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Dyslexia and mobility-related social exclusion: the role of travel information provision

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Transport is increasingly recognised as having a significant impact upon quality of life for people with disabilities. The ability to access opportunities, services, social networks and other goods is highly dependent upon the ability to access private and/or public transport. However, there are many barriers to transport access for people with disabilities. This paper considers access to the transport system for those with a specific learning disability, namely, dyslexia. The paper reports results from a series of focus groups, which highlight the problems accessing and using travel information for this group. The contribution of inaccessible information to mobility-related social exclusion is highlighted. It is argued that there is a need for accessible information as a component of strategies to tackle mobility-related social exclusion. In this context, the paper presents a number of recommendations that may facilitate greater ease of use of private and public transport for those with dyslexia, with an emphasis upon actions to create more accessible information systems. Such improvements are likely to benefit those with other learning disabilities, while also improving the usability of information systems for non-disabled travellers.

Keywords: transport; dyslexia; travel information; social exclusion; focus groups.

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Dyslexia and mobility-related social exclusion: the role of travel information provision

1. Introduction

Transport is increasingly recognised as having a significant impact upon quality of life for people with disabilities[1]. The ability to access opportunities, services, social networks and other goods is highly dependent upon the ability to access private and/or public transport. However, there are many barriers to transport access for people with disabilities. This can result in exclusion from the transport system, which can contribute to mobility-related social exclusion. This paper considers access to the transport system for those with dyslexia, a specific learning disability that affects the ability to read, spell, listen and write. Dyslexia affects at least 6 per cent of the UK population and 8 per cent of the world population (European Dyslexic Association, 2007), affecting those using alphabetic-style languages and those whose languages are based upon symbols rather than letters (Miles, 1993; Beaton, 2004). This paper reports results from focus groups undertaken in **200.** The research was framed by the hypothesis that mobility-related social exclusion is experienced by this group and the existence of such exclusion emerged strongly and naturally. Discussions aimed to uncover the reasons why people with dyslexia feel excluded from the transport system, with a specific focus upon the role of travel information as a contributor towards mobility-related exclusion.

The paper progresses through the following sections. Firstly, dyslexia is defined. Next, we discuss the contribution of a lack of mobility to social exclusion, in terms of consequences and causes, with a particular focus upon people with disabilities. The role of travel information provision in exclusion is highlighted. The research method is then presented. Results and discussion illustrate the complex way in which people with dyslexia interact with travel information and the contribution that this makes towards the mobility-related social exclusion of this group. The paper concludes with a number of recommended actions, to create more accessible information systems. It is suggested that this Is likely to facilitate greater ease of use of private and public transport for those with dyslexia, whilst serendipitously increasing usability for those without disability.

This paper draws primarily upon the UK evidence base, reflecting the location of the primary data collection. However, given the worldwide incidence of dyslexia, it is suggested that the analysis that follows is likely to be applicable outside of the UK.

[1] Section 1 of the Disability Discrimination Act 1995 defines disability as 'someone with a physical or mental impairment which has a substantial and long-term adverse effect on his/her ability to carry out normal day-to-day activities' (Department for Work and Pensions, 2007)

2. Current perspectives on dyslexia

There have been significant advances in research into dyslexia over the past two decades. Advances in MRI and other forms of brain imagery have helped to aid explanations of dyslexia, support policy and practice, and shape modern definitions (Reid, 2009a). However, a single definition of dyslexia escapes us (Solan, 1993; Miles, 1995). The following definition underlies this paper, because it best reflects current thinking in the field:

> [Dyslexia is] A specific learning difficulty which mainly affects the development of literacy and language related skills. It is likely to be present at birth and to be lifelong in its effects. It is characterised by difficulties with phonological processing, rapid naming, working memory, processing speed, and the automatic development of skills that may not match up an individual's other cognitive abilities. It tends to be resistant to convention teaching methods, but its effects can be mitigated by appropriately specific intervention, including the application of information technology and supportive counselling.
>
> (British Dyslexia Association, 2009).

Definitions of dyslexia such as the one above commonly provide a medicalised discourse of deficits. The authors recognise an alternative approach, based upon a more social discourse and focusing upon what people with dyslexia can do, because of a different cognitive style. For example, someone with dyslexia can be particularly intuitive and creative (Corrigan, 2001). The social discourse also emphasises the disabling nature of the environment, as opposed to the disabling nature of individual characteristics. Within this paper, reflecting the focus group findings, we consider both aspects of dyslexia: the disabling nature of individual characteristics and the disabling nature of the environment.

Dyslexia is a complex disability and there is much debate, not only regarding its definition, but also its root causes. A substantial body of evidence supports a core phonological deficit: that is, difficulty in learning and organising the sounds needed for clear speech, reading and spelling (Murphy, 2003; Ramus, 2003). This perspective has arisen from the evidence that phonological processing difficulties (particularly when related to phonological decoding) have been a major distinguishing factor between dyslexics and non-dyslexics (Rack et al, 1992; Bruck, 1993; Elbro et al, 1994; Snowling, 2000; Vellutino et al, 2004, cited Reid, 2009a).

The view that a phonological deficit is the only core deficit in developmental dyslexia is questionable, considering the evidence highlighting the heterogeneity of the dyslexic population. Recent studies by Reid et al (2007) and Ziegler et al (2008) revealed a striking heterogeneity of psychophysical and cognitive profiles amongst the people involved in the studies.

Sub-typing analyses by Ziegler et al (2008) suggests that dyslexics almost always have more than a single underlying deficit, further highlighting the importance of considering dyslexia at the individual level rather than as a unitary disorder. However, from a policy perspective, a common classification is sought. Considering this, Brunswick (2009) argues that it is useful to classify individuals with common dyslexic difficulties in to two main sub-types, with the majority of people with dyslexia displaying a combination of the two:

- Phonological dyslexia: characterised by a difficulty in converting written letters into their corresponding sounds. Individuals have difficulty reading non-words.
- Surface dyslexia: characterised by a difficulty in recognising words visually, as whole units. Individuals have difficulty reading irregular words.

