if we dispense with the claim that human beings were brought into creation with a divine act of creation, then we must accept that *homo sapiens* have necessarily evolved through a process of technical evolution. Contrary to popular evolutionary theory, Stiegler (1998) contends that it was the development of an upright posture, as opposed to a sudden spike in the size of the upper cortex, that was the most significant physiological development in early humanoids, as the move from quadrupedal to the bipedal stance freed the hands and face for the manipulation of tools and expression of verbal communication. When seen through this lens, our sense of humanity, and our ability to move, are deeply connected with the technical, as it provides the necessary modes of production, cooperation, and culture that have elevated us beyond 'a state of mere subsistence' (Abbinnett 2018, 11).

Stiegler (2020) termed this approach a 'general organology', which is a way of conceiving human evolution 'that is no longer thought of purely in biological terms but also in relation to

those aspects of experience that are conditioned by technical supports or ‘organised inorganic matter’ (ibid 59). Thus, in a certain sense, human memory can exist outside of our genes and brains and is exteriorized in the various artifacts that act as conduits for our daily interactions and routines (Bishop and Ross 2021). A proper account of technology in recreational settings, should therefore take into consideration the forms of memory that are *already there* in cultures of mobility, since this interdependence extends to all of us, all the time, and ‘we are all, always and already, extending our bodily and cognitive faculties via technical prostheses’ (Poulsgaard 2019, 285).

In so far as human beings can facilitate their own becoming through externalised supports, we can also reflect upon our own mortality and locate ourselves in a specific temporal moment, for to use a tool is to remember ‘how it was made, how it has been deployed, and, crucially, how it can be modified’ (Stiegler 1998, 150). This is evident in phenomenological and sociological accounts of ‘e-velomobility’ (Rerat 2021b) and mountain biking (Brown 2012), for example, which illuminate both the complex human-bike assemblages that are formed by riders and the various associations that the sport has with notions of exclusion, power, and privilege. Technics therefore provides a unique sense of mortality that comes from the technological organization of work and desire, in that we can appreciate, reflect upon, and learn from the work of our ancestors, whilst retaining this knowledge through a form collective consciousness.

In the context of cycling, Behrendt (2018) notes how the bicycle affords the rider individual freedom of mobility under the cultural promise of technological progress, and we can observe this in the burgeoning interest in cycling and e-cycling technologies. To this end, objects such as e-mountain bikes are inherently relational, as to understand and use them the individual engages in particular types of *retention*—the process of exchange in which the humans position themselves in relation to a collective consciousness—and *protention*, whereby participants in a given culture co-evolve by projecting their intentions and desires onto a collective, but unknowable, future (Stiegler 2011). Crucially, these agreed upon notions of ‘progress’ involve a futural element, in that:

...an epoch is circumscribed by its ability to generate collective protensions—expectations of a common future, and where we describe this in terms of a ‘horizon’ precisely because these expectations are not identical between individuals but converge towards a future in which it is possible to believe together. (Bishop and Ross 2021, 12)

Our collective memory, as inscribed in technologies such as the mountain bike, is thus an archive of human heritage, knowledge and experience that accumulates over time, and its existence depends on its continual re-activation by successive generations. This is an essential aspect of Stiegler’s oeuvre, and is highly prescient in our analysis of e-mountain biking, primarily because it suggests that human and technics are not diachronically opposed, but rather ‘compose together a dynamic of mutual becoming’ (Crogan 2006, 137). What is therefore appealing about Stiegler’s work, is that it allows us to challenge any straightforward definition of the human by replacing this with the figure of the non-inhuman that constantly changes and mutates according to context, but more crucially, is always threatened by the adoption of new technologies (Black and Cherrington 2022).

## The pharmacological qualities of the (E)Mountain bike

As we have shown, organology is underpinned by a particular ontological arrangement in which we are continually reminded of our prosthetic existence. Where Stiegler’s work therefore differs from the likes of Marx or Heidegger is that technical supports are not seen as external to the individual but are constitutive of our very being. In fact, our very existence as humans depends on our ability to interiorize external memory, as it is this process that makes individual experience transmissible between different generations (Stiegler 2020). However, this arrangement

necessitates a gap, or lack, in our humanity, in so far as our capacity to think and act are constantly haunted by absence and supplementation (Abbinnett 2018). Thus, it might be said that the process of subjective becoming, as experienced through technical objects, is an inherently traumatic experience, as the anxiety of our origins highlights the lack of our substantive being, and continually exposes us to the consequences of our own hubris. It is within this transitional, indeterminate space that we can situate the importance of the pharmakon.

