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Research article

Parent perceptions of cycle training for children with special education needs and disabilities: What drives intention to cycle?

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ABSTRACT

Background: Young people with Special Educational Needs and Disabilities (SEND) are especially vulnerable to physical inactivity. Research has demonstrated the effectiveness of tailored cycle training for children with SEND, however, it is unclear whether this then results in a greater uptake of cycling.
Aims: To determine parent based perceptions of a SEND cycle training programme, factors which predict intention to cycle more and ongoing barriers to cycling.
Methods: A tailored questionnaire was distributed to parents of children who took part in the cycle training.
Results: Parents reported increased confidence in their child's ability to cycle independently with many also highlighting improvements in confidence and resilience. The outcome of the cycle training (level of enjoyment and change in cycling ability) had a positive influence on intention to cycle more while cycling frequency prior to training had a negative influence. Continuing barriers to cycling were identified which included difficulties accessing specialised equipment and a need for additional on-road cycle training.
Conclusions and implications: This study demonstrates the success of a specialised cycle training programme for children with SEND in terms of improvement to cycling and influences on the intention to cycle more.

What this paper adds

Young people with SEND are at more risk of physical inactivity and the associated health risks in later life. Research has demonstrated that many of the opportunities for physical activity, which are offered to young people with SEND, are not appropriate for their skill set and are therefore, inaccessible. Tailored activities, such as cycle training for children with Autism Spectrum Disorder and Downs Syndrome has been successful in improving skill and also boosting confidence and participation. The current study has further demonstrated that tailoring cycle training to children who fall under the broad SEND umbrella can also increase cycling skill and build confidence and resilience. Uniquely, we have demonstrated that parental reports of their child's enjoyment and change in cycling ability can predict their future intentions to cycle with their child. Despite the success of the cycle training parents do report ongoing barriers to cycle training which are mainly centred on their child's confidence, knowledge and resilience. This study highlights the importance of tailored cycle training both in order to make cycling truly accessible to all children and to demonstrate to

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parents their child's potential. Continued financial and physical resources are needed to support small group tailored cycle training.

1. Introduction

Physical inactivity is one of the leading risk factors for premature mortality worldwide [1] accounting for 5.3 million deaths annually [2] with a hugely negative economic and societal impact across the globe. For example, in the UK, physical inactivity is responsible for one in six deaths and is estimated to cost £7.4 billion annually [3]. Despite the clear evidence of the health benefits of being physically active, over a quarter of the world's adult population are insufficiently active. Research has demonstrated that improved health outcomes for adults result from childhood physical activity, whereby active children are more likely to become active adults [4]. Therefore, promoting physical activity amongst young people is an important endeavour to ensure a healthy adult population that reduces the societal, economic, and environmental burden associated with physical inactivity.

Cycling is increasingly recognised as a potentially effective means of increasing physical activity levels. Cycling has been shown to be associated with an overall higher level of physical activity in young boys [5] and those children who cycle to school have been shown to be more physically fitter than those who walk [6–8]. However, the benefits of cycling go beyond physical fitness, children who cycle have higher self-reported wellbeing and a greater level of self-confidence compared to those who do not [9]. Furthermore, learning to cycle is often taken for granted as a societal norm and rite of passage [10], providing both a greater level of independence alongside a sense of achievement [11].

To this end, many countries provide cycle training for children in schools. Studies have demonstrated the efficacy of such cycle training which can both improve children's cycling ability whilst also helping to change perceptions and increase cycling behaviour [12]. In fact, a systematic review found that of six studies, five reported an increase in the frequency of cycling after training [13]. Furthermore, in a large UK based population study, cycle training courses were seen to have lasting positive effects on cycling which can persist into adolescence [14]. However, not all studies find a positive effect of cycle training on subsequent cycling behaviour, for example one study found that cycle training improved cycling ability but found no evidence that it increased cycling behaviour [15]. In order to determine why this might be we can look at factors which facilitate and factors which act as barriers to cycling. Those which facilitate cycling as a means of transport in children, include slower traffic speeds, the presence of pedestrian crosswalks and traffic lights [16,17] and peer and family support [18]. While barriers include busy roads, long distances and uphill slopes [19], and parents' concerns about their children's safety [20–22].

