

A close-up photograph of a person's hand, wearing a red sleeve, touching a circular button on a black device. The device has some white geometric patterns on its surface. The background is blurred, showing what appears to be a railing or fence.

**INDEPENDENT  
MOBILITY AND SPECIAL  
EDUCATIONAL NEEDS:  
THE EXPERIENCE  
OF CHILDREN AND  
YOUNG PEOPLE WITH  
AUTISM, ADHD, AND  
LEARNING DISABILITIES  
ON THE ROADS**



Produced with the support  
of the Department for  
Transport

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# Independent Mobility and Special Educational Needs: The Experience of Children and Young People with Autism, ADHD, and Learning Disabilities on the Roads

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## EXECUTIVE SUMMARY

### Background

Children with special educational needs and disabilities (SEND) are especially vulnerable in on the roads<sup>[1,2]</sup>. Although understanding of the cognitive and behavioural challenges faced by children with SEND in the traffic environment has increased, there is still a significant lack of research which has identified effective ways to teach these children about road safety. Children with SEND may have limited awareness of danger and face added challenges in learning road safety skills compared to their typically developing peers<sup>[2]</sup>. For example, they may be impulsive, have difficulty grasping and remembering concepts or experience challenges thinking and behaving flexibly<sup>[2,3]</sup>. There is a need for greater attention to be directed toward understanding the vulnerability of children with SEND in the traffic environment and toward identifying strategies that may help address the challenges they face in learning road safety skills and to progress towards traveling independently.

### Aims

This research project aimed to increase understanding of the facilitators and barriers to road safety and independent mobility education experienced by children between 7 and 18 years of age diagnosed with a learning disability (mild or moderate) or developmental disorder (Attention Deficit Hyperactivity Disorder (ADHD) or autism). This project aimed to provide a 'voice' to children with SEND and their caregivers to understand the challenges they face in navigating the traffic environment in order that resources/initiatives can be developed to better meet their needs and to promote the independent mobility of children with SEND.

### Method

Families were recruited via charities and organisations supporting children and young people with SEND. The final sample included 14 children (12 male and 2 female) between the ages of 7 and 18 years-of-age and their caregivers. This included 10 primary school age children (8-11 years-old), three secondary school age children (13 years-old) and one young adult (18 years-old). There were five children diagnosed with autism, two of whom were also diagnosed with passive demand avoidance (PDA). There were three children diagnosed with ADHD. There were five children diagnosed with multiple disorders.

**Video Diary.** Participants were provided with wearable cameras to record three familiar journeys they regularly undertook. Participants were asked to focus on walking journeys and to include a school/college journey where possible. Participants were asked to record the journey as they would usually travel (e.g. independently or accompanied by a caregiver). Cameras were able to record both audio and visual information.

**Interview.** Within two weeks of the video diaries being completed, the researcher completed an interview with child participants with the aid of visual prompts on a computer tablet. The interview discussed children's video diaries and their general road safety. A semi-structured interview was also conducted with the child's caregiver that explored views on their child's independent mobility and road safety as well as their involvement in their child's road safety and independent mobility support. Interviews were conducted either face-to-face or via video/telephone calling. Interviews were audio recorded and transcribed.

A thematic analysis was conducted on video dairies and interview transcripts.

## FINDINGS

The key findings of this project were:

<b>Behaviours not disorders should be the focus</b>	Children often have multiple diagnoses with overlapping disorder profiles and there is variability between children under the same disorder umbrella. Challenges that children and caregivers discussed reflected certain behaviours (e.g. anxiety/running ahead) and were not disorder specific.
<b>Road safety is one aspect of independent mobility</b>	It is not just road safety, but other aspects of independent travel, that are a concern for caregivers and prevent independent mobility. For example, children may invade others personal space or are not aware of other pedestrians when scooting or cycling.
<b>Both children with SEND and their caregivers may be anxious about independent mobility</b>	Road safety was a concern for caregivers and was a central reason they limited their children's independent mobility. Caregivers wanted to support their children to become as independent as possible but felt they needed to build their confidence and trust in their children's ability.
<b>Preparation for independent mobility is essential</b>	Caregivers felt that preparing their children for independent travel required a lot of forethought and planning. They felt that it would be a gradual process that would require frequent repetition. Providing caregivers with resources to support them in educating their children about independent mobility may reduce the preparation burden.
<b>Preparing children for unforeseen circumstances is important</b>	A significant area of concern in relation to independent travel for caregivers was if their children experience a novel or unforeseen situation. Caregivers felt that if children were traveling independently and an unforeseen event occurred (e.g. a crossing was not working) then they may be unsure what to do, they may panic and become overwhelmed, and this may result in them failing to remember road safety rules and leave them at risk.
<b>Travel training for SEND is not a one-time activity</b>	A prominent theme was the need for travel training to be continually reinforced with children with SEND. Caregivers reported that children's ability to navigate the roads may vary depending on their emotions or concentration at the time.
<b>Failure to support safe mobility early on may impact quality of life later on</b>	Independent mobility was a more central concern for caregivers of children approaching key life transitions (e.g. secondary school or college). Caregivers also felt that as children developed and wished for greater independence from their parents and to see friends then their limited independent mobility would have a greater impact.
<b>Schools and caregivers should work together to support independent mobility</b>	Caregivers believed that the school would be a good source of support for children's road safety as children were more likely to listen to their teachers. However, caregivers often reported the school were not teaching road safety or were unsure what the school were covering in relation to road safety.
<b>Inclusive street environments are needed</b>	Caregivers and children felt that more inclusive environments would promote road safety and independent mobility. In particular, the need for safe places to walk and cross were highlighted as well as the need for consistent crossings (e.g. button height).

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## RECOMMENDATIONS FOR TEACHING INDEPENDENT MOBILITY TO CHILDREN WITH SEND

This project proposed the following recommendations for independent mobility interventions targeting children with SEND:

1. The impact of certain behaviours (e.g. running off, impulsivity, sensitivity to noise) rather than categories of SEND should be the focus.
2. Road safety should be embedded in broader independent mobility training and should be repeated as required by the child, especially during key transition points.
3. The focus should be on building caregiver as well as child confidence and trust.
4. Interventions should aim to maximise children's exposure to the road and to a range of road types and car parks.
5. Incorporating practicing unforeseen circumstance into interventions is important.
6. Building stronger links between schools and caregivers in relation to supporting independent mobility would be beneficial.
7. Systems (e.g. wider family, school, community) around the child are important resources in reinforcing road safety messages and behaviours.

## Autism

Autism is a lifelong developmental disability that affects how people interact with the world. Individuals with autism experience challenges in three main areas: social interaction (e.g. interpreting and managing emotions), social communication (e.g. making eye contact and understanding non-verbal cues) and imagination and cognitive flexibility (e.g. fixations and rigid thinking and behaviour).

Individuals with autism are sometimes also diagnosed with ***pathological demand avoidance (PDA)***. PDA is characterised by extreme avoidance of everyday demands and expectations.

## Attention Deficit Hyperactivity Disorder (ADHD)

ADHD is a lifelong condition that impacts individual's concentration and behaviour. Individuals often have high levels of hyperactive and impulsive behaviour as well as finding focusing their attention for long periods of time and resisting distraction challenging.

## Learning Disabilities

Learning disabilities are lifelong developmental disorders that impact an individual's ability to understand and process information, learn new skills, and communicate.

## INTRODUCTION

Independent mobility is associated with increased social inclusion and access to employment, education and other services, as well as having a positive impact on well-being and quality of life and promoting autonomy<sup>[4-7]</sup>. Further, being able to travel around their local environment provides children with opportunities to develop their cognitive, physical, social and emotional skills<sup>[8]</sup>. However, rates of child independent mobility have been declining; with barriers often being stated by caregiver as being traffic, distance to destination and personal safety<sup>[8]</sup>.

Independent mobility and road safety are particular concerns for parents of children with special educational needs and disabilities (SEND). Children with SEND, such as learning disabilities, autism and attention deficit hyperactivity disorder (ADHD), are especially vulnerable in the traffic environment<sup>[1,2]</sup>. Around 14% of children in the UK have a statement of SEND<sup>[9]</sup>, a substantial number of children may therefore be vulnerable to road traffic injury. Children with SEND face additional barriers to independent mobility. For example, children with autism may experience challenges managing noisy environments or unpredictable travel situations<sup>[10]</sup>.

Poor road safety is also a barrier to independent mobility. Children with SEND may face added challenges in learning road safety skills compared to their typically developing peers<sup>[2]</sup>. Children with SEND may demonstrate a lack of awareness of danger as well as more specific difficulties based on their needs. For example, amongst other challenges, children with learning disabilities may have difficulty grasping and remembering concepts, children with physical disabilities may experience challenges hearing and locating potential hazards, and children with developmental disorders may be impulsive or experience difficulties thinking and behaving flexibly<sup>[2,3]</sup>. Although understanding of the cognitive and behavioural challenges faced by children with SEND in the traffic environment has increased, there is still a significant lack of research which has identified effective ways to teach these children about road safety and support their independent mobility.

There is a need for greater attention to be directed toward understanding the vulnerability of children with SEND in the traffic environment and toward identifying strategies that may help address the challenges they face in learning road safety skills. There are wider implications of addressing the road safety of children with SEND, lack of safety is a major barrier to independent mobility and participation in society and therefore further excludes these young people.

## Aims

This research project aimed to increase understanding of the facilitators and barriers to independent mobility experienced by children between 7 and 18 years of age with SEND and their caregivers. This will not only promote road safety skills of children with SEND but increase their inclusion and independence in the travel system. Due to the limited research focusing on a range of SEND, broad categories of SEND were explored. This included learning disabilities (mild or moderate) and developmental disorders (ADHD or autism). This enabled general and disability specific views to be obtained.

This project aimed to provide a 'voice' to children with SEND and their caregivers to understand the challenges they face in navigating the traffic environment in order that resources/initiatives can be developed to better meet their needs and to promote their independent mobility.





## METHOD

### Participants

Participants were recruited via several channels. The project was advertised via charities working with children and young people with SEND, university and charity social media channels, and via the Autistic database of families of a child with autism interested in research (<https://www.autistica.org.uk/>). The advert contained researcher contact details for participants to express their willingness to participate. A screening questionnaire (Appendix A) was sent to participants to identify those who were eligible to participate.

