Exploring changes to cycle infrastructure to improve the experience of cycling for families

KEYWORDS: Cycling, infrastructure, motivation, families, behaviour change.

Abstract: Positive changes to the immediate cycling environment can improve the cycling experience through increasing levels of safety, but little is known about how the intrinsic benefits of cycling might be enhanced beyond this. This paper presents research which has studied the potential benefits of changing the infrastructure within a cycle network – here the National Cycle Network (NCN) in the United Kingdom (UK) – to enhance the intrinsic rewards of cycling. The rationale in this approach is that this could be a motivating factor in encouraging greater use of the cycle network, and consequently help in promoting cycling and active travel more generally amongst family groups. The project involved in-depth research with 64 participants, which included family interviews, self-documented family cycle rides, and school focus groups. The findings suggest that improvements to the cycling environment can help maintain ongoing motivation for experienced cycling families by enhancing novel aspects of a routine journey, creating enjoyable activities and facilitating other incidental experiences along the course of a route, and improving the kinaesthetic experience of cycling. For those less experienced, this can create a legitimacy of space and mode that could help dispel real or imagined safety fears associated with cycling. Despite the potential of these benefits to assist in changing travel behaviour, it is acknowledged that they are not alone a solution to the barriers to greater cycling uptake, and continued development of off-road and specialist cycle networks must continue.

1. INTRODUCTION

The need to encourage the public to engage in active travel is seen as important in terms of a healthy and sustainable future community. The role of cycling is implicit in maintaining health and wellbeing, and reducing environmental pollution (Carnall, 2001; Cavill & Davis, 2007; Cavill, Kahlmeier, & Racioppi, 2006; Pulcher & Buehler, 2010). Attitudes and behaviours of parents towards cycling and active travel are important determinants to whether or not children cycle (Timperio, Crawford, Telford, & Salmon, 2004; McMillan, 2007; Wen, Fry, Rissel, Dirkis, Balafas, & Merom, 2008), and cycling in childhood can influence cycling throughout life (Jones, Chatterjee, and Gray, 2012). However, there are frequently documented barriers to cycling for people of all ages, including feeling unsafe and vulnerable in heavy traffic, especially as a result of poor infrastructure and lack of segregated, dedicated or prioritised routes for cyclists (Bannister, 1988; Krizek & Roland, 2005; McClintock & Cleary, 1996; Nankervis, 1999; Newby, 1993). For parents in particular, road safety (and to a lesser extent safety from crime) are important concerns, and they perceive a trade-off between ensuring children's safety and fostering their independent

mobility (Bickerstaff & Shaw, 2000; Cahill, Ruben, & Winn, 1996; Tyrrell, 2000) – where social norms tend to err in the favour of personal security over independence (Lorenc, Brunton, Oliver, Oliver, & Oakley, 2008). It is also noted that when good infrastructure is put in place, it does not necessarily increase the amount of cycling (Davies, Gray, Gardner, & Harland, 2001; Welleman, 1997), perhaps because social norms are hard to overcome and concerns over safety dominate (TfL, 2009). Higher-density living is positively correlated with high levels of cycling (Durand, Andalib, Dunton, Wolch, & Pentz, 2011) and segregation from traffic can increase cycling (Fraser & Lock, 2010; Krizek, 2007). But less is known whether the journey itself can be enhanced for the rider by the infrastructure – beyond segregation and proximity – with the potential for reducing the need to be close to the journey's end to motivate people to cycle. Jay, Mahdjoubi, Greene, and Walton (2009) have explored the influence of public artwork installations along cycle routes, and the effects of these upon young people's perceptions and experiences of using the route. Those artworks that were seen as "interactive" or "fun" held the most appeal and enriched the experience of using the cycle path. Importantly, the installations were seen to improve the experience and 'alleviate some of the boredom of cycling along a route' (Ibid, p. 11).

This paper examines how far infrastructure changes might enhance intrinsic motivation – adding excitement and fun into a cycling journey – and whether this has the potential to increase motivation to cycle amongst young people and families. A dedicated space of cycling infrastructure in Britain, the off-road National Cycle Network (NCN), is used to contextualise the suggested changes. The cycle network is a set of co-ordinated routes along traffic-free (off-road) or very low traffic (on-road) routes, covering 13,200 miles in the UK. The network is signposted and numbered for ease of navigation.

2. METHODOLOGY

The research involved three phases (see table 1) which consisted of an initial round of family interviews with eight family groups of varied cycling experience (phase 1), followed by a case-study documentation of a cycle ride by four of these families (which generated visual and narrative data) (phase 2). The final stage consisted of follow-up interviews with each of the families involved in phase 2 to elicit and explore their case-studies of family cycling in greater depth (phase 3). In parallel to this, two focus groups with school-age children were carried out to gain a wider understanding of the barriers and enablers to cycling amongst children.