The body of evidence described above excludes families who experience significant inequalities in opportunities for cycle training, such as families with children living with disabilities [23]. In the UK, the Equality Act 2010 [24] sets out the legal obligations that schools, early years providers, post-16 institutions, local authorities and others must adhere to. In line with this legislation, the UK Government is committed to the inclusive education of children and young people with disabilities by progressively removing barriers to learning and participation [25]. This applies to approximately 12.2% of school-aged children, who may need extra help during learning [26] as a consequence of one or more Special Educational Needs and Disabilities (SEND). It is generally accepted that children with SEND may have difficulties in one or more areas including: cognition and learning; communication and interaction; physical and sensory or social emotional and mental health [27]. These difficulties make children with SEND the most vulnerable group of learners [28], with the consequences of their difficulties far reaching. For example, there is a consensus that children with SEND are at risk of experiencing significantly poorer academic and psychosocial outcomes [29,30].

In addition to the educational impact, research has demonstrated that children who fall within a SEND category tend to be less physically active and therefore have an increased risk for associated health problems compared to their typically developing peers [31–34]. One of the potential reasons for increased levels of inactivity may stem from the finding that children who fall under the SEND umbrella experience physical challenges, frustrations, and failures when engaging in non-differentiated physical activities [35,36]. This can make it challenging for these children to engage with activities that are tailored for their typically developing peers, leading to social isolation and exclusion. Interestingly, children with disabilities who have positive, successful physical activity experiences report improved self-competence and self-worth [37]. These findings demonstrate the importance of providing physical activity experiences which are tailored to the needs of each child.

The Bikeability Trust, which is a charitable organisation, delivers cycle training in thousands of schools across England. In fact, recent figures suggest that approximately 50% of children receive Bikeability training in schools [38] which is provided free of charge. Despite this wide reach, the uptake of cycle training by children with SEND is low with only 1.3% of children with SEND taking up Bikeability training in 2019/2020. This may be a consequence of special schools tending not to sign up to cycle training and a perception that standard cycle training is not suitable for those falling under the SEND umbrella.

Where children with SEND have accessed cycle training, which is tailored to their needs, benefits are reported. For example, after five days of training, 73.3% of adolescents with Down Syndrome (DS) and 85.4% with Autism Spectrum Disorder (ASD) successfully demonstrated the ability to ride a bicycle more than 100 feet [11]. Similarly, a shorter training course also resulted in a significant improvement in cycle skills in children and adolescents with ASD [39]. Finally, on completion of a community-based cycle camp a group of children and adolescents with ASD demonstrated improved cycle skills and 60% rode independently for at least 70 feet [40]. Furthermore, the benefits seemingly go beyond cycle skills. For example, one paper demonstrated that structured and supported cycling therapy, on a stationary bicycle, improved inhibition and cognitive planning in children with ASD [41]. Similarly, cycle training has been shown to help improve cognitive planning in a group of children with ASD. This improvement was not, however, found in a group who engaged in stationary cycling, suggesting that the effects were due to the cognitive engagement associated with learning to ride rather than the physical activity component [42]. Additionally, moderate cycling exercise, again on a stationary bicycle, amongst adolescents with Intellectual Disability (ID) enhanced cognitive performance [43]. Another study asked parents of

adolescents with ASD or DS about their perceptions regarding the wider benefits of cycle training on adapted roller bikes [44]. After the training, parents spoke of their child's reaction to the camp, reporting a positive effect, increased social interaction, changes in attitude and increased independence. Parents also referred to benefits of cycling acquisition which included increased social opportunities and increased confidence.