In simple terms, a pharmakon represents the undecidability of human-technological relations, which can lead to positive or negative outcomes (Reader 2017). They can be curative, in the sense that they open creative possibilities that have been displaced by existing social formations, or they can be poisonous, in the way that they hide, and potentially reinforce, the internalisation of harmful attitudes and ideologies. In healthy societies, individuals form contemplative attachments to 'transitional objects' (Stiegler and Ross 2013, 21), including those within the world of sport and physical activity. These transitional objects, such as, the bicycle or the car inspire public debate regarding moral virtue and public good, which, in turn, facilitates a form of care for others as we internalise collective concerns. However, when care is seen only as a matter of compliance, as we so often see when individuals are immersed in screen-based consumption, technology can provoke dependence, which risks isolating individuals from public debate.

In relation to debates around the introduction of electric bicycles, these pharmacological effects are rendered most frequently in discourses relating to, on the one hand, the rehabilitative and inclusive qualities of assistive technologies, and on the other, the potentially damaging effects that such assistance might have in terms of physical health, the environment, and the morality of sporting competition. However, as Bijker (1997) has convincingly shown, these controversies are by no means unique. In fact, it is because, rather than in spite of, these controversies that the bicycle, as we know it today, came into being. For instance, the high-wheeled bicycle that was introduced during the late nineteenth century was initially deemed offensive to those who thought that it's middle-class usership were deliberately trying to elevate themselves above the masses.

Stiegler and Rogoff (2010) explain that this process is made possible because of the mechanism of individuation; the way that an individual and its environment are intertwined in an ongoing and ontogenic relationship of mutual constitution. Through individuation, people are offered opportunities for synchronisation AND diachronisation, that is, instances where they both *differentiate* themselves from the collective whilst *composing* these forms of differentiation from dominant rituals and behaviours. This means that creative thinking becomes an inherently situated activity, where behaviours and dispositions emerge through dynamic interaction between (human and nonhuman) bodies, materials, and symbols (Poulsen 2019). For Stiegler (2018), the goal of these interactions is what he calls *metastabilisation*, which is when agreements, or disagreements are solidified in the symbolic organisation of culture, to the extent that they become a rule. For example, in sport we may well disagree on the adjudicative capabilities of VAR in football, or the competitive advantage provided by a longer putting club in golf, but this disagreement plays an integral role in civilised societies as it allows cultural conventions to be passed on to future generations.

However, in contemporary societies, the foundations of individuation are being eroded by the pernicious effects of hyper-industrial, algorithmic, and computational capitalism – a process that Stiegler (2010, 54) refers to as 'disindividuation'. As we have already seen, a crucial feature of technology is that individuals have, throughout history, continually used tools to dialectically locate themselves within a given collective. Indeed, it is this aspect of technology that can facilitate positive pharmacological outcomes regarding e-velomobility (Rerat 2021b). In recent decades electronic devices, visual media and mass consumption have subjected human relationships to the dual processes of hypersynchronisation and hyperdiachronisation, which inhibit our ability to individuate. Here, hypersynchronisation replicates the logic of the market, bringing the individual pasts of previously separate cultures and communities into a general coalescence. It is a

'progressive absorption of the sensory and noetic faculties of human beings into the mnemo-technological systems that saturate the world and anticipate every act of will' (Abbinnett 2018, 37). Hyperdiachronisation, on the other hand, short-circuits our deep connections to the collective and replaces them with a 'stunned paralysis' (2017, 25), in which the reflective faculties of the individual are supplanted by the immediate gratification of the marketplace. Consequently, our desire to individuate has been exhausted by our constant craving for objects that are incapable of revitalising it (Abbinnett 2018).

In mountain biking, the schizophrenic interplay between hyperdiachronised and hyper-synchronised sensibilities has been located within the emergence of the sport itself, which took place within a historical phase in which capitalism was prone to the over accumulation of capital, labour and of goods (Rosen 1993). As consumer culture became more ubiquitous, there was a desire within the mountain bike industry to find more creative ways of selling bikes to consumers. Consequently, mountain bikes were marketed using quixotic images of nostalgia, wilderness and the nuclear family that had little, to no basis in reality. Yet, the irony of these images is that they were being circulated at the same time as the earths remaining wildernesses were disappearing and the nuclear family was beginning to disintegrate. In Stieglerian terminology, the phantasmic symbols presented in early mountain bike advertising have further promulgated a culture of stupidity whereby cycling consumers have been so obsessed with keeping up with technological developments and pursuing a hedonistic existence that they have been deprived of the necessary faculties for making informed decisions, succumbing to idealistic images that are grossly unfaithful to the real.