This sub-typing informs the understanding of dyslexia applied in this paper.

Finally, gender differences in the incidence of dyslexia exist: a ratio of 3 or 4 males to 1 female is quoted in the literature (Beaton, 2004; Miles, 2004). No other socio-demographic factors relating to the incidence of dyslexia are discussed in the literature.

This paper now turns to discuss the contribution of a lack of mobility to social exclusion, in terms of consequences and causes, with a particular focus upon people with disabilities. The role of information provision in mobility-related social exclusion is highlighted along with the policy developments around exclusion.

3. Travel information provision and mobility-related social exclusion

3.1. Social exclusion

Social exclusion emerged in the 1990s as the dominant discourse informing the conceptualisation of disadvantage in Europe, influencing theory and policy surrounding its causes, consequences and alleviation. It was embraced in the UK in 1997 following the election of the Labour government, which pledged to place the reduction of social exclusion at the heart of all government policy. This was to be coordinated by the cross-departmental Social Exclusion Unit (SEU), later reformed as the Social Exclusion Taskforce (SET).

3.2. Transport and mobility-related social exclusion

In 1998, the SEU launched a programme of research and consultation to inform their national strategy for neighbourhood renewal, which aimed to uncover the underlying causes of and solutions for social exclusion (SEU, 1998, 2000a). Transport and accessibility were not a focus of the research. However, these factors emerged as key contributors to social exclusion, across

many Policy Action Teams (SEU, 2000b). In transport policy, the 1998 White Paper (DETR, 1998) recognised the social policy impacts of transport policy. This led to a study of inadequate public transport and the experience of social exclusion (DETR, 2000). Responding to these findings and to a growing body of research by academic and community organisations, the SEU launched a two-year consultation into the links between (private and public) transport and social exclusion (SEU, 2001). The subsequent report (SEU, 2003) confirmed the role of transport in both causing and reinforcing social exclusion in today's mobility-dependent society.

Mobility-related social exclusion can be conceptualised within two discourses: that highlighting the problem of too little mobility and that focusing upon the problem of too much mobility (Kenyon, 2006). Within this paper, we take as our focus the problem of social exclusion as a result of too little mobility. The following definition of mobility-related social exclusion informs this research:

> Mobility-related social exclusion is the process by which people are prevented from participating in the economic, political and social life of the community because of reduced accessibility to opportunities, services and social networks, due in whole or in part to insufficient mobility in a society and environment built around the assumption of high mobility. Kenyon et al, 2002.

There is now a considerable literature linking low mobility and low accessibility to the activities, facilities and services that are considered essential for well being and quality of life for citizens in societies across the globe.

3.3 Disability and mobility-related social exclusion

'Transport disadvantage is not equally or randomly distributed throughout society, but follows the well-established lines of structural social inequality' (Hamilton and Jenkins, 1992). 'People with disabilities, elderly people, children and their carers, the unemployed and low paid, those living in certain areas, both urban and rural, people who are subjected to particular forms of prejudice, racist, sexist or homophobic' (Torrance, 1992), can find that they have difficulties using the current transport system. As a result, they experience different levels of mobility and accessibility. This is evident in statistics concerning distance travelled, the number of trips made and the modes used by different groups in society (DfT, 2005a).

People with disabilities experience a greater degree of exclusion from the current transport system than people without disability. Statistics suggest that people with disabilities make a third fewer journeys on average than those without, travelling less far, less often, by a more limited number of modes, reflecting their lower car ownership (and therefore fewer miles travelled by car) and fewer journeys made on foot and by rail (DfT, 2007).

For those with disabilities, exclusion occurs at every stage of the 'journey lifecycle'. Considering travel by public transport, the journey lifecycle includes journey planning, through travel to the interchange, arrival at the interchange, buying a ticket, finding the correct service, boarding the chosen mode of transport, getting to the desired destination and alighting from the vehicle (Human Engineering Limited (HEL) and Guide Dogs for the Blind Association (GDBA), 2008). Considering travel by private transport (car as driver or passenger), the journey lifecycle includes journey planning and execution, including the complexities of vehicle operation, negotiation of entry and exit from carriageways and information use en route, including pre-and in-trip information use. Examples of disabling factors at each stage of the journey lifecycle (travel by public transport) are considered in Table 1.

Table 1 inserted here, please.

3.3.1 People with a learning disability

As previously mentioned, dyslexia is a form of learning disability. Reduction in mobility-related social exclusion can facilitate independent living. These are worthwhile goals for all individuals to strive for. Yet, there is a lack of appreciation of the benefits that this can bring to people with learning disabilities (TTR, 2002 and 2004). Evidence suggests that mobility-related social exclusion is experienced by people with learning disabilities (Gates, 2007) of which dyslexia is a form: that they are more likely to avoid networks, routes and modes where they are treated unequally or less favorably, which adversely affects the choices and opportunities available to them (Mencap, 2004; TTR, 2002, 2004).

Carpenter (1994) highlights a number of barriers to travel on public transport for people with learning disabilities[2]:

1. Vehicle Accessibility
    - Boarding the correct vehicle;
    - Coping with a crowded environment;
    - Understanding announcements;
    - Knowing when to alight the vehicle.
2. Station Access
    - Navigating the station, i.e. entrances, routes to vehicles;
    - Understanding signs and graphic displays;
    - Identifying the correct route;
    - Locating facilities;
    - Understanding public announcement systems;
    - Accessing ticket machines and information points;
    - Correctly using gates and turnstiles;
    - Navigating the station to exit.
3. Emergency Situations

An emergency situation, defined by Carpenter as a situation outside of the norm, such as power failure; vehicle, route or timetable change; and crowded conditions, requires greater skills than normal in order to cope and react appropriately. These skills are not necessarily available to people with learning disabilities. This type of situation can cause the individual to feel a sense of

[2] Meadows (1992; cited in Lavery, 1998) highlights similar issues

anxiety, reacting similarly to how a person without a learning disability would in a real emergency, such as panic and incorrect or inefficient decision-making.