2.1 GEOGRAPHICAL CONTEXT

A study area in the town of Stroud, UK, was chosen to reflect cycling experiences in a mixed rural and urban area near an on-road and off-road cycle network. Participants from Stroud were sampled from an area along the southern fringe of the town, with good links to the NCN and surrounding countryside. Stroud itself is surrounded by rural countryside and

smaller villages, and as-such participants had relatively easy access to these by bike. It should be noted however that all participants nonetheless had to use some form of on-road cycle path to access the adjacent countryside and off-road cycle routes.

A study area in the city of Bristol, UK, was chosen upon to represent cycling experiences in an urban environment near a mixed off-road and on-road cycle network. Participants from Bristol were recruited from two residential areas in the north of the city, both of which did not have direct links to surrounding countryside. Participants had access to off-road urban NCN routes; however all of these required access via on-road cycle paths located on roads which were routinely busy with traffic.

2.2 PARTICIPANTS

Purposive sampling was used to recruit eight families into three distinct groups based upon different levels of self-reported cycling experience (see Table 1). Families were recruited through three methods: (i) contact with a school group in the Stroud area; (ii) contact with cycling clubs in Bristol and Stroud; and (iii) through attending a Local Authority organised 'family cycling day' in Bristol and engaging potential participants.

Four families from the original sample of eight (2 from group 1, and 2 from group 2: 17 participants total) were selected to complete a family cycle trip on the National Cycle Network (NCN) (phase 2) and an additional family interview (phase 3). These families were selected from the two groups of more experienced cyclists only, based on ethical considerations of safety (they were confident cyclists) and practical considerations (they had the equipment). One family each from groups 1 and 2 did not wish to take part in phases 2 and 3.

School focus groups were run in a local school with two groups of children based on different life-stages (year 7 children, aged 11-12, were recruited to represent children at threshold of independence, and year 8 children, aged 12-13, as a group who represent just beginning to cycle independently to contrast to this) (see Table 1). The school lay in a semi-urban area and represented children from urban, suburban, and rural areas within each age group. The groups were self-selecting as volunteers wishing to take part and were large enough to allow for all those who came forwards to take part, but represented a wide range of backgrounds. All participants cycled, but levels of cycling varied from those who cycled to school and for leisure daily to those who were infrequent cyclists (once a month or less). Structured group work during the focus groups took place allowing the size not to be an issue, meaning much smaller groups worked on questions being asked before bringing them to the main discussion for debate.

Insert table 1 about here

2.3. PROCEDURE

PHASE 1: Semi-structured family interviews took place in the family home with the whole family-household present. Family interviews were used to gain an insight into the cycling practices and contexts within the family as a whole, and explore the interplay between different characters. Similar to a focus group a family interview helps generate ideas and stimulate discussion, especially when talking about both extremes of the everyday and also very novel concepts. It differs from a traditional focus group however in that all the members know each other and the relationships therein, and the context and setting are familiar to one-another (Eggenberger & Nealms, 2007). At this phase discussion was on everyday travel behaviour and patterns, their interactions with the local environment as they travel, what they enjoyed and did not enjoy about cycling as a family, what would be their ideal cycling context, what leisure activities they engaged in and what games (electronic and otherwise) they played at home and outdoors, and specific knowledge and use of the NCN. The family interviews lasted around one hour.

PHASE 2: This phase consisted of a case-study documentation of families' experiences of using the NCN. Families were provided with two digital methods of recording the journey – a 'helmet cam' to record the journey in its entirety, and a digital still camera for participants to log points of interest along the way. In addition, they were encouraged to note or sketch anything else of interest using blank journals. They could choose to record a journey of their choice of around an hour in length that incorporated use of the local NCN.

PHASE 3: Follow-up interviews were conducted with the four case-study families to complete the data collection. A map of their journey undertaken at phase 2 was completed at the next interview along with the interviewer. Families were asked to focus upon documenting the places along the route which they travelled, how they interacted with their local area, how enjoyable and motivating they found the experience, and what the experience of cycling as a family is like. Similar to method documented by Hodgson (2011), participants were encouraged to annotate their map with key areas of interest and importance on their journey. In addition, their recordings of their journey (from the helmet, photography and sketching) were discussed and placed alongside the map. The findings from this phase of data collection have been used to provide recommendations on appropriate ways in which experiential improvements might be applied to the cycle network as a motivator for families to cycle

SCHOOL FOCUS GROUPS: A semi-structured focus group was developed to explore barriers and enablers to cycling, and create a discussion of how to overcome some of the barriers. This was done to examine children's views away from parental influence and assess peer support for concepts and ideas generated by the participants. Sub-groups worked on questions set and reported back to the group, which then facilitated further discussions. The two groups lasted approximately 30 minutes apiece.