This collection of studies provides evidence for the effectiveness of tailored cycle training both in terms of improving cycling ability, but also in terms of improving academic and mental health outcomes for children who fall in a SEND category. However, it tells us very little about onward intention to cycle following the cycle training. To our knowledge only a single study has considered cycling after a period of training, the study ran interviews with parents both before and after a cycling camp [45]. Seven of the 11 participants who participated were riding in the home environment at follow up. The study provided reasons as to why four of the children were not riding at home at follow up; these included no safe place, no adult support and insufficient cycling ability at the end of camp. Although this informative study does provide some insight into factors which are important in cycling after training the sample size is small. The current study, therefore, focuses on a much larger group of parents in order to gain their perceptions of their child's cycle training, investigate factors that feed into the intention to cycle with their child and investigate ongoing barriers.

Given evidence demonstrating the positive impact that cycle training can have on children and young people with SEND and legislation promoting inclusive education for these young people, The Bikeability Trust Board of Trustees allocated £300,000 to fund pilot projects across England aimed at increasing the number of children trained with SEND. The current study, using questionnaires, followed up after one of these projects which offered cycle training to four special schools in 2021. The questionnaire was a mixture of closed and open questions. Our specific research questions were.

1. How do parents perceive tailored SEND cycle training, in terms of their child's cycling ability prior to and after training, their child's enjoyment of cycle training and the importance of certain characteristics? *In line with previous research we expected parental perceptions of their child's training to be positive and for them to report an improvement in their child's ability to cycle. Furthermore, we expected parents to report that their child experienced a high level of enjoyment (in line with Hurley & Burt, 2015).*
2. What are the relationships between those variables? *This has not been previously considered and so is exploratory in nature.*
3. What predicts parental intention to cycle more with their child after tailored SEND cycle training? *Research has not yet quantitatively considered this in a SEND population, however, we expected capability (i.e. cycle ability) to influence intention to cycle (in line with Temple* et al.*, 2016). As the young people in this study had very different cycling abilities prior to training we considered both capability before and after. Furthermore, as a child's motivation is an important indicator of intention we will also considered the parent's perception of enjoyment and the parent's perception of the importance of tailored SEND training.*
4. What are the ongoing barriers to future cycling plans? *Research has not, to date, considered barriers to cycling frequency in this population and so whether these are the same as those seen in a population without SEND remains to be seen. However, we expected to see at least some of the barriers described previously, i.e. high traffic and concerns over safety (as per Carver* et al.*, 2010; Christie* et al.*, 2011; De Vries* et al.*, 2010; Hume* et al.*, 2009; Panter* et al.*, 2010; Salmon* et al.*, 2007; Timperio* et al.*, 2006).*

2. Method

2.1. Participants

The cycle training was attended by 1000 young people (10–19 years) with a 90% completion rate. Level 1 Bikeability training was delivered at the Active Tameside Cycle Circuit, UK. This level of training is conducted off-road and teaches cycle maintenance, gliding, control, pedalling and situational awareness. Questionnaire links were sent by the project lead to parents of participating young people.

A total of 49 parents responded, 37 responding for boys, 11 for girls and one choosing not to specify the gender of their child. In terms of the range of SEND, parents were asked to report their child's difficulties, 60% of parents described their child as having Autism, 12.5% Down's Syndrome, 12.5% didn't specify and a further 2% reported either behavioural social and emotional problems, Cerebral Palsy, Foetal Alcohol Syndrome, Developmental Delay, Neurofibromatosis, Williams Syndrome and Speech and Language Delay.

2.2. Materials

A single questionnaire was used to survey responses from parents of children with SEND who participated in the training. Due to the specific nature of the project a tailored questionnaire was created for this study. This questionnaire was co-created by the authors in conjunction with The Bikeability Trust and a group of instructors who deliver cycle training for children with SEND. Not all of the questions from the questionnaire were used in the analysis due to lack of responses/lack of variability/lack of parent knowledge, the questions that were used are described below and the full questionnaire can be found in Supplementary materials.

