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## OLDER PEOPLE'S TRAVEL AND MOBILITY NEEDS: A REFLECTION OF A HIERARCHICAL MODEL 10 YEARS ON

### Abstract

- Purpose (mandatory)

In 2010 we published a model of older people's travel and mobility needs in the *Quality of Ageing and Older Adults* journal (Musselwhite and Haddad, 2010). The model comprises three levels, practical (the need to get from A to B as quickly, cheaply and efficiently as possible), psychosocial (the need for independence, control and status) and aesthetic needs (the need for travel for its own sake), all which need to be fulfilled to achieve wellbeing and quality of life. Since then, the model has been translated into different languages and been cited 119 times across different formats.

- Design/methodology/approach (mandatory)

Using 10 years of analysing feedback that includes articles that cited the model, discussions with academics, policymakers and practitioners as well as from older people themselves, this paper reflects on the original model.

- Findings (mandatory)

Five key themes are generated from the re-examination: (1) the validity of the model; (2) the utility and usefulness of needs in understanding travel behaviour and turning them into policy or practice; (3) application of the model to different contexts; (4) understanding the relationship between travel needs and health and wellbeing; and (5) fitting the model to future changes in transport and social policy.

- Originality/value (mandatory)

This reflection on this well cited and well used model allows a re-adjustment of the model, updating it to be used in conjunction with policy and practice, especially highlighting the need to further distinguish mobility for aesthetic needs.

### Keywords

Health; wellbeing; ageing; older people; needs and motivation; transport; travel; mobility.

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## Introduction

### *A Highly Mobile Ageing Society*

Society across the globe is ageing at a faster rate than ever before (UN, 2017). It is not just a growing number of older people in society, but also a growing percentage of older people as a total of the population. Across Europe, for example, people aged 65 years or more will account for 29.5% in 2060 compared to around 19% now (EUROSTAT, 2017). In addition, the share of those aged 80 years or above across Europe will almost triple by 2060 (EUROSTAT, 2017). Older people, in many high income countries, are also fitter and healthier than previous generations as evidenced by an increase in years lived in later life in good health (EUROSTAT, 2017, ONS, 2015). For example, in high income countries, someone born now can expect to live up to around 80 years of age on average (ONS, 2015). Coupled with increased health, is an increased desire to be mobile, to get out and about and stay connected. Living in a hypermobile world, where home, shops, services, family and friends are more dispersed than ever before, adds an extra level of travel as necessity. Nevertheless, changes in physiology and cognition make mobility in later years more challenging, despite overall good health. There is often a need to resort to the car, a form of transportation with low requirements for physical activity or physical exertion, which runs door to door (with minimal need to change modes) and on demand (cars run when the driver decides to use it as they are not fixed to a timetable) to satisfy mobility needs for the older age group. However, changes in physiology and cognition can also mean that driving a car can be challenging or problematic and may force individuals to severely reduce or give-up driving altogether (Musselwhite, 2018d). Driver cessation is linked to poorer mental and physical health and associated with depression, anxiety and is linked to loneliness and isolation (Edwards et al., 2009; Fonda et al., 2001; Ling and Mannion, 1995; Marottoli, 2000; Marottoli et al., 1997; Mezuk and Rebok, 2008; Musselwhite and Haddad, 2010b, 2018; Musselwhite and Shergold, 2013; Peel et al., 2001; Ragland et al., 2005 Windsor et al. 2007; Ziegler and Schwannen. 2013)).