Eligibility criteria included:

- 1) having a child between 7 and 18 years-of-age,
- 2) who is diagnosed with autism, ADHD or a learning disability,
- 3) who undertakes journeys accompanied or unaccompanied that involve some walking.

The final sample included 14 children between the ages of 7 and 18 years-of-age. There were 12 males and 2 females. There were five children diagnosed with autism, two of whom were also diagnosed with pathological demand avoidance (PDA). There were three children diagnosed with ADHD. There were six children diagnosed with multiple disorders, one or more of which matched the eligibility criteria.

**Table 1. Sample characteristics**

ID	Gender	Age (years)	Ethnicity	Diagnoses	School
A001	Male	9	White British	Autism, PDA	SEN
A002	Female	13	White British	Autism, mild LD	SEN
A003	Male	13	Black British	Autism and Non-verbal	SEN
A004	Male	11	White British	Autism and PDA	Mainstream
A005	Male	11	White British	Autism, Polymicrogyria and epilepsy	Mainstream
A006	Male	7	White British	Autism, learning disability, sensory processing disorder, hypermobility	Mainstream
A007	Male	11	White Asian	Autism	Mainstream
A008	Male	18	White British	Autism, ADHD, learning disability, anxiety disorder	SEN
A010	Male	11	White British	Autism, ADHD, dyslexia	Unit in mainstream
A011	Male	13	White British	Autism, learning disability, hemiplegia and epilepsy	SEN
AD001	Male	8	White British	ADHD	Mainstream
AD002	Male	10	White British	Autism, ADHD, sensory processing disorder, hypermobility and epilepsy	Mainstream
AD003	Male	9	White British	ADHD	Mainstream
AD004	Female	8	White European	ADHD	Mainstream

## Procedure

There were two stages to the project. In the first stage participants were provided with wearable cameras to record three familiar journeys. In the second stage child participants and caregivers were interviewed about the films and the child participants road safety and independent mobility more broadly.

This study was conducted during 2019, before the COVID-19 pandemic.

This project received ethical approval. Informed consent was obtained from caregivers and verbal assent was obtained from child participants.

### Video Diaries

A wearable camera was posted to participants for them to complete three films of journeys that they regularly undertake. Participants were asked to focus on walking journeys and to include a school/college journey where possible. The camera was attached to a lanyard and could be worn around the participants neck in order to film the journey from a first-person perspective. Caregivers could also choose to film participants. Cameras were able to record both audio and visual information. Participants were asked to record the journey as they would usually travel (e.g. independently or accompanied by a caregiver) and that they did not need to censor their language or behaviour in any way.

### Interviews

After the video diaries were completed, the researcher undertook a semi-structured interview with child participants about their films and with the child's caregiver regarding their child's independent mobility and road safety. These interviews were held within two weeks of the video diaries being completed to facilitate child recall.

The researcher reviewed the films and captured screen shots of significant scenes from the film. Significant scenes were defined as those involving examples of safe road behaviour, unsafe road behaviour, or an incident (e.g. near miss). During the child interview these screenshots were presented to the child on a computer tablet and the researcher asked the child about the screenshots. The researcher also presented a series of questions to the child participant on the tablet regarding independent travel and road safety (Appendix B). There were visual responses to questions that children could select. The researcher read the question and identified the visual responses. Where interviews were conducted via phone / video calling these documents were presented on screen

or sent to the child prior to the interview via email. Interviews lasted approximately 10-15 minutes.

The researcher also conducted semi-structured interviews with caregivers either face to face or via phone/video calling. A topic guide was followed for each interview that explored caregiver views on the impact of their child's diagnoses on their independent mobility, how they support their child to travel independently, and engagement with resources and training (Appendix C). Interviews lasted between 30-60 minutes. Child and caregiver interviews were audio recorded and transcribed verbatim.

## Thematic Analysis

A thematic analysis of both video diaries and interview transcripts was carried out to identify key themes. Thematic analysis involves identifying patterns of meaning across the data and from these patterns creating higher level themes<sup>[5]</sup>.

**Video diaries.** Video diaries were analysed manually. Video segments containing both visual and auditory information were coded. Following Braun and Clarke's thematic analysis approach<sup>[5]</sup>, these codes were then revised, and themes were created from code groupings.

**Interviews.** The thematic analysis was conducted in accordance with the Braun and Clarke approach<sup>[5]</sup> using Nvivo 12. A data-driven approach was adopted in which themes were identified based on the interview data.

Themes were explored across participants rather than across diagnoses because the majority of the sample had multiple diagnoses. Further, it became apparent after analysis had commenced that themes were reflective of the sample as a whole rather than diagnostic categories.

## FINDINGS

There were four main themes identified: (1) Children's Travel; (2) Road Safety; (3) Child Factors; and (4) Supporting independent mobility.

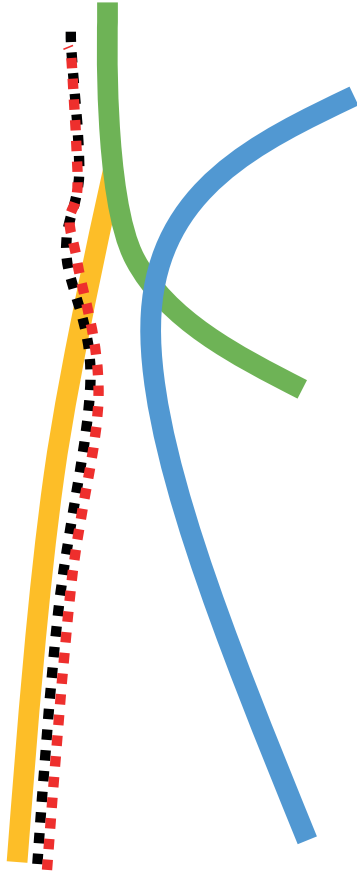
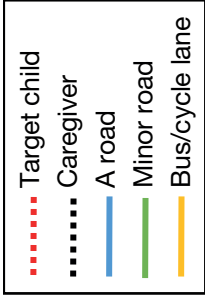
Theme	Sub-Theme	Key Findings
<i>Feelings about independent mobility</i>	Perspectives on independent travel	<ul style="list-style-type: none"> <li>● Caregivers wished for their child to be independent and saw independent mobility as one part of independence.</li> <li>● Caregivers had mixed views on children's ability to go onto travel independently.</li> <li>● Children with autism typically preferred travelling with an adult.</li> <li>● Caregivers found supporting independent mobility highly stressful.</li> </ul>
	Anxiety	<ul style="list-style-type: none"> <li>● Caregivers felt a need to balance the desire for their child to be independent with their anxiety about their child's safety.</li> <li>● Children were anxious about travelling independently.</li> <li>● It was felt children may become anxious and overwhelmed and therefore unable to focus on road safety.</li> </ul>
<i>Road Safety</i>	Crossing behaviour	<ul style="list-style-type: none"> <li>● Children and caregivers demonstrated inconsistent behaviour in the road environment.</li> <li>● When crossing minor roads / vehicle accessways children more often failed to follow the highway code.</li> <li>● Evidence of very unsafe behaviour (e.g. crossing when there were oncoming vehicles) was seen.</li> </ul>
	Navigation	<ul style="list-style-type: none"> <li>● When overwhelmed children may be less able to navigate a journey.</li> </ul>
<i>Child Factors</i>	Awareness	<ul style="list-style-type: none"> <li>● Children found dividing their attention challenging and this would often be at the expense of road safety.</li> <li>● Children had limited awareness of danger (especially in car parks) as well as personal safety and boundaries.</li> </ul>
	Impulsivity, impatience and Hyperactivity	<ul style="list-style-type: none"> <li>● Caregivers felt they could not trust their children in the road environment because they were impulsive.</li> <li>● Children with ADHD frequently ran ahead or across the road.</li> </ul>
	Information processing	<ul style="list-style-type: none"> <li>● Children needed longer to process information and found remembering multiple steps challenging.</li> <li>● Some children with autism found environmental noise challenging.</li> <li>● Some children with autism found looking drivers in the eye to anticipate their behaviour challenging.</li> </ul>
	Coordination	<ul style="list-style-type: none"> <li>● Some children were prone to tripping or falling in the road environment causing parents concern for their safety.</li> <li>● Some children with ADHD engaged in risky behaviour such as balancing on the curb and were then prone to falling.</li> </ul>
	Incidents	<ul style="list-style-type: none"> <li>● Incidents of very unsafe behaviour (e.g. stepping into the road when there were oncoming vehicles) were witnessed.</li> <li>● Caregivers were anxious due to prior road incidents or near misses.</li> </ul>

Theme	Sub-Theme	Key Findings
<p><i>Supporting independent mobility</i></p>	<p>Coaching</p>	<ul style="list-style-type: none"> <li>● Caregivers coached children in the road environment, actively engaging them.</li> <li>● Caregivers felt practical, short lessons were best that built knowledge in a sequential and gradual way.</li> <li>● Caregivers felt travel training required a lot of preparation, especially in preparing children for unforeseen circumstances.</li> <li>● Children profile may vary day to day or across days, meaning so to does their ability to travel independently.</li> </ul>
	<p>Resources</p>	<ul style="list-style-type: none"> <li>● Caregivers felt there was little support for independent travel training and no resources available.</li> <li>● Caregivers felt others (e.g. school / police) teaching road safety was beneficial as children may listen more to professionals.</li> <li>● Caregivers were often not sure if or how the school were supporting independent mobility.</li> </ul>
	<p>Environment</p>	<ul style="list-style-type: none"> <li>● Safe places to walk and cross were highlighted as important to safe mobility.</li> <li>● It was felt having consistent crossing (e.g. position of button / noise) would facilitate independent mobility.</li> </ul>
	<p>Understanding diagnoses</p>	<ul style="list-style-type: none"> <li>● Some caregivers felt the community were supportive and could be a resource in ensuring their child was safe.</li> <li>● Some caregivers reported limited understanding of SEND and the need to explain their child’s diagnosis to members of the public.</li> </ul>

## Male 8 years with ADHD (AD00001)



6:14 approach road



6:24 look left

6:25 Child says: look both ways ... cars coming



6:26 Grandmother and sister approach



6:32 look right

6:32 Child says: no cars ...



... yes car.

6:34 look right



6:41 look right

6:43 Child says: There is no cars. Look both ways.