What is important in scholarly accounts of technologies, and what we intend to address in the following sections of work, therefore, is not whether e-mountain bikes are necessarily good or bad, but whether, and, if so, *how*, in certain contexts the relationship between e-mountain bikes and their riders are conducive to more ethical, responsible, and deliberative forms of behaviour. To achieve this, we first seek to establish the organological relationship between e-mountain bikes and human bodies that has been lost in existing analyses. Via this general organology, we shed new light on the emergence of a new technological aesthetic, whilst contributing fresh empirical data to the study of this underexplored discipline of cycling. Finally, and in keeping with Stiegler's wider political project, the article explores the pharmacological qualities of the e-mountain bike experience, so as to provoke the reflective deliberation that he identifies at the heart of effective individuation.

## Methods

This paper draws on data collected from 30 semi-structured interviews with e-mountain bike riders in England. The sample represented a broad socio-demographic and geographic spread, and included riders who were both experienced in, and new to, e-mountain biking. Participants included women (7) and men (23) and involved individuals from across the life-span (10 were aged between of 21 and 29, 12 were between 30 and 39, 2 were between 40 and 49, and the remaining 8 were over 60). The sample used for this study is therefore comparable with wider trends in e-mountain bike usage in the UK, which indicate that e-mountain bikes attract a wide and diverse usership (see Chaney et al. 2019).

In recruiting participants for the study, an advert outlining key aspects of the research was initially posted to the social media site Twitter. In this advert, it was specified that participants should currently own an e-mountain bike and ride their bike at least once a week. The response to this initial advert was very pleasing, leading to the recruitment of 25 participants. 4 weeks after the initial post, we then posted a second tweet to remind people about the study. At this point, information was sent to numerous mountain bike advocacy groups in order to extend the reach of our advert, which resulted in the recruitment of a further 5 interviewees. Though we

remain wary of debates regarding the validity of qualitative samples, including those relating to 'data saturation', we felt that 30 participants would be sufficient in allowing us to tell a 'compelling, coherent and useful story in relation to the research question' (Braun and Clarke 2021, 207).

Once recruited, the 30 participants were asked to take part in a 45–60 minute, semi-structured interview that was conducted via the Zoom video conferencing platform. Interviews sought to discover the reasons for purchasing an e-mountain bike, the positive and negative qualities of e-mountain bike technology, and the implications that such technology may have on the future of off-road cycling in England. Interview questions revolved around their personal relationship with mountain biking and 'natural' landscapes, the process of adapting to e-mountain bikes, and the conflicts that they may have encountered in the English countryside.

Following Zoom interviews, the data were subject to a dialogic narrative analysis (Smith and Monforte, 2020). In engaging with this process, our focus was on the points of convergence between human, material and technical worlds, and the ways in which these complex entanglements came to bear on the participant's narratives. Specifically, we drew on the 3 aspects of a organological analysis outlined in the work of Stiegler (2020), namely: (1) how bodily organs and their respective proprioceptive, kinaesthetic, and sensorial capacities are incorporated into the experience of riding an e-mountain bike; (2) how artificial organs, or forms of prosthesis, such as a motor and a digital computer, might facilitate certain movements and interactions; and, (3) how certain social groupings are mobilised around different technological assemblages. By paying attention to a range of material-semiotic assemblages that are formed between the participants and their e-mountain bikes, we were able to identify distinctive themes within the data, and to use these to arrive at specific analytic judgements regarding the socio-technical significance of specific human-non-human relationships.

## The E-Mountain bike as prosthesis

Data from this research confirm Stiegler's (1998) observation regarding the importance of tools in the development and maintenance of human sociality. This was evident in the way that the participants positioned the e-mountain bike as a prosthetic aid that facilitated certain actions, movements, and relations:

it's a tool for a job and I think there's lots of jobs this tool can do for lots of different people. I especially like the fact that I can keep track of how far I've been going and how much I've climbed. (Kai)

... I had a knee injury so it was nice to just focus on how my leg was working and the bike would do the rest ... It was a good tool for getting back to full fitness. (Adrian)

Throughout the interviews, participants spoke to numerous other forms of compensation that have been identified in existing research (Fishman and Cherry 2016). Hannah told of how the motor allowed her to compensate for a lack of skill when ascending a technical climb, Adrian, Doug and James described how it made up for a lack of physical fitness, and Graham added that the extra weight of the engine helped him to keep his bike on the ground, whilst manoeuvring through difficult rock sections. As such, the e-mountain bike performs three of the four functions of sport technology outlined in the work of Butryn (2003): it has *rehabilitative* qualities, in that it is employed to overcome the debilitating effects of injury or physical disability; it is a *self-technology*, in that it is positioned as something that can improve performance; and/or it is an *evaluative* technology that is utilised to assess the form and efficiency of the exercisers' movements through the quantification or calculation of bodily capacities. We would add that the e-mountain bike also has a *unifying* function, as we shall explore in more detail below, in that it is able to lessen the physical, mental and sociological differences between riders whilst nurturing different forms of interaction.