### *The hierarchical model of travel and mobility needs*

As one of the SPARC projects (Strategic Promotion of Ageing Research Capacity funded by the BBSRC and EPSRC) ten years ago (funded 2006 and concluded 2008), the authors developed a hierarchical model of travel and mobility needs for older people. This arose from in-depth work with 57 older people, including 26 drivers and 31 who had given up driving all over the age of 65 residing in South West England. The methods were qualitative and involved interviews and focus groups (which also involved tasks including task sorting and playing a board game) alongside keeping a travel diary. A report of the development of the model can be found (Musselwhite and Haddad, 2008b) with two journal articles of the key findings published two years later (Musselwhite and Haddad, 2010a,b). The model consisted of three different hierarchical categories (Figure 1) based on how aware participants were of the need stemming from when in the conversations they tended to mention such factors, showing awareness of such needs from individuals and not necessarily which are more or less important. The lowest level of the hierarchy is the practical or utilitarian needs, the need to get from A to B as quickly, reliably, safely and cheaply as possible, which was mentioned by all participants very early on in conversations and repeated frequently throughout. The next level of need was termed social or affective (sometimes referred to as psychosocial) need, and related to how travel fulfils a need for independence, control and the need to be seen as normal in society and how this relates to roles, identity, self-esteem and impression management (the use of objects to show one's status or role, for example a certain brand of car or mode of transport to depict a certain image to other people). This only appeared mid-way through the discussions. The top level of need, articulated much later on by participants was the need to travel for its own sake, to get out and about, to people watch, to see nature, to test their own ability, this level of discretionary need is termed aesthetic needs. Originally the authors conceptualised the research around travel needs, defined as individual needs related to being mobile. We have since used the term mobility needs alongside travel needs to explain the importance of travel needs in relation to the wider social context (connection of travel to social practices, community and family life) and individual psychology (self-esteem, independence, freedom etc.) that the participants told us was so important in relation to travel.

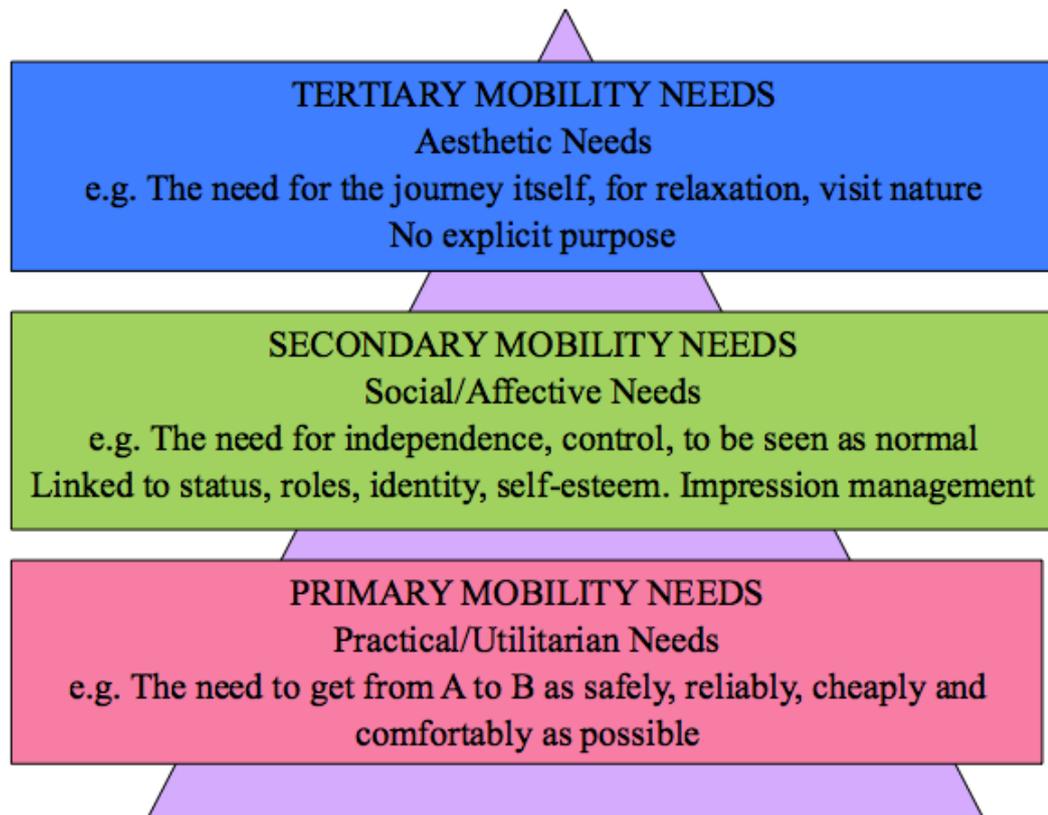


Figure 1. Musselwhite and Haddad's (2010b) Hierarchy of Travel Needs of older people

Research tends to suggest similar categories of travel or mobility need for older people. Practical or utilitarian travel was examined in more depth by Webber et al (2010). They propose a conical shaped model with ascending levels starting from the individual, and moving through their room, then their home outwards through neighbourhoods and neighbouring areas to the outside world. Each of these levels is influenced by cognitive, psychosocial, physical, environmental and financial layers, with gender, culture and biography (personal life history) viewed as cross-cutting influences. As people age they spend more time at the base of the model, at home and in the neighbourhood, so the influencers at these levels become the major issues for older people. Hence, Webber et al (2010) suggest that support for older people is best placed around the immediate environment, especially the home and the neighbourhood. By contrast, transport policy and practice usually deals with supporting hypermobility, larger scale movement, and places less emphasis on local movement at the detriment to older people's mobility (Parkhurst et al., 2014).