6:45-6:49 cross

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# FEELINGS ABOUT INDEPENDENT MOBILITY

This theme focuses on how caregivers and children perceive independent mobility and their feelings towards travelling independently now and in the future.

## Perspectives on independent travel

Caregivers expressed a desire for their children to be independent as they moved into adolescence and adulthood and an element of this was being able to travel independently. Independent mobility was seen as a broad concept, for which road safety was one aspect.

'I suppose with any family with a child, now a young adult with autism, every stage has a different challenge, and for me right now, it's developing as much independence as he possibly can. So we're doing that across the board, so travel training was definitely one of those things...'

*Caregiver of Male 18y with Autism (A008)*

Children were generally not currently travelling independently and were accompanied by an adult when making trips. Though, most children were taking some steps towards independent mobility, but the extent to which varied greatly across the sample. This was also influenced by the age of the child. Younger children and children whom their parents were not confident in their road safety were provided with some opportunities to practice independent mobility skills. For example, they may cross ahead of parents or cross the car park.

'So I don't let her go out on her own because she's still only eight but I do let her cross the road on her own so for instance I was in Ikea a couple of days ago with her in the customer services area and she wanted to go back to the car... So I asked her to talk me through how she would do it and I asked her questions, coached her through going to the car and coming back and she did it successfully so I am encouraging her independent mobility as much as I can but, no, at the moment she wouldn't walk to school on her own or anything like that but I will allow her to cross the road on her own.'

*Caregiver of Female 8y with ADHD (AD004)*

Older children were beginning to navigate longer routes such as the school / college journey or the corner shop. Some caregivers indicated that they have or would initially follow their child when they were making their first independent journeys.

Some children expressed a desire to be independent and to start making trips on their own. However, in some instances there was opposition with parents concerns for their child's safety and the child's desire to be independent.

Other children did not express a desire to travel independently and preferred to be accompanied by adults. This was mainly reflective of children diagnosed with autism and caregivers often felt this was a reflection of their limited interest in friendships.

'...because it's not something he necessarily wants to do is to go out with his friends, but if he were to, then there would be an impact on his road safety, or the road safety would have an impact on that.'

*Caregiver of Male 18y with Autism (A008)*

Caregivers felt that supporting their child with travelling was highly stressful and their child's limited independent mobility had a significant impact on their lives as they needed to accompany their child whenever they were out. Caregivers of younger children did not feel their limited mobility impacted their life at present because they were not concerned with seeing friends or were not old enough to be travelling independently. However, caregivers felt that it may become a more prominent feature of children's lives as they got older.

'I think that's just starting to become a feature the older he gets and I think it will influence him more, because I think up until this age sort of his friends haven't been going anywhere on their own either so we're coming to that point now where it will start to potentially be more of an issue...I am aware that some of his friends are doing things like going to the park on their own and that's not something I can see myself letting him do for several years because of the roads on the way there, but it's just starting to become relevant for him.'

*Caregiver of Male 11y with Autism (A004)*

There were mixed caregiver views on their children's ability to travel independently in the future. Some caregivers felt that unlike their peers, children with SEND would not be progressing to traveling independently to school, travelling with friends or using public transport independently due to their needs whereas others felt they may be able to travel familiar routes independently in the future.

## Anxiety

Independent travel was a concern for caregivers as they were unsure their children would safely navigate road crossings. Specifically, caregivers were concerned that children would not concentrate or not be aware of the dangers. They reported being hypervigilant when out with their children and ready to grab hold of them when needed. Caregivers felt that there was a need to balance their desire for their child to be independent with their need to protect their child. Caregivers felt they as well as their child needed to build confidence and some caregivers suggested that at some point you just have to trust the child and their ability and let them travel independently.

'I would really like it if he could do some journeys. He's got friends along the route to the senior school that he'll go to so if he could build up his confidence and if I could build up my confidence in him to do that on his own, I think that would be really good.'

*Caregiver of Male 11y with Autism (A004)*

It was reported that children were anxious and did not want to separate from their caregivers as well as being concerned about unexpected events, dogs, groups of young people or disorderly behaviour. It was felt that when anxious children may become overwhelmed and therefore unable to pay attention to road safety.

'I think anxiety plays a part...very quickly if the situation isn't as he expects, he will get to panic very quickly, whereas I observe that some of his typical friends would think their way through it. I think his brain gets overloaded and his nervous system kicks off faster...'

*Caregiver of Male 11y with Autism (A004)*

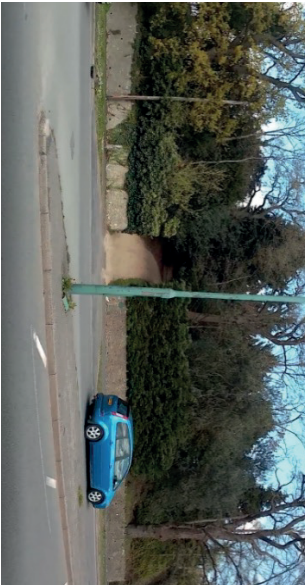
In line with caregivers concerns, there were occasions where children became distressed or anxious during the videos. Children became distressed if they were unable to take the route they wished or if they were unable to press the button at a PELCIAN crossing. Children became distressed by aspects of the environment, such as not knowing what to do when approaching a busy road. Unexpected situations, for example a lorry obstructing the pavement, also caused children anxiety. Some children were startled by noise.

A specific concern for caregivers was the transition to secondary school and how their child would manage traveling to secondary school. Some caregivers did not feel their children would be able to manage traveling independently to secondary school and others were preparing their children in the lead up. Caregivers felt more confident and less anxious about children travelling familiar routes as this may impact children's ability to cross safely.

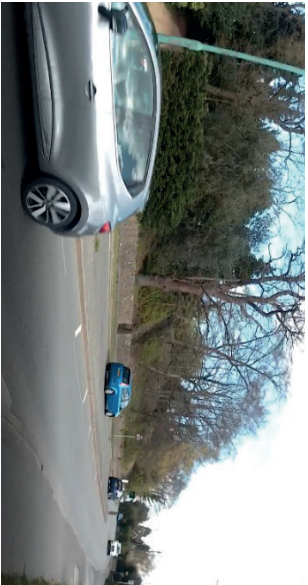
'But if it's an unfamiliar road where he doesn't know where to look, if there are other roads coming into and impacting where traffic might be coming from, then I'd be very nervous. So yes, I think, again, it's familiarity and I think I'm more relaxed about the familiar routes, but I would be less relaxed about unfamiliar routes.'

*Caregiver of Male 18y with Autism (A008)*

## Male 11 years old with Autism (A005)



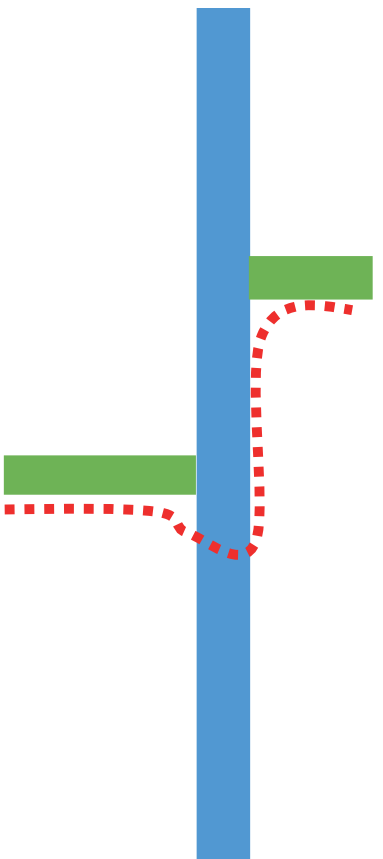
3:12 approach road  
Child says: ... we just stand here...



... and we wait for no cars to come.  
3:18 look right



3:34 look left  
Child says: But we do have to wait for these cars to come past.



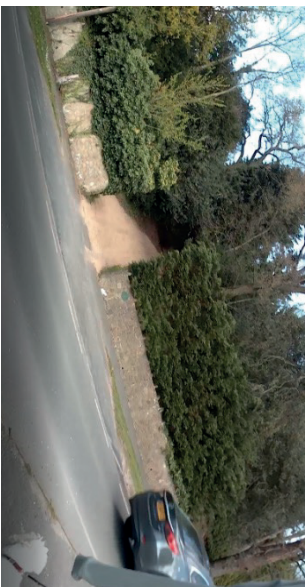
- - - - - Target child
- - - - - Caregiver
- — — — — A road
- — — — — Minor road



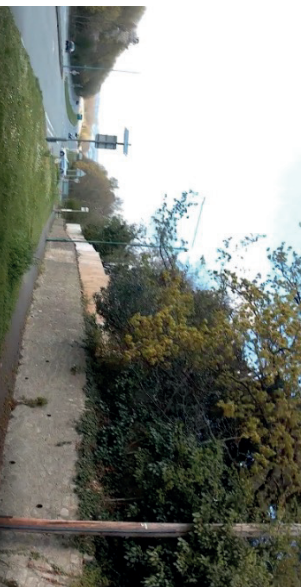
3:24 Child says: So once no cars do come. There's no car here. Although there is a car coming so we better walk quickly.



3:40 Child says: After this car we should walk.



3:27-3:31 cross to central reservation



4:44-4:49 cross



## ROAD SAFETY

This theme explores aspects of road safety, including crossing behaviour, and navigating a journey.

### Crossing behaviour

Inconsistencies in caregiver and child behaviour when crossing roads were apparent, with examples of both safe and unsafe behaviour occurring within the same journey. Children demonstrated safe crossings across various road types, including minor, major and vehicular access roads (Figure AD001 and A005 above). When crossing children stopped at the road and looked both ways repeatedly. In some cases, children could be heard stating that there were cars coming and they needed to wait for a safe gap to cross. Children often took their time when crossing, ensuring that it was safe to cross. Adults were present during these crossings, but the children were leading the crossing.

Children demonstrated the same safe behaviours when using crossings, including PELICAN and Zebra crossings (Figure A008A). That is, they stopped at the crossing, waited for cars to stop, and crossed when it was safe to do so. Children waited at the crossing until it was safe, even when other pedestrians crossed. During school journeys, children crossed with the aid of traffic control officers where these were available. Children also demonstrated safe road crossings during non-typical situations, such as vehicle obstructions and lorries stopping to allow children to cross.