These functions are not uncritically inherited from existing social norms, nor are they conceived in a subjective vacuum, but rather, are negotiated through the organological (Stiegler 2020) qualities of technological adoption, in which the 'who' and the 'what' co-emerge through an undecidable relation to one another. For the participants, the locus of this organology was located within the unique physical, material and kinaesthetic qualities of their e-mountain bikes, which were subject to an initial period of trial and error:

On an analogue bike I would always stick it in a low gear and grind up the climbs, like really stomping leg after leg after leg. But when I got on the E-Bike you've got to learn to keep your legs spinning because when you put your foot on that pedal and it kicks in you have a jerk reaction, which could throw you off. (Graham)

When I first started riding it (the bike) I used to stick it in turbo everywhere I went. However, I realised over time that turbo would be the worst decision you could make on a technical climb because you struggle to control the torque. Y'know you want a low setting where you've got quite a gradual, you've got like an initial burst of power but then you don't get any more. (Pete)

In these instances, the e-mountain bike is experienced as a temporal object (Stiegler 2009), which allows Graham and Pete to negotiate their location within a given time and space. Note, for example, how cadence constitutes a particular rhythm that patterns the actions of the riders, whilst simultaneously structuring and creating the shape or order of their movements. Similarly, the torque of the motor, and the various 'settings' that the participants used to complete each climb render a learned way of seeing the terrain and its various features (including rocks, roots and different types of dirt) that is facilitated by the presence of technology (Waitt et al. 2021). Here, the 'I'—represented by individual riders—is inseparable from the 'We', which is the collective way in which landscapes of (sporting) action are socially interpreted and negotiated. Furthermore, it is the constant tension between one and the other that brings different landscapes into being.

The imbrication of 'I' and the 'We' also surfaced when the riders played down or justified the use of a prosthetic aid. For example, when one of the researchers asked Andrea (aged 72) whether her electric bike had been a 'game-changer' she vehemently protested, replying that she was still more than capable of riding a 'normal' bike. Alex was equally staunch in his denial of the need for assistance, whilst Harry and Mandy emphasised that it was important not to boast when riding with other, non-e-bikers, for fear of causing offence. For John, this is a particularly gendered phenomenon, as he argued that 'Sometimes they (men) react in that way because they don't want to compromise what they see as their sense of masculinity'. In a sense, then, the choice to take up e-mountain biking is predicated on existing social beliefs relating to a 'hegemonic humanness' (Butryn 2003, 28) in which ideological notions of fitness, age, ableism and gender come to bear on our experience of mobility in outdoor spaces. As a result, the participants were observed to be engaging in purposeful and deliberate attempts to conceal or mask various markers of impairment (Monforte, Smith, and Perez-Samaniego 2021).

It is from within this folding of human and technics that we can discern, and further analyse, the pharmacological qualities of the e-mountain bike. Since the participants' 'humanity' is never fully human, it takes work to performatively constitute the dividing line between humans and technological objects. However, the consequence of this is that human beings are constantly exposed to the consequences of their own hubris, since the negotiation of our technical existence is always threatened by 'it's inhuman dissolution in adaption' (Barker 2012, 15). It is perhaps for this reason that participants in this study suggested that e-mountain bikes often served to expose their own (human) 'inadequacies':

I don't like not being fit enough to do without it. You will find a lot of people or some of these bike people are very defensive in the way that they only switch it on when they're really tired (Harry)

I do find it is better to stick the power up, ignore them and just go at it because interestingly it's shown how poor I am at technique, or it's showing my technique weaknesses should I say. (Wayne)

In the excerpts above, participants intimate how their bikes are accorded a key role in achieving idealised, and transient notions of fitness. At the same time, they are not just positioning the e-mountain bike as an inanimate surface upon which notions of 'good' or 'bad' are inscribed but are actively enrolling it in this process of translation, to the extent that it ends up mediating, and at times facilitating, their hopes, wishes, desires, and aspirations. Crucially, for us, this process reveals the fragility of human-technical bonds and the pharmacological qualities of technology, in that the e-mountain bike can be said to both enhance human capabilities—by making riders fitter, faster, and more skilful—whilst also (and often at the same time) exposing how these very same qualities are exclusively dependent on the presence of the bike itself. In the following sections we explore the outcomes of this pharmacological process further, by examining the reflective and proletarianising qualities of e-mountain bike technology.