2.4 Data Analysis

The same process of analysis was maintained throughout the project. Following recording and transcription from each of the interviews and the focus groups, the data was subjected to thematic analysis using NVivo 9 software. Data analysis involved a combination of an 'etic' approach (in which the themes are pre-determined by the researcher) and an 'emic' approach (in which the data suggests the themes) (See: Miles & Huberman, 1994; Silverman, 2001). An initial set of relevant themes was constructed from existing research. The focus of the starting set of themes was kept relatively broad to accommodate the exploratory nature of the topic, and this enabled further themes to be constructed from the data during the analysis. Data was then placed into these themes or created new themes (a mixture of emic and etic approach). Within-case matching of themes occurred to address consistency and was then followed by between case analysis addressing both similarities and discrepancies. Elements of similarity and difference were then transformed into a narrative (Aronson, 1994) to form the basis of the findings. The data from the video was analysed in the same way and matched to the discussion of the video within the interviews. The discussions around the photographs taken by the participants, the annotated maps, and participant-drawn sketches were captured in the interview and included in the analytic outlined above.

2.5 Ethical process

Extensive ethical safeguarding was employed to protect the safety and wellbeing of the participants and the researchers. Confidentiality was ensured through data anonymisation, and written informed consent was obtained and retained from parents in the family interviews and in the school focus groups. All groups were taken through the purpose of the research and read the code of conduct for focus groups at the beginning of each session.

The health and safety of the families that who took part in the family cycle (phase 2 of the research) was very important. All of the cyclists were required to take reasonable personal protective measures as they would ordinarily do so. Participants were asked not to deviate significantly from the designated cycle network route. The families were informed of these stipulations and required to confirm these in writing before they were allowed to take part.

3. FINDINGS

The findings are presented in terms of positive elements of cycling followed by the barriers to cycling. How far infrastructural, environmental, or experiential improvements might help overcome some of the negative elements in order to help and encourage cycling is then discussed.

3.1 Positive elements of cycling

Positive elements of cycling as a family are centred on the kinaesthetic experience of riding a bicycle. This was explained as a different feeling to that experienced on other modes of travel, and in particular, the effortless speed and exhilarating physical experience made cycling (at times) distinctly pleasurable. Coupled to this theme were other sensory experiences of interacting with the environment, including sights and smells. The significance of novelty in the experience of cycling was also noted, as was the importance of having or creating destinations, which both help to mitigate experiences of boredom or 'ordinariness'.

3.1.1. Kinaesthetic and sensory experiences of riding

Participants described in detail the sensory experience of their cycle rides together; several explained the excitement and pleasure created by *kinaesthetic experiences*: the feeling of the body moving along with the speed and flow of the bike ride.

> *"Percy* [child – 4yrs] *likes to go really fast don't you, on the bike? When you are on the back of my bike on your tagalong you go 'faster, faster, faster!' So we go really whizzing and he likes to race against you guys* [the family]*. He likes to overtake so we have to pedal really fast to go past"* (Adult M, G2:P1)

> *"I can go fast. I'm on a bike. It's quite fun. It's just a lovely feeling"* (Child F 8yrs, G1:P1)

Other participants explained the sights that they saw along the route, and discussed how these contributed to the experience of the ride. These elements were especially noted by girls rather than boys.

> *"One of the things I really like about that cycle path is the wildlife. It's pretty; it's really pretty. It's got lovely trees and flowers and a river, and it's just a really nice environment to be in"* (Child F 10yrs, G2:P3)

Getting the participants to document a cycle ride with photographs, sketches and video footage in particular highlighted other sensory elements of cycling, noting the sounds and the smells which merged with the sights and the feelings of cycling to create the overall experience.

> *"The thing that I really like about that bridge is that when you cycle over it, it has got loose slats. The concrete slats that form the bed of the track are loose, so as you go over it they go 'bloob, bloob!' (...) It's like a xylophone"* (Adult M, G1:P3)

> *"A house had loads of lovely roses like growing down the fence and the new cycle path, and they smelt so nice. They just hit you like 'ah!'"* (Child F 11yrs, G1:P3)

One participant explained how she felt that the *overall* sensory experience of the ride along cycle paths was often neglected in the face of a dominant focus on landscaping and sights along the route. Smell in particular was seen as a neglected consideration in terms of the experience, and yet both smells and sounds were seen to have an effect on participants' experiences of the cycle. Participants discussed negative experiences of both of these senses, in particular relation to harsh traffic noises and dogs fouling the cycle path.

