

Motability: disability and transport needs, gaps and innovation

Rapid Evidence Assessment

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Executive summary

Introduction

- The Motability Scheme helps thousands of people with disabilities to enhance their lives by leasing a new affordable car, wheelchair accessible vehicle, scooter, or powered wheelchair.
- Motability, the charity which oversees the Motability Scheme, has a vision: to ensure that no disabled person in the UK is disadvantaged due to poor access to transportation.
- Motability (the charity) therefore commissioned NatCen to conduct a Rapid Evidence Assessment (REA) to better understand the barriers, facilitators and gaps in the Motability Scheme; broader transport challenges and needs for people with disabilities, including innovations and interventions designed for them; and strategic and policy development in this area.

The research questions and rapid evidence assessment

- Six overarching research questions were explored, encapsulating the Motability Scheme, transport innovations and interventions, and strategic and policy development:
 1. What are the perceived barriers and facilitators to accessing and using the Motability Scheme?
 2. Do specific population groups face greater or lesser barriers and facilitators to accessing and using the Motability Scheme?
 3. What are the gaps (if any) in the current Motability Scheme in meeting the transportation needs of people living with disabilities?
 4. What (public and private) transport challenges do those living with disabilities experience?
 5. What interventions (including direct-grants) have maximised access to transport for people living with disabilities?
 6. What innovations and/or interventions are necessary to enable disabled people to enjoy the same choice and freedom of transport as their non-disabled peers?
- The REA was conducted in four stages: a scoping phase including pilot search and identification; evidence identification; evidence selection, screening and weighting of evidence; and, finally a narrative synthesis and information integration.
- A total of 2,510 papers were screened at title and abstract, 182 were screened and critically appraised (including application of the Weight of Evidence score), with a final 28 papers included in the review.
- The included papers drew on evidence from the UK (n=21 papers), North America (n=6), Australia (n=1) and Sweden (n=1). Research methods varied, with the most common being qualitative methods (e.g. interviews and focus groups), surveys (both national and smaller scale) and evidence reviews.

The Motability Scheme

- Only one paper researching the Motability Scheme was included in this REA. While a range of literatures were available, the majority could not be included owing to low scores against the Weight of Evidence criteria. The methods applied in the research were not justified as being appropriate, were insufficiently detailed and/or did not detail necessary ethical considerations.
- Three areas were explored in assessing the effectiveness and suitability of the Motability Scheme: opportunities for customisation and flexibility, information availability, and cost.

- It was reported by the research participants that their differing mobility needs were not always met by the options available within the Motability Scheme. For example, some participants identified that they had to balance their need for a wheelchair accessible vehicle with the need for boot space for shopping or luggage and necessarily had to choose a vehicle that served one need over the other.
- Others reported that the universally applied three-year lease period did not recognise any changes in circumstances and/or the short-term or long-term deterioration in disabilities and mobility.
- The appearance of equipment leased, for use both in-home and outside, was a central concern for individuals of all ages: *“Participants with disabilities wanted equipment and products that were mainstream, desirable, fun to use, and that did not make them feel different”* (Harries et al., 2015:27).
- Research participants perceived that there was a paucity of information on the Motability Scheme. This included details on eligibility criteria as well as the type and cost of products or services that may be available.
- The additional costs of adaptations or customisations to the vehicles that usually had to be paid by the customer were perceived as a barrier to uptake.
- The core benefit of the Motability Scheme highlighted by participants was the security of no-cost repairs and servicing to the leased cars.

Transportation challenges for those living with disabilities in the UK

- The literature reported that overall, only 54 per cent of people living with a mobility-impairing disability and just 39 per cent of those with a long-term illness or disability have access to a personal car compared to 69 per cent of the general population.
- Research highlighted that car users with a mobility impairment use their car less than those without a mobility-related disability.
- It was reported that those living with a mobility-related disability are far less likely to use trains, with only three per cent of this population regularly travelling by train.
- In rural areas, deprived areas and small towns in the UK, public transport options may be unreliable, insufficiently frequent, or absent. Demand Responsive Transport may be one option to mitigate such lack of provision for those living with disabilities.
- Uneven and neglected pavements, tall kerbs, access steps and position of stations and bus stops limit those with mobility-related disabilities in navigating the environment using mobility aids (e.g., scooters) as well as access to public transport.
- People living with mental health problems have specific challenges in accessing public transport that are only partially shared by others living with mobility-related disabilities. These include: noise levels, specific types of artificial lighting and unclear, complex or incomplete signposting on routes.
- Barriers to accessing public transport for those living with mobility-related disabilities and mental health problems include: a lack of train ramps, inadequately trained public transport personnel, buses with steps too high or stopping too far from the kerb, broken lifts, lack of toilet facilities and unusual bus configurations.
- Those living with mobility-related disabilities are often unable to be ‘spontaneous’ when using trains, owing to the necessity to book in advance and, at times, long-waiting lists.
- Recognising the challenges in accessing public transport, when compared with those with no disabilities, individuals with mobility-related disabilities were almost

twice as likely, and three times as likely if living in rural areas, to perceive car ownership or access to a car as essential.

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- For those unable to access transport, the consequences are significant for physical health due to lack of movement and curtailing of activities and opportunity. Less highlighted, but equally important, are the consequences for mental health, where the isolation engendered by poor transport can lead to depression and anxiety.

Interventions in the UK and international context

- Interventions are typically planned efforts, such as programmes, funding streams or pilots designed to bring about a defined improvement. Well-designed and executed interventions lend themselves to academic evaluation.
- The interventions identified in the literature and included in this REA incorporate training, accessibility of the built environment and travel programmes.
- A number of studies identified training interventions which aimed to support those living with mobility issues to achieve better access to, and confidence in using, transport and mobility aids.
- The courses identified included classroom-based discussions as well as centres to improve safety, offer training and advice, help with buying vehicles and appropriate technology. One evaluated course (Australia) focused on driving in later life, on retiring from driving, and on alternative transport and lifestyle planning. Participants reported increased use of public transport and walking alongside greater reported satisfaction with transport.
- Those courses that focused on navigating public transport, (combining classroom-based discussions with local field trips) were found to increase participants knowledge in planning and negotiating trips.
- To further facilitate access to public transport, 'buddying schemes', one-to-one travel training programmes were also discussed, although the effectiveness of these programmes were not detailed.
- One review that focused on pedestrian and public transit training interventions targeted towards younger people with learning or intellectual disabilities identified a range of interventions that were effective in providing support, including simulations, virtual and augmented reality, apps and multi-media, as well as training in natural settings. The authors of the research identified that if the intervention was to be effective, each had to be tailored to the specific types of disability.
- The evidence from interventions focusing on accessibility to the built environment, street access, paving, and accessibility of train stations and interchanges highlighted the importance of end-to-end solutions. For example, in the case of large stations and transport interchanges, ensuring that passengers can change between travel modes and make their connections is dependent on a wide range of complementary accessibility measures, including accessible signage, journey planner information and announcements.
- A number of papers detailed travel programmes designed to support those with disabilities, e.g., bus passes, voucher schemes and Demand Responsive Transport. Each were received positively when they provided flexibility for services users, when they filled a gap in scheduled public transport provision, and when they were affordable. Less positive responses were seen where there were burdensome administrative procedures, high costs or lacked a holistic approach (i.e., gaps in meeting the needs of people with disabilities who also have dependent children).

Innovations in the UK and international context

- For this review, innovations are defined as technical or technology-based developments designed to improve quality of life.
- The literature identified a number of innovations, including those addressing navigation, wheelchairs, roads, and vehicles. Whereas some papers focused on using existing technology to provide easily accessible support (e.g. navigation apps on smartphones), others were more forward thinking (e.g. the use of autonomous vehicles).
- Innovations to support individuals with a range of disabilities to navigate their environment included apps and Personal Digital Assistants. Overall these were found to improve participants' navigation, wayfinding, route learning, public transit use, and pedestrian travel.
- When discussing prescription of wheelchair provision, a number of studies highlighted the need for any national eligibility criteria to be uniform (to address inequality of access) as well as flexible; ensuring the wheelchair could effectively meet the needs of the individual.
- Any assessment around wheelchair provision needed to incorporate a consideration of psychosocial, as well as physical, requirements.
- Several papers identified the role vehicle innovations play in improving access to transport for those living with disabilities. For example, the Motability Scheme offers service users over 500 adaptations to choose from, to tailor their chosen car to specific driving, stowing and access needs.
- In exploring participant attitudes to autonomous vehicles, differential findings were reported. One paper identified that while some anxieties were present for those living with mental health problems, both they and their peers with mobility-related physical disabilities were generally curious around the technology. In contrast, a further paper found while those with physical disabilities more likely to perceive autonomous vehicles as a helpful innovation, those with higher levels of anxiety (mental health problems), were more likely to consider such innovation as dangerous.
- The research identified a range of bus innovations that are effective including changes to bus layouts, loading platforms and changes to bus stops. It was also highlighted that such changes may demand further training to improve the skills of users in accessing their specific mobility aid when negotiating public transport.

Implications for further research

- The evidence base is limited with regard to identifying the perceived barriers and facilitators to access and use of the Motability Scheme, how this may differ between population groups, and if there are any gaps in the Scheme's provision.
- To explore the perceived barriers and facilitators of accessing and using the Motability Scheme, further research should consider implementing a cross-sectional survey of the Motability Scheme's existing and potential client base. A larger sample size would allow views to be analysed by specific groupings, such as those living with a range of disabilities, socioeconomic group, age, and ethnicity.
- To understand why the majority of those eligible to access the Motability Scheme do not do so, future research should apply qualitative methods to explore participants' awareness and understanding of the Motability Scheme, their rationale for taking up (or not) the offer; and, what may persuade them to join the Scheme in future.

- There was limited research on the experience of people with intellectual disabilities or mental health conditions using public and private transport. Given the prevalence of mental ill health in the UK population, more high-quality research is needed to better understand the challenges for people living with these conditions, and the types of interventions or innovations which may improve their access to transport.
- Any future research needs to move away from presenting older people as a homogenous group with frailty as a single condition, exploring the complexities of multimorbidity and its impact on access to transport.
- The literature identified within this rapid evidence assessment tended to consider the barriers and facilitators for those with mobility-related disabilities in single transport modes. Few papers recognised that navigating private and public transport is an ‘end-to-end’ or ‘door-to-door’ process requiring individuals to use multiple forms of transport. Future research needs to adopt a more holistic view of any ‘journey’.

Implications for third sector organisations, central and local government

- A range of structural changes as well as personal training support needs to be undertaken if individuals with mobility-related disabilities are to appropriately access public and private transportation. Third sector organisations can play a central role in communicating the needs of service users and communities to central or local government, either by conducting the research and evaluation to identify the overarching needs or by advocating on behalf of their beneficiaries.
- It is necessary for central and local government, third sector organisations as well as user groups to work in a joined-up or integrated way when developing national eligibility criteria to facilitate access to a range of mobility interventions and innovations (e.g., access to the Motability Scheme, mobility aids, bus passes, voucher schemes and Demand Responsive Transport). This will ensure a mitigation of inequality of access, as well as the delivery of a holistic and flexible assessment of need.
- Third sector organisations are likely to find their influence with policy makers strengthened if they pursue a programme of high-quality research which demonstrates their understanding of the needs of service users and communities, building a strong evidence base to lobby for change. Such research can provide new understanding of attitudes, the evaluation of pilot and existing services, and also support the development of innovative solutions to the challenges faced by people living with disabilities.

Conclusion

- Convenient access to transport is vital to working lives, community participation and maintaining social networks.
- People living with disabilities are as diverse as those who are able bodied, yet this is perhaps lost when formulating policy and infrastructure planning. This may seem an impossible task, but a better understanding of availability, range and usage of transport will reap dividends in understanding future transport accessibility, needs around transport and customer satisfaction.
- Training interventions designed to assist those with mobility issues are invaluable in delivering practical help and support to encourage the behaviour change necessary to become regular users of such transport services.
- There was limited research on the experiences of people with intellectual disabilities and mental health conditions. Most papers reported on physical conditions, with only a small number explicitly addressing so-called ‘hidden’ disabilities.

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- The evidence identified in this review reveals a tension between the Equality Act's (2010) stipulation of access for all, versus the economic limitations inherent in making systemic change.
 - Motability are in a strong position to engage with their clients (as well as the wider population) by conducting or commissioning high quality research that can detail personal preferences and travel needs. Improving the existing (somewhat limited) evidence base is likely to influence the national policy agenda as well as inform best practice in delivering services, enhancing the quality of life for all those living with mobility challenges.

1 Background

It is well-documented that access to transport for those living with disabilities is challenging, despite its centrality to work, community and social inclusion.^{1 2 3} To support such access, over four and a half million cars, wheelchair accessible vehicles, scooters, and powered wheelchairs have been leased through the Motability Scheme.⁴ Individuals claiming the Enhanced Rate of the Mobility Component of the Personal Independence Payment (PIP) are able to rely on such provision.⁵ However, while over 600,000 people with disabilities currently benefit from the increased independence facilitated by the Motability Scheme, fewer than one-third of those eligible for such essential provision take up this opportunity. It is unclear why this is the case.

Access to transport encompasses far more than 'owning a car'. Appropriate public and community transport services should be in place and accessible to those with a variety of conditions and complex multimorbidities. These need to be flexible enough to accommodate changing mobility requirements over time as individuals age and as the overall proportion of older adults increases in the UK.⁶ Additionally, access to public and community transport should not be dependent on geographies, enabling equal access to those with mobility-related disabilities, whether living in urban, suburban or rural areas.⁷

Consequently, a core area of enquiry for Motability the charity is to understand the barriers to taking up the Motability Scheme it oversees, as well as the extent to which the existing transport infrastructure meets the needs of those living with disabilities. In addition, Motability has recognised that owing to an ageing population and the way in which disabilities and therefore mobility requirements change over time, innovative approaches will be necessary to support transport needs. Fortin et al., (2005) (cited in Smith et al., 2008) found that amongst adults seen in primary care, multimorbidity is now the norm, and near universal in those aged over 65 years.⁸ Such new approaches will contribute to changing and 'future-proofing' organisational initiatives and interventions.

At Motability's request, we conducted a rapid evidence assessment (REA) that gives an overview of the existing literature in disability and transport, including interventions and innovations, so that the charity can build on existing insights and knowledge when considering future research and policy development it might pursue in this space.

¹ Ward, M.R.M., Somerville, P., Bosworth, G. (2013) 'Now without my car I don't know what I'd do': the transportation needs of older people in rural Lincolnshire. *Local Economy*, 28(6): 553-566.

² Cross, M. (2013) Demonised, impoverished and now forced into isolation: the fate of disabled people under austerity. *Disability and Society*, 28(5): 719-723.

³ Thoreau, R. (2015) The impact of mobility scooters on their users. Does their usage help or hinder? A state of the art review. *Journal of Transport & Health*, 2: 269-275.

⁴ Power, A. (2016) Disability, (auto)mobility and austerity: shrinking horizons and spaces of refuge. *Disability and Society*, 31(2): 280-284.

⁵ Harries, P., Giacomini, J., Nickpour, F., Young, W., Unsworth, C., Boniface, G., Morgan, D., van Hoorn, L., Lim, Y., O'Sullivan, C., Belsy, E., Rourke, J., Windeatt, S., Goth, M., Harries, L. and Golkap, H. (2015) *Scoping our future research priorities*. London, Motability. Available at:

<https://bura.brunel.ac.uk/bitstream/2438/15885/1/Motability%20Report%20FINAL%201%20Dec%202015.pdf> (Accessed 15.05.2020)

⁶ Van den Berg, P., Arentze, T., Timmermans, H. (2011) Estimating social travel demand of senior citizens in the Netherlands. *Journal of Transport Geography*, 19(2): 323 – 331.

⁷ Samuel, P.S., Lacey, K.K., Giertz, C., Hobden, K.L., LeRoy, B.W. (2013) Benefits and quality of life outcomes from transportation voucher use by adults with disabilities. *Journal of Policy and Practice in Intellectual Disabilities*, 10(4): 277-288.

⁸ Smith S.M., Ferede, A., and O'Dowd, T. (2008) Multimorbidity in younger deprived patients: An exploratory study of research and service implications in general practice. *BMC Family Practice*, 9(1): 6.

2 Research questions and method

2.1 Research Questions

We conducted a rapid evidence assessment (REA) to comprehensively identify the peer-reviewed and grey literature, and critically evaluate the evidence found. The REA explored the following research questions.

Motability Scheme

1. What are the perceived barriers and facilitators to accessing and using the Motability Scheme?
2. Do specific population groups face greater or lesser barriers and facilitators to accessing and using the Motability Scheme?
3. What are the gaps (if any) in the current Motability Scheme in meeting the transportation needs of people living with disabilities?

Transport needs and innovative interventions

4. What (public and private) transport challenges do those living with disabilities experience?
5. What interventions (including direct-grants) have maximised access to transport for people living with disabilities?

Strategic and policy development

6. What innovations and/or interventions are necessary to enable disabled people to enjoy the same choice and freedom of transport as their non-disabled peers?

2.2 Methods

The rapid evidence assessment (REA) method enables the robust and transferable collation, review and synthesis of relevant literature. It is conducted in a relatively short time frame, while using a similar methodology to a systematic review.⁹ The aims and objectives of this REA were to:

- Consider the electronic and print-based literature comprehensively, but within policy and/or practice timescales;
- Collate descriptive outlines of the evidence available on a specific topic;
- Critically evaluate the evidence identified;
- Identify, record and exclude evidence that is considered of poorer quality; and,
- Summarise the information in its entirety, linked to project specific research questions.

The REA was conducted in four systematic stages, each of which is briefly outlined below and further detailed in Appendix A. For each stage of the REA, all activities were developed in partnership with Motability.

The first stage (stage zero) of our REA was a scoping phase to refine the research questions and to produce a detailed research protocol. We applied the initial research questions and the processes described below to create and test our search strings,

⁹ HM Treasury (2020) *Magenta Book: Central Government Guidance on Evaluation*. London: HM Treasury. March 2020. Available at: <https://www.gov.uk/government/publications/the-magenta-book> (Accessed 27.05.20)

inclusion and exclusion criteria, extraction sheet, screening and weighting. Search terms and synonyms for different types of disability and transport modes were co-produced between NatCen and Motability and then refined following consultation with our search specialist. These were tested on one academic database and amendments were made to the REA tools (i.e., search terms, inclusion/exclusion criteria, extraction sheet), as prompted by the pilot. In addition, shortened (or condensed) search terms were tested on a number of sources to identify high-quality relevant grey literature.