## E-mountain bikes and the cultivation of care

Overall, the participants in this study were largely positive about their experience with e-mountain bikes. Respondents described personal benefits that included being able to go further than they would on an analogue bicycle (Brendan, Alex, Doug), staying out for longer periods of time (Hannah, Harry, James), fitting more riding into a shorter time period (i.e. when the window of opportunity was limited due to work or childcare responsibilities), and being able to explore route options that would otherwise be unfeasible due to the unpredictability of the terrain (Edward, Kai, Graham). Interestingly, several participants suggested that their e-mountain bike allowed them to commute more regularly to work (Behrendt 2018), and to explore the option of more regular, healthy, and sustainable forms of transport (Jenny, Betty, Ben). The culminating effect of this was that participants felt that e-mountain bikes had made an important, and long-term contribution to their physical and mental health (Fishman and Cherry 2016).

Notwithstanding these benefits, it was clear that the advantages of e-mountain bikes extended beyond individuals and into the public sphere. This is something that is rarely discussed in the ebike literature, but it was this function of the e-mountain bike experience that the participants expressed most fervently in their interviews. Below, for instance, Brendan talks about how his bike helped him to establish a cycling club for at risk children following a life-changing incident in the military, which is worth quoting at length:

I mean, to say it was life changing is quite an understatement really. Essentially, I then realised that I could properly go mountain biking again, I went and qualified for a course that was facilitated by Help for Heroes. Then I went and qualified as a trail leader and came back to X to set up a club at the school I was working at. On the first day I expected to get half dozen lads who would want to go and jump bikes up in the woods, and we wound up with over 50 kids. Now I'm training as a Level 2 mechanic, and the scope for the impact that we could have on people is mind-boggling. Essentially this all stems back to me getting an e-mountain bike and being able to start riding again.

Other, more subtle contributions to the public good emerged throughout the research, particularly in relation to the accommodating way in which participants dealt with other riders. This was evident where riders rode with other e-mountain bikers, but also where analogue bikers were part of the same activity. For example, Andrea, Will and William described how the motor allowed them to 'hang back' when they encountered small mechanical problems on route, whilst others recounted towing analogue bike riders back to the car or their accommodation when similar issues had occurred (Julie). On several occasions, participants indicated that they had offered their bikes to analogue riders when they were too tired to reach their intended destination.

Such findings extend work we have done elsewhere, which suggests that mountain bikers, and by extension e-mountain bikers, are not always the reckless, irresponsible hooligans that they are otherwise made out to be (Cherrington 2021a), but rather, exhibit an ethic of care towards others that is mediated by the shared experience of riding an off-road bicycle.

Specifically, e-mountain biking facilitates a specific kind of reflection in which individuals measure their own need for assistance against the norms of a given social milieu:

Well, it's difficult sometimes because you don't want to seem as though you're rubbing their noses in it and the fact that you're having a much easier day. So, I have to constantly ask how hard it is and assess my level of tiredness in relation to other members of the group. (John)

...you just be sensitive like you would if you were going out with a brand-new rider; you wouldn't just charge off because it's not going to be fun for them. So, it's just about making sure everyone has fun, which means knowing your group and being sensitive. (Hannah)

In these excerpts we learn how John and Hannah's relationship with their e-mountain bikes are underscored by a process of individuation in which they both synchronise with the symbolic order, whilst negotiating these rules according to their own physical and cognitive retentions. Here, it is worth noting that not *all* the participants were as patient as John and Hannah. William talked of 'bombing off' in front of others on a climb and waiting for them at the summit, and Kelly pointed out that she would often leave the rest of the group to do another lap of a downhill while she was waiting. Nonetheless, what each of these respondents had in common was that these attitudes are never *assumed*, but rather, configured as part of a process of social deliberation within which the meaning and purpose of the motor is continually (re) formulated, leading to a form of 'metastabilisation' (Stiegler 2018).