> *"I said about the traffic noises. It is just quite bad because the canal was really nice, but then it kind of spoils it because of all the traffic noises and stuff."* (Child F 8yrs, G1:P3)

It is evident that sights, sounds, smells, and kinaesthetic aspects of speed and flow often contribute to creating a rich experience of the cycling environment, and this corporeal pleasure attained from cycling provides some of the strongest reasons that families enjoy their rides together. The findings above demonstrate that understanding the sensory experience of cycling is important in considering how infrastructure might be better designed to provide a pleasant, engaging, and attractive environment in which to ride.

3.1.2. The role of novelty in cycling

The importance of novelty in the experience of cycle routes was highlighted by several participants. The very act of cycling itself provided a relatively new experience for both the adults and the children who did not cycle often. Novelty for more experienced cyclists had to come in different forms, for example it could be provided by changes due to engineering work, or the ever-changing views throughout the seasons; appreciation of this novelty was made possible by the relatively slow speeds of the cycle ride.

> *"You have got the canal on one side and the river on the other side as well, so quite often you are cycling between the water on both sides which is nice. There's lots of things to look at and they have been doing work on the canal so it was interesting to see. We hadn't been for a while so there were lots of changes"* (Adult F, G1:P3)

3.1.3. The role of destinations in the journey

Getting participants to document their route through photographs, sketches and video highlighted the importance of the activities for which families stopped along their route. These activities either constituted the destination of the ride, or were different places at which the family stopped along the course of the cycle. Sometimes these activities were provided by the natural environment:

> *"There's this stream that runs alongside the cycle tracks. Any time we just saw a good place to paddle, we just stopped and paddled. So yes, it's very fun"* (Child F 10yrs, G2:P3)

For many of the participants their more regular experiences of cycling were constituted by functional trips, in which cycling and the cycle paths they utilised were a means of reaching their destination, as opposed to being "the destination" *per-se*.

> *"I don't know how I feel about cycling for cycling's sake; not going anywhere in particular. We don't do a lot of this kind of cycling; we generally use our bikes as transport to get somewhere. We have to go to a tea shop or pub to make it feel more ended and purposeful"* (Adult F, G1:P3)

Having a reason for the cycle appeared to give a kind of *validation* to the family cycle, within which the participants could then enjoy the actual experience of cycling together. Particularly for younger children (aged 9 and under), having a destination (or several destinations) was important as it spurred them along on longer rides, provided points of rest along a route, and gave them something to aim for.

> *"I don't really like just cycling; I prefer cycling to a destination. When we got to Stonehouse, the place where we got biscuits, I thought that was good because it was a destination to get to, but we didn't have to get there quickly"* (Child F 8yrs, G1:P3)

Halfway stops at pubs or picnic grounds or other points along a route were frequently described as a positive part of the experience. These would often provide a form of reward for the exertions of the cycle, and provided a frame within which to set the experience. At other times, participants would stop at points of particular interest, often to explore the natural environment or to enjoy the scenery.

3.2. Barriers to family cycling

Despite there being a great deal of positive discussion about the experience of cycling together as a family, nonetheless the findings show that there are several barriers which can outweigh the pleasurable experiential aspects and discourage parents from taking children out on their bikes as much as they would like to. These barriers are centred on confidence in cycling, both in terms of safety (road and personal) and knowledge of the norms and structures associated with cycling and its immediate environment.

3.2.1. Confidence – safety and skills

Concern for children's safety when cycling on roads was a recurrent theme throughout all of the interviews; it was something which had a strong negative effect on the experience of cycling together as a family. Traffic was the key issue when parents discussed the safety of themselves and the children when cycling together. Several of the parents felt that when taking children out on their bikes roads were not an option as there was too great a risk.

> *"I haven't really been cycling for years, so I think it's confidence as well, you know? I suppose because I'm older and I've got young kids I'm more aware of the difficulties*

that cyclists can have, but I think it's definitely confidence and I wouldn't let the kids cycle around here" (Adult F, G3:P1)

If adults were not confident on their bikes, then this would lead to them being less likely to cycle with the children, which in turn would result in the children themselves being less confident. Parents felt responsible for their children's levels of confidence in cycling on the roads, and also that the children had the proper cycling skills to support this.

> *"It's copying isn't it; if they* [the children] *can see we're nervous they're going to think 'well, why are you nervous? Should I be nervous?' So Janice* [mother] *and I are confident cyclists and we go out with our children on the roads to expose them to that so they're exposed under our guidance"* (Adult F, G2:P1)

Parts of the cycle network which were on-road were also deemed to be unsafe, despite having dedicated cycle lanes.