Hjorthol (2013), Mollenkopf et al. (2011) and Siren et al. (2015) examine utilitarian needs in relation to affective or psychosocial needs, showing how the two are interrelated, suggesting that travel is never for purely utilitarian purposes but always contains affective motives too.. However, it is common for older people, practitioners and policy makers to talk about the need for travel at the utilitarian level and less common for them to discuss social or affective needs. Even less common is the discussion of travel for its own sake or for 'luxury' or 'discretionary' purposes; the aesthetic needs. Hence, transport provision in later life is usually centred on practical or utilitarian support while forgetting other important levels of need. So older people with mobility difficulties who may have given up driving can actually get their utilitarian needs satisfied somewhat (though this can still be difficult) by, say, community transport, but their social, affective and aesthetic needs are not met (Musselwhite and Haddad, 2010b, 2018). In our hypermobile world, driving a car readily fulfils all three levels of needs.

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Parkhurst et al (2014) and suggest that there is an over emphasis on literal mobility in satisfying mobility needs for older people, and in fact, mobility can be additionally satisfied through virtual, potential and imaginative means. Virtual mobility refers to the use of information computing technology (ICT) to satisfy mobility needs, such as using video conferencing to keep connected with family and friends and using the internet to shop online. Potential mobility, is the perceived ability to be able to go anywhere, when and how often an individual wants (Metz, 2000). Imaginary mobility relates to travel and mobility in the mind, of observing others' mobility and perhaps reminiscing about travel and mobility. If this wider conceptualisation of mobility is embraced the reliance on the car in later life might be less important.

Ten years from its conception, this paper re-examines the hierarchical model of older peoples' travel and mobility needs developed by the authors; updating it to include any subsequent findings and challenges to the model from changes in society while reflecting upon it as a result of feedback from academics, practitioners, policy makers and older people, ultimately addressing whether it is still relevant.

## Methods

In order to reflect upon the model, distinct types of information was gathered from five different sources.

### 1. Additional research projects involving older people carried out by the authors

The data from four research projects, involving 150 people aged over 65 from the United Kingdom, was re-examined in the context of Musselwhite and Haddad's (2010a) hierarchical model of travel and mobility needs. These four projects all involved discussions on transport and travel in later life, though did not directly ask about transport needs *per se*. Hence, a simple mapping of collected data against the three categories of the model has taken place for this paper. The data examined derived from the following four research projects:

(i) *Grey and Pleasant Land (Parkhurst et al., 2014). An Interdisciplinary Exploration of the Connectivity of Older People in Rural Civic Society*. This project examined rural transport issues through interviews with 55 older people from South West England and South Wales (45 were semi structured interviews and 10 involved a phenomenological approach).

(ii) *Successfully giving-up driving (GuD) project (Musselwhite and Shergold, 2013): Exploring how older people contemplate and experience giving-up driving*. This project involved a self-selected group of 21 older people aged over 65 years from South West England and South East Wales who were going through or were contemplating giving-up driving. The research followed these 21 individuals documenting the process over a period of 10 months using five waves of focus groups and interviews coupled with travel diaries.

(iii) *Driving Hands project (Musselwhite et al., 2015) Transport behaviour and road safety of drivers who had their lower forearm or wrist in plaster following a break*. This involved 14 telephone interviews with older people about transport and mobility before and after breaking their wrist, noting changes to travel behaviour.

(iv) *Modal Differences Research (Musselwhite, 2017)*. This work consisted of semi-structured interviews conducted with participants aged over 65 to explore the needs of travel and mobility. The sample consisted of 60 participants, three different groups of 20 people in each category: (1) older people who still drive; (2) community transport users; and (3) non-drivers who regularly rely on friends and family (outside the immediate household) to drive them.

In each of these four research projects, a thematic analysis of the findings in relation to the original model was investigated. Themes were coded and categorised by the lead researcher. These were then further categorised and matched to the original model and findings outlined below.