Keeping with this theme, participants highlighted two specific contributions that e-mountain bikes could make in combatting the individualising and proletarianising tendencies of contemporary hyper industrial societies. Firstly, individuals suggested that the e-mountain bike has a key role to play in combatting the fragmentation and dissolution of family life. Though we remain wary of the ideology that is attributed to the nuclear family, we would also agree with Stiegler (2010) that the family—as an important mechanism for the transmission of culture—is being 'short-circuited' by a range of attention-sapping information technologies (ibid, 13). E-mountain bikes, however, appear to facilitate forms of play that remove children and parents from their screens, whilst 'giving access to the Muses, to the imagination, which alone can lead to the child's enchantment, and which grounds the imaginative life ... and all forms of cultural connection' (ibid, 15).

In this research, this was evident with participants who were part of younger *and* older families, albeit for differing reasons. In relation to the latter, there were parents such as Ben (32) and Becky (38), who used the assist provided by the bike to spend more time with their young children, who would otherwise be unable to cope with the demands of off-road riding. At the other, there were parents such as Darren (56), Edward (58), Mandy (55) and Kelly (68), who purchased their e-mountain bike as a way of reconnecting with their adult children after a period of ill-health or illness. In this context, e-mountain biking appears to play an integral role in the performance of specific family practices, as it helps to connect and (re)engage users with one another, whilst engendering specific notions of kinship and care.

Secondly, the e-mountain bike seems partially to counter what Stiegler (2018) describes as the 'entropic' character of socio-technical, and ecological, relations. This refers to a society in which 'nature' (as a symbolic marker of human differentiation) is no longer positioned as a crucial aspect of our (individuated) existence, but rather, is increasingly seen as a resource for human enjoyment, leading to many of the anthropocentric attitudes that we see exhibited in various leisure forms today. However, individuals in this study suggested that e-mountain bikes were the conduit for a more harmonious and sustainable relationship with symbiotic life. For example, Becky and Ben were keen to emphasise how conscious they were about the potentially erosive qualities of the heavier bike and the added torque in the wheels, Brendan and Graham talked of how their bikes allowed them to 'see' different aspects of the countryside more vividly as they were less focussed on being physically exhausted, and Hannah added that the motorised assistance would help expose a whole new generation of young people to the 'great outdoors'.

Thus, our findings contribute to a growing body of research which emphasises the role that mountain biking, in both electronic and analogue forms, might play in promoting more ethical and responsible sensibilities (see Brown [2014] on this important subject).

### **E-Mountain biking as a form of disindividuation**

Despite the positive role that e-mountain bikes can play in enhancing the physical, mental, and social wellbeing of the population, individuals also raised concerns regarding the potentially harmful consequences of this emerging technology. Specifically, criticism was directed towards the dual processes of hypersynchronisation and hyperdiachronisation (Stiegler 2019). For instance, participants noted how the addition of the motor had also made them 'lazier' (John) and 'less likely to enjoy pedalling' (Pete).

Respondents also insinuated that pedalling an electronic mountain bike was more likely to resemble the automated, linear rhythms outlined in the work of Lefebvre (1991), than the organic rhythms of movement that we might typically associate with off-road cycling (i.e. predicting the terrain whilst adjusting one's body to accommodate variances in texture and gradient). Hills were said to be flattened by the presence of the motor, and one's experience of climbs becomes inherently instrumental (i.e. means to an end), rather than experiential in nature. As such, e-mountain bikes were perceived as promoting automated behaviours that risk de-humanising the riders, disincentivising learning, and closing off their bodies to landscapes and other people, leading to an attitude of 'baseness or indifference' (Stiegler 2013b, 39).

Relatedly, numerous participants attested to how the combination of the battery and on-board computer allowed them to efficiently quantify and to survey the physical output of their bodies. Indeed, participants such as Rob made direct comparisons between his own physiological output and the energy that is stored in the battery suggesting that: 'It's an energy supply that you can use up, but once it's depleted, you have to ride more casually until it's recharged again'. Dave also talked us through how to manage the battery in relation to the distance travelled by switching between the different settings as you ride. For many, this relationship brought about what was commonly described as 'range anxiety', whereby participants felt so dependent on the battery that they feared running out of energy before the end of their ride.

Like Thorpe, Brice, and Clark (2020), we recognise that datafication can, under certain circumstances, be empowering for exercisers, and can also play a key role in the transformation of bodily subjectivities and knowledges. In these cases, however, it seems that the e-mountain bike and its various digital components may have tipped the balance between technology and the subject in the wrong direction, disrupting the delicate relationship between inherited memory and psychic/collective interpretation that are necessary to perform the individuated self. The danger with this is that the difference between the organic and inorganic has become blurred. Quia Stiegler (2019), this suggests a situation where the riders' psyches, and their memories of different landscapes, are all scripted by the automative qualities of the motor and the battery, rather than their own subjective and corporeal experiences.