> *"The trouble is, the National Cycle Network is great, but to go as far as we'd like sometimes, a lot of it is road. (…) Bristol is deemed as the first Cycling City, a lot of money went into it, but a lot of it was painting a line on a road. You think, 'yes, that's okay, but not for children'"* (Adult F, G1:P1)

This meant that families would sometimes not access off-road NCN routes which could only be reached by cycling on sections of on-road cycle path.

Of importance to children was that parents were concerned about allowing children to cycle alone. Children at the ages of 11 and 12 in the school focus groups were very aware of not being allowed to cycle places, despite wanting to. As parents did allow their children to cycle independently, it was often to certain distinct places, for example to and from school, to the park, to the local village centre, and often short journeys between friends' homes,

> *"I can go a short distance though, on my own, I can, I can go round a friend's home and to the park." (year 7, M, focus group)*

Almost all the journeys children were allowed to do coincided with a definite place or activity at the end, hence the importance of destination again; they were far less likely to be allowed to go off exploring on their bike. As children got older, they began to want to use the bike for more adventurous purposes and the year 7 and especially year 8 children felt they were ready, but understood their parents' concerns which mainly lay around road safety.

> *"I mean, we all want to cycle, right. It's often parents won't let us. 'Stranger danger' and the cars. They don't think it's safe" (Year 7, F, focus group)*

They all felt this would change in a few years' time as well, as they got older and were very much looking forward to their independence that the bicycle would afford them.

3.2.2. Confidence - Knowledge

Another main barrier linked to confidence was a lack of knowledge about the cycle paths in the area, and a perceived lack of information about where to cycle. Some of the comments related to a lack of information that would allow people to plan cycle trips, such as information provided by local authorities and cycling organisations.

> *"I think just some cycle routes, just some suggestions of cycle routes that we could do with a focus, that's what I would love to do. Since we've lived here* [seven years] *I know that there's some kind of cycle track in the Forest of Dean, but that's all I know. I've never gone there and it's just a vague notion really. I'm always kind of trying to find things out, but practically it just seems too hard"* (Adult F, G3:P1)

Two of the parents discussed the sense of a 'missed opportunity' to provide information on the ways in which local attractions, shops, and services could be accessed by the cycle path. Extra site or context-specific detail was sometimes desired but lacking.

> *"*[There needs to be] *better signposting, I do think the signposting is poor. It took me a while to figure out how the path connects"* (Adult M, G1:P1)

> *"There's loads of history around that way. People go 'what's that?' And they don't know because there's nothing to tell them"* (Adult M, G2:P1)

The sketches, photographs and annotated maps suggested that legitimacy of the route for cycling was important. For example, the importance of having signs to indicate that cyclists were indeed on a cycle path was reassuring and gave families confidence in the fact that they were 'on the right track'. In the interviews with more experienced cycling families, there was discussion about how their personal knowledge of cycle paths and routes in-and-around their local area was seen to reduce the need for "official" information and designated cycle routes. Several of the participants explained that they cycled extensively on a daily basis, and yet were relatively unaware of the details regarding NCN designated cycle paths.

3.3. Exploring how games and leisure activities might encourage cycling

To explore the potential benefits of experiential improvements to the cycling environment, families were asked how the creation or facilitation of games and other incidental leisure activities along the course of the cycle network might enhance their cycling experience. Participants generally saw games as something that they themselves would want to create in the spaces provided for such activity. They suggested, for example, placing dedicated infrastructure from which games might be developed, including ramps, bars, off-road tracks

and similar. Games can enhance the positive aspects of cycling; they can create spaces to maximise the kinaesthetic experiences, to embed novelty, and make a series of destinations. Games can help overcome *some* of the barriers by improving confidence in skills and by legitimising cycling space, making it accessible for families.

3.3.1. Enhancing the kinaesthetic experience

Games can help encourage kinaesthetic elements of cycling, such as places for swooping down hills, banking round corners, gliding along under the shade of trees, and racing against one other could occur. There was a discussion of how cycle networks like the NCN could be improved if there were 'alternate routes' immediately adjacent to the cycle path which could facilitate more playful cycling.