There was evidence across all participant video diaries of failing to stop and look before crossing. This was typically witnessed when participants were crossing vehicular access ways or minor roads. Behaviour in the road environment may thus be influenced by the type of road. Caregivers may be less cautious when crossing minor roads or using crossings.

Children failing to look both ways when crossing was a common occurrence and caregivers were often heard reminding children to look both ways. When walking in car parks children were often not surveying their surroundings (Figure AD002). Even when children demonstrated safe looking prior to crossing, most children did not continue to look both ways when in the road.

There were instances of failing to use crossings appropriately. Incorrect crossing use typically related to PELICAN crossings. Participants could be seen crossing before the lights indicated they should or in front of the crossing because the lights were already

green for pedestrians. Participants were also seen crossing the road when a crossing was available a few metres away. Added to this there were examples of participants crossing roads diagonally.

With a progression in skill level children may deviate from text-book crossing. For example, they may cross at a PELICAN without using the light system if it is safe to do so (Figure A003A). This shows a higher level of decision making and should be child led. These instances of incorrect crossing use were typically instigated by caregivers and there were at times vehicles at the crossings. Caregivers may be capable of crossing safely while deviating from text-book crossing use. However, children with SEND may not yet have progressed to this level of ability.

Incidents of very unsafe behaviour were evidenced on a few journeys. These involved crossing when there were oncoming vehicles (Figure A003B). In a couple of these instances' children were aware of the behaviour being unsafe.

### Navigation

Caregivers often reported that children had a good sense of direction and would not have challenges knowing routes to take. During some videos children were stating the road they were on and where they were going, whereas in other videos children were asking parents where they were going. Some caregivers felt that if their children lost focus then they may experience challenges knowing where they are.

'I think he'd be able to find his way because he is quite good in the car knowing where we're going. But then I still wouldn't put it past him to get distracted and then. Because suddenly he can be like, "I don't know where I am"...'

*Caregiver of Male 8y ADHD (AD001)*

This may explain the differing levels of navigational skill in the videos. When children are not focused on where they are going or are overwhelmed they may find navigation more challenging.

### Male 18 years-old with Autism, ADHD and learning disability (A008A)



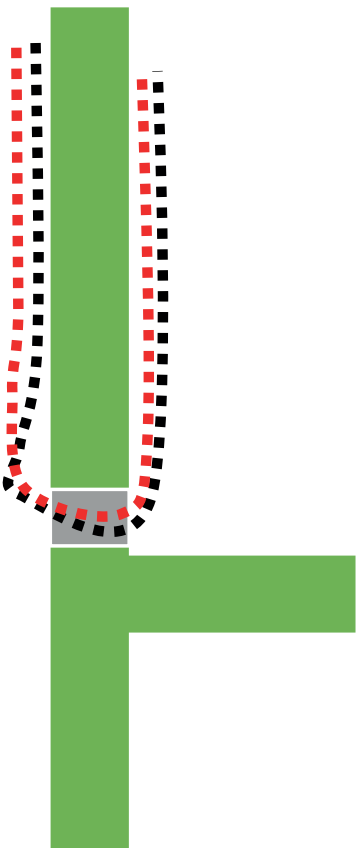
5:53 approach crossing



5:59 press button



6:29-6:32 look right



- - - - - Target child
- - - - - Caregiver
- — — — — Minor road
- — — — — PELICAN



6:03 look right



6:44-6:47 look right

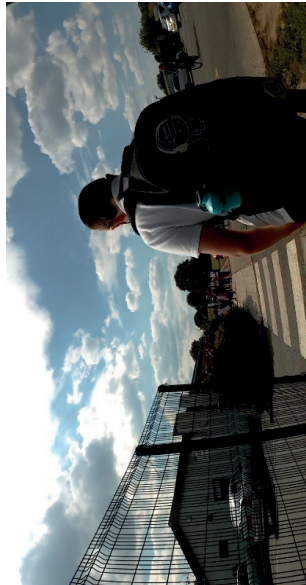
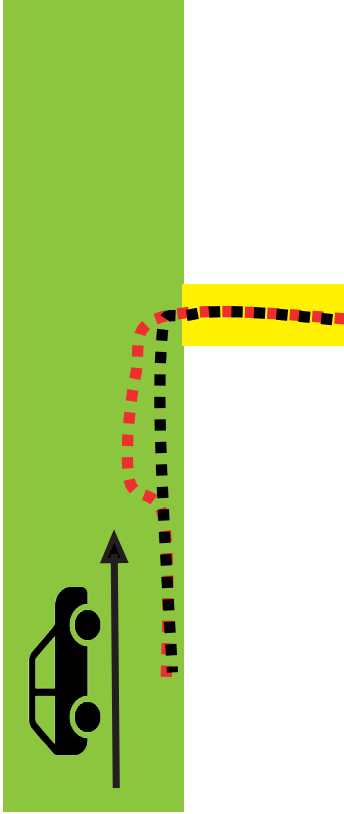
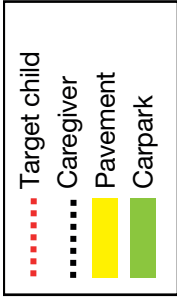


6:19 pedestrians cross when green for traffic



6:47-6:55 cross

Male 10 years-old with Autism, ADHD and other disorders (AD002)



2:35 Enter carpark



2:40 Turn left – looking down



2:41 Car approaching – child not looking

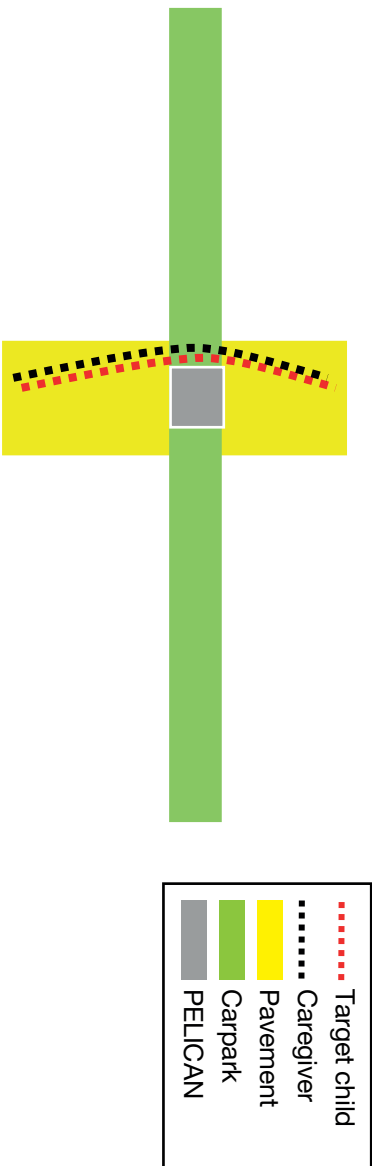


2:43 Car passes – child looks at car

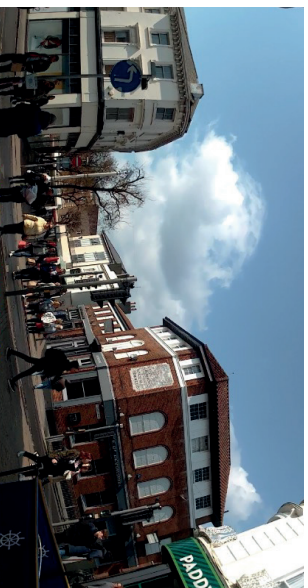


2:44 Moves to left hand side – child not looking

Male 13 years-old with Autism (A003A)



2:35 Enter carpark - PELICAN Crossing



7:21 Crossing bleeps

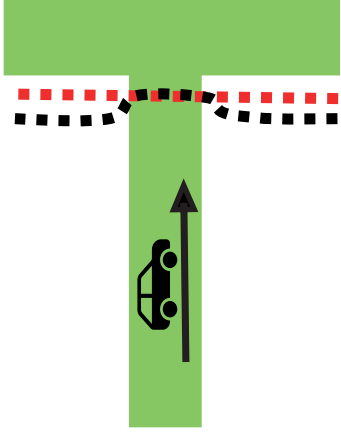
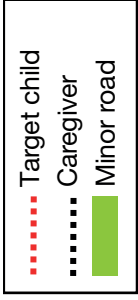


7:25 Crossing stops bleeping  
7:29 Cross to the left of crossing



7:34 Reach other side

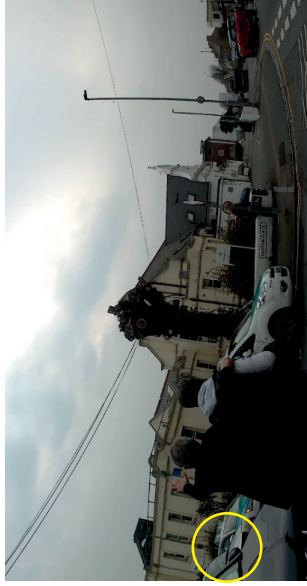
## Male 13 years-old with Autism (A003B)



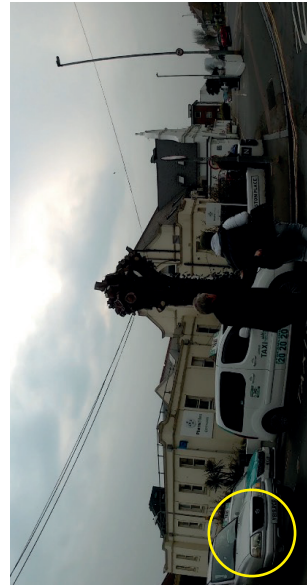
0:40 Approaching minor road (junction)



0:48 Reach curb – vehicles present



0:50 Child steps out and is grabbed by adult – oncoming car



0:55-0:57 Child runs across road

## CHILD FACTORS

This theme explores how cognitive, behavioural and social factors associated with children's diagnoses impact their independent mobility and road safety.