Following the pilot stage and the finalisation of the tools, we identified the relevant evidence for the REA (stage one). Three academic journal databases were systematically searched to identify relevant published literature. These search terms were in the form of Boolean search strings. Databases used for the searches and the finalised search strings are included in Appendix B. Alongside this, grey literature repositories and websites were manually searched to identify relevant grey literature. These search terms were in the form of key words, as determined during the pilot stage. The approach varied according to the structure and sophistication of each grey literature website's search engine, but usually involved searches using Boolean operators, filtering on themes or subjects, and browsing. Finalised key words and filters are included in Appendix C.

Stage two included title and abstract screening, full-text screening using a Weight of Evidence (WoE) tool and substantive criteria marking system (see Appendix E), followed by the development of a proposed shortlist, and the extraction of papers into an agreed framework. Firstly, title and abstracts were checked against an agreed inclusion and exclusion criteria (see Appendix D). Title and abstract screening of the grey literature took place at source. Papers were screened on the website or repository for materials identified as relevant. Following title and abstract screening, any papers where inclusion (or exclusion) was unclear were discussed amongst the NatCen research team. All inclusion decisions at the title and abstract screening stage were checked by a second reviewer. This resulted in a list of potentially relevant papers to be chosen for full text review.

All papers subject to full-text screening were reviewed using an agreed framework (see Appendix E). Studies were excluded if they did not meet the full-text inclusion and exclusion criteria, which included eight substantive domains (Appendix E) and, for example, particular countries of interest (Appendix D). Reviewers scored each paper against the substantive criteria relevant to the research questions to identify the topics covered by each paper. The WoE tool was subsequently applied to each paper (see Appendix A) to assess the papers for relevance, quality and robustness.

A systematic process (detailed further in Appendix A) was applied, to develop the proposed shortlist of papers for data extraction. Firstly, all papers with a WoE score of below eight (out of nine) were excluded, which resulted in 70 papers. This prioritised the papers with the strongest level of evidence. From that pool, all papers with a substantive evidence score of below two were initially excluded, which left 15 papers. At this point, three substantive criteria were under- or overrepresented in the papers. To redress this and achieve a wider range of evidence, the threshold for substantive criteria was lowered to two for papers that focused on transport challenges and non-public transport. This ensured that the researchers were still satisfied with the strength of evidence, while securing the inclusion of papers on less well-researched areas. This resulted in 15 additional papers, and 31 papers were included in the proposed shortlist.

The shortlist, along with the REA's research questions, were then sent to an academic subject expert. Dr Michelle Pyer, (Senior Researcher and Postgraduate Research Lead within the Faculty of Health and Society, University of Northampton), for review. After careful consideration, she concluded that the shortlist was comprehensive and

reflected her understanding of the research undertaken in this field. Data extraction was the last phase of stage two. On screening for final inclusion, core information about each paper was inputted into an extraction sheet (Appendix F), for internal analysis use in Stage 3 (below) and subsequent report development. The extraction sheet was refined in consultation with Motability and included (amongst other areas):

- a. Short summary of key findings;
- b. Sample size and whether nationally representative;
- c. Setting of the research;
- d. Level of focus of the article on the Motability Scheme;
- e. Challenges experienced by those with disabilities in accessing transport and mobility aids, and the extent to which people with disabilities use different modes of transport;
- f. Interventions and innovations to improve access to transport for those living with disabilities; and
- g. Main conclusions.

Stage three included the narrative synthesis and information integration of the data extracted at stage two. The literature selected to answer the research questions (see section 2.1) was heterogeneous in terms of methodologies (e.g., cross-sectional surveys, observational, 1-2-1 interviews, focus groups). To bring these data together we used extraction sheets (Appendix F) to carry out a narrative synthesis. Research papers and grey literature were analysed using a method analogous to qualitative data analysis. Papers were inspected closely line by line, areas of interest were coded, and the data was organised into broader descriptive or conceptual themes. This process built complete models of concepts, outcomes or findings. Inferences drawn from across the papers were organised into coherent narratives. In interpreting the data, we were mindful of the extent to which international examples are transferable to the UK context.

3 Findings

3.1 Type and extent of included papers

In applying the search terms and working through the different stages of this REA (see previous section and Appendix A), a range of papers were extracted which covered the three research themes: The Motability Scheme, use of, and challenges to access; Transport and mobility aids in the United Kingdom (UK); and Interventions or innovations designed to maximise access to transport for those with disabilities. Table 1 below provides key details of the 28 papers extracted, including areas of study focus and details of the disability groups included in the research.

Study	Country	Methods	Sample size	Population/ Disability	Transport/ Mobility aid type	Area(s) of study focus		
						Motability scheme	Use of, and challenges accessing, transport /mobility aids	Interventions/ innovations aiming to maximise access to transport
Harries et al., 2015	UK	Interviews and survey	Interviews = 102 Survey = 22	Motability customers/ex-customers; other stakeholders including mobility assessors and carers	Cars	✓	✓	
Phoenix et al., 2015	UK	Interviews	48	Visual impairments in adults over 60	Multiple (public)		✓	
Unsworth et al., 2019	Multiple countries (including UK)	Evidence review	N/A	Wheelchair users	Multiple (public and private)		✓	
Davies and Christie, 2018	UK	Interviews	7	Cerebral Palsy	Public (Planes)		✓	
Chatterjee et al., 2019	UK	Longitudinal national surveys	Large, nationally representative ¹⁰	Multiple (physical and mental health issues)	Multiple (public and private)		✓	
Davies and Christie, 2017	UK	Interviews	8	Wheelchair users (including Paraplegia and Tetraplegia)	Public (Planes)		✓	

¹⁰ In the papers analysing large, national surveys, sample size differs depending on the variable(s) being analysed. The overall sample size was often not provided.

Table 1: Summary of included papers (cont/...)

Study	Country	Methods	Sample size	Population/ Disability	Transport/ Mobility aid type	Area(s) of study focus	Study	Country
						Motability scheme	Use of, and challenges accessing, transport /mobility aids	Interventions/ innovations aiming to maximise access to transport
Bray et al., 2014	UK	Evidence review	N/A	Child wheelchair users	Wheelchair		✓	
Clery et al., 2017	UK	National surveys	Large, nationally representative	Multiple (physical and intellectual)	Multiple (public and private)		✓	
Ormerod et al., 2015	UK	Evidence review	N/A	Older people	Multiple (public and private)		✓	✓
Lucas et al., 2019	UK	Mixed methods including secondary analysis of national survey data and expert workshop	Large, nationally representative	Multiple (mental and physical)	Multiple (public and private)		✓	✓
Jones et al., 2020	UK	Mixed methods including stakeholder consultation, focus groups, surveys and site visits	Surveys = (1) 27, (2) 256 (not all sample sizes provided)	Multiple (mental and physical) including dementia and mental health conditions	Multiple (public)		✓	✓
Heward, 2011	UK	Mixed methods including field testing of handheld navigational devices and interviews	Interviews = 20	Multiple (physical and mental); older people (65+)	Multiple (public)		✓	✓
Lubin et al., 2017	USA	Surveys	342	Older people (primarily 65-84)	Multiple (public)			✓
Sze and Christensen, 2017	Multiple countries (including UK)	Evidence review	N/A	Physical disability leading to mobility problems (including visual/hearing impairments); older people	Multiple (public and private)			✓
Duckenfield, 2017	UK	Mixed method including station accessibility audits and interviews	Interviews = 1849	Physical disability leading to mobility problems (including wheelchair users, visual/hearing impairments)	Public (Train)			✓

Table 1: Summary of included papers (cont/...)

Study	Country	Methods	Sample size	Population/ Disability	Transport/ Mobility aid type	Area(s) of study focus	Study	Country
						Motability scheme	Use of, and challenges accessing, transport /mobility aids	Interventions/ innovations aiming to maximise access to transport
Bennett, et al., 2019	UK	Interviews and questionnaires	177	Learning/ Intellectual disabilities	Cars (self-driving)			✓
Bennett et al., 2019	UK	Interviews and questionnaires	797	People with difficulties walking	Cars (self-driving)			✓
Dolan et al., 2019	UK	Secondary data analysis	482	Wheelchair users (largest disability groups: Multiple Sclerosis and Cerebral Palsy)	Wheelchair			✓
Archambault et al., 2017	Canada	Interviews and questionnaires	17	Wheelchair users (largest disability groups: Multiple Sclerosis and Cerebral Palsy)	Wheelchair			✓
Samuel et al., 2013	USA	Cross-sectional postal survey	73	Multiple (physical and intellectual)	Multiple (public and private) Cars			✓
Di Stefano et al., 2019	Australia	Mixed method including survey and focus groups	Survey = 45 Focus groups = 53	General physical disability/ mobility problems	Paratransit			✓
Wang et al., 2014	UK	Case studies	16 Demand Responsive Transport Schemes	Demand Responsive Transport users	Paratransit			✓
Jacob et al., 2015	USA	Mixed method including survey and documentary analysis	Survey = 92	Paratransit users	Paratransit			✓
D'Souza et al., 2019	USA	Mixed method including simulation and questionnaire (P=48)	48	Wheeled mobility device users (largest disability groups: Cerebral Palsy, Multiple Sclerosis, Paraplegia).	Public (bus)			✓
Lindsay and Lamptey, 2019	Multiple (including the UK)	Evidence review	N/A	Multiple (physical and intellectual, including developmental disabilities and Down's syndrome)	Multiple (public and pedestrian)			✓

Table 1: Summary of included papers (cont/...)

Study	Country	Methods	Sample size	Population/ Disability	Transport/ Mobility aid type	Area(s) of study focus	Study	Country
						<i>Motability scheme</i>	<i>Use of, and challenges accessing, transport /mobility aids</i>	<i>Interventions/ innovations aiming to maximise access to transport</i>
Colver et al., 2011	Eight European regions (including UK)	National cross-sectional surveys	Large, nationally representative	Children (aged 8-12) with Cerebral Palsy	Multiple (public and private)			✓
Sochor and Nikitas, 2016	UK & Sweden	Mixed methods including questionnaires, focus groups and interviews	Questionnaires = (1) 148, (2) 252 Focus groups = 30 Interviews = 23	Older people (60/65+); visual impairments	Multiple (public and private)			✓
Smith et al., 2018	Canada	Evidence review	N/A	Wheelchair/ scooter users	Wheelchair and scooters			✓

As demonstrated in Table 1, much of the research included in this REA was UK-based (n= 21). Other countries included the United States (US) (n= 4), Canada (n= 2), Sweden (n= 1), and Australia (n=1). Research methods varied, with the most common being qualitative methods (e.g. interviews and focus groups), surveys (both national and smaller scale) and evidence reviews. While many of the papers focused on evaluating innovations or interventions, there was little use of robust evaluation methods such as Randomised Control Trials (RCTs) or quasi-experimental methods¹¹, which enable findings to be analysed against a comparison group. While four papers analysed large, national surveys, many sample sizes were also quite small (i.e. n<100). Although this is common of qualitative work, it can limit the conclusions drawn on the scale and variation of transport challenges for disabled people across different groups and the effectiveness of interventions or innovations.

¹¹ These methods use a control group or other mechanism to try and isolate the effects of an intervention.

The papers included in the REA cover a range of disabilities, including physical, intellectual and mental health conditions.¹² Most papers focused on physical disabilities, with only eight explicitly considering intellectual disabilities or mental health problems. The primary reason for this disparity is that there was significantly less research involving these latter groups within the scope of this project. Further to the eight papers included, only eleven additional papers focusing on intellectual disabilities or mental health conditions were considered at full-text screening. These papers did not meet the thresholds for the shortlist, scoring below either two on the substantive criteria or eight on the WoE criteria.

Most of the papers focused on forms of transport rather than mobility aids, with half (n=14) of the papers included in the REA considering multiple transport types. Only four papers centred around mobility aids, including wheelchairs and scooters. Seventeen of the papers extracted focused on the third research theme, Interventions or innovations aiming to maximise access to transport for disabled people. Twelve papers were included under the second research theme: Use of, and challenges accessing, transport and mobility aids. Only one paper researching the Motability Scheme was included in the final shortlist. In comparison with the other research themes, less literature overall was found on the Motability Scheme. The literature identified typically received low scores against the WoE criteria as the methods applied in the research were not justified as being appropriate, were insufficiently detailed and/or did not detail necessary ethical considerations.

3.2 The Motability Scheme

As discussed in section 2.1, one paper included in the REA (Harries et al., 2015) specifically focused on the Motability Scheme. The authors conducted interviews (n= 102) and a follow-up survey (n= 22), which included 45 Motability customers, 15 former Motability customers, 12 carers, and other experts and professionals in the field. For the purposes of this research, the key findings of this paper relate to three groups of issues which create barriers to access, usage, and gaps in the service of the Scheme. These were: limited opportunities for customisation and flexibility; availability of information; and cost.

The first barrier perceived by participants related to the options available, and opportunities for customisation and flexibility. The Motability Scheme is limited to certain models of vehicle (Ormerod et al., 2015). Differing needs, which are dependent on personal circumstances, were not always met by the options available. For example, parents of children with disabilities sometimes needed a larger vehicle (e.g. including a large boot space) to accommodate the whole family and the ability to add features, such as changing stations for an incontinent child. Some participants commented that they were required to balance their need to a wheelchair accessible vehicle with the need for boot space for shopping and luggage and choose a vehicle that served one need over the other. Others felt that greater availability of smaller wheelchair-accessible cars (for example, under two metres high) would improve their ability to access to parking and public spaces, or they needed more wheelchair adaptations to ensure that they could participate in all the activities they enjoyed.

Some respondents also had reservations with the three-year lease period. Firstly, it was perceived that this did not allow for changes in circumstances:

“One example was an individual who had a back operation and found driving in their Motability car extremely uncomfortable due to their new post-operation

¹² As shown in Table 1, some papers did not identify specific disabilities, defining the population of interest instead by reference to use of a particular aid (most commonly, a wheelchair) or by age (i.e. older people).

physical state but was unable to change their car due to the three-year lease... leaving her no option but to compromise and leave her car standing and let her daughter do the driving.” (Harries et al., 2015: 31)

In contrast, others wanted to buy a more expensive car than those offered by Motability and adapt it for the longer term, rather than exchange it every three years or less.

Aesthetics was also considered an issue which prevented individuals purchasing and using adapted vehicles and mobility aids. Some suggested this was particularly an issue for young people, but impacted those of all ages:

“The appearance of equipment, for use both in the home and outside was a central concern for individuals of all ages. It acted as a visual reminder of their difference and it influenced how people reacted to them. Some did not to go out or would not take their equipment with them when they went out because they were embarrassed. Participants with disabilities wanted equipment and products that were mainstream, desirable, fun to use, and that did not make them feel different.” (Harries et al., 2015: 27)

It was broadly agreed that mainstream products were generally unattractive, and the appearance of mobility scooters was thought to be a particular issue for young people. However, some professionals did note the increasing availability of new, more attractive products on the market such as the Ogo wheelchair and Kenguru smart car.

Availability of information was also perceived to be an issue with accessing and using the Scheme. This lack of information related primarily to eligibility criteria, in that respondents cited instances where individuals had been unsure whether they or their children would be eligible. A paucity of information was also perceived to be a barrier to selecting appropriate equipment and services, as well as keeping up to date with the latest available equipment and adaptations. This issue appeared to relate to the Scheme itself, but also to a broader lack of timely information around equipment and adaptations available for people with disabilities:

“For example, one family carer who also worked as a professional physiotherapist mentioned difficulty with keeping up to date with latest available equipment and adaptations and mentioned as a professional she would only know about things she would have seen already, implying that up to date information relating to equipment is also not filtering through to professionals. This suggests that information is difficult to find or is not readily available.” (Harries et al., 2015: 40)

Cost was an important factor which could act as a barrier to usage of the Scheme or to securing access to the right equipment. The cost of equipment was raised as a core issue, particularly given that Motability customers were often thought to have low incomes:

“I think the average Motability customer has an income of less than £20,000 a year. So if you’re going to start changing £20,000 for a wheelchair they’re just not going to be able to afford it and what we should be doing is getting this technology down in price and we should price it properly so that people can afford it.” (Harries et al., 2015: 44)

A further issue was the costs of adaptations. Some respondents felt that their ability to choose the right vehicle was constrained because they either had to pay for adaptations before they could test drive the vehicle or be a passenger While someone else drove the car. The large deposits required on wheelchair-accessible vehicles or

vehicles with automatic transmission was also a significant financial barrier. However, some participants also cited some cost benefits to the scheme which provided security:

“...It’s the security of if something goes wrong, it can go straight to the garage without costing me anything because obviously I’ve done from a damn good wage working at the hospital of nearly £2,000 a month and now I’m just living on benefits now.” (Harries et al., 2015: 26)

This study described several barriers to accessing and using the Motability Scheme, including limited options and opportunities for customisation, lack of flexibility, aesthetics, availability of information and cost. Some of these were specific to the Scheme, however other barriers (such as the availability of information around available equipment) were broader issues in the sector.

These findings were drawn from a small-scale, qualitative study involving 60 current or ex-Motability customers. While this research provides useful insights, the small sample size makes it difficult to ascertain how widespread these issues are, and which of those barriers highlighted by the research participants might be most problematic. Larger scale surveys with current and former Motability customers would be needed to confirm these findings. The researcher also recruited only current or former Motability customers and therefore could not investigate the barriers which may stop others who are eligible from accessing or using the Scheme. Some of the professionals interviewed talked about potential barriers for these individuals. However, conducting more targeted qualitative research with a wide range of people who are eligible for the Scheme but not yet using it would provide valuable insights to improve future uptake.

3.3 Transportation challenges for those living with disabilities in the United Kingdom

A discussion on the transportation challenges that those living with disabilities have to face in the UK should take into account a range of different aspects. People living with disabilities are not a homogenous group. Their needs, behaviours, and preferences vary noticeably according to the type and severity of their disability, as well as other demographic characteristics, e.g. age, gender, and ethnicity (Clery et al., 2017; Bennett et al., 2019a).

A first step to understand the transportation challenges faced by those with disabilities in the UK is to assess the types of transport available and, where possible to what extent these are used. In addition, the role of complimentary provisions for transport use (e.g. real time information and timetables) should be considered when exploring accessibility. Further aspects concern the impact of barriers and facilitators on people living with disabilities and their psychological, physical and social effects.