> *"It would be good to have one part which is a nice straight track, and then a little bit up the left-hand side or whatever; where there's a little bit of jumps and bumps and all that sort of thing. They'd love it"* (Adult M, G2:P1)

It was felt that such additions might be a motivator for children to use cycle networks more frequently and independently, to use it for fun as opposed to simply for access, and even making the cycle path a destination in its own right. The rationale behind these suggestions stemmed from the fact that the children interviewed would often *request* to go cycling in local parks, woods, and commons, and these would often have such features and would be exciting places to go and cycle in their own right. These actually stemmed from the adults observation of the child's enjoyment and the relief that it took away the persuasion needed to get the child cycling,

> *"If you had, like, bumps along there and bits that you could whizz along, I think you would be more tempted to just go, 'well, let's go for a gentle cycle ride'. You'd probably be more likely to go along with your friends, wouldn't you? Because where you do like to go, boys, what you really like is the common, because there are lots of little dippies up on the common. It's the pure fun of it isn't it?"* (Adult M, G2:P3)
>
> *"Yes yes yes!"* (Child M 9yrs, in response to above)
>
> *"It's them saying they want to go, so I'm not having to persuade them; not having to cajole them or anything like that"* (Adult F, in response to above)

These findings are useful in explaining how cycle paths might be re-conceptualised or engineered to create a more playful aspect to cycle rides for families, tap into children's desires for and exciting sensory experience of using their bikes. In addition, it helps make cycle paths *somewhere to go*, as opposed to simply something to use – and children hoped it might help encourage their parents to see them as a legitimate space for recreation, as say children might in the park, shifting the focus from movement-based to place-based

infrastructure. This, however, would probably be dependent on access from home or school to the cycle path was considered safe by parents

Children discussed how when they did use such spaces, for example at BMX parks they changed the games they played frequently. The equipment was designed in such a way that many different games could be played as an individual and within a group. Hence, there is potential to retain the novelty of the space.

3.3.2. Improving skills in cycling: Bicycle challenges (skills and confidence)

Several participants suggested that *challenges* could be placed on cycle paths which aimed to help children (and sometimes adults) practise and improve their cycling proficiency, whilst also being enjoyable. For example, participants explained that it would be useful to have cycle training features built into infrastructure of the cycle network, which could allow both adults and children to practise their bike-handling skills in a safe, off-road setting – helping increase their confidence and encouraging them to cycle more together. This is linked to earlier findings concerning perceptions of safety and the link between this and confidence when cycling as a family. The suggestions from one family included having embedded challenges or enjoyable activities which improved skills in changing gears, cycling at speed, taking corners, braking, cycling no-handed, manoeuvring (slalom), and balance. Again, participants described this in terms of an infrastructure change that would then encourage practise to take place in an enjoyable and informal setting. A participant explained that there was a 'bike skills' area at the end of one of their local cycle paths (which had since been removed), and that this was something which the children enjoyed using and which they would like to see more of.

> *"At the end they've got like a sort of bike skill thing. That would be fun to have a bit more of that"* (Child F 11yrs, G1:P3)

3.3.3. Confidence: Legitimising and signposting the experience

Extra signage is needed to legitimise the space, simply to allow cyclists to know they are supposed to be there, as much as to wayfind. It was suggested these could be in the form of signpost displays in the cycle infrastructure and encourage the exploration of the environment around the cycle path, delivering information about the local area. For example, these could include elements of history and information about the local flora and fauna. Within this suggestion however there was an understanding that too much change to the infrastructure could negatively affect the local environment, spoil the experience of the natural areas bordering cycle paths, and be counterproductive to encouraging exploration and enjoyment of a route.

> *"But then again, you don't want to take away from it. You don't want to have like big information posters up because it takes away from the feel. It needs balance"* (Adult F, G2:P3)

4. Discussion

The findings demonstrate that connectivity is important in positive cycling experiences. Participants like to feel connected to the environment they are moving through, as well as feeling connected to the movement and propulsion itself. Cycling provides a unique sensory experience, and the act of cycling itself – the feeling of movement; the sights, smells, and sounds – was often the main reason that the participants, especially the children, enjoyed it. Taylor (2003, p. 1617) describes the pure experience of cycling as 'a sense of exhilaration, or pure delight, in just experiencing motion without strain or struggle'. Therefore there is a need not to disturb or displace this fundamental 'delight' of being in the saddle. Traditionally, the more intangible, experiential elements of cycling have been ignored in research in favour of instrumental analyses of how and why people travel on bikes (Spinney, 2009). However more recently there have been efforts to explore the kinaesthetic and sensory experience of cycling from a range of perspectives (see: Spinney, 2006, 2009; Aldred; 2010; Taylor, 2003; Horton, Rosen, & Cox, 2007).