2.2.1. Cycling ability prior to training

Included questions on the regularity of cycling prior to the training. Question 2 asked how regularly they cycled with an adult and question 3 how regularly they cycled independently. Both using a five-point scale from 'daily' (5) to 'never' (1), a further response (0) was created for those children who couldn't cycle prior to training.

2.2.2. The cycle training

Included questions on 1. Child's enjoyment of the training (five point scale with an additional option of 'don't know'), this was question 9; 2. The importance of six factors in terms of their child's cycling training (that the training was tailored to SEND; that it was one-to-one training; that there were smaller groups of children; that they trained with other children with SEND; that they used an adapted cycle; and the level of knowledge of the instructor), this was questions 10–15. These were all answered on a five-point scale from 'very important' to 'not important' with a 'don't know' option.

2.2.3. After the cycle training

Included questions on 1. Agreement with the statement 'my child's cycling ability has improved following their cycle training', using a five-point scale 'strongly agree' to 'strongly disagree' (question 16); 2. Confidence in their child being able to cycle independently (five-point scale from 'very confident' to 'very unconfident') (question 17) and whether their confidence had increased following the cycle training (yes/no) (question 18); and 3. The opportunity to provide their opinion of the training.

2.2.4. Ongoing barriers and future plans

This section included open questions only. Included questions on whether they planned to cycle more as a family as a consequence of the cycle training (question 20) and the opportunity to generate up to five factors (of their own) which might still prevent their child from cycling more.

2.2.5. Demographics

Description of their child's SEND and their child's gender and age.

2.3. Procedure

All questionnaire links were distributed by the project lead and responses were collected using Qualtrics, Responses were anonymous unless participants chose to enter a prize draw, in which case they provided their email address. Ethical approval was obtained from Oxford Brookes University and each participant provided consent prior to participation.

2.4. Data analysis

Both closed and open questions were used within this study. Quantitative data were analysed using Jamovi 2.2.5. Descriptive statistics, including percentage of responses, frequency of responses, median and mean were calculated. Prior to addressing research question 2 and 3 which required inferential statistics, data from the questionnaire was reduced using an exploratory factor analysis with oblimin rotation. Likert scale questions relating to the child's cycling prior to the training (question 2 and question 3), the child's enjoyment of the training (question 9), the perceived importance of different aspects of the cycle training (questions 10, 11, 12, 13, 15)[1] and questions regarding cycling ability after the training (questions 16 and 17) were included in this reduction and the number of components was chosen based on the number of eigenvalues above 1. Data was reduced in line with the outcome of the factor analysis by taking a mean value. We used Perason correlation coefficients to demonstrate relationships between variables. Finally, we used linear regression to determine factors that predict intention to engage in future cycling behaviour with assumption tests run prior to interpretation.

Qualitative data from open questions was analysed using content analysis for coding. There were two instances of this in the questionnaire (when asked to give their opinion of the training and when asked to comment on ongoing barriers to cycling). Content analysis followed the published seven steps of Treadwell (2013) [46]. In each case the coding scheme was developed by KW who then also assigned each response to one of the codes. In order to ensure inter-rater reliability CP also checked the coding scheme and then, blind to previous allocations, re-allocated responses to codes.

3. Results

3.1. RQ1: how do parents perceive tailored SEND cycle training, in terms of their child's cycling ability prior to and after training, their child's enjoyment of cycle training and the importance of certain characteristics?

3.1.1. Cycle ability prior to training

Prior to training 33% of the young people were able to ride a two-wheeled bicycle without stablisiers, 24% of the young people rode a two-wheeled cycle with stabilisers, 18% of the young people rode an adapted cycle and 24% of the young people could not ride any sort of cycle. The frequency at which young people cycled both with an adult and independently is shown in Table 1.

3.1.2. The cycle training

In terms of enjoyment, parents stated that their child enjoyed the cycle training very much (61%), enjoyed it (35%) or neither

[1] Question 15 which refers to the use of adapted cycles was not included as many parents did not answer this question as it was not applicable to them.