### Awareness

Children varied in their level of focus and attention during journeys. Children were often chatting during the trips, but also while crossing the road. Some children engaged in fantasy talk or became fixated on certain aspects, such as a passing ambulance or a mobile phone app. Children also frequently stopped during trips to explore aspects of the environment, such as trees or leaves. It was reported in the interviews that children were often 'consumed' by their interests and would be focused on this and therefore not aware of their behaviour in the road environment. Children were easily distracted, and this diverted their attention from crossing the road. Children may be distracted by the task at hand e.g. going to the shop or something in the environment. Children were frequently seen holding different items during their trips, such as food, shopping bags, magazines or mobile phones. Children were also witnessed holding these objects while crossing the road. Children's attention often appeared to be directed towards the object they were holding, which may reduce their attention towards the road environment, particularly when crossing the road.

Caregiver and child interviews suggested that although children cognitively understood road safety (e.g. how to cross the road safely or use a crossing), they did not always implement this knowledge because they were distracted. This could result in children stepping out into the road when it was not safe to do so:

'She would know that the road is danger but she wouldn't necessarily be thinking about it. She knows those kind of rules and she knows where to cross and pressing the button at the zebra crossing and stuff like that, but she just won't continually think it.'

*Caregiver of Female 13y  
with Autism and Learning Disabilities (A002)*

A few caregivers also discussed that if their children become overwhelmed then their emotions can take precedent and they will not focus on road safety (Figure A011).

'When he does that and he deregulates or whatever, that is a time that would be a worry in terms of road safety because he can be so engulfed in his emotions and his anger and things that the awareness of what's around him is very minimal, and that would be something that would be a concern in terms of road safety.'

*Caregiver of Male 9y with Autism and PDA (A001)*

Thus, children appeared to find dividing their attention challenging and this would often be at the expense of road safety. Caregivers could often be seen looking and deciding when safe to cross while children continued chatting.

Some caregivers discussed how their children had limited awareness of danger. In particular parents highlighted that children often failed to appreciate that they needed to remain aware in car parks (Figure AD002).

'And even going out into the car park you have to constantly remind him that you don't go out the door before we get down there because he'll just walk out into the car park...'

*Caregiver of Male 8y with ADHD (AD001)*

Children often found it challenging to remember to be aware of other pedestrians or to be respectful of others personal boundaries.

'Although it is quite difficult because you get really excited cycling, don't you, and then sometimes you forget to stop for pedestrians which is then not safe the other way.'

*Caregiver of Male 11y  
with Autism and other disorders (A005)*

Video diaries showed children walking in close proximity to other pedestrians, scooting or cycling on the pavement, and weaving in-between pedestrians (Figure AD003A). Consequently, pedestrians had to move out of the child's path. There were occurrences where children narrowly avoided scooting into other pedestrians. Parents and grandparents were also seen cycling on the pavement; thus this may be normative behaviour for some families. This may be of increasing importance in the current context of the Covid-19 pandemic and social distancing measures.

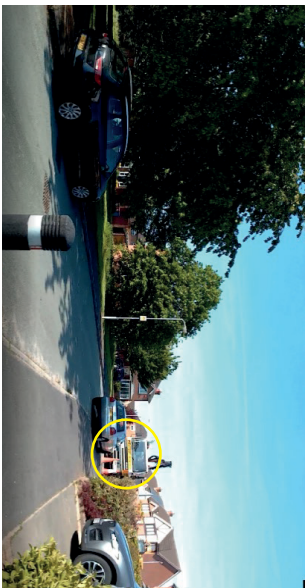
It was also reported that some children had limited awareness of personal safety and this could make them vulnerable when travelling independently.

'[He] is very comfortable speaking to adults, loves hugging people and doesn't always think...'

*Caregiver of Male 9y with Autism and PDA (A001)*



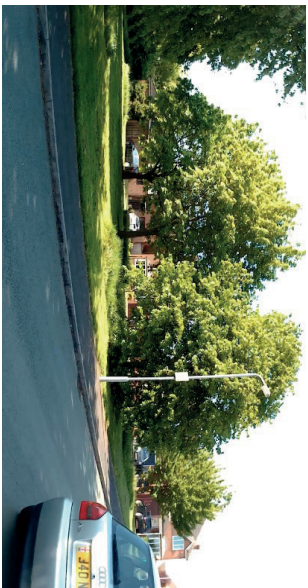
Male 13 years-old with Autism, learning disabilities and other disorders (A011)



4:52 Lorry blocking pavement  
Child says: Oh wow!



5:06 Parent says: Stand there.  
Child says: What is going on? [Child looking at lorry not road.]



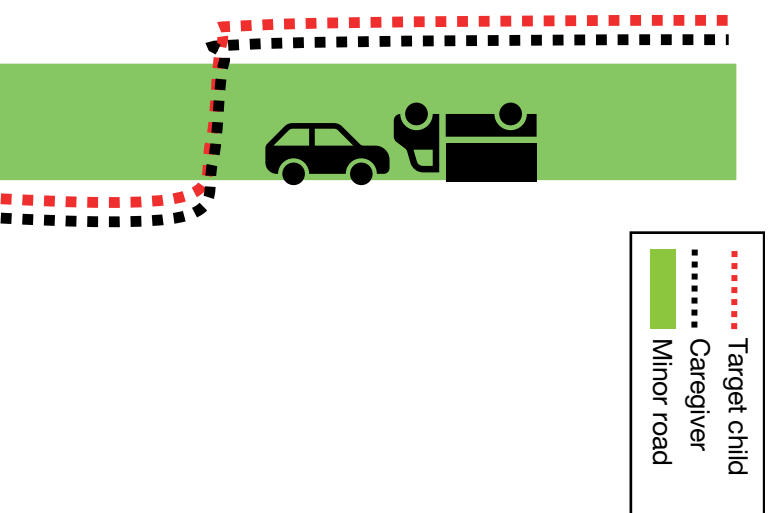
5:10-17 Cross



5:17 Child 'Look ..... wow.'



5:43 Child says: I feel panicked.  
Parent says: Why?  
Child: I don't know.  
Parent: About what?  
Child: The digging.  
Parent: ...its alright. The digging is just digging a driveway. Yeah.  
Child: Mmhm.  
Parent: Yeah.  
Child: Mmhm.  
Parent: Ok .. no harm done. [inaudible]  
Child: Why are they blocking the pavement? [inaudible]





Male 9 years-old with ADHD (AD003A)



13:20 Scoot along pavement



13:26 Reach PELICAN crossing – pedestrians crossing - child waits on pavement in front of crossing



13:35 Mother joins and child continues scooting along pavement amongst pedestrians



13:48 scoots past adult and child pedestrians



13:45 Scoots past young child on scooter



13:48 Continues scooting along pavement

## Impulsivity and Hyperactivity

The video diaries showed that impulsivity, impatience and hyperactivity impacted children's behaviour in the road environment. Children's impulsivity in the road environment reduced caregivers trust in their ability to manage crossings independently. They had experienced situations in which children would go to cross before it was safe to do so. Caregivers felt children with ADHD acted on impulse before thinking about the consequences of their actions.

'...he knows what to do but I wouldn't trust him to do it on his own yet. Because he just wouldn't have the patience – if he saw a gap I think he would just go. Or not even that. He would just walk out. He wouldn't think to wait. Because he'll press the button, and he'll be waiting for the green man but he's not actually looking to see if the green man's on then he'll just start to try and walk out.'

*Caregiver of Male 8y with ADHD (AD001)*

Some children with ADHD were impatient when crossing the road and repeatedly asked caregivers if they could cross even when there were oncoming vehicles. Mainly children became impatient at PELICAN crossings regarding the length of time before they could cross and were seen pressing the button multiple times.

Caregivers discussed that they could not always trust their children in the road environment because they would run off or run across the road. This was evidenced in the videos, particularly for children with ADHD. There were examples where children would run ahead to get to a desired destination, such as a PELICAN crossing to press the button or a shop/food establishment. Children were also seen running across the road. One child stated that this was because they did not want to get run over. This was something that caregivers reported as more common when children were younger. This was corroborated by child interviews as children reported that they did not always wait for their caregiver when in the road environment.

Interviewer: eah? Do you wait for her?  
Child: Sometimes.

*Male 9y with ADHD (AD003)*

Some children were very active in the road environment. Children shouted out, sang or hummed, were jumping around on the pavement, or climbing walls while walking. Though, this behaviour may be reflective of children's behaviour generally and not necessarily disorder related.

## Information Processing

Caregivers reported that children required longer to process information and had poor short-term memory which meant they found it challenging to remember multiple instructions.

'So I think sometimes it takes you a bit longer to...if there's lots of stuff going on in a page, or on the road, it takes [him] a bit longer to process that.'

*Caregiver of Male 11y  
with Autism and other disorders (A005)*

Sensory processing was also reported to be challenging for children. The majority of children found environmental noise overwhelming:

Child: If there was one thing I don't really like it is most probably like all the people in cars.  
Interviewer: Can you tell me why you don't like those?

Child: Because they are like quite loud and it disturbs me.

*Male 11y with Autism and ADHD (A010)*

Children indicated that it was stressful for them to navigate the social cognitive skills of road crossings. The need to anticipate driver behaviour and to make eye contact was highlighted as challenging for some children with autism.

Parent: ...And the roads are really hard to read, because there's so many different things going on, and people indicate badly, and either they go very fast or they go very slowly. And actually, that's even harder, because you have to A: be able to see into the car to see people's faces, and if the sun's at the wrong angle, you can't. And then you have to make eye contact, and that's not always easy for you, [child name], is it?

Child: I hate it.

Parent: And you have to interpret what they're saying, and sometimes they're indicating to a car to go, rather than telling you to go.

Child: And so I find that stressful.

*Male 11y with Autism and other disorders (A005)*

Children with autism were often described as very rules focused and followed the rules rigidly:

'In terms of road safety, he will follow the rules, so if the light is red he won't cross, those kind of things; he's very rules-based.'

*Caregiver of Male 9y with Autism and PDA (A001)*

However, a couple of caregivers stated that children follow their own rules and these are not necessarily reflective of road safety rules.

## Coordination

A further challenge that was frequently mentioned was children tripping and falling when walking. Some children had physical issues (e.g. in turned feet) that meant they were less stable on their feet. Other children found coordinating themselves challenging due to their diagnoses, including ADHD and dyspraxia. This also impacted their ability to ride a bike due to poor balance. Children with ADHD were also likely to engage in risky behaviour in the road environment, such as balancing on the curb which increased their risk of tripping:

'or he would just be stood on the edge of the kerb and he'd end up falling into the road because he's just, it's just the way he is. Because he likes to like teeter on the edge all the time.'