Participants suggested that pleasurable kinaesthetic and sensory experiences of cycling could be further facilitated through providing playful space for – or simply encouraging – 'fun cycling' along the cycle path. Enhancing the infrastructure of the cycle network to create playful spaces could have the potential to assist in reducing some barriers to its use. The main barriers to cycling which families experienced were issues of safety and knowledge, both relating to confidence in use of the bicycle. Knowledge is an area of concern for participants, with a sense of not knowing areas in which they are legitimately allowed to cycle, cycling norms and behaviour, and potential areas that are worth exploring. Changing the infrastructure can legitimise space for family cycling, improving confidence of cyclists through the placing of signs, of bars and ramps, inviting cyclists to use the route. In addition, space to gain confidence is provided. The issue of confidence on bikes amongst both children and adults is heavily entwined into perceptions of freedom. The findings suggest that learning skills and gaining confidence from parents is an important aspect of children wanting to cycle. If adults are not confident on bikes then it was generally accepted that their children would be far less likely to be exposed to cycling or to have the opportunity to learn from their parents. In this sense there is a vicious circle of low confidence being passed down from parent to child. However, the wider barriers to cycling remain, especially if the cycle network remains disconnected and cycling on roads continues. Hence, creating playful spaces by enhancing the off-road cycle network does not reduce the need for lowering speed limits and formalised training for cyclists (and indeed other road users).

Riders' delight in motion sets cycling apart from other forms of travel, especially motorised modes, where there is an emphasis on creating a cocoon to shelter the traveller from their moving environment: whether that be in the ever-more luxurious interiors of cars, or the increasingly high specification trains, coaches, and buses – with air conditioning and Wi-Fi

keeping the traveller entertained and comfortable, and sound mufflers and shock absorbers keeping the outside world well away from the traveller. The disparity between motorised travel and cycling is worthy of further investigation. In what situations or contexts do people prefer one extreme or the other? Does lifestage make a difference? Do the family groups in this research collectively experience the children's need or desire for kinaesthetic or sensory experiences, or does this wane with age? Children liked to have a destination, and this contained an element of excitement and adventure – the destination giving the journey purpose but the journey also adding meaning to reaching the destination. It is possible that this becomes less important with age as the destinations of travel become increasingly routinized and familiar – travelling to work, to the shops, on the school run: the quotidian nature of travel may make an exciting or novel experience of cycling less realistic. It can be surmised that as people age, in general, their desire for kinaesthetic or sensory feedback changes from the literal, yet the need to feel connected does not diminish and cycle infrastructure needs to also support this. Interestingly, in later life, as people physically cannot get out and about as much as when they were younger, older people often lament the passing of travel for its own sake, rather than as a by-product for reaching a destination, highlighting its significance (Andrews, Parkhurst, Susilo, and Shaw, 2012; Musselwhite and Haddad, 2010; Musselwhite and Shergold, 2013).

Hence, it could be the link between travel, work, and daily routine in middle-life that causes a natural desire for the travel itself to be an exhilarating experience to be surpassed by the desire for it to be one of comfort. It is important to consider these differences, because any national cycle network needs to consider how it might cater for (and indeed encourage) a broad variety of users. Creating playful spaces to enhance the kinaesthetic and sensory elements of cycling, allow for the practise of skills, and facilitate a growth of confidence needs to be carefully done so as not to create physical and psychological barriers for cyclists with different needs. For example, developing playful spaces may become a physical barrier for those wanting to cycle smoothly: those cycling to work or to the shopsIt may also be a barrier to those who suffer physical discomfort from cycling on uneven surfaces. Hence, any playful space must be created *in addition* to existing infrastructure, without upsetting the smooth continuity of the cycle network. Even when this is the case, creating playful spaces may re-emphasise that cycling is the preserve of children, the young or something to be done for sport or leisure and hence not a serious or legitimate mode of transport, which is another well-known barrier to wider adoption of cycling (see: Gatersleben and Haddad, 2010). Nonetheless, the research does emphasise the importance of creating a pleasant environment within which to cycle and suggests the extension of off road cycling network, away from elements that negatively impact on the kinaesthetic and sensory cycling environment, for example motorised traffic.

With specific regard to the children interviewed, there is some evidence of age and gender differences in the views put forward, although the lines here are not very distinctly drawn. As children age, their desire to utilise the independence afforded by cycling increases, in

terms of it allowing them to go off and explore with friends, or travel to school by themselves. Regarding gender, girls tended to discuss the aesthetic elements of the cycle ride more frequently than boys, particularly making reference to pleasant visual, aural, and olfactory aspects of the environment. Both girls and boys discussed the thrilling experiences created by jumps, bumps, and speed; however boys focussed on these elements more singularly and consistently, and they often formed the main motivations for boys to cycle – where girls' motivations were more holistic. Traditionally research suggests boys are more likely than girls to enjoy risk-taking on bikes and enjoy the thrill of riding (e.g. Briem, Radeborg, Salo, & Bengtsson, 2004). However, the utilisation of a variety of research methods in this research has highlighted that girls enjoyed that aspect just as much as boys did, but also girls had a wider appreciation of other aspects of cycling, including the how the bicycle acted as a nexus between themselves and the local environment. Additional gender differences in motivation to and enjoyment of cycling did not surface amongst the children.