Table 1
Frequency data indicating the frequency of cycling prior to training.

	With an adult		Independently	
	N	%	N	%
Never – can't cycle	12	24.5%	12	24.5%
Never – can cycle	3	6.1%	19	38.8%
A few times a year	14	28.6%	2	4.1%
A few times a month	15	30.6%	8	16.6%
A few times a week	5	10.2%	7	14.3%
Daily	0	0%	1	2.0%

enjoyed or did not enjoy (4%). Parents were asked to rate their perceptions regarding the level of importance of six different factors. All of these six factors had high average scores indicating that they were seen as important, these can be found in Table 2.

3.1.3. Cycling ability after training

Of those parents who answered the survey the vast majority agreed that their child's cycling skill had improved with 76% agreeing or strongly agreeing that cycling skill had improved (25% strongly agreed, 55% agreed, 10% neither agreed or disagreed, 4% disagreed and 6% didn't know). Furthermore, 84% of parents stated that their confidence in their child's ability to cycle independently had increased following their child's training. This resulted in 73% of parents stating that, after training, they were very confident or confident in their child's ability to cycle independently.

Finally, parents were asked whether they would cycle more as a family as a consequence of the cycle training. Nearly 82% of parents 'strongly agreed' or 'agreed' with this statement (31% 'strongly agreeing' and 51% 'agreeing'), with 14% 'neither agreeing or disagreeing' and 4% 'disagreeing'.

3.1.4. Overall perception of training

Parents were asked to provide open comments regarding their opinion of the training, these comments were subject to a content analysis which highlighted three clear categories: 1. The training resulted in an increase in aspects of confidence and competence; 2. The training was appropriate (either in terms of the equipment available or the stage); and 3. Importance (either to the child or more widely) and enjoyment. The occurrences of these along with some indicative quotes are provided below in Table 3. Agreement between the coders was high, with coders assigning responses to the same category in 79% of cases, disagreements were resolved through discussions between the coders.

3.2. RQ2: what are the relationships between those variables?

The factors analysis yielded three factors explaining 67% of variance. Bartlet's test of Sphericity demonstrated a significant outcome (χ^2 (45) = 272, $p < .001$) and KMO scores were all above 0.536 and so were considered adequate. Loadings can be found in Table 4.

Component one explained 33.3% of the variance and included questions focused on the perceived importance of aspects of the training, a high score on this component would indicate a high agreement in the importance of these factors, this will be referred to as *factors important in training.* The second component added 16.9% variance and this included questions on the child's cycling after training and their enjoyment of the training, a high score on this factor would indicate a high enjoyment/a large improvement in cycling, this will be referred to as *cycle training outcome*. Finally, the third component explained an additional 16.8% of variance and included questions regarding the child's cycling regularity prior to the training, a high score here would indicate children who cycled more regularly prior to the training, this will be referred to as *cycling prior to training.*

Pearson's correlations were conducted between the three components from the factor analysis (*cycling prior to training, factors important in training, cycle training outcome)*. Significant correlations can be found in Table 5. Factors important in cycle training was positively related to cycling training outcome, demonstrating that parents who perceived their children to have a positive outcome from the cycling also perceived a greater level of importance of the tailoring of the SEND training and their child's cycling ability after training.

Table 2
Mean and median score for the six importance factors.

	Mean score (SD)	Median
Tailored for SEND	4.56 (.71)	5.00
Having one to one training	4.53 (.51)	5.00
Having smaller groups	4.70 (.47)	5.00
Being with other SEND young people	4.41 (.79)	5.00
Using an adapted cycle	4.39 (.74)	5.00
The knowledge of the instructor	4.70 (.46)	5.00

Table 3
Outcome of the content analysis along with some indicative quotes.

Code	Number of occurrences	Indicative quote(s)
Confidence and competence	10	"It has enabled my child to ride" "Helps children to learn and grow in confidence"
Appropriate training	5	"It makes a massive different having session tailored to my child's needs rather than what they're 'supposed' to be able to do."
Importance and enjoyment	4	My son loved it" "Any sort of fitness and hobby is a positive for children with SEND"

Table 4
Factor loadings for the relevant questions with the question number and short description of the question provided. These are ordered by loading size.