3.3.1 Types of transport and mobility aids used

Drawing on secondary data from the Understanding Society and English Longitudinal Study of Ageing (ELSA), Chatterjee et al. (2019) explored the access to transport and life opportunities of those living with disabilities. The study found that only 54 per cent of people living with a mobility-impairing disability and just 39 per cent of those with a long-term illness or disability have access to a personal car, compared to 69 per cent of the general population (see Figure 1, below).

Figure 1: Access to a personal car, Chatterjee et al., 2019



Those car users living with a mobility impairment also used their car less than those without a mobility-related disability. On average the former drive 245 trips per year, while the latter take 509 trips annually. The use of bicycles is also less common amongst individuals living with mobility-related disabilities, whereby just 3 per cent “use bicycles often compared to 11% of those without mobility impairments” (Chatterjee et al., 2019: 53).

Jones et al. (2020) explored the transport choices of those with mental health problems by conducting a non-representative survey (n= 80). They reported that for those who travelled, everyday walking and driving were the most common modes of transport (both selected by 36.1 per cent of respondents). Those who travelled less frequently (one to three days a week) were more often car passengers (45.9%).

With assessing the use of public transport, Chatterjee et al. (2019) found that 25 per cent of people living with mobility-related disabilities use buses often (at least once a week), which is comparable to the frequency of use of people without disabilities. The frequent use of bus services is more likely (54 per cent) amongst individuals living with disabilities who do not have access to a car and “for people living near frequent bus services and those living in London and other large cities” (Chatterjee et al., 2019: 11). However, when the authors controlled for other factors, they found that “[having] mobility impairments are associated with a much lower likelihood (0.55 times) of using buses often” (Chatterjee et al., 2019: 50). It was suggested that this may be explained by the likelihood of using buses when individuals become elderly, which increases more for people without mobility impairments than for those living with disabilities. This finding is also confirmed by the work of Clery et al. (2017), who conducted secondary analysis drawing on data from the National Travel Survey, Understanding Society, ELSA, British Social Attitudes and Life Opportunities Survey. The authors found that the use of public transport is more frequently associated with ageing in the general population, whereas this tendency is the opposite for those with disabilities who are less likely to use public transport as they age. Regarding the use of trains, while eight per cent of the adult population in England often use this type of transport, it is far less frequent for those living with a mobility-related disability. Only three per cent regularly travel by train (Chatterjee et al., 2019).

One extracted paper reviewed the wider evidence to find that in rural areas, deprived areas, and small towns in the UK, public transport options may be unreliable, insufficiently frequent, or absent (Ormerod et al., 2015). In such cases taxis can be the only viable option, although costly (Ormerod et al., 2015; Phoenix et al., 2015; Unsworth et al., 2019a). A further option, where available, can be a type of on-demand door-to-door transport called Demand Responsive Transport (DRT), described as “*an intermediate mode that can provide public transport access to members of the general public in areas where demand is too low to support conventional forms of bus-based public transport systems*” (Wang et al., 2014: 590). Drawing on secondary data to conduct multi-level modelling, Wang et al., (2014) explored the demand and usage of 37 DRT services in Greater Manchester, UK (see section 3.4.3 for further discussion). This type of transport is more flexible than other more common modes of public transport as it can modify routes and timetables based on passenger demand. Furthermore, its use is not limited to specific categories of users, such as older adults or people living with disabilities and it “*is provided by low capacity road vehicles such as small buses, vans or taxis*” (Wang et al., 2014: 590).

Aside from taxis and DRT, when people living with disabilities do not have access to a personal car or other types of public transport (e.g. buses and trains), lifts from family and friends and specialised types of on-demand door-to-door transport (e.g. community transport and transport provided by a hospital) can be amongst the few options left (Wang et al., 2014; Ormerod et al., 2015; Phoenix et al., 2015; Clery et al., 2017). For example, Clery et al. (2017) found that 54 per cent of older adults (65+) living with disabilities use lifts from family and friends, compared to 36 per cent of their non-disabled peers. Regarding on-demand door-to-door transport, Clery et al. (2017) observed that two per cent of people aged 65 and over used community transport and four per cent of those in the same age group used transport provided by a hospital.

People living with disabilities have different patterns of transport use compared to without disabilities. Patterns vary according to type and severity of disability as well as wider factors such as age and locality. Those living with disabilities use cars, bikes, buses and trains less, meaning that they are more likely to have to rely on others for lifts or specific services such as taxis or on-demand transport such as DRT. These options are likely to be less frequent and reliable and in the case of taxis, more expensive. However, it is important to note that the extracted papers in this REA often investigated aspects of the urban environment, with a lack of discussion around the specific challenges faced by those living in rural areas.

3.3.2 Accessibility

Unsworth et al., (2019) conducted a systematic review of 26 papers to explore public transport accessibility for people using mobility devices. The authors argued that a focus on accessibility requires the assessment of several features which include but are not limited to: Access to transport facilities (e.g. pavements, curbs, ramps, pedestrian lights, lifts, doorways, and road signage); the facilities themselves; boarding and alighting from public transport; and the public transport conveyance itself. In their review of the wider literature, Ormerod et al. (2015) identified several features that contribute to making an environment more accessible to pedestrians. These include durable and maintained pavements, absence of clutter, a sufficient number of well-designed bus stops with appropriate sheltering and information, and places where it is possible to stop and rest or use other services such as toilets (Newton et al., 2010; Ormerod et al., 2014; Aspinall and Ormerod, in press; Newton et al., 2010; Schmoker et al., 2008; l'DGO, 2012; Broome et al, 2013 in Ormerod et al., 2015: 24). Based on some of the issues described by Ormerod et al., (2015) it may also be possible to add other features such as good artificial illumination and reducing antisocial behaviours.

As discussed, uneven and neglected pavements, tall kerbs, access steps, and the position of stations and bus stops are accessibility challenges for a wide number of people living with disabilities (Harries et al., 2015) and older adults (Ormerod et al., 2015; Jones et al., 2020). However, the challenges experienced by individuals may vary between groups, and what is considered an accessibility measure for some may be an obstacle for other individuals with specific needs. For instance, Jones et al. (2020) found that older people have a higher risk of falls and trips when they walk on slopes and ramps (both usually designed to improve access for mobility aid users), and on tactile paving, which is used to help people with visual impairment. The authors also found that mixing pedestrians and other population groups, such as cyclists on the same pathways can be potentially dangerous to older people and those with mental health issues, discouraging them from walking as a result (Jones et al., 2020). Street crossing is a further potential cause of problems for older pedestrians (Jones et al., 2020). According to Ormerod et al. (2015), this may be due to visual and cognitive decline that makes the correct assessment of the velocity of the oncoming traffic more difficult. Furthermore, a reduced walking speed can be an issue since “[older] pedestrians typically walk much slower than the 1.2 m/s recommended by the UK’s Department for Transport” for the timing of pedestrian crossing lights (Ormerod et al., 2015: 25).

People living with mental health issues also have specific accessibility problems that are only partially shared by others living with disabilities. As discussed by Jones et al. (2020), large, uncluttered, and well-maintained pavements, as well as safer environments, are beneficial to all people living with disabilities. However, individuals with mental health problems are also affected by other accessibility issues that may limit them when walking around. These include the general atmosphere (e.g. noise level, air quality, specific types of artificial lighting), unfamiliar environments with unclear and complex information on possible routes, alternative routes not clearly signposted, and unclear or incomplete online information that makes it difficult to plan a journey.

The issues that those living with disabilities may encounter do not just relate to the ease of use of the transport service, but also to several other services such as information systems, toilets, and lifts. Harries et al. (2015) found that during a journey, the accessibility and fit for purpose of toilets were amongst the main concerns of individuals living with disabilities and their carers. The authors argue that “[even] when toilets were deemed accessible, the narratives of participants highlighted a range of issues including the lack of hygiene, the space being cluttered by bins and other items or handrails that were incorrectly located, preventing some individuals from using the toilet” (Harries et al., 2015: 27-28).

Unsworth et al. (2019) found that the main challenges people with disabilities encounter in the UK are the placement of information boards which can be out of sight and reach. Ormerod et al., (2015) also found evidence of overcomplex information with too many options. Sze and Christensen (2017) reviewed transport accessibility guidelines from the UK, US, and Hong Kong, followed by a review of the literature around the influences on travellers’ perceptions and behaviour. They presented the negative impact of unclear or missing audio information and inadequate signage on those living with disabilities, especially those with hearing or visual impairments (Sze and Christensen, 2017). As discussed, the needs of people living with disabilities may differ based on individual characteristics and issues that are specific to their type of condition. Duckenfield (2017) identified the lack of station attendants and help points as accessibility issues for most people living with disabilities (further discussed in section 3.4). However, to better guarantee accessibility to all with disabilities, one study recommended improving all systems of information provision so as to “remove the

need to speak to staff” since interactions with strangers can be distressing for some individuals with mental health issues (Jones et al., 2020: 29).

Once a person has reached a station or bus stop, further issues may arise when they need to board the conveyance, move within it and alight from it. These actions can be made more difficult or impossible by further accessibility issues such as missing train ramps (Harries et al., 2015), inadequately trained public transport personnel (Bennett et al., 2019b: further discussed in section 3.5), buses with steps too high or stopping at an excessive distance from the kerb (Ormerod et al., 2015). One extracted paper also identified broken lifts, unusual bus configurations, and “*societal issues described as the buggy wars where wheelchair users and mothers with children in buggies/ prams compete for space*” (Unsworth et al., 2019: 8).

Ormerod et al. (2015) also highlight that “*despite improvements on the London Underground, it is accessibility that remains the biggest problem among older people, especially with long staircases (perceptions and concerns about), overcrowding and the fast speed of closing doors, and concern about crime on the underground, particularly during very busy periods*” (Ormerod et al., 2015: 29-30). Further issues may concern the need to book in advance certain transport types (Bennett et al., 2019a), and the long waiting lists and unreliability of some community transport options (Ormerod et al., 2015). The problems linked to booking specific services for people living with disabilities may cause stress and anxiety, as well as feelings of discouragement and exclusion when there is not enough time to plan travel (Harries et al., 2015). One respondent interviewed, “*mentioned how they needed to plan in advance for their transport to make sure they will receive the support they needed at the train station while if they wanted to ‘go on the spur of the moment’ there would be [no] guarantee they could get enough help*” (Harries et al., 2015: 38).

Figure 2: Summary of accessibility issues



In exploring accessibility issues associated with car use, Heward (2011) highlights that the onset of disabilities in old age corresponds to a reduced use of personal cars and an increased reliance upon public transport. This was also found to result in more

frequent use of walks for short distance journeys (Clery et al., 2017). Nevertheless, as discussed by one study, “*car access is more important for those with mobility impairments (by nearly double (1.7 times) that of those without mobility impairments) and for those living in rural areas (by over three (3.3) times compared to those living in Inner London)*” (Chatterjee et al., 2019: 62). The authors also add that having access to a car increases individuals’ chances to use services, while lack of access is associated with less chances to go out socially (Chatterjee et al., 2019).

In the scoping review conducted by Harries et al. (2015), it was found that one of the main challenges respondents with disabilities encountered with the vehicles adapted for them was the lack of flexibility and multifunctionality of most of the equipment. This problem is particularly present when users move between different environments and when they are travelling. Coping with this required most of them to make some compromises and to adapt to new physical and cognitive challenges, “*this was particularly the case where the individual’s conditions and needs had changed since acquiring their equipment or vehicle*” (Harries et al., 2015: 31). Customisation of vehicles responds both to the need to personalise equipment, to make it “*desirable or aesthetically pleasing*” (Harries et al., 2015: 27), and to the necessity of adapting it to specific needs. For example, “[parents] *and carers considered their adapted car as an alternative changing facility; if the windows could be switched to black out or blinds closed and a changing kit designed for the boot of the car they would find that an effective space*” (Harries et al., 2015: 28). The authors found that in some cases, new vehicles, although designed and adapted for specific disability types, were lacking some features designed to cater to specific needs present in previous vehicles (Harries et al., 2015).

A further challenge people face when interested in purchasing or leasing a car is the cost of the adaptations, which can be so expensive they require fundraising and grant applications (Harries et al., 2015). According to participants in this study, this is one of the key factors involved in their decision-making process and one of the main limitations. For example, one of the respondents “*indicated that her former ‘action man’ husband wished to continue numerous outdoor activities; she felt this could have been possible had he been able to afford the necessary equipment needed to access the outdoor terrain*” (Harries et al., 2015: 44).

Bennett et al (2019a) conducted a cross-sectional survey (n= 177) to explore perceptions of those living with mental health problems towards Autonomous Vehicles (AVs). This study identified parking as a potential challenge for such drivers, mainly because of the lack of parking spaces dedicated to people with disabilities. Moreover, the behaviour of other drivers who occupy dedicated parking spots or park their vehicles on kerbs, against slopes or ramps may make driving more difficult for this group (Harries et al., 2015). A further issue with parking is due to the size of most mobility aids (e.g. electrically powered wheelchairs) which require a larger surrounding area to get in and out of a car. As reported by some respondents interviewed by Harries et al. (2015), even when a dedicated parking spot is available, the space assigned to get in and out of the car may be insufficient.

Davies and Christy (2017) conducted semi-structured interviews (n= 7) with parents of children living with disabilities to understand their experiences when travelling on planes. People living with disabilities and their carers encounter some specific challenges that have a low or no impact on other passengers without disabilities. Flying with a child with disabilities involves planning and careful assessment of airport procedures to have the necessary documents and avoid issues with the necessary pieces of equipment or medications (Davies and Christie, 2018). Moreover, some equipment and medicines often need to be checked as hold luggage, increasing the risk of damage and loss. To cope with these challenges, respondents in Davies and

Christie's study (2018) reported using multiple bags to store medicine and equipment to minimise disruption if a piece of luggage is lost. Concerns about missing and broken pieces of equipment and wheelchairs were common to both adults (Davies and Christie, 2017) and parents of children (Davies and Christie, 2018) with disabilities.

Security checks, embarkation, and disembarkation can also be challenging when children and their parents are separated, since this was cause of anxiety and concern (Davies and Christie, 2018). Embarkation and disembarkation, as well as sitting, were the cause of issues for both adults (Davies and Christie, 2017) and children (Davies and Christie, 2018) with disabilities. The manual handling of people can be difficult, causing them physical harm and generate unpleasant feelings of humiliation and embarrassment (Davies and Christie, 2017; 2018). Moreover, in most cases, seats are unsuitable, can be uncomfortable, and can even cause pain and injuries (Davies and Christie, 2017; 2018).

A further problem faced by wheelchair users as aircraft passengers is the inaccessibility and unsuitability of toilets (Davies and Christie, 2017; 2018). Respondents told of how they did not even attempt to use on-board toilets, and in the absence of other options "*some participants reported methods they used to avoid using the toilet including fasting and catheterisation*" (Davies and Christie, 2017: 91). In their interviews with parents of children who are wheelchair users, Davies and Christie (2018) found that some parents had tried to use the on-board toilets, but these attempts were not always successful. Alternative options mentioned included the use portable toilets or incontinence pads, to ask flight attendants to curtain off a small area, or to use the airport toilet right before the boarding process starts. The concerns of those living with a mobility impairment when flying is relatively less studied than other transport types, despite the large annual volume of flights and passengers (Davies and Christie, 2017).

When considering transport accessibility, all types of transport need to be considered, including public transport such as buses and trains as well as planes and personal cars. In addition, it is important that all parts of the journey are considered, including getting to stations, the stations themselves as well as boarding and alighting from transport. Unless accessibility is considered in all aspects of the transport journey, various risks are presented for different groups, discouraging use and causing stress and anxiety. These impacts will be explored further in the next section.

3.3.3 Impact of accessibility barriers and facilitators on people living with disabilities

The lack of access to a range of transport types has various physical, psychological, and social consequences for people living with disabilities (see Figure 3, below). According to a systematic review conducted by Unsworth et al. (2019a), the inaccessibility of public transport was a cause of frustration, anxiety, physical harm, and social isolation, as well as limiting leisure opportunities for, (in particular), younger respondents. Similarly, Davies and Christie (2017; 2018) reported that the absence of more appropriate services and accessibility measures for passengers with disabilities was a cause of physical harm, pain, and psychological distress including feelings of humiliation, embarrassment, nervousness, and anxiety.

Figure 3: Summary of the impact of accessibility issues.



The risk of social isolation and the lack of social inclusion caused by accessibility issues was also stressed by the work of Harries et al. (2015). Lack of access to a car contributes to worsening health and reduces work force participation, which has a direct impact on economic and social status: “*The car can be viewed as an effective means of enhancing public health; it protects individuals from the health risks associated with loneliness and isolation*” (Harries et al., 2015: 22). Having a car or the appropriate mobility aids helps people living with disabilities to have a more active and socially full life. This enhances not only health but also social identity, a positive sense of self, and overall quality of life (Harries et al., 2015). These findings were confirmed by Lucas et al. (2019), who applied mixed methods (rapid synthesis review, trend analysis data, a workshop, and review of best practice) to assess inequalities and access in the UK transport system. The authors concluded that the social exclusion caused by ageing and disability is reinforced by inadequate access to transport. The lack of suitable transportation that meets the needs of older adults and those with disabilities “[prevents] people from accessing key local services or activities, such as jobs, learning, healthcare, food shopping or leisure” (Lucas et al., 2019: 8).

The presence of a station or a bus stop with a regular service can make a difference. As stated by one of the professional carers interviewed by Harries et al. (2015), the fact that their organisation’s building is next to a train station allows some patients to be more active and to travel, albeit for short distances. Phoenix et al. (2015) also highlighted that a regular transport service promotes a more active lifestyle amongst people with a visual impairment, while inaccessible public transport reduces the chances for them to be more physically active.

As discussed in the previous section, a well-maintained pathway is also a key component to guarantee access to transportation. According to Sze and Christensen (2017), an environment with an improved transport system (including walking paths) is perceived as safer, which in turn affects accessibility and quality of life, and allows people in a vulnerable condition to have access to a more active and full social life. They state that “[improved] accessibility to transport facilities may enhance the activity participation and thus perceived quality of life, especially for the elderly and individuals

with disabilities. [...] Improvement of public transport service, walking environment, and perceived security and safety were influential to the association between activity participation and accessibility” (Sze and Christensen, 2017: 72).