Ease of access to the public transport system means facilitation and support that is sufficient to enable individuals to easily understand and use:

- Transit vehicles;
- Routes and networks;
- Paths of travel, e.g. entrances, exits;
- Primary functions, e.g. platforms;
- Amenities, e.g. ticket machines, telephones;
- Emergency facilities, e.g. exits and emergency procedures.

The limitations of people with learning disabilities also have a number of implications for private transport (car as driver). Telscan (1999) identify the barriers facing this group:

- The multitasking nature of the driving task;
- Correctly estimating the speeds of surrounding traffic;
- Correctly estimating time and distance;
- Reacting in good time to sudden hazards or unexpected situations;
- Easily navigating through an unknown area;
- Correct and efficient use of information requiring spatial awareness, orientation and navigational skills;
- Finding a parking space;
- Undertaking the parking manoeuvre;
- Relocating the car.

There is a paucity of research into the effects on travel of dyslexia as a specific learning disability. However, an understanding of the nature of dyslexia, as outlined above, highlights that many of the difficulties applied to the generic concept 'learning disability' can also be applied specifically to those with dyslexia. This is particularly the case when we consider exclusion of those with learning disabilities from the transport system due to inadequate travel information provision, to which this paper now turns.

3.4. Travel information provision and mobility-related social exclusion

Table 1 highlights the role of travel information in mobility-related social exclusion. Emerging as an issue at almost every stage of the journey lifecycle, inaccessible information is a barrier not only to people's ability to make effective journeys, but also to their ability and desire to travel, which has been linked to a reduced perception of the journeys (both modes and destinations) available to them (SEU, 2003; also Hine, 2007).

All travellers have a need for information, both before and during their journey, regardless of mode or individual characteristics. Information helps us to decide if we can travel, how to travel and when to travel. It tells us where we are, to help us to locate our service, to find our way at the interchange and to deal with unexpected barriers to travel, for example delays, or

cancellations. However, people with disabilities have not only a greater need *for* information, but greater needs *from* the information provided.

In terms of the needs *for* information, people with disabilities need information about journey planning in order to assess their travel options. But they need to know more than the reliability, timing, convenience and cost information demanded by non-disabled travellers (TRG 2000, cited Lyons, 2006). In order to choose their mode and to assist in undertaking and completing their journey, information about modal options is required, which for public transport includes the physical accessibility of the vehicle and interchange, the availability of accessible toilets, the availability of assistance from staff (both before and during the journey) and details of the layout of the vehicle and interchange, to increase confidence in wayfinding, are essential (Maher, 2008). Travel by private transport (car as driver or passenger) requires less information about interchange and vehicle, but more about services en route and the nature of the road system – access, exit, signage, congestion, etc. For those with learning disabilities, information to increase confidence is particularly important, both directly facilitating a journey through this increase in confidence and reducing the need for in-journey information which, as discussed above, can be difficult to access and process in a timely fashion.

In terms of the needs *from* information, the information provided must be accessible to people with disabilities. The following discussion focuses in particular upon those with learning disabilities, but is also applicable to other groups of people who have problems with written information, such as those with poor sight, children and people who do not speak the national language. Geehan (1996) explores journey planning and execution, highlighting the need for print, electronic and audio information that considers the needs of those with auditory, cognitive, physical and visual disabilities. The MAPLE Consortium (2005) and Rosenkvist et al (2009) further explore these issues, highlighting the inadequacy of pre-and in-trip information as insurmountable barriers, preventing people with disabilities from travelling and therefore from accessing essential opportunities, services, social networks and other goods. Whilst there have been some improvements in recent years, with guidelines issued on the legibility of, for example, printed timetables (DPTAC, 2000) and Internet-based travel information (Kenyon et al, 2001), many transport providers fail to meet the needs of people with disabilities, in terms of both the accessibility of information and the nature of the information provided. The following aspects of transport information system design could help to support people with a learning disability (Carpenter, 1994):

- Use of simple text, graphics and colour coding;
- Clear display of stop and vehicle details;
- Clear audio information;
- Talking Signs.;
- Low-technology solutions such as help desks;
- Ground-level staff training;
- Travel training;
- Awareness of (and access to) Smart Cards.

3.5 Research Focus

The evidence presented above has largely focused upon the needs of those with generic learning disabilities. As highlighted above, there is a paucity of evidence specifically considering the needs from travel information of travelers with dyslexia. However, with c. 1 in 17 people in the UK experiencing dyslexia and c. 1 in 13 in Europe, there is a clear need for research which could help those with dyslexia to travel. The research reported in this paper seeks to build upon the generic literature, taking as its focus the exclusion from the transport system of those with dyslexia. That people with dyslexia feel excluded emerged naturally and strongly in the research, but the nature of this exclusion is not the focus in this paper. Rather, this paper is concerned with the *reasons why* people with dyslexia feel excluded. Within this, there is a specific focus upon the role of travel information as a contributor towards mobility-related social exclusion. In this sense, mobility-related social exclusion is the context within which difficulties with travel information are discussed, providing the justification for the research and the reasoning behind our claims for the importance of inclusive information systems for those with dyslexia.

This paper now turns to describe the research undertaken, highlighting the methodology used, before presenting the results.

4. Material and Methods

Given the present lack of knowledge regarding dyslexia and personal travel, a qualitative exploration was necessary. Although a quantitative-based survey would have highlighted the prevalence of the problem, the findings would have been of little use to those wishing to gain a deep understanding of the complex needs and experiences of people with dyslexia. Such exploratory research is well-served by a qualitative approach, as participants are able to express themselves in their own words, illuminating factors of importance to them, free from control by a fixed research agenda. Considering that dyslexia is particularly related to written language and is exacerbated by stress, focus group research offers a way of placing people with dyslexia in a suitable environment where they can comfortably share their attitudes and experiences, without the need for the use of written language and with peer support.