	Component		
	1	2	3
15. Knowledge of instructor	.937		
12. Smaller groups	.912		
11. One-to-one training	.883		
10. Tailored to SEND	.818		
13. With other SEND children	.528		
16. Cycling improved		.898	
9. Enjoyment		.712	
17. Confidence in cycling afterwards		.706	
2. Cycling regularity before with adult			.914
3. Cycling regularity before independently			.904

Table 5
Correlation coefficients and p values for all significant correlations. All non-significant correlations were $p > .05$.

		Pearson's r	P value
Cycling prior to training	Factors important in training	−.159	.274
Cycling prior to training	Cycling training outcome	.205	.157
Factors important in training	Cycling training outcome	.369	.009*

3.3. RQ3: what predicts parental intention to cycle more with their child after tailored SEND cycle training?

A regression analysis with '*Future cycling intentions*' (response from question 20) as the outcome variable and '*cycling prior to training, factors important in training and cycling training outcome*' as the predictor variables found a significant regression model: $F(3,45) = 11.1$, $p < .001$, *Adjusted* $R^2 = 0.386$. Of the variables inputted 'cycling prior to training' and 'cycle training outcome' were significant predictors, correlation coefficients can be found in Table 6. Parents who perceived a very positive cycle training outcome had more certain plans to increase cycling frequency with their child than those reporting a less positive outcome. However, parents who reported their child had a high frequency of cycling prior to training had less certain plans to increase cycling compared to those parents who reported less cycling prior to training. Assumption tests were conducted prior to the regression, Durbin-Watson test was non-significant ($p = .736$) indicating auto-correlation of errors, tolerance values were all above 0.792, thus not approaching zero, the Q-Q plot indicated close clustering of residuals to the line, demonstrating normal distribution of residuals and the residual plots suggested random distribution. All of these checks suggest assumptions were met and so the outcome of the regression analysis is reliable [47].

3.4. RQ4: what are the ongoing barriers to future cycling plans?

Parents were asked to generate up to five ongoing barriers to cycling. The responses provided were subject to a content analysis and

Table 6
Regression coefficients when predicting future cycling intentions.

	Beta	SE	Standardised Beta	t	p
Cycling prior to training	−.17	.07	−.29	−2.42	.020*
Factors important in training	<.001	.16	<.001	.002	.998
Cycle ability after training	.77	.15	.646	5.09	<.001*

responses were grouped into three broad categories: environmental barriers; individual child barriers and individual parent barriers. The majority of barriers were individual child barriers (lack of confidence, lack of road knowledge, lack of skill, lack of interest and inappropriate behaviour) accounting for 55%, next were the environmental barriers (lack of appropriate space, no equipment, unsafe roads, poor weather) accounting for 40% and finally individual parent barriers accounting for 5% (lack of time). Agreement between the coders was high, with coders assigning responses to the same category in 100% of case. The percentage of these is provided in Fig. 1.

4. Discussion

The current study has contributed to the existing literature by providing a detailed analysis of the perspectives of a large sample of parents regarding their child's SEND tailored cycle training. This study had four main aims: 1. To determine how parents perceive tailored SEND cycle training, in terms of their child's cycling ability prior to and after training, their child's enjoyment of cycle training and the importance of certain characteristics. 2. To determine the relationships between those variables. 3. To determine what predicts parental intention to cycle more with their child after tailored SEND cycle training. 4. To determine the ongoing barriers to future cycling plans. The findings are discussed below.