*Caregiver of Male 8y with ADHD*

## Incidents

A few caregivers also reported that their children had had serious incidents in the road environment, including stopping in the road when cars were coming, running into the road when there were cars and being hit by cars and buses. This increased caregiver anxiety about their children traveling independently.

'... basically I ran across the road because I was excited to go to the park but [a car] was going fast; it slowed down but it didn't stop. It tried to curve around me and that's why I ended up hitting it... I mean I was okay... I was crying but I wasn't crying so bad because it wasn't that much of a hit.'

*Male 9y with ADHD (AD003)*

The incidents did not necessarily increase child anxiety regarding the roads and in one case resulted in the child feeling that they were 'invincible' and therefore potentially more likely to engage in risky behaviour.

Mother: I think sometimes, no, after the accident as well he thought that he was kind of like invincible...

Child: Invincible!

*Male 9y with ADHD (AD003)*

## SUPPORTING INDEPENDENT MOBILITY

This theme explored caregiver's interactions with children in the road environment and the impacts of this on children's road safety.

### Coaching

Caregivers reported that they were actively teaching their children road safety and that they had been doing so since their children were young. Caregivers said they coach children about road safety while they are out walking with them as they felt road safety should be taught in a practical manner as it was easier for children to focus and learn the lessons. In addition, caregivers also felt that short lessons were best to maintain child concentration.

'And I think it could be practical as well probably because it's very much, if they're sitting in a class and they're like talking and obviously it's not going in, I think it should be like more of a practical session like they do with like bike riding and that sort of thing.'

*Caregiver of Male 9y with ADHD (AD003)*

Caregivers were shown coaching children how to identify safe places to cross, how to safely cross different road types and how to safely use road crossings (Figure A008B). Caregivers frequently reminded children to look in all directions before crossing. At designated crossings parents often reminded children to wait, look in both directions, and ensure that vehicles had stopped prior to crossing. Caregivers engaged with children. They asked children what they needed to do when crossing the road / using a crossing, enabling children to demonstrate their knowledge and abilities.

Caregivers felt that teaching independent mobility would be a gradual and sequential process and would involve reinforcing and repeating lessons to ensure that children could remember the rules/steps.

'So it's going to be a very slow process, I think, certainly for [him]. I'm sure it'll be different for other kids, but for him, it is repetition of instructions, getting him to relay back to me what he needs to do, and then just repetition of the journeys.'

*Caregiver of Male 18y with Autism, ADHD, learning disabilities and other disorders (A008)*

Caregivers also mentioned the need to consistently model safe crossings when out. However, caregivers did not consistently teach children how to safely cross the road at each crossing in the videos. There were occasions where parents led the crossing and did not coach the child. This may reflect time pressures or child motivation. It was felt by caregivers that children needed to be motivated to engage in road safety practice. If children were not emotionally ready or interested then they would not engage:

'I do try and get him to do it but it depends where he's at emotionally. He'll often be like, "Uh, I'm not doing it," particularly on the way to school or the way from school.'

*Caregiver of Male 11y with Autism and PDA (A004)*

Caregivers of younger children demonstrated inconsistent hand holding behaviour. At times caregivers held their child's hand and at other times they did not. In addition, caregivers and children often interchanged who was walking roadside. There was a slight tendency for caregivers to hold their child's hand more frequently when crossing the road or in busier areas. It was reported that children often did not like holding their caregivers hand when walking. Further, some caregivers were required to supervise multiple children within the road environment, including siblings and peers. At times caregivers were holding sibling hands when crossing the road or having to manage sibling behaviour, which reduced caregiver resources for the target child.

Caregivers felt that independent mobility required a lot of preparation and pre-planning, especially preparing children for unforeseen circumstances as they felt this would increase children's anxiety and they were unsure how children would respond.

'... if actually things like the crossings are out, what do you do? You have to really wait for everyone to stop before you cross that road, you know? ... Or look down and find another crossing, so it's playing out scenarios where things go wrong, what can you do.'

*Caregiver of Male 10y with Autism, ADHD and other disorders (AD002).*

A common theme that was discussed was variability (within the umbrella of each diagnosis as well as variability in a single child's behaviour across the day or between days). Caregivers felt that children diagnosed with the same condition may vary considerably and therefore it is not always appropriate to develop an intervention for a specific diagnosis. In addition, caregivers felt that children's level of hyperactivity and concentration could vary across the day or day to day. Caregivers would alter the level of freedom they offered children based on how they were at the time.

'... at the end of the day he'd be exhausted and it's then sometimes irrational behaviour or could come out.'

*Caregiver of Male 10y  
with Autism, ADHD and other disorders (A010)*

A few caregivers and children mentioned that wider family relatives also taught children road safety when they were out with them, including grandparents and siblings. This allowed children to receive road safety messages from those around them. However, the consistency of the messages taught were not commented on. In some video diaries, siblings or other children were seen engaging in unsafe behaviour in the road environment. For example, siblings were seen running ahead, running across the road, texting while crossing the road, or walking on the edge of the pavement. Child pedestrians were also seen running across the road when crossing outside the school with a crossing patrol officer. In some videos parents and grandparents were also seen cycling on the pavement. In interviews caregivers mentioned feeling their child was safer cycling on the pavement. Considering the behaviour of other important individuals in children's lives may therefore be important as they may be role models for the child's behaviour in the road environment as well.

## Resources

A common theme across caregiver interviews was that there was little support with road safety and independent mobility. Caregivers were not using any road safety resources and there were contrasting views on the level of school involvement in road safety and independent mobility. Some caregivers and children reported the school did not teach road safety and some said the school had taught road safety while out walking as part of social development or in more formal lessons. Some caregivers were unsure whether the school had taught road safety or not. This highlights the need for more effective communication between schools and caregivers around road safety

and independent mobility.

Caregivers often reported that others teaching road safety to their children would be beneficial as children were more responsive to learning from others, such as teachers.

'... that it's being taught not just by a parent but by a teacher...children have selective hearing to parents.'

*Caregiver of Male 10y  
with Autism, ADHD and other disorders (A010)*

Caregivers also felt that individuals such as the police teaching road safety would be beneficial as this would align with children's rule focused nature. However, having rules enforced by the police may cause distress to children when others do not adhere to these rules. Caregivers reported in interviews that children could become fixated on incidents of unsafe behaviour (e.g. seeing a cyclist riding without a helmet).

A few caregivers felt a road safety course, held at the school, for children with SEND would be beneficial. Caregivers referred to the cycling proficiency and felt there should be an equivalent for road safety.

'What would be really helpful is if someone trained in those areas would do like they do cycling proficiency, it would be really helpful if something was run for ADHD and autistic children to be more aware, because they've all got the same issues, have a group on their own to sort of say, it would be difficult, and what to do.'

*Caregiver of Male 10y  
with Autism, ADHD and other disorders (AD002)*

A small number of caregivers felt that visual road safety resources would assist with children's learning. A range of resources were suggested including social stories, videos and games.

**Male 18 years-old with Autism, ADHD, learning disabilities and other disorders (A008B)**



4:20 Parent says: So where's the safest place to cross?

Child says: Right over there... just at.. To cross at the stopper right over there.

Parent: That's right. It's called an island.

Child: it's called an island.

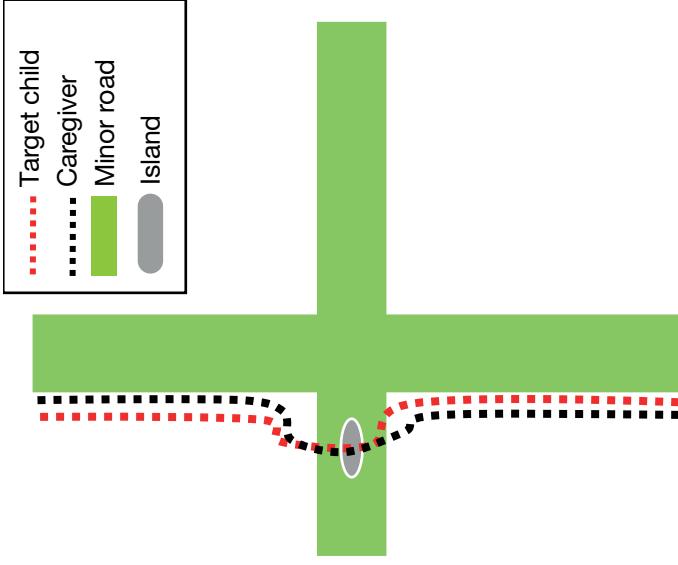
Parent: Ok, so that means you can do half the road, then do the other half the road. Can't you?

Child: Alright.

Parent: Yeah.



4:45 Reach curb



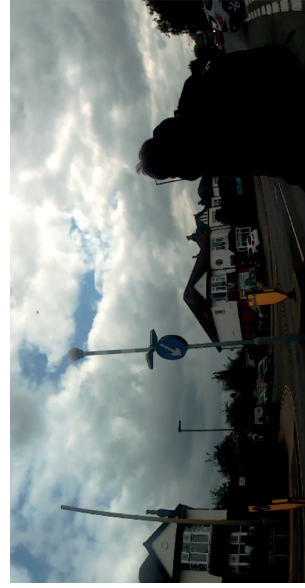
4:45 Parent: Right now, concentrate now ... right where are you looking first.

Child: Over there.

Parent: Ok, do you think you can go now?

Child: Yes.

Parent: Ok, go then.



4:56- 59- run across  
Parent: Right, how far are you going?



4:59 Child: To here.  
Parent: Right, stop. Can you go now?

## Male 18 years-old with Autism, ADHD, learning disabilities and other disorders (A008B) (continued)



5:01 Child: Wait for it ... now we go. [Waiting for car to pass].  
Parent: Go now. That's very good [child name].



5:05-5:08 Run across  
Parent: And do we run or do we walk across the road?  
Child: We walk.  
Parent: Yeah.  
Child: But I just don't want to get run over by cars.  
Parent: No. So, walk the whole way even if there is a car there.

## Environment

The environment was frequently suggested by caregivers to limit children's road safety. It was suggested that changes to the street environment, especially safe places to walk and cross, would support children's safety in the road environment. The need for crossings, especially in busy areas or by SEND schools, was highlighted. Crossings enable children to follow a clear set of rules e.g. cross when green man. The need for consistent crossings was also mentioned. Caregivers discussed how some crossings were not well marked and others varied in the location of the traffic light and whether they made a sound.