Six focus groups were undertaken at different locations across the UK, with each discussion lasting approximately 90 minutes. 52 participants were recruited through dyslexic support groups. The sample size was appropriate because the study aimed not to establish facts that can be statistically verified or generalised, but to advance theoretical and contextual understanding by means of qualitative empirical findings.

This was not a comparative study with non-dyslexics. For that reason, recruitment was solely with people who have received an official diagnosis of dyslexia. Whilst socio-demographic factors are not discussed in the literature as influences upon dyslexia, many such factors influence travel behaviour. Therefore, a maximum variation sample was sought. A good spread

of age (18-60) was achieved. There was an equal mix of gender. All participants were either dependently or independently mobile, with a mix of modal experiences to draw upon[3].

A topic guide was used to structure the discussion. The guide was flexibly used, to ensure that participants had the freedom to discuss issues of importance to them. The initial discussion focused upon the participants' experiences of dyslexia, before turning to focus upon their experiences of travel and transport. Participants discussed their travel patterns and mode use, before being guided to consider reasons for these. Information use emerged naturally through discussion. Participants were encouraged to discuss their travel in terms of the journey lifecycle, before considering travel by car and/or public transport for unfamiliar local or long distance journeys. Travel behaviour and attitudes towards different modes were explored to investigate the perceived constraints on travel choice and hence the barriers to social inclusion. Data was collected using a digital recorder and transcribed prior to analysis.

Data analysis was exclusively qualitative. The primary aim was to draw out the significance and relevance of information-related causes of mobility- related exclusion to people with dyslexia. Data was categorised, following a modified grounded theory approach. By doing so, it was easier to recognise relationships, facilitated by further developing the existing categories, thereby enabling conclusions to be drawn (Saunders et al, 2009). Categorising the data involved two main tasks. Firstly, categories were developed, which consequently provided a relevant structure for organising and analysing the data. In this study, the categories emerged from the data, existing theory and the literature (as per the discussion below in Section 5), forming a coherent set of labels that provided a well-structured analytical framework to pursue data analysis. Corresponding to Dey (1993; cited Saunders et al, 2009), the categories were both internally and externally meaningful, i.e. meaningful in relation to the data and the other categories. The second stage of categorisation involved unitising the data, or linking meaningful pieces of data (or units) to the categories derived (Saunders et al, 2009). Subsequently, key themes, patterns and relationships in the data and between the data, existing theory and the literature were investigated.

5. Results and discussion

The causes of mobility-related social exclusion have been conceptualised in a number of ways, by different authors (including Church et al, 2000; DETR, 2000; Hine and Mitchell, 2001; Edinburgh Council, cited Hine and Mitchell, 2001; and Solomon, 2003). This paper applies the conceptualisation developed by Lucas (2004) to participants' discussions of the role of information in their mobility-related social exclusion, focusing upon about the interaction between person-type factors and factors related to the transport system (i.e. acceptability, accessibility, affordability and availability). Lucas also relates the causes of mobility-related social exclusion to spatial factors (i.e. the construction of the built environment, with particular emphasis upon increasing distances between activities, linking to the discourse on too much mobility as a cause of mobility-related social exclusion). Whilst mobility-related exclusion for

[3] Although the experiences of immobile dyslexics would be valuable, no participants of this nature were recruited

people with dyslexia is related to spatial factors, evidence from the focus groups discussions suggests that person-and transport-type factors predominantly apply. Therefore, this paper takes these factors as its principal focus and refers the reader to Lucas (2004) for further discussion of the role of spatial factors in mobility-related social exclusion.

5.1 Person-type factors

Considering both private and public transport, it emerged strongly that participants do feel excluded from the transport system. For example, participants described situations in which they had been unable to visit friends and family, and access certain facilities and services. This paper focuses upon the reasons behind this exclusion.

It emerged naturally and strongly that information was a considerable barrier to use of the transport system and, therefore, a direct cause of mobility-related social exclusion. Participants' dyslexia was seen to influence their ability and willingness to use information, pre-and in-trip, leading directly to an inability and/or unwillingness to travel.

Participants highlighted the particular functional implications of dyslexia and how these relate to their difficulties when using travel information, both before and during their journeys. The discussion considered: learning; listening; numerical processing; reading; speech; spelling; wayfinding; and emotional effects. Each of these person-type factors was seen to contribute towards an inability to use travel information in its present form, which acts to inhibit the use of the transport system by people with dyslexia, directly resulting in their mobility-related exclusion.

5.1.1 Learning

Similarly to people with other types of learning disabilities, people with dyslexia experience difficulties which impact upon the learning process (Corrigan, 2001; Hoyles and Hoyles, 2007). Learning emerged as a particularly important element of pre-journey planning for the participants, lessening the need to access travel information en-route, which can be difficult and, therefore, reducing the stress associated with travel, which can exacerbate the symptoms of dyslexia.

Corresponding to Corrigan (2001) and Hoyles and Hoyles (2007), the participants reported learning visually and intuitively. In line with Carpenter (1994), they explained that learning is most effective if information provision supports this, for example, providing symbols, pictures and graphics, or text which provides a meaningful visual description. A majority of the participants expressed a preference for a practical/experiential approach to learning and visualisation (supported by Corrigan, 2001). Discussions exposed the common need to practice a journey prior to taking an unfamiliar journey, lessening the need to access travel information en-route. Participants placed considerable emphasis on this, suggesting that this allows them to build a visual picture of the journey, influencing their ability to undertake unfamiliar journeys:

> If I have to go somewhere new, my husband always has to take me there first on a dry-run. By performing a dry-run I remember the route by looking at the shops and pubs rather than all the street names and road numbers.
>
> (Rachel)

5.1.2 Listening

Hearing and listening emerged as problematic for the participants, caused by phonological weaknesses and impaired auditory skills (Rost, 1994; Corrigan, 2001). The process of listening is complex for those with dyslexia, with problems related to sequencing and understanding. Participants linked listening with short-term and working memory and an inability to coordinate the listening task with choosing and retaining the correct information (supported by Miles, 1993; Corrigan, 2001; and Pollock, 2004):

> They'll say turn here, go up there. By the time he's walked away, I've forgotten what he said.
>
> (Deborah)

Despite the auditory problems, participants exhibited a preference for receiving travel information via auditory channels because they experience more significant problems processing written language (discussed in Sections 5.1.3, 5.1.4, 5.1.6 and 5.2).