Previous research suggests boys are more likely to cycle and hold positive attitudes towards cycling when compared to girls, but these differences tend to occur in senior school age – from 11 or 12 years and above (e.g. Moore, 2009; Thorne, 2002) – whereas the children in this study were below that age. This suggests that there is currently a missed opportunity to maintain and encourage the positive attitudes to cycling discussed by the girls in this study as they move from childhood to adolescence and greater independence – where existing research suggests that their affinity may tail off. The findings of this study demonstrate that both girls and boys would value experiential enhancements to infrastructure on cycle routes, and there is an argument that in any investment in experiential improvements it would be prescient to place particular emphasis on capturing and retaining girls' enthusiasm for using the NCN.

Further research is needed on the potential impact of such infrastructural changes on different groups of cyclists. It could be that in creating playful cycling spaces it further emphasises the stereotypical view that cycling is for children, the young, for leisure or for sport – and reduce the view that cycling might cater for utilitarian purposes and potentially exclude other groups of individuals. In this sense, further research is also required which would examine any potential tensions between playful cycling spaces which encourage cycling from a young age and reconnect parents with the cycle network, and the core functional infrastructure of the NCN that allows the smooth, speedy flow of cycles necessary for those using cycle paths as a means of access .

5. Conclusion

. With regards to increasing levels of cycling over a longer term, it can be seen that investment in infrastructural enhancements such as these which aim to encourage, bolster, and maintain children's interest in cycling could arguably be an important aspect of future improvements to cycle networks, and in securing the "next generation" of cyclists. Coupled with this is the potential for such improvements to have a collective benefit for the family

group. The best way of achieving this would be to offer experiential infrastructure changes, such as placing bars, ramps or jumps adjacent to the cycle network, which enables innovation around the ways in which playfulness can be created during cycle rides to stem from the cyclists themselves. Such playful cycling spaces for enjoyment, family-time, skills practise, and confidence building have the potential to have a positive influence on both children and adults.

However, spaces for more playful activities, within the context of wider investment in cycle infrastructure will not be of value to all cyclists, and those using the cycle network for commuting or other more utilitarian purposes may see little benefit from such enhancements. Undoubtedly the main focus of investment in cycling infrastructure in the short term needs to remain on improving the safety of the network and building high-quality, acceptable cycle lanes/routes for all users. That is not to say that enhancing the environment of the cycle network is of no value: many participants felt that different types of additional infrastructure or embedded challenge could enrich the cycling experience. As such, it is suggested placing enhanced infrastructure and challenges alongside and in addition to the current cycle network could be considered as an innovative solution to any toolkit of measures aimed at changing travel behaviour change from a number of different angles.

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Family interview group compositions		
Group (G) 1: 3 families (12 participants)	Group (G) 2: 3 families (13 participants)	Group (G) 3: 2 families (8 participants)
Family interview group characteristics		
Regularly cycle together as a family activity, equipped for cycling with extensive recent experience of cycling.	*Occasionally cycle together as a family activity, equipped for cycling with some recent experience of cycling.*	*Rarely/never cycle together as a family activity, not fully equipped for cycling and little/no recent experience of cycling.*
Phase (P) 1		
3 families	3 families	2 families
Family 1: Rural/urban Adults: 1M, 1F Children: 1F 8yrs	**Family 4:** Rural/urban Adults: 1M, 1F Children: 1F 6yrs, 1F 10yrs, 1F 16yrs	**Family 7:** Rural/urban Adults: 1M, 1F Children: 1M 8yrs, 1M 10yrs
Family 2: Urban Adults: 1M, 1F Children: 1M 7yrs, 1M 10yrs, 1F 12yrs	**Family 5:** Rural/urban Adults: 1M, 1F Children: 1M 4yrs, 1M 6yrs, 1M 9yrs	**Family 8:** Urban Adults: 1M, 1F Children: 1F 10yrs, 1M 11yrs
Family 3: Rural/urban Adults: 1M, 1F Children: 1F 8yrs, 1F 11yrs	**Family 6:** Urban Adults: 1M, 1F Children: 1M 9yrs	
Phase (P) 2 and Phase (P) 3		
2 families	2 families	0 families
Family 1 **Family 3**	**Family 4** **Family 5**	
School focus groups		
Focus group 1: 16 children (8 male; 8 female) in school year 7 (ages 11-12 years)		
Focus group 2: 15 children (8 male; 7 female) in school year 8 (ages 12-13 years)		

Table 1: Background details of the participants at different stages of the research