The implementation of universal design was also found to be of benefit to those living with disabilities. A Norwegian study reviewed by Sze and Christensen (2017) found that public transport trips across six cities increased by 2.5 per cent following the implementation of universal design on busses (Aarhaug et al., 2015, in Sze and Christensen, 2017). It was also found that improved access to transport increased engagement in activities and reduced dependence on others, especially amongst older adults (Sze and Christensen, 2017).

The evidence found suggests that a lack of access to a range of transport types can have various psychological, social and physical consequences. In contrast, if transport is designed and implemented in a way that ensures accessibility to a range of users (including those with mobility-related disabilities), it can enhance quality of life and psychological, social and physical well-being.

3.4 Interventions in the UK and international context

This section presents the evidence from interventions to improve access to transport for people with disabilities and long-term health conditions. Section 3.5 then assesses the literature on relevant transport innovations. Evidence from successful interventions and innovations, particularly where these translate to the UK context, can provide an understanding of ‘what works’. This will help to inform Motability’s future strategy and policy development to improve access to transport.

The two concepts, interventions and innovations, are overlapping but distinct. Interventions are typically planned efforts, such as programmes, funding streams or pilots designed to bring about a defined improvement. Well designed and executed interventions lend themselves to academic evaluation (for example, process, impact or cost-effectiveness).¹³ Interventions can themselves be innovative or can stimulate innovation. For this review, innovations are defined as technical or technology-based developments designed to improve quality of life in some way.

The interventions identified in the literature included training, accessibility of the built environment (e.g. rail stations and pavements), and travel programmes. These were classified as interventions rather than innovations, in that they involved the evaluation of a specific programme or pilot. Many of the interventions presented below were found to be successful, however these findings were usually based on smaller scale, qualitative studies and this is discussed further at the end of this section.

3.4.1 Training

A number of studies identified training interventions which aimed to support those living with mobility issues to achieve better access to, and confidence in using, transport and mobility aids. Two studies included training programmes designed for older people who may face mobility problems (Ormerod et al., 2015; Lubin et al., 2017). These were classroom-based, with subjects of interest including driving and public transport use. Unlike studies focused on specific age groups or conversely others where age is not a

¹³ HM Treasury. The Magenta book: guidance notes for policy evaluation and analysis. March 2020. [Accessed 19 May 2020]. Available from: <https://www.gov.uk/government/publications/the-magenta-book> (2020).

consideration, mobility problems associated with age tended to be perceived as a homogenising feature, with a lack of focus on how to tailor interventions to the range of disabilities experienced by older adults.

As part of a wider evidence review, Ormerod et al. (2015) identified the Forum of Mobility Centres, a UK network of 17 independent centres aimed to improve driver safety, offer training and advice, help with buying vehicles and appropriate technology. Although these centres were 'well received', no formal evaluation had been conducted. It was also highlighted that training aimed at older drivers needed to prepare participants for life without a car. This was illustrated by one evaluated course from Australia which, in addition to driving in later life, focused on the experience of retiring from driving, alternative transport, lifestyle planning, and advocacy and support (Liddle et al., 2007 cited in Ormerod et al., 2015). The findings reported a subsequent increase in the use of public transport and walking, alongside greater reported satisfaction with transport.

The implementation of training programmes to support older people with public transport use was also identified in the US. Lubin et al. (2017) evaluated the Travel Independence Program Senior Mobility and Resource Training (TIP SMART), which consisted of a 90-minute classroom session on using buses and trains, followed by a local field trip during which participants applied their learning to real-world scenarios. Based on self-reported survey data (n=222), the programme was generally viewed as a success. The vast majority of participants (85 per cent) rated the training as 'excellent' and there was a 20-percentage point increase in participants reporting that they knew how to plan a trip on public transport. A different format of travel training aimed at older people found in the literature was that of buddy systems (Ormerod et al., 2015). These one-to-one travel training programmes, which are generally administered by local authorities, were found to provide bespoke support for participants throughout the UK (Wandsworth Council 2014; UK HAIL, 2013; West Yorkshire Local Transport Plan Partnership, 2006; in Ormerod et al., 2014). However, no further details were found in the extracted papers as to the effectiveness of these programmes.

One extracted evidence review focused on pedestrian and public transit training interventions aimed at younger people (Lindsey and Lamptey 2019). This systematic review of international papers (n= 29) included those with a focus on the use of simulations, virtual and augmented reality, apps, and multi-media, as well as training in natural settings.¹⁴ Of the 29 studies reviewed by Lindsay and Lamptey (2019), 24 reported a significant improvement across a range of outcomes. In contrast to the homogenising approach of interventions designed for older adults, the vast majority of interventions were designed to support young people with specific intellectual disabilities such as Down's syndrome, Hydrocephalus, Williams syndrome, and autism. With this in mind, the authors argue that it is "*important to develop interventions that are tailored for specific types of disabilities because they arguably have different needs for travel training*" (Lindsey and Lamptey, 2019: 2618).

Lindsay and Lamptey (2017) reported that a range of topics were taught more or less effectively according to the mode of delivery. For example, for those interventions taking place in natural settings, participants showed poorer landmark recognition and poorer spatial cueing, but improved pedestrian skills and route learning. In comparison, virtual and augmented reality interventions improved route learning, landmark recognition, and navigation skills. The results of simulation studies were more mixed, with an improvement in pedestrian skills and navigation demonstrated in some studies, but poorer navigational abilities and landmark recognition in others.

¹⁴ The apps presented in this paper are better categorised as an innovation. Accordingly, they are discussed in section 2.5.

A further extracted paper evaluated a home computer-based simulation training aid, which enabled new users of powered wheelchairs to practice manoeuvres in realistic scenarios at home (Archambault et al., 2017). The authors applied a Short Feedback Questionnaire and perceived Ease of Use Questionnaire, as well as interviews to measure success (n= 17). Participants reported a positive perception around the simulation's ease of use and experience, however many felt neutral about repeating the process in the future. To mitigate this, the authors suggest that simulation scenarios should be more varied and that participants should not be encouraged to continue once their skills had plateaued.

Despite the perceived success of the intervention evaluated by Archambault et al. (2017), the authors suggest that it should supplement rather than replace real-world training. Interview data revealed that participants valued the real-life scenarios the training presented them with, such as navigating to a toilet. The recommendations from the TIP SMART intervention evaluation (Lubin et al., 2017) also supported this notion, in that training interventions take an 'asset-based approach' in design. That is, trainers should make "*a concerted effort to first identify and then familiarize with and teach participants how to use accessible services in the area to reach local destinations participants expressed interest in accessing.*" (Lubin et al., 2017: 23). Findings from the TIP SMART evaluation revealed that a greater percentage of those who participated in both the classroom and field trip sessions used public transportation after programme participation, compared to those who participated only in the field trip. However, it was not reported whether (or not) this finding was statistically significant.

The papers reviewed indicate that tailoring any classroom-based teaching or wider field trips to specific disabilities and health issues resulted in greater effectiveness when compared with taking a more homogenous approach. In addition, it was demonstrated that there were benefits from both real world virtual/augmented reality training. Lastly, there was some evidence that training could increase both use of, and satisfaction with, public transport.

The reported impact and effectiveness of the interventions discussed above are, in some cases, limited by the rigour of the applied measurement methods. In the absence of a comparison group, the 'success' (or otherwise) of an intervention cannot be fully validated. For example, a travel training programme for older adults may have been found to be effective (Lubin et al., 2017; Ormerod et al., 2015). However, in the absence of a comparison (or control) group, these findings may have been influenced by other interventions operating in parallel in the same area.

3.4.2 Accessibility of the built environment

The accessibility of the built environment is defined as human made spaces, such as rail stations and pavements. The REA identified an accessibility programme in the UK aimed to make rail stations more user friendly, an analysis of footfall at rail interchanges, and the use of tactile paving to guide those who are visually impaired.

Some papers focused on or included improving access to rail for those living with disabilities. The Access for All Programme (A4A), an intervention funded by the Department for Transport, aimed to improve access to the UK's rail network for those with disabilities (Duckenfield, 2017). Station accessibility audits were conducted, finding that all six stations selected for the study had implemented structural changes in accordance with the A4A programme. These audits reported stations of varying quality, highlighting issues with location, signage, and maintenance of the accessibility infrastructure, all of which have been identified as being essential for the visually impaired, but may also affect those with other disabilities (see section 3.3). Of those participants made aware of the improvements made by the A4A programme, both

those with hearing (19 per cent) and mobility impairments (15 per cent) reported that they increased their use of the station (Duckenfield, 2017).

The A4A programme focused mainly on station accessibility, with other 'complementary' measures also encouraged. These included clear passenger information, a user-friendly system to plan journeys in advance, and appropriate staff training (Duckenfield, 2017). As discussed in section 2.3, complementary measures such as these are important across public transport modes. Two studies in Sze and Christensen's (2017) review highlighted the importance of geospatial information regarding accessibility and its perceived importance in pre-trip planning for those with mobility issues (Aarhaug et al., 2015; May et al., 2014 in Sze and Christensen, 2017). Furthermore, clear and large signage, and large print timetables were found to be essential in improving access for those with visual impairments (Aarhaug et al., 2015; Verbich et al., 2016 in Sze and Christensen, 2017).

The evaluation of the A4A programme found that station access was compromised by passengers being unable to get on to their train, and that this "*should be borne in mind when considering funding priorities*" (Duckenfield, 2017: 25). However, no elaboration was provided on whether, or how, this should inform funding priorities. A more detailed recommendation was offered by a paper reviewed by Sze and Christensen (2017). Ferrari et al. (2014) conducted spatio-temporal analysis¹⁵ of a public transport network, finding that accessibility was improved by 'multi-modal interchanges', including a raised rail transit platform to align with rail transit vehicles, and provision of street-to-platform and platform-to-platform step-free access. To reduce journey times for older adults and those with mobility issues, the authors recommended that high-demand rail stations are prioritised for multi-modal changes to make key interchanges easier for passengers.

The literature noted that the cost efficiency of public transport programmes was an important area (Sze and Christensen, 2017). An economic appraisal of the A4A programme found that the combination of benefits to users, non-users, and rail operators exceeded costs by 2.4 to 1, with a crucial factor in the programme's business case being the number of disabled and 'encumbered' passengers using the station (Duckenfield, 2017). Although the author conceded that beyond the business case, improved access provides a number of social benefits, it is clear that reliance on economic appraisals may offer improved access for some while negating parity for all.

The literature around the built environment also featured interventions designed to maximise street access for pedestrians, which focused mainly on older people and those living with visual impairment. One evidence review found that access to public transport for older adults improved with the provision of level and slip-resistance footpath surfaces, benches, safe crossings, extended pedestrian green light time, and protection from fast moving traffic (Sze and Christensen, 2017). A further evidence review also found that 'good quality' and clutter free pavements were an important feature of the built environment to promote outdoor mobility for older adults (Newton et al., 2010; Ormerod et al., 2014 in Ormerod et al., 2015). Road signage also featured in the paper, with high-contrast white lines, clear and unambiguous signage, and reduced speed limits on priority roads approaching high-risk junctions suggested as solutions to make roads safer for older drivers. However, the authors also expressed concerns that such measures could make younger drivers increase their speed, although complex environments could improve safety by keeping motorists engaged (Ormerod et al., 2015).

¹⁵ This methodology draws on data from space and time around a particular phenomenon, in order to answer questions of "when", "where", and "why" effects occur at a particular time or location.

One UK-based study found mixed results with regard to tactile paving aimed to support those with visual impairments (Jones et al., 2020). The authors applied a mixed methods approach consisting of an evidence review, two focus groups (number of participants not reported), a survey (n= 256), and site visits (n=5). Although many visually impaired participants understood the meaning of blistered (76 per cent) or corduroy surfaces (49 per cent), just 15 per cent were able to identify one or other surface type. As such, both users and practitioners expressed a desire to keep design consistent and simple, supported by clear guidance. Included in the specific design recommendations of Jones et al. is that any guidance should stress the importance of avoiding the need for tactile paving in the first place, describing how *“this can be achieved through more thoughtful design of the public realm from the start of the design process”* (Jones et al., 2020: 8). This view was supported by another paper reviewed by Sze and Christensen (2017), which called for accessibility to be incorporated into strategic urban planning, including disability policies, an accessibility advisor, cooperation with advocacy organisations, and awareness of government directives (Hallgrimsdottir et al., 2014, in Sze and Christensen, 2017).

The evidence from interventions focusing on the built environment, street access, paving, and accessibility of train stations and interchanges highlighted the importance of end-to-end solutions. For example, improving street access for pedestrians with disabilities can allow them to take advantage of public transport. In the case of large stations and transport interchanges, ensuring that passengers can change between travel modes and make their connections is dependent on a wide range of complementary accessibility measures, including accessible signage, journey planner information and announcements. The finding that some tactile paving and road layouts were beneficial to some groups, while being confusing or unhelpful for others, raises questions for future policy and stakeholder engagement, as did the finding that some tactile paving caused confusion due to inconsistent use by local authorities in different areas.

3.4.3 Travel programmes

A number of papers featured travel programmes designed to support those with disabilities. These included bus passes, voucher schemes and community transport, such as paratransit and Demand Responsive Transport (DRT).

The travel programme most widely cited in the literature was the UK’s concessionary bus pass scheme aimed at those living with disabilities and older people, who are likely to face a range of mobility issues. No one paper specifically explored or evaluated bus passes, but rather cited other papers which had. The pass was found to be widely used by older people, especially amongst those on lower incomes (80 to 82 per cent), with longer, more costly journeys travelled in rural (45.5 per cent) rather than urban areas (26.5 per cent) (Dargay et al., 2010 in Ormerod et al., 2015). Despite this success in take up, past research cited by Heward (2011) reported problems with crime and intimidation on buses, as well as concerns with poorly lit bus stops and stations (Goulder, 2007; Help the Aged, 2007b; Social Exclusion Unit, 2006 in Heward, 2011). No recent research was cited in the literature to confirm if these issues have persisted.

Heward (2011) found that many of those eligible for a bus pass were unable to make use of free travel at national level, leading to some paying for specialist services or relying on family or friends (as discussed in section 2.3). The importance of family and friends in improving access to transport for those with disabilities, especially when faced with limited public transportation options, was also highlighted in an evaluation of a transportation voucher programme (Samuel et al., 2013). The scheme, which was implemented in the US, supplied participants with set mileage vouchers which could be used to pay a friend or family member for a ride, or a volunteer driver, taxi, paratransit,

and on public transport. Results from a cross-sectional survey (n= 73) found that the voucher was most commonly used to pay friends and family (41.8 per cent), followed by volunteer drivers (23.5 per cent) and public transportation (20 per cent). As discussed in section 3.3.2, these results support findings regarding older adults, which found that 54 per cent of over 65s with disabilities use lifts from family and friends (Clery et al., 2017). The flexibility of the scheme, in that it could be used for a range of travel modes and based on mileage rather than restricted to local transport networks, was perceived to be a key facilitator to its success. As one participant expressed:

“It really helped out with transportation to school for the last 3 years and to [go to meet with] my social worker for counseling [sic], as those were considerable distances beyond city lines. Our city has no public metro bus service outside the city . . .” (Samuel et al., 2013: 282).

The voucher scheme evaluated by Samuel et al. (2013) was found to have a positive impact on participants’ wellbeing, including perceived improvement in stress levels (61.2 per cent), to have time to relax (47.7 per cent), and experience better relationships with friends and family (43.3 per cent). Although participants also reported an overall increase in community participation (61.2 per cent), those with multiple or intellectual disabilities were less likely to report this benefit. The paperwork involved in using the vouchers was also cited as a barrier for some, especially amongst those with intellectual disabilities, who often required a sponsor to help them claim their allocated miles. This was perceived as a limitation to their independent mobility by the authors, as this group of participants had to rely on a non-disabled person to make use of their vouchers.

The evaluation of the voucher scheme demonstrated that, although friends and family were the preferred voucher use for the majority of participants, many may not have access to a car (Samuel et al., 2013). Another type of transportation scheme identified in several papers was Demand Responsive Transport (DRT), ‘community transport’ or ‘paratransit’ (as discussed in section 2.3). These programmes appeared to address the gap between car ownership and public transport. As one paper described: *“Community transport is a user-oriented form of public transport characterised by flexible routing and scheduling of vehicles, operating between pick-up and drop-off locations determined according to the needs of passengers.”* (Ormerod et al., 2015: 35).

One paper drew on secondary data to conduct multi-level modelling to explore the demand and usage of 37 DRT services in Greater Manchester, UK (Wang et al., 2014). The scheme, which is supplemented by a ‘dial-a-ride’ service, provides links to essential services and the wider transport network where there is insufficient demand for conventional bus provision. Results indicated that *“areas with a higher level of car ownership or lower level of overall deprivation generate fewer DRT trips”*. The model predicted that if the unit of household cars in a Lower Layer Super Output Area (LSOA: a geographic unit used by the Office for National Statistics) increased by just one, and holding all other variables constant, DRT trips would decrease by 81.5 per cent. Furthermore, demand for DRT services were higher in areas with low population density, a high proportion of white people, and high levels of social deprivation.

Wang et al. (2014) did not explore the experiences of individuals in accessing and using the DRT scheme, which would have been difficult to determine as a result of the methods they used and not within the remit of the study. However, Ormerod et al (2015) cited a wide range of benefits related to community transport, including the added value of the community transport driver as ‘quasi-carer’ and a vital addition to the journey itself (Webber et al., 2010; Musselwhite, 2011 in Ormerod et al., 2015). This suggests that community transport transcends its utilitarian purpose, offering both

social and emotional interaction between drivers and users (Musselwhite, 2011 cited in Ormerod et al., 2015).

While the literature identified several benefits of community transport-type schemes, it also identified challenges. For example, it was found that community transport provision in the UK is varied, only serves a small number of users, and is often oversubscribed (Ormerod et al., 2015; TFL 2009 in Ormerod et al., 2015). One paper from the US also identified a number of challenges faced by parents when travelling with children on paratransit services (Jacob et al., 2015). Although a survey conducted with paratransit managers or their nominated colleagues (n= 92) found that those travelling with children represented a very low proportion of their ridership, the services they did offer parents were limited. One major problem identified was that only 12 per cent of agencies provided car seats for their passengers and just over a third (35 per cent) assist with loading or unloading seats. Alongside various other barriers, this resulted in the authors making the following recommendations to providers (see Figure 4, below).