5.1.3 Numerical processing

In line with Miles (1993), Johnson and Peer (2003), it emerged that dyslexia affects numerical skills:

> I have to be very careful boarding the correct bus when the bus number contains 6s or 9s. I can easily mix them up.
>
> (Deborah)

Being able to correctly process numbers is an important skill that we need to use on a daily basis. In relation to travel, knowing the date, how much something costs and related monetary interactions understanding the passage of time and reading timetables, route information and vehicle numbers are essential skills. Therefore, poor numerical skills present people with dyslexia with a major barrier to participation.

5.1.4 Reading

Findings from the focus groups suggest that phonological deficits prevent dyslexics from developing effective reading strategies. The participants tend to make a large number of visual errors and consequently visual problems are experienced, for example, distortions, double vision, vibrating words and changes to the sequence of letters. This is particularly the case if the information is presented solely in upper case lettering because the shape of the letters makes the outline of the words appear too uniform. Figure 1 draws upon this, highlighting the many different ways in which a person with dyslexia may perceive the word 'CAT':

Figure 1 inserted here, please.

It was also reported that the participants tend to read slowly. This is particularly the case if they have to read and remember large quantities of information. Memory deficiencies exacerbate this issue, causing them to forget what they have read before they reach the end of the text (supported by Miles, 1993).

5.1.5 Speech

Dyslexics can exhibit speech production weaknesses (Hales, cited Miles, 2004; Beaton, 2004). A number of areas of speech processing emerged as having a direct impact upon the participants' ability to ask for travel information. Articulatory problems, misuse of words, word-finding and word sequencing problems emerged as common occurrences. It became apparent during discussion that speech difficulties lead to mobility-related exclusion because the individual's ability or desire to ask for information is affected (discussed further in Section 5.2). Thus, so are travel choices and travel behaviour.

5.1.6 Spelling

Spelling poses one of the greatest problems for people with dyslexia (Brown and Ellis, 1994; Pollock and Waller, 1997). This was substantiated by many of the participants of this study, with the most significant problems emerging at the pre-trip planning stage of the journey lifecycle (expanded in Section 5.2).

5.1.7 Wayfinding

Wayfinding refers to how people find their way in the physical world and what they need to find their way (Raubal, cited Campbell and Lyons, 2008). Effective wayfinding requires sophisticated decision execution and information processing skills, which people with dyslexia do not necessarily possess. Difficulties can occur during journeys by private and public transport, particularly at interchanges and the end-leg stage. Participants with severe difficulties explained

that they feel totally lost and unable to relate themselves to other objects. The participants with less severe problems possess a language-based difficulty with 'connectives' -a word used to describe the relative position of one object to another, with a relationship between the objects. The wrong responses originate from verbal labelling and naming weaknesses and are particularly exposed where one term has to be distinguished from another, such as left and right or north and south (Miles, 1993). For participants, incorrect turnings are routinely experienced as a result, prompting a greater need for information and wayfinding skills and resulting in heightened feelings of anxiety.

5.1.8 Emotional effects

Participants expressed that living day-to-day with dyslexia is a real challenge. Consequently, many felt negative emotionally: for instance, frustration, nervousness, a lack of confidence and low self esteem, feelings of inferiority, confusion and embarrassment (supported by Naylor cited Maughan, 1995; Johnson and Peer, 2003). Corresponding to Hampshire (cited Miles, 2004), the participants explained that a cyclical relationship between dyslexia and stress exists, which can further exacerbate the physical and practical difficulties experienced.

Journeys that change unexpectedly lead to intensely negative emotional feelings, because the inherent skills needed in order to manage stress and deal with changes to travel circumstances, i.e., using travel information, cannot be drawn upon. This can lead to an avoidance of certain routes and modes and the abandonment of journeys, if circumstances change.

5.2 Transport factors

5.2.1 Introduction

Findings suggest that participants experience social exclusion because of transport difficulties. Corresponding with Christie et al (2000), Dickins and Ford (2001) and Homer (2003)[4], participants suggested that their needs were not being met by current transport systems. Discussions highlighted an exclusion from mobility, which directly resulted in exclusion from activity participation. The reasons for this exclusion were subsequently explored. Participants naturally focused upon the role of travel information. As hypothesised in relation to other groups (Raje, 2003; SEU, 2003; SRA, 2003; Hine, 2007) and other groups of people who have problems with written information, such as people with other learning disabilities, children or people who are not speaking the national language, travel information is fundamental in supporting people with dyslexia through the entire journey lifecycle, substantially influencing the perception of the journeys (in terms of modes, routes and destinations) available and thus travel choices and behaviour. As highlighted by a number of authors (Geehan, 1996; the MAPLE Consortium, 2005; Rosenkvist et al, 2009), the information provided must be accessible. However, this study has shown that many transport providers fail to meet the needs of people

[4] These studies primarily consider limb disorders which limit movement, but 'disability' includes visual and hearing impairment, learning disabilities and mental health problems. Illiteracy and innumeracy can similarly pose barriers to the use of transport systems (Williams, 1986)

with dyslexia. At present, both inaccessible and inadequate pre and in-trip information is a barrier not only to people with dyslexia's ability to make effective journeys, but also to their desire to travel, which can prevent this group from accessing opportunities, services, social networks and other goods. Consequently, the individual faces limited travel horizons, because they are unable to explore available travel options. In summary, since information is either unavailable or unusable, participants are highly conservative in their travel behaviour, rarely exploring alternative travel choices. Consequently, participants explained that they continue to use familiar routes and modes. This is particularly the case for travel by public transport, which corresponds to previous studies which highlight the inequitable use of public transport by other groups of people with disabilities (Casas, 2007; Currie and Allen, 2007; McQuigg, 2008; Rosenkvist et al, 2009).