At the same time, riding an e-mountain bike also contributed to the process of hyperdiachronisation (Stiegler 2019), through which the participants pursued their own, singular rhythm, whilst circumventing proper, engaged participation in public life. Throughout our interviews, this was most evident in the attitude that some participants adopted towards other users of the countryside. For instance, Rob spoke about his own frustration at having to share 'his' favourite riding routes with others:

During lockdown I've seen way more people out walking who – and this sounds really snobbish – but are clearly new to the countryside and fair play to them, that's great. But you know people do get uptight about things when they feel like it's their patch. I've found myself sort of saying that a few times recently. The people that are using the countryside now are usually the ones that I am using my ebike to get away from (laughs)

John observed a similar trend in the behaviour of other riders:

I've spoken to people on ebikes who just stick it on turbo and want to go round as fast as they can. Often, when you stop at a section of a trail you have a chat and you talk to people. But no! They've got a battery that's 700 watts or they've got another battery pack in the back of their rucksack, and they'll plug it in and they're going for it; no time to talk. They'll have done two laps of a trail centre as fast as you like and probably upset everyone in the process!

This motivation to pursue one's own space, and to go faster when doing so, was a common theme across our interviews. Many of the participants described how they competed against themselves and others on GPS tracking devices such as Strava, whilst others, such as William, said that on some rides he 'barely looks up' from the ground during a ride as to achieve a personal best. For this reason, it was interesting to find that three of the participants vehemently refused to ride with analogue mountain bikers, since they were worried about them compromising their Strava times or detracting from the 'flow' of their ride.

Following Smith (2018), this suggests that in certain circumstances, wearable and integrated tracking devices can be enrolled with other forms of technology to create affordances for immoral, disrespectful, and irresponsible forms of behaviour. The upshot of this process is the potential loss of knowledge that is brought about by the transference of the riders cognitive and corporeal capacities into the repetitive qualities of the machine. In the above excerpts, we can observe this in the way that riders prioritised the objective of getting to their destination in the quickest and most efficient way possible, often at the expense of other land users. For the participants, this has a marked impact on people's relationship with the lived environment, as riders are said to become increasingly disinterested in engaging with their local surroundings:

During lockdown there's all these people on e-bikes that, you know, went up to the Peak District and they were littering and not respecting the countryside. What is boils down to is that their riding is different. Y'know, different speeds and wanting to go as far as possible in the shortest space of time. I think these people are riding differently to somebody who's grown up pedalling and is forced to appreciate what's around them. (Kai)

As a result, riders were frequently observed getting themselves into situations that they do not have the knowledge, or technical competency, to overcome:

My main concern is that access is given to novices on e-mountain bikes and they're not prepared for what's out there. They're massively reliant on the battery for range and don't have the skills to ride on the mountains. I know mountain rescue have been called out to loads more novices that have made it to a summit and have no idea how to get back down safely (Adrian)

Analogue mountain biking requires a complex relationship between riders, bikes and terrain that is embedded in the psychosomatic, and cultural fabric of the activity (Brown 2012). Through careful experimentation and progression, riders learn to be attentive to the limits and abilities of the body-bike, and in so doing gain a deep-felt appreciation for the both the corporeality of the trail and micro/macro topographies of the landscape. This complex body-bike relationship has also been shown to choreograph encounters (and conflicts) with different user groups, as mountain bikers make concessions for others based on the mutuality of their embodied experiences. Yet, in this research, the automated and digitised aspects of e-mountain bikes have been shown to short-circuit this process, culminating in a form of disindividuation, through which riders are de-possessed of the necessary know-how to operate their bicycles in shared, 'natural' environments.

## Conclusion

It has been the aim of this article to both introduce and apply Stiegler's conception of the pharmakon to explore the interrelationships between humans, technics, and, as the empirical evidence in this paper elucidates, e-mountain bikes. Indeed, Stiegler's conceptual oeuvre provides

for insightful investigations on ‘traditional’ subject/object distinctions as well as the ‘inhuman’ dimensions that remain implicit in our sport, leisure and mobility practices. We contest that such dimensions remain widely neglected within studies on recreational mobilities and their relation to, and impact on, nature/culture debates. On this basis alone, we consider this paper to be one of the first of its kind within the study of sport and leisure.

There are, of course, other conceptual frameworks for problematising subject/object relations and decentring ‘the human’, including Non-Representational Theory, Actor-Network Theory, and ‘Speculative/Dialectal Materialism’ (see Black and Cherrington 2021 and Cherrington 2021a, 2021b, for a commentary on the merits and limitations of these approaches). At the same time, there are related arguments about how such understandings put into question linear understandings of technological progress, included, for example, in the work of Michael Callon and Bruno Latour.