Figure 4: Recommendations for paratransit in supporting parents and children (Jacob et al., 2015).

1	Identify parental status of paratransit users at eligibility assessment and record children's ages
2	Treat parent and child as a unit when assessing eligibility for paratransit
3	Provide detailed information on riding with a child
4	Accommodate car seats for children (e.g. providing, assisting with, stowing)
5	Revise policies to take account of parents travelling with children
6	Improved services for parents including scheduling changes, allowing for volunteer helpers, collaboration with other agencies

The papers by Samuel et al. (2013) and Wang et al. (2014) are not directly comparable, however the findings do indicate that travel programmes improve access to activities which participants' non-disabled peers may take for granted. For example, the main reason for using the vouchers in the former were 'recreation' (25.7 per cent), followed by errands (21.7 per cent), medical appointments (13.2 per cent) and employment/training (10.5 per cent). In Wang et al. (2014), DRT services were also mainly used for 'leisure' (33 per cent), followed by 'employment-related trips' (29 per cent) and shopping (17 per cent).

The interventions described above were received positively when they provided flexibility for service users, e.g., vouchers which could be used according to personal preference, when they filled a gap in scheduled public transport provision, and when they were affordable. Less positive responses were seen when there were burdensome administrative procedures, high costs, and lack of holistic approaches (for example gaps in meeting the needs of people with disabilities who also have dependent children). Better access to transport had the effect of improving

connectedness and a sense of community: people with disabilities were able to visit family and friends, and also interact with their local area and with their drivers.

Several interventions were identified through the research studies. However, their conclusions were often based on self-reported data from small samples, with a notable absence of comparison groups. Although many of the interventions in this REA were reported to have an impact, the extent of this reported effectiveness is limited by the rigour of the applied measurement methods. In the absence of a comparison group, the 'success' (or otherwise) of an intervention cannot be fully validated. Schemes administered by UK local authorities were identified by one paper, however local authority websites were excluded from the grey literature search. Consequently, there may be local interventions or innovations not included in this review, unless cited in the wider, high-quality grey literature or the subject of an academic journal article.

3.5 Innovations in the UK and international context

The literature identified a number of innovations, including those reporting on navigation, wheelchairs, roads, and vehicles. Whereas some papers focused on using existing technology to provide easily accessible support (e.g. navigation apps on smartphones), others were more forward thinking (e.g. the use of autonomous vehicles). As we have discussed (section 2.4, above), for the purposes of this review, innovations are defined as technical or technology-based developments designed to improve quality of life.

3.5.1 Navigational innovations

The literature identified several innovative ways in which pedestrians living with a range of disabilities can be supported to navigate their environment. In Lindsay and Lamptey's (2019) review, seven studies were identified that featured innovative apps and Personal Digital Assistants (PDA's) to support pedestrian navigation, delivered by existing technology such as smartphones and iPods (see Table 2). This technology was applied to support a wide range of participant groups, including those living with physical, cognitive, visual, intellectual, learning and developmental disabilities. Overall, apps and PDAs were found to improve participants' navigation, wayfinding, route learning, public transit use, and pedestrian travel. For example, one Spanish-based study (n=18) included a wayfinding app named 'AssisT-OUT' which supported young people with cognitive disabilities to calculate routes correctly to reach two different city-based destinations (Gomez et al., 2014 in Lindsay and Lamptey, 2019). Table 2 below sets out the information that Lindsay and Lamptey (2019) used to present those studies which included app and PDA-based innovations.

In their discussion, Lindsay and Lamptey (2019) suggest additional benefits of delivering apps to younger age groups, recognising the high number who own a smartphone and the reduction of labour due to decreased adult supervision. However, the literature also highlighted important considerations for how those with mobility issues perceive such innovations. One Swedish-based paper conducted interviews (n=23) and a survey (n=252) to explore the attitudes of older adults and those living with disabilities around technology-based solutions (Sochor, 2015 in Sochor and Nikitas, 2016). Elderly and visually impaired participants did generally welcome and show an interest in technology, expressing that such pedestrian navigation systems could improve independence and mental health. However, there were concerns around continued support once the project had finished, such as updating technology, and data privacy. Participants also questioned if pedestrian navigation systems were the

best use of resources compared to focusing on the built environment, which was perceived to have a greater impact.

Navigational innovations in the form of mobile apps or other technological innovations have been shown to be effective in aiding pedestrians living with a range of disabilities to navigate their environment. However, conclusions were often based on self-reported data from small samples. The extent of reported effectiveness of innovations is therefore limited by the rigour of the applied measurement methods. Despite this, the studies highlight important considerations for navigational innovations. These include participants concerns about using technology without support, data privacy and difficulties faced by elderly and visually impaired participants.

3.5.2 Wheelchair modification and prescription

The use of wheelchair modifications, how they should be prescribed and the policies which inform this were identified as important in the literature. One UK-based paper profiled and compared the seating, characteristics, functions, and equipment costs of electric powered wheelchairs, with the aim of improving how they are prescribed (Dolan et al., 2019). Drawing on secondary National Health Service case data (n= 482), the authors identified a range of controls, seating and other electric functions which can make electric powered wheelchairs more accessible and useable. These included control devices (e.g. joy stick, switch, chin joystick foot control and 'sip and puff'), 'electric-powered functions' (e.g. tilt and recline backs, a lift or raiser, and elevating lower leg support), and seats which were mostly found to be of low complexity (e.g. sling seat and back with or without a seat cushion manufactured for comfort, and 'additional posture support devices'). The study was descriptive rather than evaluative, finding that equipment for those with spinal cord injury and muscular dystrophy was several times the cost of equipment used by those living with disability following a stroke, which resulted in an additional 60 to 70 per cent increase of the cost of basic provision.

Table 2: app and PDA-based innovation studies (Lindsay and Lamptey, 2019: 2613-2614)

Table 2: Apps/PDAs							
References (all from Lindsay and Lamptey 2019, p. 2613-2614) [country]	Objective(s)	Sample characteristics	Disability type	Study design (measures)	Intervention (delivery and dosage)	Key findings	Quality rating (AAN) and limitations
Goldberg et al., 2014 [US]	To provide students with disabilities with location and time for attending a learning resource that is optimal with their learning style and activities	5 college students (mean age n/a; gender n/a)	Physical disability, visual impairment	Pre-post survey and focus group (navigation and wayfinding, barriers)	An interactive, mobile wayfinding tool which was experience-centred to find optimal routes and directions Dosage: 4 weeks, intervention was delivered on campus	The wayfinding tool aligned well with their needs and helped to address navigation barriers Youth participants described the tool benefits and ways to improve its functionality	Quality rating: 4 Small sample (socio-demographics not provided) No control group
Gomez et al., 2016 [Spain]	To assess a wayfinding system for people with cognitive disabilities	18 (mean age 23.7; 11 male, 7 female)	Cognitive	Mixed methods: video, survey, focus group (looking at performance and mistakes)	AssisT-OUT adapts to the user for route calculation, instructions and interface design and includes 2 city routes Dosage: 1 session per route for 2 routes	Google maps had better results than the AssisT-OUT No significant differences between AssisT-OUT and Google Maps regarding the number of errors	Quality rating: 4 Small sample Inequitable gender composition No controls
Rodriguez-Sanchez and Martinez-Rombo 2013 [Spain]	To validate a new service system in the context of Wayfinding services to improve SmartCities mechanism	5 (aged 21-30, mean age n/a; gender n/a)	Visual impairments, hearing impairments, motor disability	Observation and questionnaires (accessibility validation)	Wayfinding including managing content, information and mobile navigation apps. Includes 3 scenarios (indoor, outdoor, indoor/outdoor) Dosage: 3 trials/scenarios	Participants validated the accessibility and functionality of the system. Information and feedback in real time was helpful The wayfinding system alerted them to physical reference points	Quality rating: 4 Small sample No controls Wide age range and various disability types

Table 2: Apps/PDAs (cont/...)

<p>Haveman et al., 2013 [Germany]</p>	<p>To increase the independent use of public transport by students with intellectual disabilities</p>	<p>124 students (aged 7-18, mean age 12.6; 72 male, 52 female)</p>	<p>Intellectual disability</p>	<p>Pre-post survey (independent travel) Social-ecological model</p>	<p>Mobility individual educational plans, curriculum, training for teachers, parents and bus drivers, coach Dosage: baseline and follow-up within 1 year</p>	<p>At the start of the intervention, less than 1% of students used public transit, 3 years later this had increased to 65.3% Significant improvement in public transport and wayfinding.</p>	<p>Quality rating: 4 No controls Non- standardized measures</p>
<p>Stock et al., 2011 [US]</p>	<p>To determine to what extent apps can help a person to travel independently and help with decision making and problem-solving.</p>	<p>1 (age 19 years; male)</p>	<p>Down syndrome</p>	<p>Case study – pre and post interviews (Arc's self-determination)</p>	<p>Discovery desktop and visual assistant apps that combine photos and videos with verbal instructions 4 new travel routes Dosage: 1-2 months</p>	<p>The technology assisted the participant in using public transportation No significant difference in self-determination between pre and post test scores</p>	<p>Quality rating: 4 Small sample size No controls</p>
<p>Davies et al., 2010 [US]</p>	<p>To examine the utility of a personal digital assistant software with an integrated GPS for location aware prompts to navigate a bus route</p>	<p>23 (mean age 31.9; 14 female, 9 males)</p>	<p>Intellectual disability</p>	<p>Randomized experiment (landmarks, errors, prompts)</p>	<p>Wayfinder with integrated GPS software for location aware prompts Dosage: 30-60 minutes</p>	<p>Participants using the system were significantly more successful at completing a bus route than controls (73% versus 8%)</p>	<p>Quality rating: 3 Small sample Presence of researchers on the bus</p>
<p>Mechling and Seid 2010 [US]</p>	<p>To evaluate a personal digital assistant with prompts to facilitate pedestrian travel</p>	<p>3 (mean age 21.4; all female)</p>	<p>Moderate intellectual disability</p>	<p>Experiment: multiple probe design (landmarks)</p>	<p>Personal digital assistant with prompts Participants travelled to one destination 3 days per week Dosage: 100 minutes</p>	<p>Participants independently used the personal digital assistant Students infrequently used the video prompts</p>	<p>Quality rating: 3 Small sample No males</p>

Based on their findings and that of the wider literature, Dolan et al., (2019) recommend that an individual's primary diagnoses should not predetermine the prescription of their wheelchair. Rather, service planning and budgeting should support provision based on individual need and clinical judgement of healthcare professionals. A further UK-based paper, which conducted a systematic review of studies, policies and guidelines, supported this notion in the context of service provision for child wheelchair users in Canada (Bray et al., 2014). Specifically, the authors found that "*strict eligibility criteria can be prohibitive to each child receiving the right wheelchair*" (Bray et al., 2014: 12) and therefore called for national eligibility criteria to be uniform and flexible in order to address the inequity of services. These findings resonated with results from an evaluation of policies by Smith et al. (2018) who examined governing equipment funding for Canadian adults with respect to wheelchairs, scooters and related equipment (Smith et al., 2018). While many policies provided full funding for wheelchair users, others limited provision by way of strict eligibility criteria, a problem compounded by varied definitions of disability or 'basic and essential need' across geographical jurisdictions. As a result, the authors made the following policy recommendations (see Figure 5, below).

Figure 5: Policy recommendations from Smith et al., 2018



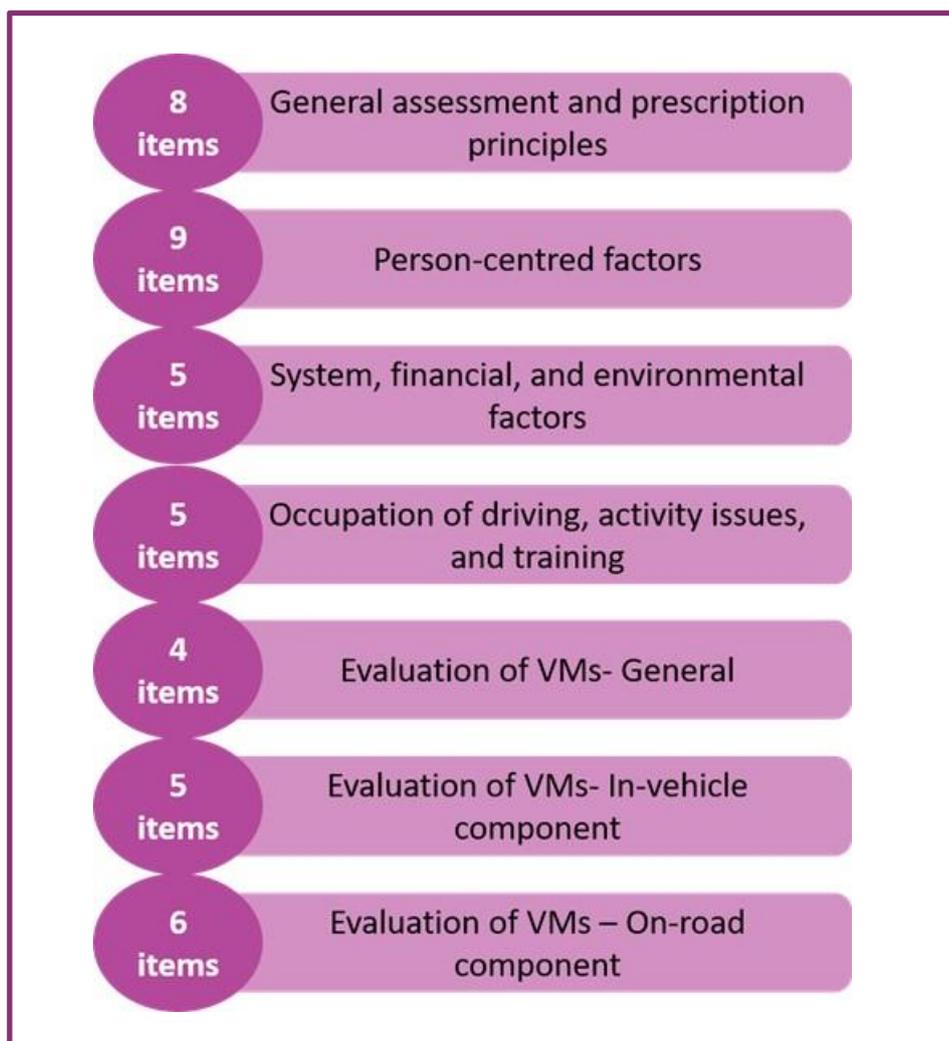
Further recommendations made by Bray et al. (2014) focused on the requirements of child wheelchair users and their families, and the need for clear outcome measures. It was found that children benefit when their psychosocial needs are considered alongside their health needs as part of a holistic assessment. This includes ensuring that the supplied wheelchair meets user needs, and that higher quality wheelchair services consider the needs of the whole family. To evaluate the effectiveness of such services, the authors identified a need to develop "*reliable and valid measures of holistic benefits [...] in order to measure the wider benefits of PWC [powered wheel chair] interventions*" (Bray et al., 2014: 12).

The evidence in this section suggests wheelchair modifications are most effective when they are based on individual need and the clinical judgement of healthcare professionals. In addition, it was emphasised that any national eligibility criteria should be uniform (as well as flexible) if equity of access was to be achieved.

3.5.3 Road and vehicle innovation

Several papers identified the role road and vehicle innovations play in improving access to transport for those living with disabilities. The Motability Scheme offers service users over 500 adaptations to choose from, to tailor their chosen car to specific driving, stowage, and access needs.¹⁶ One Australian-based paper explored the prescription of such Vehicle Modifications (VMs), with the aim of improving guidance for the occupational therapy profession (Di Stefano et al., 2019). The authors applied participatory action research methods in order to develop, assess, and refine a set of guidelines aimed at Occupational Therapy Driving Assessors (OTDAs). Firstly, a review of the evidence and relevant documents informed initial draft guidelines. These were subsequently reviewed by a Project Advisory Group (PAG) consisting of compensation providers, advocacy organisations, the licensing authority, health agencies, occupational therapy university staff, a vehicle engineer, and OTDAs. The resulting draft guidelines consisted of 49 items across a range of categories, for which feedback from OTDAs was sought in focus groups (n= 53) and a survey (n= 45). The findings informed a new 42 item set of guidelines, consisting of the following categories, albeit these have yet to be evaluated for effectiveness (see Figure 6, below).

Figure 6: Categories of guidance from Di Stephano et al., 2019



¹⁶ Motability. (2020). Print this page Adaptations available on the Scheme. Available: <https://www.motability.co.uk/products/adaptations/adaptations-available/>. Last accessed 29.05.2020.

Two papers considered future innovations by exploring participants' attitudes towards the use of Autonomous Vehicles (AVs). The first paper investigated the views of those living with mental health conditions (n=177) with the notion that AVs "*will make available far wider and more convenient transportation opportunities to intellectually impaired people who at present cannot, or voluntarily do not, drive*" (Bennett et al., 2019a: 2). Those more in control of events, environments and outcomes were found to be more curious about AVs and less fearful of this new technology. In contrast the answers of respondents with higher levels of anxiety were more likely to be fearful yet were also more likely to value freedom and independence. Similar to those with physical disabilities, those who were aware of AVs prior to the interview were generally more curious and less fearful than other respondents; they were also more likely to give answers falling into the 'freedom' category.

The second and largest study conducted a survey of those living with physical disabilities (n= 444) and those without disabilities (n= 353), with results revealing polarised views amongst participants (Bennett et al., 2019b). Those with physical disabilities who had an interest in new technologies, as well as higher levels of internal locus of control (i.e. that they have control over the outcome of events in their lives) and action orientation (i.e. their willingness to pursue action to deal with a situation), were more likely to see AVs as a helpful innovation and less likely to describe them as dangerous. In contrast, those with no prior knowledge of AVs and higher levels of generalised anxiety were more likely to consider AVs as a dangerous innovation and less likely to perceive them as helpful. The association with 'ambivalence' was not explained strongly enough by the independent variables to be considered significant.

Recommendations from both papers centre on the need for public information campaigns for AVs. For those living with mental health problems, there is a requirement that their needs and attitudes should first to be assessed if effective (and tailored) information is to be provided. In addition, this should be delivered alongside information from manufacturers to build trust amongst those who are sceptical of commercial information sources (Bennett et al., 2019a). The positive association between those living with physical disabilities' with less prior knowledge of AVs and, perceptions of danger is also something to consider (Bennett et al. 2019b). To address this, the authors suggest that information campaigns should be carefully designed and targeted toward specific population groups. However, there is no concrete discussion of the content or focus of these campaigns.