5.2.2 Travel by public transport

5.2.2.1 Auditory information

Reflecting the hearing and listening difficulties of people with dyslexia, a large number of participants experience difficulties with auditory tasks during a journey lifecycle. It emerged that participants feel excluded from certain routes and modes because of a lack of appropriate audible information. This exclusion affects travel choices and resultant travel behaviour, with participants either unable to access certain routes and modes or avoiding those where audible information is inappropriate or lacking:

> Information is never provided in short steps which you might remember. I lose sight of the words that are important if speech extends beyond one or two words.
>
> (TJ)

5.2.2.2 Timetables

Problems with timetables emerged strongly during the discussions, for reasons related to the nature of dyslexia, including:

- Amount of information displayed;
- Colour contrast;
- Font size;
- Font style;
- Information presented horizontally/linearly;
- Timetables printed on glossy paper;
- Use of the 24 hour clock.

5.2.2.3 Electronic variable message signs

Electronic variable message signs are challenging for similar reasons, with the addition of the scrolling feature. Participants find scrolling text and numbers difficult to process and feel anxious because they are unsure that they are processing the information correctly, especially if they are in a time-constrained situation and forced to act quickly. Participants suggested that the information does not remain static for long enough for them to process it correctly:

> When you have to read the screen where it's got all the place names and numbers. It's down to colour contrast, font, it's all horizontal and presented together. I can't process the information.
>
> (Lynn)

5.2.2.4 Web-based travel information

Reflecting the reading difficulties of people with dyslexia, participants explained that they find it almost impossible to read web-based journey information because such a wealth of information is provided and that there is a lack of trust in their ability to process the information correctly. Subsequently, as a coping strategy, participants explained that they will seek assistance or verification from someone who is not dyslexic. However, this isn't always possible. Some participants stressed that if they are unable to find help, they will consider modifying their travel behaviour, which may not necessarily be the most efficient or effective alternative. Some abandon the journey altogether, resulting in reduced activity participation. Web-based journey planners are also particularly problematic for those with spelling weaknesses. Having to correctly spell the origin and destination on a journey planner, where the user must be close to the correct spelling in order to locate the word, emerged as particularly challenging. If a list of similar place names is presented, it is unlikely to be of use. Participants suggested that they are unable to recognise differences between words. Therefore all options look quite similar, which results in misinterpretation: for example, 'Regents Street' and 'Regents Park'.

5.2.2.5 Obtaining travel information by means of a human source

Owing to the difficulties experienced with other types of information media, participants expressed a preference for obtaining information from a human source, i.e. referring to 'someone' rather than 'something'. Despite this preference, many participants feel uncomfortable about disclosing their condition, therefore inhibiting their ability to ask for assistance whilst travelling and hence their ability to travel effectively. The negative attitudes of staff were cited as one of the main barriers to asking for travel information. Participants felt that the attitudes of staff towards them highlight a lack of awareness and understanding of dyslexia, reflecting a principal reason why people with dyslexia experience difficulty using the current transport system. Transport providers, policymakers and staff are largely unaware of the nature of dyslexia and how to accommodate dyslexic travellers' needs. This leads directly to an avoidance of routes and modes which negatively affect the traveller's emotional state, which means that certain choices and opportunities are not available to them.

5.2.2.6 On-board information

The difficulties people with dyslexia experience with reading continue once on-board public transport. Asking a fellow passenger for information is a common coping strategy, with participants also relying upon audible information. However, participants explained that if this is not possible, they must decide for themselves when to alight. In such situations, they are likely to make the wrong decision because they have misread the information. Participants expressed real anxiety associated with this, with heightened levels of psychological unrest exacerbating their symptoms of dyslexia and further affecting their ability to process information and make decisions. Getting lost and subsequently getting back on track emerged as a significant concern, both practically and emotionally.

5.2.3 Travel by private transport (car as driver or passenger)

On account of the difficulties experienced with public transport and to ensure that travel and thus activity choices are not restricted, the majority of participants exhibit a preference for travel by car as driver or passenger. Although the above discussion may suggest that mobility-related exclusion affects only those without access to a car, car users equally experienced exclusion from mobility.

5.2.3.1 Text-based directions

Concerns surrounded text-based directions, particularly those produced by web-based journey planners. Participants explained that they contain a substantial amount of information presented in lengthy lines of text, which is too complex for someone with dyslexia to process. As discussed above, learning directions is not really an option for people with dyslexia. However, reading directions whilst driving is especially difficult, because of difficulties managing multiple tasks and an inability to process the information quickly.

5.2.3.2 Road maps

A large number of participants are unable to read road maps because they are not appropriate for people with dyslexia. The font and colour contrast used and the amount of information displayed on maps make them difficult to process. In addition, a strong feeling was that they fail to provide the right detail to support the visual and intuitive needs of people with dyslexia:

> Maps would be easier for me if I could see that the next thing I'm looking out for after the Red Lion pub is the Esso garage.
>
> (Deborah)

5.2.3.3 Road signs

Participants also explained that they are unable to easily and efficiently process road signs whilst driving (supported by Brachacki et al, 1995). Participants discussed losing their way and avoiding travelling through certain areas, because of difficulties with road signs, in terms of the amount of information on a single sign and the presence of multiple signs at junctions, particularly roundabouts.