### 2. Discussions and reviews of the model by academics

These were taken from questions asked or discussions raised when the model was presented at 16 conferences (9 academic conferences and 7 with academic presence as part of a wider conference) crossing disciplines that included gerontology, transport, psychology, sociology, geography and design (see appendix 1 for list of conferences). The

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lead author keeps reflected records of many conferences (though not all) and these notes were used in conjunction with reflection on conferences that had fewer or no details stored. These also included feedback from reviewers of submitted journal papers and book chapters (Musselwhite in press, a, b; Musselwhite and Haddad, 2010a,b, 2018) This feedback could be obtained from emails of peer review and key points were then thematically analysed. In addition, informal conversations and discussions were included where they could be remembered by the researchers.

### *3. Discussion and reviews of the model by practitioners and policy makers*

Feedback from 16 presentations and workshops given by the authors to policy and practice audiences (9 direct to policy and practice and a further 7 mixed with academics), including presentations at the House of Lords, House of Commons, Welsh Senedd, Parliamentary Advisory Council on Road Safety, Chartered Institute of Logistics and Transport, TISPOL European traffic police network and presentations to charity and third sector workers including presentations and discussions with the International Longevity Centre and AGE UK (see appendix 1 for list). Again records for these conferences are not always kept in detail and reflection on conferences that had fewer or no details stored accompanied more detailed thematic analysis of notes on discussion points.

### *4. Discussion of the model from older people themselves*

Feedback from 8 public engagement conferences or workshops, including 2 British Science Festivals (2008 and 2016) and local events such as the Vale of Glamorgan Older People's Forum (2009) and Art House Café Southampton (2012) (see appendix 2 for more details). Reflective notes on each of these was kept by the lead author. In addition, any feedback generated from various appearances on TV and radio is included here from the public via email (n = 6) and handwritten letters (n = 3). A thematic approach to the older people's comments was employed and again emerging themes matched to the original model.

### *5. Academic papers citing the model*

The model (Musselwhite and Haddad, 2010, 2008a,b) has been cited by 119 different papers. These papers were identified through Google Scholar and the abstracts were read and the citation cross referenced. Each abstract has been read and where there was substantial commentary on travel needs the paper was then read (n=19 papers; see appendix 3 for details), this was then analysed in more detail using a narrative review approach (Jones, 2004).

### *Overarching analysis*

Given the amount of data collected from the methods used above, a structured matrix mapping process was then used to help manage the data. The three level model and policy and practice application were listed on an initial template: this allowed data to be compared, also allowed for further elaboration or adaptation of the templates (Miles and Huberman, 1994; Silverman, 2006). Matrix mapping also helped assess commonalities and differences between data (see Haddad, 2014; Lyons and Haddad, 2008; Musselwhite, Avineri, and Susilo, 2014 for details on this approach). The matrix allows room to expand and include new key themes that are found in the data.

## **Findings and Discussion**

Using the feedback from academics, policy makers and practitioners and older people themselves, findings could be structured around five key themes. The initial two themes stem from *a priori* categories searched for in the data by the researchers: (1) the validity of the model and; (2) the utility and usefulness of needs in understanding travel behaviour and turning them into policy or practice. Both are strong categories that appear frequently throughout the analysis. A final three themes were developed during analysis of the data itself and appear through the authors' reflection of the findings. These three categories tended to stem from an important set of minority comments: (3) application of the model to different contexts; (4) understanding the relationship between travel needs and health and wellbeing; and (5) fitting the model to future changes in transport and social policy.

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### 1. *The validity of the model*

Academic feedback has in particular focused on the validity aspects of the model, especially conceptualising need and whether they exist or not, along with the development of the categories and their names themselves.

The original model was inspired by Maslow's Hierarchy of Human Needs (1954) and although this model is pervasive in many academic and practice circles today across many disciplines, it is criticised for a lack of robust evidence supporting it (e.g., Hofstede, 1984; Wahba and Bridwell, 1976). One of the major challenges is identifying what is meant by *needs and motivation*. Theory from computer science reminds us that needs and requirements (as they are often called in that discipline) are hard to conceptualise and even harder to capture. Robertson and Robertson (2013) propose that there are three layers of needs: a) needs that are known by individuals; b) needs that are unconscious and require teasing out through in-depth techniques; and c) needs that are not known and can be generated in conversation and as a result of behaviour that takes place, in this way needs have to be generated between people. Hence, needs are fluid and dynamic and can change through interaction with the environment. The notion that needs are stable *within* people, let alone *between* people, is therefore challenged.