'...I think perhaps more pedestrian crossings where they're likely to be, around special schools in particular. I mean, that is a road where at the top of it, there's a special school and kids come down it, and I just feel like, it doesn't have to be maybe necessarily for every school, but for special schools, I think it's really important. So yeah, because that makes things so much easier, and reduces the anxiety, not just for him, but for me if he's out and about, knowing that he's got a controlled crossing...'

*Caregiver of Male 18y with Autism, ADHD, learning disabilities and other disorders (A008)*

In addition, wide pavements without overgrown hedgerow or other obstructions (e.g. vehicles parked on pavements/bins left on pavements) and the need for clearly defined pavement or pedestrian area was felt to improve road safety.

Driver behaviour was also a prominent theme. Caregivers felt that consideration of drivers would reduce children's risk in the road environment. Speed and failing to stop at crossings were felt to put children at risk as children may be less able to judge driver speed or expect drivers to stop. Further, not indicating or indicating late or early meant it was more challenging for children to navigate road crossings.

## Understanding of diagnosis

The fact that SEND are often hidden disabilities and the impact this has on other road users was discussed by some parents.

'... If he was just crossing with his shopping bags you wouldn't tell that there's something wrong. So that's bound to make drivers annoyed.'

*Caregiver of Male 13y with Autism*

There were mixed views on public understanding. Some caregivers experienced a supportive community. It was felt the community had / could support children in their independent mobility by knowing and understanding their needs.

'I had a meeting with the school last week and they were saying, "Oh, [he] will be known locally once he starts venturing out on his own."'

*Caregiver of Male 18y with Autism, ADHD, learning disabilities and other disorders (A008)*

The community were thus seen as a resource that could be utilised to support children with SEND to travel independently.

However, other caregivers indicated that they often had to explain their child's need to the public because their disabilities were not always visible.

'We took his bike up to his granny's house and in about half an hour three people just said, "He's too old, he shouldn't be on the pavement," so we haven't taken the bike there again... One of them wanted to have a proper conversation about it but as soon as I said that he has autism and I didn't feel he was safe on the road he was okay with it after that...'

*Caregiver of Male 11y with Autism (A004)*



**Male 9 years-old with ADHD (AD003B)**



13:20 Approaching road – sibling on phone



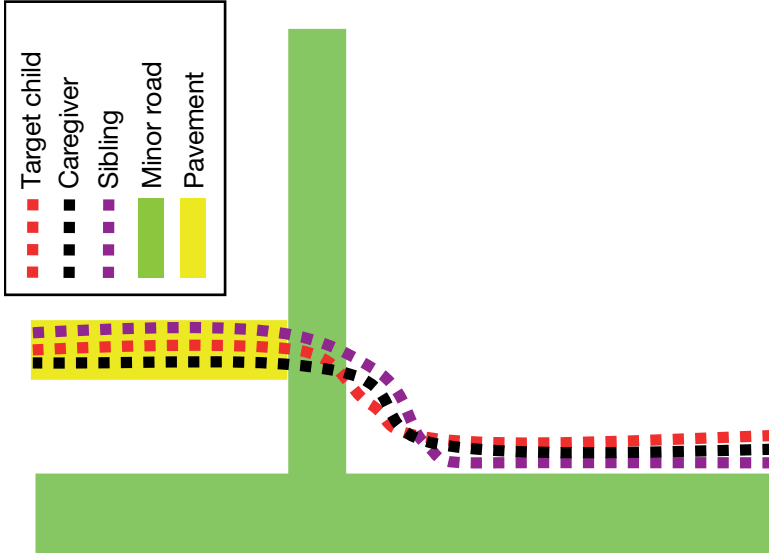
13:36 Mother reaches curb and waits for children  
Child says: She is texting Cat.



13:41-13:47 Cross road – Sibling on phone  
Sibling says: Huh?  
Child says: Cat...Oh Cat [inaudible]



13:48 Continue walking along pavement



## DISCUSSION

This project explored the impact of autism, ADHD and learning disabilities on road safety and independent mobility in children between 7 and 18 years-of-age through an inclusive video and interview procedure. Understanding of the impact of SEND on road safety and independent mobility and how to support these skills is limited. Mobility forms an important part of young people's independence. The revised SEN Code of Practice<sup>[12]</sup> now specifically references independent mobility:

'Do the arrangements for transition include appropriate training and assistive technology, other support, (e.g. in encouraging independence in travel, coping with money)?'

Its increased prominence in the SEN Code of Practice<sup>[12]</sup> may thus enable young people to access greater support for independent mobility. Providing early support with independent mobility for children with SEND has a significant social and economic impact; it provides greater opportunity for these young people to socialise, engage with the community, and travel to places of study or employment.

There were some disorder specific findings for autism and ADHD. Children with autism generally preferred to be accompanied by adults, which caregivers typically felt was reflective of the fact they were not interested in forming peer friendships. Further, children with autism were often very rules focused, became fixated during travelling, found noisy environments overstimulating and found the social cognitive side of independent mobility (e.g. making eye contact with drivers) challenging. In contrast, children with ADHD were often impatient in the road environment and ran ahead or across the road. However, children within the sample often had multiple diagnoses with overlapping disorder profiles. Caregivers also highlighted that there was variability under the umbrella of these disorders and that not all children with a disorder, such as autism, have the same profile and benefit from the same interventions. The project highlighted that it may therefore not be beneficial to explore the impact of individual disorders on independent mobility and road safety. Instead, it may be beneficial to consider the impact of certain behaviours (e.g. running off, impulsivity, sensitivity to noise) rather than categories of SEND.

### Supporting road safety and independent mobility

The findings of this project highlighted several areas that need to be attended to when supporting the road safety and independent mobility of children with SEND.

The findings revealed that road safety was a concern for caregivers and was a central reason they limited their children's independent mobility. Caregivers wanted to support their children to become as independent as possible and felt they needed to build their confidence and trust in their children's ability. Caregiver anxiety was especially heightened where there had been incidents such as near miss or minor road traffic incidents. Caregivers' ability to trust that children had the awareness and skills to keep themselves safe was a prominent underlying theme. Caregivers of children who displayed impulsive behaviour also felt that they couldn't trust their children in the road environment.

Children had mixed views, with some wanting to be independent and others preferring being accompanied by a caregiver. This may reflect the fact that caregivers reported that children need to be emotionally ready and motivated before they could work on building independent mobility skills.

**Interventions to support the road safety and independent mobility of children with SEND may not only need to focus on building child confidence but also caregiver confidence and trust.**

A significant theme was children's tendency to run ahead or across the road. Impatience and impulsivity were a central concern for caregivers who were anxious about their children crossing the road. Caregivers stated that they tried to hold their child's hand or hold onto their children, but children were often reluctant. This became more challenging when caregivers were responsible for siblings as well as the target child when traveling.

**Interventions should consider how families are traveling and whether the caregiver is responsible for multiple children to ensure that interventions reflect the needs of the family.**

**Focusing on running in the road environment in an intervention may be core target.**

The findings revealed that it is not just road safety but other aspects of independent travel that are a concern for caregivers and prevent independent mobility. Road safety, is thus, one aspect of independent mobility. In particular, children's limited personal safety and awareness of others was highlighted. For example, children may invade others personal space or may not be aware of other pedestrians when scooting or cycling.

**Providing a purely road safety focused initiative for children with SEND may thus be insufficient. Interventions should focus on all aspects of independent mobility not just road safety.**

The findings supported the need for practical lessons in the road environment which provided children with SEND concrete examples of safe crossing behaviour. Teaching children road safety while out walking and in short bursts was felt to be the most effective method in the context of children's limited attention, challenges with abstract constructs, and limited information processing and memory capacity. Video diaries showed children were engaging when caregivers were supporting them in the road environment and allowing them to take the lead under the supervision of their caregiver.

Added to this, caregivers reported that their children often knew how to cross the road but at times failed to implement this behaviour in the road environment. This was often due to distraction, impulsive behaviour, or being overwhelmed. Providing children with opportunities to practice crossing the road may therefore assist children in being able to implement and cement their knowledge in different scenarios that may provide distraction or distress under the supervision of an adult.

The video diaries and the interviews highlighted that considering road safety across different road types, such as vehicular accessways and carparks, is needed. Children were more likely to not stop and look before crossing at minor roads, cul-de-sacs and vehicular accessways. Further, children often showed limited awareness of the dangers in car parks and car parks were often an area of stress for caregivers.

**Interventions should consequently aim to maximise children's exposure to the road. Providing children with exposure to a range of road types and car parks is needed to ensure that children are able to be safe in a range of road environments.**

A significant area of concern in relation to independent travel for caregivers was if their children experience a novel or unforeseen situation. Caregivers felt that if children were traveling independently and an unforeseen event occurred (e.g. a crossing was

not working) then they may be unsure what to do, they may panic and become overwhelmed, and this may result in them failing to remember road safety rules and leave them at risk. In addition, caregivers stated that they felt more confident in their children managing familiar routes and felt that children may become overwhelmed and anxious and be unsure how to navigate unfamiliar routes. Relatedly, caregivers of children approaching the transition to secondary school or college were concerned about their child learning the new route and in some cases were starting to prepare their child for this journey in advance.

**Incorporating practicing unforeseen circumstances into road safety interventions would support children's and caregiver's confidence in children's ability to manage these situations.**

**Interventions for children with SEND may need to be tailored to the individual and focus on the routes that the child is going to frequently undertake; moving onto unfamiliar routes when or if they are ready.**

**It may be that interventions need to be repeated more frequently for children with SEND, especially when a transition period is near.**

Caregivers believed that the school would be a good source of support for children's road safety as children were more likely to listen to their teachers. However, caregivers often reported the school were not teaching road safety or were unsure what the school were covering in relation to road safety. Providing caregivers with updates in relation to road safety skills taught at school, especially if this is part of the child's Education and Healthcare Plan, may facilitate these links. This would further ensure that children are receiving consistent messages. Consistency was highlighted by caregivers as essential.