5.2.3.4 Satellite navigation systems

It was clear that satellite navigation systems support the above difficulties, particularly during the end-leg of a journey, where directions become more complex and dense:

> I purchased a road navigation system and it help tremendously. It 'points' which way to go, it talks, and turns the map so it is easy to follow.
>
> (Terry)

Such systems are seen as a 'person' looking after the user, facilitating travel and travel choice and assisting if/when the journey changes unexpectedly. The participants with the most severe cases of dyslexia even classed these systems as essential to independent mobility, because without them, unfamiliar journeys would be dependent upon another person or would not be undertaken. These systems are attractive because they support the dyslexic traits which make orientation and wayfinding difficult, providing:

- 2D and 3D maps and instructions using visual points of interest and universally recognised/culturally-accepted symbols;
- Audible information;
- Real-time traffic alerts;
- Rerouting if circumstances change;
- Ability to store contact information.

The above sections have highlighted the role of travel information as a contributory factor in the mobility-related exclusion for people with dyslexia. Since people with dyslexia have inadequate access to mobility because of person-type and transport factors, this group experience reduced access to activity participation. This paper now concludes with an overview of potential solutions for people with dyslexia, with an emphasis upon actions to creating more accessible information systems.

6. Conclusions

As previously explained, information helps us to decide if we can travel, how to travel and when to travel. It tells us where we are, to help us to locate our service, to find our way at the interchange and to deal with unexpected barriers to travel. However, people with disabilities, specifically in the context of this paper, those with dyslexia, have not only a greater need *for* information, but greater needs *from* the information provided. In terms of journey planning to assess travel options, to choose their mode and to assist in undertaking their journey, information is essential (Maher, 2008).

This study has focussed upon dyslexia and mobility-related social exclusion, with specific reference to the role of information in facilitating, or preventing, travel by this group. The research concludes that information that does not cater fully for the needs of dyslexic travellers can contribute to exclusion from the transport system. Where exclusion is not experienced, it certainly makes use of the transport system more difficult and may discourage reduced levels of use than are absolutely necessary, albeit that the system continues to be used.

The task of planning and undertaking a journey is affected by dyslexia, with this relationship associated with and exacerbated by a lack of appropriate informational support. This results in people with dyslexia facing poor accessibility to the transport network, which can in turn contribute to mobility-related exclusion. Although there will be differences in the way dyslexia manifests itself across modes, similar symptoms and root causes are at the centre of the difficulties faced. Concurrent travelling and comprehension of information, together with complex transport systems and street layouts require sophisticated processing skills, which many dyslexics do not possess. The situation is intensified because travel information does not support these weaknesses. It is either unavailable or of little use, being difficult to access and decipher. In consequence, the travel choices and travel behaviour of people with dyslexia can be restricted. People with dyslexia continue to use familiar routes and modes and face limited travel horizons because they are unable to explore the choices and opportunities available to them. Since the discussions surrounded unfamiliar journeys, socio-demographic factors such as age, gender and experience (with dyslexia and the transport system) were not influential upon modal experience.

This paper applied the conceptualisation developed by Lucas (2004) to participants' discussions of the role of information in their mobility-related social exclusion. Although spatial factors make mobility an essential tool for participation and provide a backdrop for the experience of mobility-related social exclusion, for participants, the interaction between person-type factors and factors related to the transport system predominantly apply. Building on this, the focus groups highlighted many areas, applicable to transport operators, manufacturers and policy makers across public *and* private transport, in which travel information provision could be improved, to facilitate greater inclusion for dyslexic travellers, which could in turn widen opportunities for

activity participation[5]. The following recommendations focus upon the greater needs *from* information of people with dyslexia:

- The provision of graphical displays of routes and/or text which provides a meaningful visual description of local landmarks would greatly help people with dyslexia in the route-learning process, which would provide them with the opportunity to consider a wider range of travel choices, particularly for independent travel;

- A number of suggestions for supporting the auditory weaknesses of people with dyslexia can be put forward. Staff training should emphasise how the industry can effectively and empathetically deal with the needs of dyslexic travellers and audible information should be delivered clearly and at a reasonable pace, using important words only;

- Support for the numerical processing weaknesses of people with dyslexia, including the visual representation of time and text-to-speech and speech recognition, should be made available;

- Supporting reading abilities, through more readable timetables and directions;

- Audible information is already provided on some modes of transport and it is suggested that this medium should be fully embraced;

- Although guidance exists on the design of information on electronic variable messaging signs, further research to investigate how better to accommodate people with a specific learning disability such as dyslexia is necessary;

- Ensuring that travellers can access useful and usable journey information en-route via a mobile device may lessen (or even negate) the need to refer to traditional forms of information;

- Travel information which better supports the needs of dyslexics will lessen the need of these individuals to ask for information. However, better staff training would ensure that dyslexics are attended to more appropriately, which would have a positive effect upon their ability to ask for information in situations where it is unavoidable. As a consequence of this, people with dyslexia may find they feel more comfortable about disclosing it to others, which in turn could broaden travel horizons and hence opportunities for greater activity participation;

- Considering spelling weaknesses, spell-checking facilities and speech-to text/speech recognition software within journey planners may be of benefit;

- Whilst a clickable map would not negate the need to correctly recognise place names, it would eliminate the need to write them and would provide a visual clue, which could support correct identification;

- Whilst useful, satellite navigation systems are not necessarily a panacea. Many of the features which appeal to the dyslexic traveller could be incorporated into other

[5] The authors have highlighted the variance in experience of dyslexia and do not wish to impose an undue uniformity of experience

information forms. Maps and instructions which use visual points of interest and universally recognised/culturally-accepted symbols provide a low-tech alternative;

- Interchange signage which makes use of symbols and visual clues could facilitate journeys by public transport. Making a visual plan of the interchange available to allow forward planning and in-journey guidance would also be useful.

Considering greater needs *for* information, within the above recommendations are calls for a greater volume of pre-trip information to be available. For example, visual plans of the interchange could reduce the need to ask for information en route and help to reduce anxiety before and during travel, which may in turn enable greater absorption of information, reflecting the links between anxiety and severity of symptoms.