In qualitative research defining categories and naming them is always open to criticism. One of the comments on the original peer review of the journal article asked whether there was actually only two layers of needs, utilitarian and affective, since it could be argued that the aesthetic needs are simply another utilitarian need – travelling to see the world around us, to see beauty and nature, for example, is travelling in order to do something. Indeed other transport, travel and mobility models, for older people and the wider population, often only distinguish between two levels of need, utilitarian and affective, where either the aesthetic needs are not seen as different to utilitarian, are missed out altogether or are seen as being the same as affective needs (for example see Hjorthol, 2013; Mollenkopf et al., 2011) and Siren et al., 2015). Examining the data from the other projects outlined in the methodology, suggests all three levels of need are present and distinct, but re-defining the third level of need in more detail has occurred which makes it more categorically different to the initial model. Musselwhite (2017b) looked in more detail at aesthetic needs in a paper on discretionary needs. This resulted in dividing the aesthetic needs into two related sub-categories, in line with Parkhurst et al's (2014) 'imaginative category of mobility'. First, aesthetic needs may be met through literally being mobile in the presence of beauty and feeling and experiencing the mobility itself. Second, the aesthetic quality may be simply remembered or imagined and therefore is not literally being mobile within a beautiful place, but remembering, reminiscing about a beautiful place or journey. Musselwhite (2017b) concluded the car, and especially driving oneself, was seen among older people as they best way to meet their discretionary travel needs. Berg et al. (2014) added a geo-spatial context to studying older people's mobility in Sweden and concluded that undirected travel, similar to Musselwhite and Haddad's (2010) aesthetic travel, is more likely to be taken on foot than in the car. Perhaps Sweden has more opportunities for older people to walking or perhaps adding a spatial element resulted in different types of mobility being taken at different locations.

Mollenkopf et al (2011) addressed psychosocial or affective needs in more detail, explaining the importance of out-of-home mobility as an emotional experience, and noting physical movement as a basic human need. They state mobility should be seen an expression of personal autonomy, freedom and stimulation. The absence of movement is equated with the end of life, and movement is an expression of the person's life force. Siren et al. (2015) also stress the importance of affective needs. They distinguish between utilitarian and discretionary needs in their research with older people in Denmark. Similar to practical and aesthetic needs, utilitarian needs were important in fulfilling basic needs, while discretionary activities were important for the individual existing in relation to the surrounding environment. In their discussion, they relate psychosocial needs entwined within the two other levels of need and not distinguished as separate as in the authors model. Similarly to the model, however, they concluded that supporting just basic practical utilitarian need was not enough to achieve satisfaction with mobility.

Hyde (2015) mentions the rather neglected area of older people as tourists. European figures suggest tourists aged 65 years and older are more likely to make longer tourism trips,

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trips within their country of residence (domestic trips) and trips spent at non-rented accommodation in holiday homes and campervans they own (Baush, 2016). How tourism relates to the model has not yet been studied. The importance of affective and aesthetic components of mobility are likely to be central to a touristic mobility needs. The model perhaps reflects some of the leisure and tourism elements of older people's mobility in the importance of affective and aesthetic qualities of mobility. Parkhurst et al (2014) distinguish between utilitarian, discretionary and touristic journeys. Perhaps aesthetic journeys could include a distinction between discretionary and touristic journeys. More research in this area would be useful.

Finally, a point frequently mentioned by both academics and practitioners in the field, is the relationship between needs and behaviour; is the relationship between the two as neat as is thought; or are there other factors at play that can change, challenge or enhance the relationship? In this, the question arising is similar to that of attitude-behaviour gap, which depending upon the theory and context can be mediated by many different variables, some of which are not yet being captured in the model.

## *2. The utility and usefulness of needs in understanding travel behaviour and understanding needs in policy and practice*

One of the important aspects of the model is, if we do retain its three layers, what does this mean for practice? In discussions with policy makers, the general feeling of the theoretical model is positive and reflects what they understand to be key motivators for using transport in later life, in particular how the car is important in meeting these needs. Two conversations that repeatedly come up with academics and practitioners are worthy of further investigation; (1) is the model simply for older people or would it fit for any age group? and (2) is it a model of driving rather than travel or mobility needs?