Parents reported that their child's cycling ability had improved following the training with the majority of parents reporting that they were confident in their child's ability to cycle independently. The improvement in cycle skill following tailored cycle training in children with SEND has been seen previously [11,39,44] demonstrating the effectiveness of cycle training in this population. We have also described that the majority of parents reported that the children enjoyed the cycle training. This is consistent with previous research for example, one study surveyed university staff and students with disabilities in Canada and reported that cycling to and around campus was considered enjoyable [48]. Likewise qualitative interviews with disabled adult cyclists demonstrated that cycling is experienced as joyful and fun, with participants describing cycling as intensely pleasurable, using words like 'love' and 'joy' to express their feelings [49]. Similarly, in childhood populations, interviews with children with Cerebral Palsy (CP) aged between 6 and 18 years concluded that adapted cycling is a fun and engaging activity for children with CP [50]. Taken together with the current findings, the evidence for promoting inclusive cycling as a means of enjoyable physical activity is compelling and consistent. Interestingly in the current study we also demonstrate relationships between parental perceptions of the enjoyment of the training and the parents' perception of cycling ability after the training, this relationship furthers previous research and demonstrates a relationship between enjoyment of the cycle training and perceived skill.

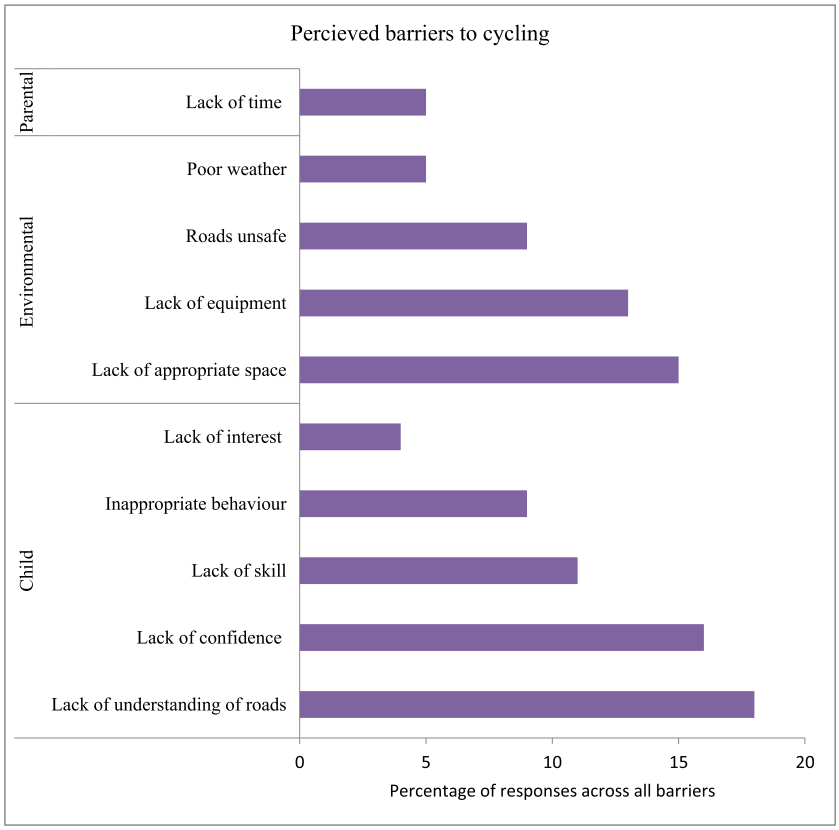

Fig. 1. An illustration of the percentage of responses for difference ongoing perceived barriers to cycling.

The premise of this study, and many which have come previously, was that tailoring cycle training is beneficial for young people with SEND. We asked parents to determine the importance level of a number of factors identified by the course instructors as being distinctly different about this training compared to that provided for children without SEND. Knowledge of the instructor was rated as the most important factor and when combined into a composite variable it was seen that parents who had a higher level of agreement to all of these factors also rated their child's post-training cycle ability as higher and the child's enjoyment as higher. This finding demonstrates a clear relationship between parents' perceptions of the value of a training course and their perceptions of their child's experience.