**Building stronger links between schools and caregivers in relation to supporting road safety would therefore be beneficial.**

Caregivers are a central gateway to children's independent mobility. Interviews with caregivers highlighted the need for caregivers to coach children when crossing the road and to model safe behaviour consistently. However, video diaries demonstrated that although caregivers did support children to cross the road safely this was not always consistent. Caregivers did not always coach children at every road or crossing and at times incorrectly used crossings or demonstrated unsafe crossing behaviour. This may reflect the inconsistent behaviour witnessed in video diaries in which children at times crossed the road safely and

others did not. It is important to differentiate between unsafe behaviour and higher-level road safety ability. An individual may cross at a PELICAN without relying on the lights but cross safely. This may evidence higher skill. However, incorrect crossing use was often instigated by caregivers and not child led in the video diaries, suggesting that it was not always evidence of children's skill progression. Thus, it may be vital to assess a child with SEND's skill level to determine whether text-book crossing always needs to be modelled and adhered to. A further reason for inconsistent behaviour in the road environment may be due to child motivation to learn. Caregiver interviews reported that children needed to be motivated to engage in road safety lessons and therefore caregivers may be tailoring when they offer support in line with their child's needs.

Interventions that engage with caregivers may therefore be highly beneficial. Prior research has indicated that engaging caregivers in road safety education has positive impacts on children's road safety knowledge and behaviour[7]. It may also support caregivers to ensure that they are modelling correct behaviour consistently. Further, the video diaries highlighted areas of children's road safety that could be improved. For instance, although caregivers were ensuring children were looking in all directions before crossing this was often not continued during the crossing. Involving caregivers in road safety interventions may therefore provide caregivers with knowledge of the skills they need to teach children. Caregivers found independent mobility highly stressful and preparation intensive. They reported receiving little support with road safety and independent mobility and were not aware of any resources they could use.

**Developing resources to support caregivers to teach road safety and independent mobility may support caregivers to provide consistent, up-to-date messages as well as reducing stress and preparation time.**

The behaviour of others in the road environment may impact the safety of children with SEND. Siblings may represent role models of road safety, so ensuring that they are also demonstrating safe behaviour is important. Added to this, video diaries demonstrated children running across the road when there were crossing patrol officers. Engaging with others who come into contact with children, such as crossing patrol officers, to promote road safety may therefore enable consistent messages to be presented to children and support their road safety. This may be particularly beneficial as caregivers felt children were more likely to listen to road safety messages from others.

**Interventions for children with SEND may need to consider the systems around the child as well as the child themselves in order to reinforce safety messages and safe behaviour.**

Caregivers and children felt that more inclusive environments would promote road safety and independent mobility. In particular, the need for safe places to walk and cross were highlighted. The presence of more crossings was thought to improve safety as the rules are more prominent for children (e.g. at a PELICAN you press the button, wait for green man and cross the road when cars have stopped). However, the need for consistent crossings was discussed. Driver behaviour was also thought to be a factor. Children with SEND may find it challenging to anticipate driver behaviour therefore if a driver is not indicating or indicating incorrectly children may not be able to use other cues (e.g. speed of vehicle) to determine what the driver is going to do. This was evidenced in video diaries. In addition, public understanding was thought to be important as SEND conditions are often not visible.

**When developing an intervention for children with SEND it may be important to consider the systems around a child (e.g. caregivers, wider family, school, community) to improve children's safety.**

**Engaging with policy makers and local authorities to provide streets that are safe for children with SEND may not just improve their safety but the safety of everyone.**

## Limitations

There has been limited work exploring the impact of SEND on independent mobility, despite it being an area of concern for caregivers. This project provided a rich exploration of the impact of autism, ADHD and learning disabilities on road safety and independent mobility. However, there were some limitations. The cameras were worn by children which meant the actions of the child were not always clear and footage could at times be distorted from movement. This video method was chosen in order to be less invasive and disruptive to the child. Added to this, some films were accidentally recorded without sound by families, meaning audio information was lost. The sample was diverse in relation to disorders which limited disorder specific analysis. However, this is reflective of the fact that many children have multiple diagnoses and themes were apparent across participants. The sample was mainly males which may mean gender differences have been missed. The sample, though, reflects the gendered nature of many of these conditions, in which there are a higher number of males diagnosed. Males are also more likely to be killed or seriously injured on the roads<sup>[14]</sup>.

## Conclusions

Independent mobility and road safety were areas of concern for caregivers of children with SEND. However, it was felt that road safety was one aspect of independent mobility and a broad focus on teaching independent mobility was needed. Caregivers felt the need to balance the wish for their child to be independent with concerns for their safety. Consequently, supporting children's road safety should involve the child themselves and their caregiver in order to build the confidence of both. With the specific reference to independent mobility in the updated SEN Code of Practice, greater support may be provided by schools. This was felt to be important by caregivers as children may be more engaged to learn from others. Children are often diagnosed with multiple conditions, and it is often the profile rather than the specific label that impacts their road safety. Targeting specific behaviours rather than specific disorders may therefore be a more effective approach. Added to this, in line with the key point in the SEN Code of Practice<sup>[12]</sup> that 'the transition to adulthood is not a one-off activity', travel training may need to be repeated throughout the child's life, especially at key transition points (e.g. transition to college) as each transition may bring new challenges. Developing an assessment of child ability in order for caregivers and professionals to track children's road safety level would support independent mobility teaching. Added to this, road safety for children with SEND should focus on the system around a child (e.g. family, school, community), considering individuals that have contact with the child and the environment as well as the child themselves. Providing a guide on skill areas to develop in relation to independent travel and how these may be impacted by specific behaviours would support the independent mobility of children with SEND.

## Next Steps

**This is the first stage of a three year project funded by the Department for Transport exploring SEND and road safety. Building on this the second stage of the project will involve:**

- **Conducting an evaluation of road safety interventions targeting children between 7 and 20 years of age with SEND in order to identify effective methods of teaching road safety to children with SEND.**
- **Developing an assessment of road safety skill and a guide outlining how specific behaviours may impact road safety and independent mobility.**
- **Co-production of educational resources for children with SEND to support road safety.**

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## APPENDICES: APPENDIX A

### Road Safety and Me: Road Safety Education for Children with SEN Screening Questionnaire

Please complete this form on behalf of your child/young person.

The information provided in this form is being collected so that we can identify whether your child is eligible for inclusion in the present study. This form will not be shared with anyone.

**If you do not wish to answer any of the below questions then please feel free to leave them blank.**

<b>Child Name</b>		
<b>Child Date of Birth</b>		
<b>Child Ethnicity</b>	<input type="checkbox"/> White British <input type="checkbox"/> White Irish <input type="checkbox"/> White Gypsy/Irish Traveller <input type="checkbox"/> White and Black Caribbean <input type="checkbox"/> White and Black African <input type="checkbox"/> White and Asian <input type="checkbox"/> Indian	<input type="checkbox"/> Pakistani <input type="checkbox"/> Bangladeshi <input type="checkbox"/> Chinese <input type="checkbox"/> Black African <input type="checkbox"/> Black Caribbean <input type="checkbox"/> Black British <input type="checkbox"/> Arab <input type="checkbox"/> Other _____
<b>What special educational needs does your child have?</b>	<input type="checkbox"/> Autism Spectrum Disorder <input type="checkbox"/> Attention Deficit Hyperactivity Disorder <input type="checkbox"/> Cognition and Learning (e.g. learning disability, working memory impairment) <input type="checkbox"/> Other (please specify) _____	
<b>Has your child been formally diagnosed?</b>	YES / NO / Diagnosis in progress	

<b>How old was your child when they were diagnosed?</b>	
<b>Does your child currently have an EHCP or receive SEN support?</b>	EHCP / SEN Support / No support or plan
<b>Is your child taking any medication associated with their diagnosis?</b>	YES / NO  Medications:
<b>Is your child currently receiving any treatment/therapy for their diagnosis?</b>	YES / NO  Treatment/Therapy:
<b>Does your child attend a mainstream or special educational needs school?</b>	<input type="checkbox"/> Mainstream School <input type="checkbox"/> Special Education School <input type="checkbox"/> Mainstream college <input type="checkbox"/> Special Education college <input type="checkbox"/> Unit within Mainstream School <input type="checkbox"/> Pupil Referral Unit <input type="checkbox"/> Home Schooled <input type="checkbox"/> Other _____
<b>Does your child currently use school transport?</b>	YES / NO





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## APPENDIX B

Today I am here to talk to you about the films you made of you traveling.

I am going to show you some pictures from your film on my Ipad and ask you some questions about your films. Is that ok?

### Your Films

In your films you went to ...

[Images from child's films]

You went by ...

[Images from child's films]

On the way you ...

- Is there anything you enjoy about walking to these places?

[Images from child's films]

Example options: shops, cycling, walking, pressing the button, people, cars

- Is there anything you do not like about walking to these places?

[Images from child's films]

Example options: walking, cycling, noise, cars, people

- Do you go to any other places?

Example options (with pictures): school, friends, family, clubs, park

- Who do you go to these places with?

Options (with pictures): dad, mum, brother, sister, carer, grandad, grandmother, friend, teacher

- How do you go there?

Options (with pictures): walking, bike, car, bus, scooter/skateboard, bus, train, tram, tube

### Road Safety

- Have you learnt about road safety?

Options (with pictures): yes, no, not sure

- Who helps you know how to cross the road?

Options (with pictures): dad, mum, brother, sister, carer, grandad, grandmother, friend, teacher

- How do they teach you about road safety?

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## APPENDIX C

### Interview Topic Guide: Parent

1. Can you tell me a bit about your child and their diagnosis/disability?
2. How does your child generally get about e.g. to school?
  - a. Accompaniment? (you/other)
  - b. Use of taxis, buses, private car
  - c. Demands on time/cost
3. How about other journeys e.g. activities/clubs or to see friends?
4. How does your child's diagnosis/disability influence their ability to acquire road safety knowledge and behaviour?
  - a. To what extent does it limit their independent mobility?
5. To what extent is your child's road safety a concern for you?
6. Is road safety something you have taught your child about?
  - a. If yes, in what ways have you done this? Have you used any specific resources/techniques?
  - b. If no, why have you chosen not to do this?
7. What support has there been in helping your child learn about road safety?
8. To what extent do you feel your child's road safety influences their quality of life?
  - a. How does it affect your quality of life?
9. What sort of things do you think would help your child be safer using the roads?
10. Is there anything else you would like to say that we have not covered?

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