Of course, the above recommendations would not only help those with dyslexia. Some of the difficulties reported in the focus groups may equally be experienced by people without dyslexia, such as people with learning disabilities, the elderly, children who travel independently and people who are not speaking the national language. It is suggested that implementation of more accessible information systems could also therefore help to include, or make travel easier for, a greater number of non-dyslexics, providing which the balance of information is both reasonable and appropriate. Further to this, many needs are different and special, as this paper shows. Conversely, current developments in the field of design-for-all/access-for-all, particularly the solutions for people with learning disabilities, are adoptable and adaptable to help those with dyslexia, such as the use of symbols, graphics and simple language. Further research to determine the extent to which the needs of groups with seemingly similar needs from travel information, including those with dyslexia, with other learning disabilities, children and those not speaking the national language, have convergent experiences and perceive convergent solutions, would be useful.

This study calls for greater recognition and awareness of dyslexia across the transport industry, particularly within travel information provision, throughout the journey lifecycle. Greater awareness of and support for dyslexia in the provision of travel information services could result in more useful, more usable and more used information systems, which could broaden the travel horizons of people with dyslexia and, from this, the opportunities available to them.

Through Transport Direct, the UK government attempted to tackle the problem of information as a contributor towards mobility-related exclusion (Maher, 2008). However, much remains to be done if people with dyslexia, numbering c. 1 in 17 of the UK population and, potentially, others with similar needs (see above), are to be empowered to make more fully informed choices about whether, when and how to travel and if they are to be assisted in successfully undertaking and completing their journeys. The Internet provides an opportunity to tailor the type and volume of information presented to the user's needs. As such, this government initiative could be adapted to present different levels of information, in differing formats, for different clientele, ensuring that, if research shows that information presentation for people with dyslexia is unsuitable for those without dyslexia.

This paper has provided insight into dyslexia and the role of information in facilitating or preventing travel by dyslexic people, and provided an essential first step towards understanding the complex needs of this group from traveller information provision. However, further research will be necessary in order to advance understanding in this area. For example, the role that dyslexia plays in the travel behaviour (destination, routes, scheduling, time of travel, trip chaining, multitasking...) of this group. Further to this, by examining the co-existence of dyslexia and travel information provision through an ethnographic study, a deeper understanding of the movement and behaviour of dyslexic people and the informational and emotional setting within which these travellers find themselves would emerge, as well as the circumstances in which reported barriers can be overcome. Research examining the influence (or otherwise) of improved information provision upon the travel behaviour of people with dyslexia, would be useful in testing these results and in further developing best practice guidance in the provision of information to facilitate travel and, therefore, activity participation, for this group. Additional research to assess the cross-applicability of results to other sub-groups of the population, as outlined above, would also be useful in promoting change in a competitive private market and in ensuring that dyslexia-friendly information services were additionally usable and useful to non-dyslexics.

In order to address the limitations caused by the nature of the existing sample, a new sample of dyslexic people should be incorporated into further research. The views of immobile dyslexics with the ability/desire to travel and dyslexics living in rural areas would be valuable. Similarly, the views of dyslexics who fall outside of the age range previously studied would be significant, to determine whether age affects the results and whether there is a relationship between age and use of the transport system in relation to dyslexia. To clarify the value of qualitative evaluations and conclude that the challenges faced by dyslexic travellers are unique and felt more frequently and severely than non-dyslexics needs to be verified by incorporating non-dyslexic control sample data. Only then can the conclusion of specificity be derived.

The literature points to some concerns regarding focus group research. The results are not quantifiable and involve modest sample sizes to ensure that in-depth discussions develop. This means that the findings are only representative of the sample being studied and not necessarily typical of the entire population from which the participants have been recruited (Edmunds, 1999). A quantitative follow-up study which builds upon the theories developed through this qualitative research and involving a larger data set would address these concerns and provide valuable support data for this research. However, the obvious issues regarding reading and comprehension may potentially cause problems regarding recruiting to, and administering, such a survey.

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Figure 1

Figure 1. Illustration of the reading difficulties associated with dyslexia

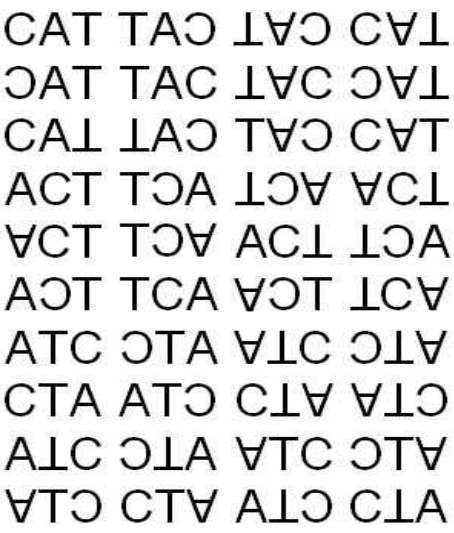

Table 1. Disabling factors within the journey (adapted from HEL & GDBA, 2008)

Journey stage	Disabling factors
Journey planning	Inaccessibility of journey planning information, in print, by telephone and by Internet
Travel to the interchange	Poor pedestrian environment (uneven pavements, lack of drop kerbs, street furniture, parked cars, poor wayfinding information)
Arrival at the interchange	Poor interchange design,(poor wayfinding information, lack of seating, inadequate lighting, inadequate shelters)
Buying a ticket	Poor design of ticket offices (lack of low level access and induction loops, staff attitudes, difficulty locating the ticket office due to poor design and wayfinding information) and ticket machines (lack of low level access, inappropriate interfaces for those with visual and cognitive impairments)
Finding the correct service	Poor interchange design (poor wayfinding information, street furniture, inaccessible vehicle information, physical access within the interchange)
Boarding	Poor vehicle design (access to and within the vehicle, e.g. kneeling buses, wheelchair bays, space for assistance dogs, contrasting colours, toilet facilities)
Getting to the destination	Provision of real time information to inform the user of their location
Alighting	As for boarding