One of the main original contributions of this study was to determine factors that predict a parent's intention to cycle with their child. The study has demonstrated that the child's cycle ability prior to training was negatively related to their parent's intentions to cycle more whereas the parent's perception of the outcome of the cycle training (enjoyment and improvement) was positively related to their intention to cycle more. The first finding, that those children who cycled a lot prior to training had parents who did not intend to cycle more may simply be an issue of capacity and an inability for those parents to increase their child's cycling. However, the relationship of perceived cycling outcome (enjoyment and improvement) and intention in cycling is an important one. Therefore, it would seem the cycle training acted as a mechanism by which parents realised the value of cycling for their child's enjoyment and improvement. In fact, the open comments from parents very much indicated this. This supports other evidence which is well described in papers proposing a model describing the relationships between perceived competence, enjoyment and physical activity [51]. Furthermore, this paper goes on to suggest that enjoyment might act as a mediator between perceived competence and level of physical activity. This sits well with the theory of planned behaviour which states that the intention to engage in future behaviours is partly regulated by the individual's attitudes towards those behaviours [52]. Therefore, within this context the parental perception of their child's enjoyment influences their intention to cycle. To our knowledge this is the first time that this has been demonstrated for a group of young people with SEND within a cycling context.

Making cycling accessible is legislated for in the Equality Act (2010), which requires authorities to make reasonable adjustments to remove barriers for disabled people. This is particularly important in relation to cycling as a form of physical activity as the health and wellbeing benefits for people with disabilities are well documented [49,53,54]. Despite this, many barriers still exist that prevent people with disabilities from accessing the benefits associated with cycling. Parents in the current study reported a range of barriers relating to their child, including lack of skill and lack of road knowledge, barriers relating to the environment including lack of equipment and barriers relating to them as parents, specifically a lack of time. This is in line with previous research which typically reports infrastructure, social conflict, cost of adapted bicycles, risk of loss and risk of breakdown as significant barriers to cycling for adults with disabilities [54]. It is worth noting, that some of these barriers are also cited by parents of children without SEND [16–22].

4.1. Limitations

Although the sample here was bigger than that used previously, the study does still have limitations. Firstly, we have measured the intention to cycle in the future rather than future cycling behaviour, previous research focusing on physical activity in children has demonstrated an intention–behaviour gap whereby intention does not always result in behaviour [55]. Therefore, it is important to validate these findings with studies which measure actual behaviour after SEND cycle training. Furthermore, our measure of enjoyment is based on a single question and showed little variance among participants, it is important that future studies unpack this variable of enjoyment to determine its importance in parental intention and behaviour. In addition, our study focuses on parental perceptions and so the reporting of factors such as enjoyment or ability are subjective and might not reflect the child's experience. However, given that parents very much hold the key to their child's cycling opportunities their perceptions can be as important in measuring engagement in cycling as the children themselves. Finally, the questionnaire we used was tailored for this group of parents and co-created with the instructors who work with these children, the strength of this is that it taps into the precise areas which are important for this group. However, it does mean there is no data regarding the reliability or validity of this tool.

5. Conclusions

This study has highlighted the efficacy of cycling training for young people with SEND, both in terms of improving cycle skill but also more widely. In particular the level of enjoyment was seen as a significant predictor of parental future intention to cycle with their child. These findings highlight the importance of special education schools ensuring they include appropriate cycle training which may have a positive impact on future participation in cycling. In addition, this study has highlighted several barriers to continued cycling that need to be addressed in order for children with SEND to profit from the known health and wellbeing benefits of cycling. In order to make cycling truly accessible to all children, continued financial and physical resources are needed to support small group tailored cycle training. Furthermore, widespread access to specialised equipment and appropriate instructor training is needed. Finally, a consistent approach to evaluating cycle training for SEND children is needed in order to gain a more holistic understanding of the health and wellbeing benefits.

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Author contribution statement

Kate Wilmut: Conceived and designed the experiments; Performed the experiments; Analysed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Catherine Purcell: Conceived and designed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Data availability statement

The authors do not have permission to share data.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2023.e16173.

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