3.5.4 Bus innovations

Some papers identified changes or innovations to buses that could improve access for those living with disabilities. One US-based paper applied simulation research methods (n= 48) using a full-size static bus layout, to explore perceptions around the acceptability of design and the preferences of those using scooters, manual or powered wheelchairs (D'Souza et al., 2019). Three different interior layouts were tested using two levels of passenger load, resulting in six different test conditions, with seven tasks per condition. Those bus layouts with a rear entry and exit points were reported to be significantly more popular amongst all participants, independent of passenger load level. Despite this, the authors made recommendations for the prescription of mobility devices and further training for how to use them, rather than modifications to bus layouts. Drawing on evidence from the UK regarding increased wheeled mobility sizes and challenges to their accommodation on public transit vehicles, D'Souza et al. (2019) recommend that engineers and therapists need to consider device size relative to bus capacity. Furthermore, the authors suggest that training is needed to provide mobility aid users with the skills they need to make the manoeuvres identified in the paper; e.g., paying a fare and safely reaching the securement zone.

Several papers reviewed by Sze and Christensen (2017) identified further innovative ways to make buses more accessible for those living with disabilities and mobility issues. For example, one study evaluated a portable bus loading and unloading platform, designed to support frequent bus route changes and improve operation flexibility (Suksawang et al., 2014 in Sze and Christensen, 2017). The study found that the introduction of a plastic lumber platform for wheelchair users could enhance bus safety *and* operational efficiency, thus improving cost effectiveness of the service.

Further papers cited in this review suggest that innovative access design should encompass bus stops and complementary information. A Norwegian study (first cited in section 2.3.3) applying universal design principles to improve bus access found that essential design elements include barrier-free access to buses, elevated bus stop platforms, tactile markers with contrasting colour for buses and platforms, gentle ramps, and small gaps between buses and platform buses (Aarhaug et al., 2015, in Sze and Christensen, 2017). These findings were supported by a further paper, which found that the perceived level of service of those with disabilities and mobility issues was improved with the level of route and schedule information, as well as the provision of shelters, waiting areas, seat availability, and reduced journey times (Verbich et al., 2016 cited in Sze and Christensen, 2017).

The papers included in this review showed numerous bus innovations to be effective including changes to layouts, loading platforms and changes to bus stops. It was also highlighted that such changes may require people to receive training to improve skills such as wheelchair manoeuvres. Although many of the navigational, wheelchair, road and bus innovations described in this section were reported to have an impact, the extent of the reported effectiveness is often limited by the absence of a comparison group to fully validate the 'success' of any innovation.

4 Implications of the research

4.1 Implications for further research

The evidence base is limited with regard to identifying the perceived barriers and facilitators to access and use the Motability Scheme, how this may differ between population groups, and any gaps in the Scheme's provision. As previously discussed (section 2.1), most of the existing literature on the Scheme was excluded from the REA as the literature identified typically received low scores against the WoE criteria. The methods applied in this research were not justified as being appropriate, were insufficiently detailed and/or did not detail necessary ethical considerations. We recommend that any future research commissioned to explore the Motability Scheme should ensure that methods (including sample size and data collection methods) are presented in detail and clearly justified, and any ethical considerations identified and addressed.

To explore the perceived barriers and facilitators of accessing and using the Scheme, further research should consider implementing a cross-sectional survey of the Motability Scheme's client base. A larger sample size would allow views to be analysed by specific groupings, such as those living with a range of disabilities, socioeconomic group, age, and ethnicity. There is also a lack of evidence to understand why the majority of those who are eligible to access the Scheme do not do so. To explore the experiences of this hard to reach group, future research should apply qualitative research methods, such as in-depth interviews or focus groups, to explore: participants' awareness and understanding of the Scheme; their rationale for taking up (or not) the offer; and, what would make them consider joining the Scheme in the future.

This REA has presented findings from high-quality research that illustrates the varied challenges those with disabilities face when accessing and using transport. As discussed, the extent to which this includes the experiences of those living with potentially hidden disabilities (e.g. neurological, intellectual and mental health conditions) is limited. Studies focusing on or including those living with a broader range of disabilities were subject to full text screening but later excluded as they did not meet the WoE threshold. This indicates that more high-quality research is needed to understand the transportation challenges and needs of those living with hidden disabilities, especially those with mental health conditions.

As discussed throughout, older adults are often presented as a homogenous group with frailty as a single health condition, a view also expressed by Ormerod et al. (2015). Although this group may have some experiences in common regarding mobility and transport, future research could consider the consequences of specific disabilities arising from a range of health conditions, as well as the complexities of multimorbidity in older populations.

As noted previously, the interventions and innovations presented in this REA are often reported to be effective. However, most studies have relied on self-reported data and small sample sizes to evidence this success. While these results are promising, more rigorous testing of such interventions and innovations is needed to strengthen the basis on which future funding is allocated. In addition, research needs to include any unintended policy or practice consequences. As we identified, some measures may have a positive impact on those living with one type of disability, while negatively affecting someone with another (see section 3.3.2).

The literature discussed tends to consider the effects of using individual modes of transport. Future research must adopt a more holistic, 'door-to-door' view of how those living with disabilities travel using multiple forms of transport, specifically their experience of getting to and changing between different transport types (e.g. travel to a rail station or bus stop, station interchanges, transport mode interchanges, and reaching destinations once leaving rail or bus stations).

4.2 Implications for third sector organisations, central and local government

This REA has presented a range of support and training needs provided to individuals with disabilities using mobility aids and accessing transport (see section 3.4.1). Although training and buddy schemes administered by local authorities were identified in the literature, no formal evaluations or discussions around best practice were found. This is an area where third sector organisations can play a key role in communicating the needs of service users and communities, either by conducting the research to identify wider needs, or by working alongside their user base in lobbying for them. Local government and third sector organisations may consider the findings from this REA as a basis to inform future interventions. We do know that these programmes are best delivered flexibly, designed around local need, and should include opportunities for real-world application. Moreover, it is recommended to policy makers that any educational programmes aimed at older adults need to “*deal with the social, habitual, emotive and status issues of transport and travel that are relevant to older people.*” (Ormerod et al., 2015: 42).

While there is a compelling case for transport policy to consider local needs, the literature also identifies areas where consistency could be improved. For example, Jones et al. (2020) argued for the simplification and standardisation of tactile paving to make navigation easier for visually impaired pedestrians who may travel to another area with different paving surfaces. The authors stressed that such paving should be developed as part of “*thoughtful design of the public realm from the start of the design process*” (Jones et al., 2020: 8). It was also identified that accessibility should be built into strategic urban planning, including disability policies, supported by an accessibility advisor and cooperation with advocacy (or third sector) organisations (Hallgrimsdottir et al., 2014, in Sze and Christensen, 2017). This indicates that a more joined up and integrated approach is necessary for any built environment or transport design with third sector organisations central to any advocacy process; bringing the experience of those with mobility-related disabilities to the fore in any national discussion.

Two papers identified the need for consistency regarding wheelchair policy as a result of unequal access experienced by those requiring mobility aids (Bray et al., 2014; Smith et al., 2018). Bray et al. (2014) identified that any national eligibility criteria should be uniform and flexible to address the inequity of services. Moreover, Smith et al. (2014) made recommendations around eligibility, funding, basic or essential mobility, repair and replacement, prescriber requirements, and family considerations (see section 3.5.2). It is recognised that such nationally applied and consistent guidelines may go some way to improving equality of access to wheelchair provision regardless of geography. Third sector organisations working alongside those with mobility-related disabilities have a core role in any future policy development, ensuring that their knowledge and experience in providing support and interventions is embedded in any proposed future practice.

While it was recommended that some innovations (e.g. pedestrian navigation apps) should be tailored to the needs of specific disabilities (Lindsay and Lamptey, 2019), it was also identified that some measures designed for one type of disability may

negatively affect another (e.g. tactile paving causing problems for older adults) (Jones et al., 2020). These issues are based on notions of personal versus public space. An app is used by an individual, whereas tactile paving is used by all. It may be helpful for policy makers, both in central and local government, to consider the possibility that an intervention or innovation in public spaces may affect other population groups in unintended ways. The principles of universal design may provide a possible solution to this, in that it aims to design space accessible to all regardless of age or disability (Aarhaug et al., 2015, in Sze and Christensen, 2017).

As we have discussed above (section 4.1) the majority of papers in this review focused on a single transport mode and, we have recommended that any future research takes a more holistic view of individual journeys (end-to-end). It is suggested that this holistic focus is similarly reflected in the activities of policy makers and third sector organisations. For example, Duckenfield (2017: 25) highlights that “*accessibility to a transport service is only as good as the weakest link. In the rail example, the benefit of improving access to stations is severely compromised if passengers cannot then get on their train. This should be borne in mind when considering funding priorities.*” In the context of the use of multiple modes of transport, this concept should be extended to inform a holistic approach to transport accessibility policy, whereby interchanges (e.g. between pedestrian travel to a rail station, rail platform interchanges, and subsequent rail to bus interchanges) need to be considered. Third sector organisations are ideally placed to continue to build up a picture of the experiences of those with disabilities as they make their journeys door-to-door and report these findings to policy makers to ensure improvements and ongoing quality of travel services.

It has been identified that community transport programmes can bridge the gap between car ownership and access to public transport (Wang et al., 2014). However, this relationship may need special consideration in rural areas. Ormerod et al., (2015) highlight that some UK bus companies do not feel recompensed by the concessionary fares policy, which threatens bus service provision in local areas. While community transport programmes may address this need to some extent, it is argued that these services require ‘joined-up thinking’ to improve current fragmentation and equitably serve both urban and rural populations.

It has been argued that it is important for interventions and innovations to be economically efficient (Duckenfield, 2017; Sze and Christensen, 2017). However, it was also highlighted that beyond the ‘business case’ evidenced by economic appraisal, value should be given to the “*important social benefits in terms of giving everyone the opportunity to travel by rail*” (Duckenfield, 2017: 25). A similar idea was put forward regarding community transport, which was found to go beyond its utilitarian purpose by offering both social and emotional interaction between drivers and users (Musselwhite, 2011 cited in Ormerod et al., 2015). Third sector organisations should strongly emphasise the social and mental health benefits of transport to government, to ensure that this message is not lost amongst the practical considerations of transport planning. While economic efficiency is of course important, the added social and emotional benefits should also be considered by policymakers throughout the design, administration and review of interventions.

One tool that third sector organisations may find effective when working alongside central and local government is the delivery of a programme of high-quality research. A strong evidence base will demonstrate the needs of service users and communities as well as highlight innovative solutions to the challenges faced by those with disabilities, informing policy and practice development.

5 Conclusion

Convenient access to transport is vital to working lives, community participation and maintaining social networks. The Motability Scheme enables this by leasing a range of transport options to people with disabilities such as wheelchair accessible vehicles and powered wheelchairs. While thousands use the Scheme successfully, there are many others who are eligible but do not take it up. Consequently, Motability wanted to understand any barriers to adoption, but also how the wider transport infrastructure does or does not meet the needs of those with disabilities, and what further gaps need to be filled. NatCen conducted a rapid evidence assessment (REA) to review the literature on disability access, and to recommend directions for future research and policy.

This review identified many smaller scale, qualitative studies, both from the UK and internationally. While they provide insights into the transport challenges faced by those with disabilities, there was a lack of larger scale, national surveys which help us to gather robust evidence from a representative sample of people. This issue also arose in respect of the one study included which addressed the Motability scheme. While the evidence on barriers to the Scheme was informative, the small sample size prevented broader conclusions being drawn on the extent of these challenges across the UK. Quantitative large-scale survey data with clearly defined methodologies is needed to detail the experiences of former and current customers to gain a reliable understanding of the barriers and facilitators to using the Scheme. However, to better understand the reasons *why* people do not use the Scheme, in-depth qualitative interviews or focus groups with those living with a range of disabilities of different ages and localities will give valuable insights which can feed in to future strategies to promote uptake. As explained in section 3.1, any new studies should ensure the methods applied in the research are justified as being appropriate, sufficiently detailed and consider any ethical considerations.

People living with disabilities are as diverse as those who are able bodied, yet this is perhaps lost when formulating policy and infrastructure planning. A better understanding of availability, range and usage of transport is likely to result in greater future uptake and customer satisfaction. At present, older adults tend to be treated as one homogenous group, which completely overlooks the range a complexity of conditions and associated challenges they face. Nevertheless, it must be recognised that the social exclusion experienced with ageing and disability can be heightened by lack of access to transport.

While it is vital to have a well-planned and responsive travel infrastructure, more vulnerable population groups may well lack the confidence to use it. A number of studies reported on training interventions designed to support those with mobility issues. These are invaluable in delivering practical help and support to encourage the behaviour change necessary to become regular users of such transport services. In turn, those who feel more in control of their environment may be more likely to be receptive to new technology or further changes that may further enhance their lives.

Equally important is the travel experience from home to an intended destination, which will be defined by the weakest part of the journey. A train station may be fully wheelchair accessible, but if the lift is broken or there is a lack of clear and up-to-date travel information, the journey may be abandoned. Travelling to different parts of the UK may have become easier in recent years for those with disabilities, but the lack of consistent paving and facilities between local authorities may dissuade travellers whose uncertainty leads to anxiety and frustration.

We also learned that there was very limited research on the experiences of people with intellectual disabilities and mental health conditions. Most papers reported on physical conditions, with only a small number explicitly addressing so-called 'hidden' disabilities. This may be in part due to the methodological challenges of researching those with less tangible, visible conditions who may be more likely to conceal their condition, possibly exacerbating and perpetuating the feelings and experience of social exclusion. Given the high prevalence of mental health conditions and intellectual disabilities in the population, further research is needed to better understand the challenges for people living with these conditions, and the types of interventions or innovations which will improve their access to transport.

Finally, the evidence identified in this review reveals a tension between the Equality Act's (2010) stipulation of access for all, versus the economic limitations inherent in making systemic change. Perhaps unsurprisingly, the innovations and interventions reviewed focus on improvement of services and infrastructure rather than parity of access. Motability are in a strong position to engage with their clients (as well as the wider population) by conducting or commissioning high quality research that can detail personal preferences and travel needs. Improving the existing (somewhat limited) evidence base is likely to influence the national policy agenda as well as inform best practice in delivering services, enhancing the quality of life for all those living with mobility challenges.

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Appendix A: Methodology

We carried out a REA which enabled robust and transferable collation, review and synthesis of relevant literature in the most efficient way. The aims and objectives of this REA were to:

- a. Consider the electronic and print-based literature comprehensively;
- b. Integrate descriptive outlines of the evidence available on a specific topic;
- c. Critically evaluate the evidence identified;
- d. Identify, record and exclude evidence that is considered of poorer quality; and,
- e. Summarise the information in its entirety, linked to project-specific research questions.

The REA was conducted in four stages, each of which is detailed below. For all stages of this REA, all activities were developed in partnership with (and approved by) Motability.

Stage 0: Scoping phase including pilot search and identification

The first stage of our REA focused on a scoping phase to refine the research questions as well as co-produce, develop and deliver the detailed protocol and supporting documents, including the relevant inclusion and exclusion criteria for title and abstract screening.

We carried out a pilot stage of the REA. In this pilot stage, we tested all processes on Scopus, an academic database focused on social science journals. We applied the initial research questions as well as those processes detailed in each of the stages below, to create and test our developed search strings, inclusion and exclusion criteria, extraction sheet, screening and weighting.

The terms for different types of disability, transport modes and synonyms for these categories were co-produced between NatCen and Motability. Subsequently, the search specialist provided their expertise to comment on, refine and add to these terms.

Amendments to the different tools (i.e. search terms, inclusion/exclusion criteria, extraction sheet) were undertaken prior to the full search using the additional databases of PsycINFO and MEDLINE. These additions and changes were discussed and shared with Motability as part of ongoing weekly catch-up meetings.

In addition, a range of shortened (or condensed) search terms were tested to identify relevant grey literature. These were applied in a number of sources of high-quality grey literature, including GreyMatters and the OECD website.

Stage 1: Evidence Identification

Following the pilot stage and the finalisation of the tools, we identified the relevant evidence for the REA. The sources used and, processes applied are detailed below.

Database searches

Three academic journal databases were systematically searched to identify relevant published literature. These search terms were in the form of Boolean search strings that incorporated a range of key words and concepts into literature databases. Finalised search strings are included in Appendix B.

The following databases were searched using the finalised search strings:

- a. MEDLINE;
- b. PsychINFO; and
- c. Scopus.

Grey literature searches

Grey literature repositories and websites were manually searched to identify relevant grey literature. These search terms were in the form of key words, as determined during the pilot stage (Stage 0, above). The search applied a fluid approach, due the varied nature and sophistication of each website's search engine. For example, whereas some search engines support the use of BOOLEAN operators, others allow the user to categorise or filter their search by transport, thus rendering the 'transport' search term redundant. Finalised key words and filters are included in Appendix C.

Stage 2: Evidence selection, screening and weighting

Title and abstract screening

Following the searches in the databases and grey literature sources identified above, a process of screening the titles and abstracts of all the evidence against the inclusion and exclusion criteria (Appendix D) took place. At the title and abstract screening stage, studies that appeared to be relevant were included for full-text review. Title and abstract screening took place at source, whereby papers were screened on the website or repository, for materials identified as relevant. Title and abstract screening was completed using Abstrackr, an online database screening tool at this stage. The tool applies artificial intelligence (AI) to prioritise papers dependent on the content of the abstract selected (or not selected) by researchers, therefore refining the order of relevance in which papers are screened. Sensitivity analyses of results generated by this AI programme has demonstrated that Abstrackr has the potential to reliably identify relevant citations. In exploring this, a study¹⁷ found that in two datasets, all relevant

¹⁷ Rathbone J., Hoffman, T and Glasziou, P. (2015) Faster title and abstract screening? Evaluating Abstrackr, a semi-automated online screening program for systematic reviewers. *Systematic Reviews*, 4(80) DOI 10.1186/s13643-015-0067-6

citations were identified, While in a further two datasets, only one relevant citation was missed.