For us, the appeal of Stiegler’s work is that it allows us to maintain the ambivalence of being human without relinquishing our responsibility towards objects and technologies. Indeed, what is special about Stiegler’s conceptual oeuvre is that it allows philosophers working at the intersection of technology and mobility to focus on the very uncanniness of objects such as the electric mountain bike, and to unpack those technical experiences that are both constitutive of, and distanced from, certain materials, surfaces, and environments. As opposed to being simply subjective (i.e. the phenomenological qualities of e-mountain bikes), or object-oriented (i.e. the assemblage of technological components as they come to bear on their users), the ontological gap between our humanity and our technicity that we have focussed on in this analysis facilitates more deliberative and open relationships with the environment, engendering new and emerging forms of (onto)political subjectivity that are made to the measure of the Neganthropocene (Stiegler 2018).

Here, our work differs from others in leisure and mobility studies in two significant respects. First, we concur with Harman’s (2018) critique that many posthuman analyses of technology are guilty of duoming the importance of objects in the coming together of ontological relations, and we believe the same to be true of the mobilities literature. In these analyses, the ‘stuff’ of recreational mobilities (i.e. bicycles, footballs, GPS watches) is often uncritically assumed to be commensurable to the interpretations of human beings and is subsequently added onto an already existing (and largely inflexible) layer of human interpretation. This is most evident, for example, in those analyses that speak to the ‘hybrid’ qualities of human-nonhuman assemblages, whereby nature and culture are always mixed, thus promulgating the idea that the two are necessarily separate – ‘an idea that must be rejected’ (Harman 2018, 58).

Secondly, though recognising the coextensive relationship between mobility and technology, much research commonly avers that the advent of emerging technologies has, in recent years, intensified the fragmentation of self and society. However, as we hope to have shown throughout this article, and what the work of Stiegler (1998) has helped us to elucidate, is that if such contemporary formations teach us anything, it is not that new (or ‘post’) forms of humanism have emerged out of these relations, or that new hybrid entities are being formed from the use of contemporary forms of technological-enhanced mobility. Rather, objects such as the e-mountain bike facilitate a re-discovery, and renewed familiarity with, our technical origins.

In addition, though we welcome less anthropocentric analyses of sport, we also share Stiegler’s (2019) reluctance to embrace ‘posthuman’ thinking fully. Indeed, whilst references to the materiality or object power of different non-human forces and entities can offer a compelling shift away from human chauvinism and forms of empirical determinism, they also lack discipline, offering little in the way of affirmative politics or collective action (Black and Cherrington 2022). Furthermore, as he consistently warns throughout his work (see Stiegler 2018), there is an inherent danger in the shift to transhuman forms that we must be attentive to at all times; namely that, as we transfer more and more of our agency to machines, we risk losing our ability to

think, care, and act in the interest of others. It is this that must remain central to developing responsible and sustainable attitudes towards technology and outdoor environments.

By contrast, what we have highlighted in relation to the pharmacological qualities of the e-mountain bike is the relationship between our own 'human' inadequacies and our subsequent reliance on technical forms in meeting this lack. While discussions on technology and its role in sport/leisure often rely upon the potential benefits that they provide, in this paper, we have offered a reorientation of such approaches by drawing attention to the very 'non-inhuman' inadequacies that are exposed in the e-mountain bike (Stiegler 2009, 157), and the forms of care and attention that emerge from these realisations. Equally, in accordance with academic research that has sought to trace the interlinkages in ecological discussions regarding ongoing environmental changes and catastrophes (see Stiegler [2018]), we conceive that the e-mountain bike can help promote greater ethical responsibility amongst its users, as it forces consumers to face up to the moral implications of its adoption. This was reflected in the familial and ecological relations that were procured through the use of this technology.

To this end, identifying the contradictions within the pharmacological tendencies that inhabit our human-technical bonds remains not just an essential component of the way we engage, maintain and develop our socio-techno relations but also to our future sporting/leisure mobilities. Implicit within work on sport – from both sociology and philosophy – we consider the prevalence of contradiction as central to developing future research in the study of sport, mobilities, the environment and the subject. In this case, we offer the following conclusion: it is in examples of disindividuation that the use of technics in sport and leisure can aver a number of important significances in exploring the relationship between the human subject and the public spaces and 'natural' environments that we engage in.

## Disclosure statement

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