Following title and abstract screening, any papers where inclusion (or exclusion) was unclear were discussed amongst the NatCen team. All inclusion decisions at the title and abstract screening stage were checked by a second reviewer.

Full-text screening

All full-text screening papers were screened using an agreed framework (see Appendix E), with studies excluded if they did not meet the full-text inclusion and exclusion criteria. For example, it was not always clear from the abstract which country the research took place in, resulting in full text screening identifying papers to be excluded if they were not situated in a country of interest (see Appendix D for a list of relevant countries). Papers were scored by reviewers against eight substantive criteria (see Appendix E), which were relevant to the research questions, to identify the topics that each paper covered. Each paper receives a maximum score of 17 points (incorporating both the thematic areas within the framework as well as the Weight of Evidence score). Papers were sorted by score and, following discussions with Motability, we determined a minimum score for each paper to obtain for inclusion in the review.

Weight of Evidence (WoE) tool

Weight of Evidence (WoE) criteria were applied to score papers according to relevance and robustness (see Appendix E). The WoE analysis is based on a methodology first developed by the EPPI-Centre (Evidence for Policy and Practice Information and Coordinating Centre) and has been applied in the analysis of both quantitative and qualitative research¹⁸. A WoE analysis explores each source in terms of quality and relevance to the overarching research aims and objectives, in addition to scoring it on a scale between one (lowest quality) to nine (highest quality). Each study is weighted/scored based on:

- a. Relevance;
- b. Quality of design and methodology; and
- c. Whether the research paper meets its stated aims and objectives.

A final assessment is then made which considers these criteria and the source in its entirety, with scores for both relevance, insightfulness, and robustness.

Proposed shortlist

A systematic process was applied to develop the proposed shortlist of papers for data extraction. Firstly, all papers with a WoE score of below eight (out of 9) were excluded, which resulted in 70 papers. This prioritised those papers with the strongest level of evidence in terms of having clear research, a justified sampling strategy, data collection approach, ethical transparency and soundness, clear information on funding sources, justified data analysis methodology, accuracy, and sufficient, robust evidence to draw conclusions. From that pool, all papers with a substantive evidence score (this marked the relevance of the paper's content) of below two were initially excluded, which resulted in 15 papers. Subsequently, three criteria had a noticeable absence of papers or were overrepresented:

¹⁸ Gough, D. (2007) WoE: a framework for the appraisal of the quality and relevance of evidence. *Research Papers in Education*, 22(2): 213-28.

- a. Those papers featuring interventions or innovations were overrepresented
- b. Papers focusing on transport challenges were underrepresented
- b. The majority of papers focused on public transport, with private transport such as wheelchairs underrepresented

To increase the number of papers in underrepresented areas and achieve a wider range of evidence, the sum of substantive criteria was lowered to two for papers investigating that transport challenges and private transport. This ensured that researchers remained satisfied with the strength of evidence as these papers fulfilled the majority of the criteria listed above, while recognising the importance of including papers which contributed to less well-researched areas. This resulted in the inclusion of an additional 16 papers, with a total of 31 papers included in the proposed shortlist.

The shortlist, along with the REA's key research questions, were then sent to an academic subject expert for review. After careful consideration, the subject expert concluded that the shortlist was both detailed and reflected their understanding of the research undertaken in this field.

Data extraction

On screening for final inclusion, core information about each paper was placed in an extraction sheet (see Appendix F) for internal analysis use in Stage 3 (below) and subsequent report development. The extraction sheet was refined in consultation with Motability and included (amongst other areas):

- a. Short summary of key findings
- b. Sample size and level of representation (e.g. is the study nationally representative)
- c. Setting of the research (e.g. a lab, on public transport, in participant's homes)
- d. Degree to which the article focused on the Motability Scheme, including facilitators and barriers, differences between demographic groups and gaps in the scheme's provision
- e. The challenges those with disabilities experience in accessing public and private transport, use of mobility aids, and the extent to which different modes of transport are used
- f. The interventions and innovations implemented or proposed to improve access to transport for those with disabilities, what enabled or prevented their success, and the learning and recommendations from such interventions and innovations
- g. Main conclusions

To ensure consistency in how data was extracted, researchers extracted the same two papers (four separate extractions in total). During extraction it transpired that three papers did not substantially answer the relevant research questions and were therefore excluded, resulting in a total of 28 papers.

Stage 3: Narrative synthesis and information integration

The literature identified with the capacity to answer our REA research questions (see section 2.1) was heterogeneous in terms of methodologies used (e.g. cross-sectional surveys, observational, 1-2-1 interviews, focus groups). To bring these data together we used extraction sheets to carry out a narrative synthesis. Research papers and 'grey' literature were analysed using a method analogous to qualitative data analysis. A line-by-line inspection of the studies was carried out on the area of interest in each paper, e.g. the results or discussion section. Different codes were attached and then organised into broader descriptive or conceptual themes, building complete models of concepts, outcomes or findings. Inferences were then drawn from across the papers and the information was organised into coherent narratives. In interpreting the data, we were also mindful of drawing out any differences in international examples that are more (or less) transferable to the UK context.

Appendix B: Search strings for database searches

Research questions one, two and three

These search strings are designed to capture papers related to research questions one, two and three, which focus on the Motability Scheme. Specifically, the perceived barriers and facilitators to using the scheme, if specific population groups face greater or lesser barriers and facilitators, and any gaps identified in the current scheme in meeting the transportation needs of those living with disabilities. All searches were run on 2nd March 2020

Scopus

```
(TITLE-ABS-KEY ( motability )) OR ((TITLE-ABS-KEY ( "people with disabilities" OR disable* OR disability OR veteran* OR ( ex-service W/2 personnel ) OR "long-term condition*" OR "chronic condition*" OR multimorbidity OR "mental health" OR "mental illness" OR "neurological condition*" )) AND (TITLE-ABS-KEY ( ( ( government OR state ) W/2 ( aid OR assistance OR grant* OR subsid* OR help OR subvention* ) ) OR "public welfare" OR ( ( welfare W/2 eligib* ) ) ) OR TITLE-ABS-KEY ( barrier* OR obstacle* OR challeng* OR difficult* OR issue* OR problem* OR hinder OR hindrance OR inhibit* OR impeded* OR obstruct* OR hamper OR prevent* OR restrict* OR limit* OR frustrat* OR thwart* OR curtail* OR debar ) OR TITLE-ABS-KEY ( facilitat* OR motivat* OR enabl* OR empower* OR influenc* OR induc* OR encourag* OR inspir* OR instigat* OR galvanis* OR galvaniz* OR persua* OR need* OR demand* OR requir* OR access* OR use* OR using )) and (TITLE-ABS-KEY ( transport OR transportation OR vehic* OR car OR automoto* OR "motorised scooter*" OR "motorized scooter*" OR "public transit" OR wheelchair* OR rail* OR train OR trains OR bus OR buses ))) AND ( TITLE-ABS-KEY ( "united kingdom" OR uk OR britain OR ( british AND NOT ( "british columbia" OR "british guyana" ) ) OR ( england AND NOT "new england" ) OR scotland OR ( wales AND NOT ( "new south wales" ) ) OR "northern ireland" OR ulster ) ) AND ( LIMIT-TO ( PUBYEAR,2019) OR LIMIT-TO ( PUBYEAR,2016) OR LIMIT-TO ( PUBYEAR,2020) OR LIMIT-TO ( PUBYEAR,2018) OR LIMIT-TO ( PUBYEAR,2017) OR LIMIT-TO ( PUBYEAR,2015) OR LIMIT-TO ( PUBYEAR,2014) OR LIMIT-TO ( PUBYEAR,2013) OR LIMIT-TO ( PUBYEAR,2012) OR LIMIT-TO ( PUBYEAR,2011) OR LIMIT-TO ( PUBYEAR,2010) )
```

MEDLINE (R) and In-Process & Other Non-Indexed Citations and Daily (Ovid)

1 motability.ti,ab,kw. (0)

2 ("people with disabilities" or disable* or disability or veteran* or (ex-service adj2 personnel) or "long-term condition*" or "chronic condition*" or multimorbidity or "mental health" or "mental illness" or "neurological condition*").ti,ab,kw. (363232)

3 disabled persons/ or amputees/ or disabled children/ or mentally disabled persons/
or mentally ill persons/ or persons with hearing impairments/ or visually impaired
persons/ or veterans/ (79963)

4 exp Intellectual Disability/ec, lj, nu, pc, px, rh [Economics, Legislation &
Jurisprudence, Nursing, Prevention & Control, Psychology, Rehabilitation] (16995)

5 disability evaluation/ or work capacity evaluation/ (51668)

6 or/2-5 (442125)

7 (transport or transportation or vehic* or car or automoto* or "motorised scooter*" or
"motorized scooter*" or "public transit" or wheelchair* or rail* or train or trains or bus or
buses).ti,ab,kw. (580358)

8 transportation/ or motor vehicles/ or automobiles/ or railroads/ or transportation
facilities/ or parking facilities/ (23962)

9 or/7-8 (590086)

10 (((government or state) adj2 (aid or assistance or grant* or subsid* or help or
subvention*)) or "public welfare" or (welfare adj2 eligib*) or barrier* or obstacle* or
challeng* or difficult* or issue* or problem* or hinder or hindrance or inhibit* or impeded*
or obstruct* or hamper or prevent* or restrict* or limit* or frustrat* or thwart* or curtail*
or debar or facilitat* or motivat* or enabl* or empower* or influenc* or induc* or
encourag* or inspir* or instigat* or galvanis* or galvaniz* or persua* or need* or
demand* or requir* or access* or use* or using).ti,ab,kw. (16171417)

11 social welfare/ or community integration/ or personal autonomy/ (26048)

12 or/10-11 (16184373)

13 ("united kingdom" or uk or britain or (british not ("british columbia" or "british
guyana")) or (england not "new england") or scotland or (wales not "new south wales")
or "northern ireland" or ulster).ti,ab,kw. (227795)

14 united kingdom/ or exp channel islands/ or exp england/ or northern ireland/ or
exp scotland/ or wales/ (360731)

15 or/13-14 (470811)

16 6 and 9 and 12 and 15 (322)

17 1 or 16 (322)

18 limit 17 to yr="2010 -Current" (153)

PsycINFO (Ovid) <1806 to February Week 4 2020>

1 motability.ti,ab. (1)

2 ("people with disabilities" or disable* or disability or veteran* or (ex-service adj2 personnel) or "long-term condition*" or "chronic condition*" or multimorbidity or "mental health" or "mental illness" or "neurological condition*").ti,ab. (299065)

3 disability evaluation/ or "disabled (attitudes toward)"/ or disabled personnel/ or exp disability laws/ or disability management/ or impaired professionals/ or disabilities/ or exp learning disabilities/ or exp multiple disabilities/ or exp reading disabilities/ or disability discrimination/ or mental disorders/ or mental health/ or hearing disorders/ or exp deaf/ or partially hearing impaired/ or vision disorders/ or partially sighted/ or military veterans/ (231612)

4 or/2-3 (408608)

5 (transport or transportation or vehic* or car or automoto* or "motorised scooter*" or "motorized scooter*" or "public transit" or wheelchair* or rail* or train or trains or bus or buses).ti,ab. (69477)

6 transportation/ or exp ground transportation/ or public transportation/ or "commuting (travel)"/ or mobility aids/ (8894)

7 or/5-6 (71962)

8 (((government or state) adj2 (aid or assistance or grant* or subsid* or help or subvention*)) or "public welfare" or (welfare adj2 eligib*) or barrier* or obstacle* or challeng* or difficult* or issue* or problem* or hinder or hindrance or inhibit* or impeded* or obstruct* or hamper or prevent* or restrict* or limit* or frustrat* or thwart* or curtail* or debar or facilitat* or motivat* or enabl* or empower* or influenc* or induc* or encourag* or inspir* or instigat* or galvanis* or galvaniz* or persua* or need* or demand* or requir* or access* or use* or using).ti,ab. (3418740)

9 community services/ or exp community mental health services/ or community welfare services/ or exp "Welfare Services (Government)"/ or autonomy/ or empowerment/ or exp Employment Discrimination/ or exp Social Discrimination/ or exp Age Discrimination/ or exp Disability Discrimination/ or exp Discrimination Laws/ or exp "Race and Ethnic Discrimination"/ or Government Policy Making/ (72541)

10 or/8-9 (3431396)

11 ("united kingdom" or uk or britain or (british not ("british columbia" or "british guyana")) or (england not "new england") or scotland or (wales not "new south wales") or "northern ireland" or ulster).ti,ab,lo. (154444)

12 4 and 7 and 10 and 11 (266)

13 1 or 12 (266)

14 limit 13 to (english language and yr="2010 -Current") (135)

Research questions four and five

These research questions are designed to capture papers related to research questions four and five, focusing on the transport challenges (both public and private)

faced by those living with disabilities and any interventions which have facilitated their access to transport.

Scopus

(TITLE-ABS-KEY (transport OR transportation OR vehic* OR car OR automoto* OR "motorised scooter*" OR "motorized scooter*" OR "public transit" OR wheelchair* OR rail* OR train OR trains OR bus OR buses)) and (TITLE-ABS-KEY ("people with disabilities" OR disable* OR disability OR veteran* OR (ex-service W/2 personnel) OR "long-term condition*" OR "chronic condition*" OR multimorbidity OR "mental health" OR "mental illness" OR "neurological condition*")) and (TITLE-ABS-KEY (intervention* OR benefit* OR payment* OR grant* OR award* OR subsid* OR bursary OR dla OR "disability living allowance" OR pip OR "personal independence payment*" OR donation* OR allowance* OR subvention* OR barrier* OR obstacle* OR challeng* OR difficult* OR issue* OR problem* OR hinder OR hindrance OR inhibit* OR impeded* OR obstruct* OR hamper OR prevent* OR restrict* OR limit* OR frustrat* OR thwart* OR curtail* OR debar OR challeng* OR problem* OR troubl* OR exclusion* OR experienc* OR tolerat* OR feel* OR encounter* OR confront*)) and (TITLE-ABS-KEY ("united kingdom" OR uk OR britain OR (british AND NOT ("british columbia" OR "british guyana")) OR (england AND NOT "new england") OR scotland OR (wales AND NOT ("new south wales")) OR "northern ireland" OR ulster)) AND (LIMIT-TO (PUBYEAR,2020) OR LIMIT-TO (PUBYEAR,2019) OR LIMIT-TO (PUBYEAR,2018) OR LIMIT-TO (PUBYEAR,2017) OR LIMIT-TO (PUBYEAR,2016) OR LIMIT-TO (PUBYEAR,2015) OR LIMIT-TO (PUBYEAR,2014) OR LIMIT-TO (PUBYEAR,2013) OR LIMIT-TO (PUBYEAR,2012) OR LIMIT-TO (PUBYEAR,2011) OR LIMIT-TO (PUBYEAR,2010))

Ovid MEDLINE(R) and In-Process & Other Non-Indexed Citations and Daily <1946 to February 28, 2020>

- 1 motability.ti,ab,kw. (0)
- 2 ("people with disabilities" or disable* or disability or veteran* or (ex-service adj2 personnel) or "long-term condition*" or "chronic condition*" or multimorbidity or "mental health" or "mental illness" or "neurological condition*").ti,ab,kw. (363232)
- 3 disabled persons/ or amputees/ or disabled children/ or mentally disabled persons/ or mentally ill persons/ or persons with hearing impairments/ or visually impaired persons/ or veterans/ (79963)
- 4 exp Intellectual Disability/ec, lj, nu, pc, px, rh [Economics, Legislation & Jurisprudence, Nursing, Prevention & Control, Psychology, Rehabilitation] (16995)
- 5 disability evaluation/ or work capacity evaluation/ (51668)
- 6 or/2-5 (442125)
- 7 (transport or transportation or vehic* or car or automoto* or "motorised scooter*" or "motorized scooter*" or "public transit" or wheelchair* or rail* or train or trains or bus or buses).ti,ab,kw. (580358)

8 transportation/ or motor vehicles/ or automobiles/ or railroads/ or transportation facilities/ or parking facilities/ (23962)

9 or/7-8 (590086)

10 (intervention* or benefit* or payment* or grant* or award* or subsid* or bursary or dla or "disability living allowance" or pip or "personal independence payment*" or donation* or allowance* or subvention* or barrier* or obstacle* or challeng* or difficult* or issue* or problem* or hinder or hindrance or inhibit* or impeded* or obstruct* or hamper or prevent* or restrict* or limit* or frustrat* or thwart* or curtail* or debar or challeng* or problem* or troubl* or exclusion* or experienc* or tolerat* or feel* or encounter* or confront*).ti,ab,kw. (9143662)

11 social welfare/ or community integration/ or personal autonomy/ or empowerment/ or social discrimination/ or social isolation/ or social marginalization/ (40453)

12 or/10-11 (9166341)

13 ("united kingdom" or uk or britain or (british not ("british columbia" or "british guyana")) or (england not "new england") or scotland or (wales not "new south wales") or "northern ireland" or ulster).ti,ab,kw. (227795)

14 united kingdom/ or exp channel islands/ or exp england/ or northern ireland/ or exp scotland/ or wales/ (360731)

15 13 or 14 (470811)

16 6 and 9 and 12 and 15 (257)

17 1 or 16 (257)

18 limit 17 to yr="2010 -Current" (**134**)

PsycINFO (Ovid) <1806 to February Week 4 2020>

1 motability.ti,ab. (1)

2 ("people with disabilities" or disable* or disability or veteran* or (ex-service adj2 personnel) or "long-term condition*" or "chronic condition*" or multimorbidity or "mental health" or "mental illness" or "neurological condition*").ti,ab. (299065)

3 disability evaluation/ or "disabled (attitudes toward)"/ or disabled personnel/ or exp disability laws/ or disability management/ or impaired professionals/ or disabilities/ or exp learning disabilities/ or exp multiple disabilities/ or exp reading disabilities/ or disability discrimination/ or mental disorders/ or mental health/ or hearing disorders/ or exp deaf/ or partially hearing impaired/ or vision disorders/ or partially sighted/ or military veterans/ (231612)

4 or/2-3 (408608)

5 (transport or transportation or vehic* or car or automoto* or "motorised scooter*" or "motorized scooter*" or "public transit" or wheelchair* or rail* or train or trains or bus or buses).ti,ab. (69477)

6 transportation/ or exp ground transportation/ or public transportation/ or "commuting (travel)"/ or mobility aids/ (8894)

7 or/5-6 (71962)

8 (intervention* or benefit* or payment* or grant* or award* or subsid* or bursary or dla or "disability living allowance" or pip or "personal independence payment*" or donation* or allowance* or subvention* or barrier* or obstacle* or challeng* or difficult* or issue* or problem* or hinder or hindrance or inhibit* or impeded* or obstruct* or hamper or prevent* or restrict* or limit* or frustrat* or thwart* or curtail* or debar or challeng* or problem* or troubl* or exclusion* or experienc* or tolerat* or feel* or encounter* or confront*).ti,ab. (2377468)

9 community services/ or exp community mental health services/ or community welfare services/ or exp "Welfare Services (Government)"/ or funding/ or autonomy/ or empowerment/ or employee benefits/ or employee assistance programs/ or disability evaluation/ (50545)

10 or/8-9 (2394045)

11 ("united kingdom" or uk or britain or (british not ("british columbia" or "british guyana")) or (england not "new england") or scotland or (wales not "new south wales") or "northern ireland" or ulster).ti,ab,lo. (154444)

12 4 and 7 and 10 and 11 (222)

13 1 or 12 (223)

14 limit 13 to (english language and yr="2010 -Current") (117)

Research question six

These search strings are designed to capture papers related to research question six, which asks what innovations and/or interventions are necessary to enable those living with disabilities the same choice and freedom of transport as their non-disabled peers.

Scopus

(TITLE-ABS-KEY (transport OR transportation OR vehic* OR car OR automoto* OR "motorised scooter*" OR "motorized scooter*" OR "public transit" OR wheelchair* OR rail* OR train OR trains OR bus OR buses)) and (TITLE-ABS-KEY ("people with disabilities" OR disable* OR disability OR veteran* OR (ex-service W/2 personnel) OR "long-term condition*" OR "chronic condition*" OR multimorbidity OR "mental health" OR "mental illness" OR "neurological condition*")) and (TITLE-ABS-KEY (intervention* OR benefit* OR payment* OR grant* OR award* OR subsid* OR bursary OR dla OR "disability living allowance" OR pip OR "personal independence payment*" OR donation* OR allowance* OR subvention* OR policy OR policies OR strategy OR strategies OR scheme* OR program* OR system OR systems OR plan OR plans OR benefit* OR support OR help OR aid OR assist* OR enabler* OR enabling OR

enablement)) and (TITLE-ABS-KEY ("united kingdom" OR uk OR britain OR (british AND NOT ("british columbia" OR "british guyana")) OR (england AND NOT "new england") OR scotland OR (wales AND NOT ("new south wales")) OR "northern ireland" OR ulster OR sweden OR denmark OR finland OR norway OR australia OR "United States" OR usa OR canada OR germany OR japan OR france OR netherlands OR "New Zealand")) AND (LIMIT-TO (PUBYEAR,2020) OR LIMIT-TO (PUBYEAR,2019) OR LIMIT-TO (PUBYEAR,2018) OR LIMIT-TO (PUBYEAR,2017) OR LIMIT-TO (PUBYEAR,2016) OR LIMIT-TO (PUBYEAR,2015) OR LIMIT-TO (PUBYEAR,2014) OR LIMIT-TO (PUBYEAR,2013) OR LIMIT-TO (PUBYEAR,2012) OR LIMIT-TO (PUBYEAR,2011) OR LIMIT-TO (PUBYEAR,2010)) AND (LIMIT-TO (LANGUAGE,"English")) AND (LIMIT-TO (SUBJAREA,"SOCI") OR LIMIT-TO (SUBJAREA,"HEAL") OR LIMIT-TO (SUBJAREA,"ENGI") OR LIMIT-TO (SUBJAREA,"NURS") OR LIMIT-TO (SUBJAREA,"MULT") OR LIMIT-TO (SUBJAREA,"DECI") OR LIMIT-TO (SUBJAREA,"ECON") OR LIMIT-TO (SUBJAREA,"Undefined"))

Ovid MEDLINE(R) and In-Process & Other Non-Indexed Citations and Daily <1946 to February 28, 2020> Searched 2nd March 2020

- 1 motability.ti,ab,kw. (0)
- 2 ("people with disabilities" or disable* or disability or veteran* or (ex-service adj2 personnel) or "long-term condition*" or "chronic condition*" or multimorbidity or "mental health" or "mental illness" or "neurological condition*").ti,ab,kw. (363232)
- 3 disabled persons/ or amputees/ or disabled children/ or mentally disabled persons/ or mentally ill persons/ or persons with hearing impairments/ or visually impaired persons/ or veterans/ (79963)
- 4 exp Intellectual Disability/ec, lj, nu, pc, px, rh [Economics, Legislation & Jurisprudence, Nursing, Prevention & Control, Psychology, Rehabilitation] (16995)
- 5 disability evaluation/ or work capacity evaluation/ (51668)
- 6 or/2-5 (442125)
- 7 (transport or transportation or vehic* or car or automoto* or "motorised scooter*" or "motorized scooter*" or "public transit" or wheelchair* or rail* or train or trains or bus or buses).ti,ab,kw. (580358)
- 8 transportation/ or motor vehicles/ or automobiles/ or railroads/ or transportation facilities/ or parking facilities/ (23962)
- 9 or/7-8 (590086)
- 10 (intervention* or benefit* or payment* or grant* or award* or subsid* or bursary or dla or "disability living allowance" or pip or "personal independence payment*" or donation* or allowance* or subvention* or policy or policies or strategy or strategies or scheme* or program* or system or systems or plan or plans or benefit* or support or help or aid or assist* or enabler* or enabling or enablement).ti,ab,kw. (6752321)

11 social welfare/ or community integration/ or personal autonomy/ or empowerment/
(26113)

12 or/10-11 (6768086)

13 ("united kingdom" or uk or britain or (british not ("british columbia" or "british
guyana")) or (england not "new england") or scotland or (wales not "new south wales")
or "northern ireland" or ulster or sweden or denmark or finland or norway or australia or
"United States" or usa or canada or germany or japan or france or netherlands or "New
Zealand").ti,ab,kw. (1080775)

14 united kingdom/ or exp channel islands/ or exp england/ or northern ireland/ or
exp scotland/ or wales/ or exp canada/ or exp united states/ or exp japan/ or exp
france/ or exp germany/ or netherlands/ or "scandinavian and nordic countries"/ or exp
denmark/ or finland/ or exp norway/ or sweden/ or exp australia/ or exp new zealand/
(2536236)

15 13 or 14 (3022771)

16 6 and 9 and 12 and 15 (1781)

17 1 or 16 (1781)

18 limit 17 to yr="2010 -Current" (1014)

19 limit 18 to english language (990)

PsycINFO (Ovid) <1806 to February Week 4 2020> Searched 2nd March 2020

1 motability.ti,ab. (1)

2 ("people with disabilities" or disable* or disability or veteran* or (ex-service adj2
personnel) or "long-term condition*" or "chronic condition*" or multimorbidity or "mental
health" or "mental illness" or "neurological condition*").ti,ab. (299065)

3 disability evaluation/ or "disabled (attitudes toward)"/ or disabled personnel/ or exp
disability laws/ or disability management/ or impaired professionals/ or disabilities/ or
exp learning disabilities/ or exp multiple disabilities/ or exp reading disabilities/ or
disability discrimination/ or mental disorders/ or mental health/ or hearing disorders/ or
exp deaf/ or partially hearing impaired/ or vision disorders/ or partially sighted/ or
military veterans/ (231612)

4 or/2-3 (408608)

5 (transport or transportation or vehic* or car or automoto* or "motorised scooter*" or
"motorized scooter*" or "public transit" or wheelchair* or rail* or train or trains or bus or
buses).ti,ab. (69477)

6 transportation/ or exp ground transportation/ or public transportation/ or
"commuting (travel)"/ or mobility aids/ (8894)

7 or/5-6 (71962)

8 (intervention* or benefit* or payment* or grant* or award* or subsid* or bursary or dla or "disability living allowance" or pip or "personal independence payment*" or donation* or allowance* or subvention* or policy or policies or strategy or strategies or scheme* or program* or system or systems or plan or plans or benefit* or support or help or aid or assist* or enabler* or enabling or enablement).ti,ab. (1905902)

9 community services/ or exp community mental health services/ or community welfare services/ or exp "Welfare Services (Government)"/ or autonomy/ or empowerment/ (43039)

10 or/8-9 (1918449)

11 ("united kingdom" or uk or britain or (british not ("british columbia" or "british guyana")) or (england not "new england") or scotland or (wales not "new south wales") or "northern ireland" or ulster or sweden or denmark or finland or norway or australia or "United States" or usa or canada or germany or japan or france or netherlands or "New Zealand").ti,ab,lo. (629038)

12 4 and 7 and 10 and 11 (772)

13 1 or 12 (772)

14 limit 13 to (english language and yr="2010 -Current") (500)

Appendix C: Search terms for grey-literature searches

The following search terms were used for the grey-literature searches. The search applied a fluid approach, due the varied nature and sophistication of each website's search engine. For example, whereas some search engines support the use of BOOLEAN operators, others allow the user to categorise or filter their search by transport, thus rendering the 'transport' search term redundant.

Name of organisation/website	Search terms and filter
Joseph Rowntree Foundation Policy Exchange Bright Blue Centre for Policy Studies IPPR Mind Scope MS society Papworth Trust	<ol style="list-style-type: none"> 1. Filtered on "disabled people". 2. Search for "transport" 3. Search for "motability" 4. Search for "subsidy" 5. Search for "mobility"
Age UK	<ol style="list-style-type: none"> 1. Filtered on "reports and briefings" 2. Search for "motability"
Social Care Institute for Excellence	<ol style="list-style-type: none"> 1. Search for "motability" 2. Filtered on "transport" 3. Filtered on "disabilities"
Department for Transport	<ol style="list-style-type: none"> 1. Filtered on dates AND "department for transport" and search for "disabled AND motability" 2. Filtered on "research and statistics" 3. Filtered on "policy papers and consultations"
Government Office for Science	<ol style="list-style-type: none"> 1. Filtered on dates AND "government office for science" and filtered on topic "transport" 2. Added filter for sub-topic "Transport accessibility and mobility"
The OECD	<ol style="list-style-type: none"> 1. Search for "motability" 2. Search for "transport* AND intervention** AND disab**" 3. Search for "motability" 4. Search for "transport and disability" 5. (All Fields contains 'disab**') from (contains 'en') AND from (All Fields contains 'interven*') AND from (IGO collection contains 'OECD') From Theme Transport published between 2010 and 2020

Name of organisation/website	Search terms and filter
Open Grey	<ol style="list-style-type: none"> 1. Search for "motability" 2. Search for (DISAB* or MOBIL*) AND TRANSPORT* 3. Search for "transport* AND intervention* AND access**"
Social Market Foundation	<ol style="list-style-type: none"> 1. Search for "motability" 2. Searches for "transport AND disability", "transport* AND disab**", "transport" 3. Filtered on topic "Transport" and output type "Publications, sorted by year to view 2010 onwards, searched within PDFs for string "disab" 4. Filtered on topic "Health and Social Care" and output type "Publications", sorted by year to view 2010- onwards, searched within potentially relevant PDFs for strings "disab" and "transport". 5. Filtered on topic "Welfare" and output type "Publications", sorted by year to view 2010-onwards, searched within PDFs for string "transport" 6. Search for "disability" and filtered on "Publications" and sorted by date
Policy Exchange	<ol style="list-style-type: none"> 1. Search for "motability" 2. Search for "disability" 3. Review of first 7 pages of Publications pages
Bright Blue	<ol style="list-style-type: none"> 1. Search for "motability" 2. Filtered on Library - webpage containing all the organisation's publications 3. Search for "transport"
Centre for Policy Studies	<ol style="list-style-type: none"> 1. Search for "motability" 2. Search for "disability" 3. Search for "transport" AND January 2010-February 2020
Institute for Public Policy Research (IPPR)	<ol style="list-style-type: none"> 1. Search for "motability" 2. Search for "transport", filtered on "Publications"
Mind	<ol style="list-style-type: none"> 1. Search for "motability" 2. Search for "transport" 3. Browse through all reports
Scope	<ol style="list-style-type: none"> 1. Search for "motability"
MS Society	<ol style="list-style-type: none"> 1. Search for "motability" 2. Search for "motability" 3. Search for "transport"
Papworth Trust	<ol style="list-style-type: none"> 1. Viewed all publications 2. Search for "motability" 3. Search for "transport"

Appendix D: Inclusion/exclusion criteria for title and abstract screening

Motability: Disability and transport needs, gaps and innovation: Title and Abstract Screening Tool		
All papers <u>must</u> feature one inclusion factor from <u>each</u> row in rows 1-5		
Criteria	Inclusion factors	Exclusion factors
1. Country focused in research (OECD member states)	Research question 1-5: UK Research question six: UK OR Sweden OR Denmark OR Finland OR Norway OR Australia OR United States OR Canada OR Germany OR Japan OR France OR Netherlands OR New Zealand)	All other countries
2. Date of publication	January 2010 – February 2020	Published outside of these dates
3. Publication language	English	Languages other than English
4. Evidence type	All types of evaluative studies (where available): systematic literature reviews (including scoping reviews, rapid evidence assessments, meta-analyses, narrative analyses), randomised control trials, quasi-experimental studies (including cohort and pragmatic trials, case and observational studies. Grey literature (those publications or policies not published in peer reviewed journals).	Protocols, opinion pieces, popular media (e.g., blogs, social media feeds and/ or newspaper articles).
5. Methodology	All paradigms (i.e., quantitative, qualitative, mixed methods).	Where methods are unclear, do not respond to the research question and/ or are of low-quality (excluding grey literature).
All papers <u>must</u> feature one inclusion factor from <u>at least one</u> of rows 6-9		
Criteria	Inclusion factors	Exclusion factors
6. Substantive topic: access to the Motability Scheme	Article discusses the barriers and/or facilitators to accessing and using the Motability Scheme, including if specific population groups are affected	Access to other transportation schemes; access for those without mobility issues
7. Substantive topic: gaps in the Mobility scheme	Article discusses any gaps in the current Motability Scheme when meeting the needs of those with mobility issues	Gaps in other transportation schemes; gaps in DLA or PIP This does not include those who do not qualify for the enhanced payment but have mobility issues
8. Substantive topic: transport challenges and interventions	Article discusses the transport challenges those with disabilities face in the UK, both public and private. Article identifies or discusses interventions or innovations that mitigate/ improve access to transport. This includes those with the enhanced DLA and PIP, and those who do not qualify for the enhanced payment but have mobility issues.	Non-UK challenges to transport (except flying); non-UK based interventions; proposed interventions as opposed to functioning/past interventions;
9. Substantive topic: policies and strategies	Article discusses innovations and interventions that have been enacted and/ or proposed to create parity in transport between those who are disabled and their non-disabled peers. This includes those with the enhanced DLA and PIP, as well as those who do not qualify for the enhanced payment but have mobility issues.	Policies or strategies in any other country other than UK, Sweden, Denmark, Finland, Norway, Australia, United States, Canada, Germany, Japan, France, Netherlands, New Zealand.

Appendix E: Full text screening and Weight of Evidence (WoE)

Full text screening consisted of recording article information, substantive criteria marking, and WoE scoring.

Please see below for the article information recorded:

Search string	Article ID	Article Title	Article Author (all names)	Screened by	Year of publication	Country	Evidence type	Disability/Population type	Transport type
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Please see below for the substantive criteria each paper was marked against:

Article discusses to what extent people are using different modes of transport	Article discusses the barriers and facilitators to accessing and using the Motability Scheme	Article discussed specific demographic groups in relation to the barriers and facilitators to accessing and using the Motability Scheme	Article discussed the gaps in the Motability Scheme's aim to meet transportation needs of those with disabilities	Article discussed the transport challenges of those living with disabilities	Article discussed what interventions and innovations have maximised access to transport for those with disabilities	Article discussed what innovations are necessary to enable parity of choice and freedom of transport	(If applicable) Please state if columns P and Q applies to an innovation or intervention	Article focuses on the Motability Scheme itself
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Please see below for the WoE (WoE) tool used to assess the quality of papers:

<p>Is there a clear statement of the aims and objectives and/or clear research questions? (Yes = 1; No = 0)</p>	<p>Do the study authors justify their sampling strategy (or data selection strategy if not collecting primary data) as representative and/or appropriate for the research questions/aims? (Yes = 1; No = 0)</p>	<p>Is the method of data collection clearly described by the researchers as being appropriate to answer the aims/research questions? (Yes = 1; No = 0)</p>	<p>Do the researchers identify ethical issues involved in the study design and explain steps to address these? (Yes = 1; No = 0)</p>	<p>Is the paper or research team explicit about sources of funding for the project? (Yes and it's a potentially conflicting industry e.g. car industry =1, Yes and non-conflicting=2, No=0)</p>	<p>Are the methods for data analysis justified as being appropriate for the aims/objectives and/or research questions? (Yes = 1; No = 0)</p>	<p>Are there any concerns regarding accuracy (e.g. discrepancies within the report)? (Yes = 0; No = 1)</p>	<p>Is sufficient data/ evidence presented to support the discussion/ conclusions? (Yes = 1; No = 0)</p>
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Appendix F: Data extraction tool

The data extraction tool recorded the same article information as the full text screening tool (see appendix D). Data was extracted relevant to the themes outlined below:

Short summary of key findings	Sample size and comment as to whether nationally representative	What setting did the research take place in?	What are the perceived barriers to accessing the Motability Scheme?	What are the perceived facilitators to accessing the Motability Scheme?	What are the perceived barriers and facilitators in relation to specific demographic groups?	What are the gaps in the Motability Schemes sim to meeting people's transportation needs?
The challenges those with disabilities experience in accessing public and private transport in the UK	The challenges those with disabilities experience in accessing mobility aids the UK	To what extent are disabled people using different types of transport?	To what extent are disabled people using different mobility aids?	Does the article focus on an intervention? If so, please explain what this is	If applicable, to what extent was the intervention a success	What were the facilitators and barriers of the intervention?

What were the learnings and recommendations?	Does the article focus on an innovation? If so, please explain what this is	If applicable, to what extent was the innovation a success	What were the facilitators and barriers of the innovation?	What were the learnings and recommendations?	Does the article propose any type of intervention? If so, what does this look like?	Does the article propose any type of innovation? If so, what does this look like?	Any further comments/ notes
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