A critique of Maslow's hierarchy of needs is that priority of needs, and even needs themselves, differ throughout a person's life course (Tay and Diener, 2011). The model would certainly seem to fit any age groups, though it has only been explored, at present, with older people. In examining the model against the population as a whole, there are key elements that could be seen as unique to this demographic: the additional importance of physiological issues in later life, and changes in cognition, eyesight, muscle strength that can influence the need for door-to-door services with minimal physical exertion (see Musselwhite, 2018d for review). Coupled with this is the physical and psychological need to feel safe, something that is challenged in later life and this translates onto personal safety with mobility, on public transport and walking and cycling, hence the need for eyes on the world, a friendly trusted driver or train manager becomes even more important when using public transport, for example (Musselwhite, 2018a). Although, it is worth noting this is largely a perception – though they feel more vulnerable than other age groups, older people are less likely to be the victim of crime (Farrall et al, 2009; Hale, 1996). It has also been noted that there is an opportunity to create a third space using mobility, a space to chat and to watch the world go-by (Musselwhite, 2017). With less opportunities to do this in later life (e.g., due to retiring from work, going out less often) transport as a place for interaction would seem more crucial than that for younger people. Overall, more comparative work is needed in this area.

Second, since the model shows that driving a car fulfills all the levels of needs easily (Musselwhite and Haddad, 2018, 2010b), the development of the model is in itself influenced by the pervasiveness of cars in society: thus is a model of *driver's* travel needs rather than *travel needs per se*. In terms of the second point, the majority of participants in the study have been or still are car drivers, so mobility is often compared to the car. Care has been taken to examine the model from different perspectives, especially in recent studies examining different modes (Musselwhite and Haddad, 2018; Musselwhite, 2017, 2018, b, in press, a). Musselwhite (in press, a) suggests that walking satisfies aesthetic needs, partially satisfies social or affective needs but to a lesser extent utilitarian needs. Using the bus and getting lifts can satisfy aesthetic and utilitarian needs but not affective needs.

Practitioners working in the field have commented on the usefulness of identifying the three separate levels of needs when considering transport issues when working with older people. Practitioners commented that it helped explain why some people continued to use their car

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when they were finding it increasingly stressful to drive, when the bus might be a simpler option. Another community transport provider mentioned how it helped them satisfy the importance of providing days out just for pleasure for older people.

A very common comment from practitioners as to how to improve the model and make it more useful has been to enumerate the model. Practitioners stated that they would find the model easier to use if details could be collected as to how far needs were being met among different populations and across different areas. There is potential then to create GIS (Geographic Information Service) maps identifying areas where needs are met and areas where needs are not. Burholt et al's (2016) work on measuring neighbourhood age friendliness has utilised a website enabling older people and practitioners themselves to rate their local neighbourhood for age friendliness using a robust tool (see [www.operat.co.uk](http://www.operat.co.uk)), which, at present, does not include transport and travel *per se*.

### *3. Application of the model to different contexts*

Originally the model was developed with people from a variety of backgrounds, deliberately chosen to represent different contexts, although the participants were not representative in a numerical and statistical sense. Practitioners are frequently enquiring whether the model fits different contexts, for example is it applicable in urban and rural areas? Musselwhite (in press, b) has recently proposed an explanation for the differences found in how the needs are met in rural and urban areas. Rural participants often have their aesthetic needs met whereas this is less likely for urban older people. By virtue of their location older people living in rural areas are readily immersed in more natural beauty than urban dwellers are, for example, and it is easier to access and travel to and through such beauty. In contrast, people in urban areas, get more of their utilitarian needs met, due to locality and accessibility of services and shops, but they find meeting their aesthetic needs much more problematic. This is a useful addition to the model and could become nuanced. How about urban or rural areas that buck the trend? Do some older people prefer urban aesthetics, as has been suggested by Musselwhite (2018b), based on their experiences of lifetime homes and living; for example, people who have always lived in urban areas are more happy with an urban view. What about suburban areas? Suburbs need more attention with regards to transportation and accessibility for older people as in the US and UK there is potential they will age at a faster rate than urban or rural areas as people who moved in during mid-life stay in place (Gould, 2015).

The model has been applied to older people's travel and mobility needs in different countries. For example translations of the model exist in Spanish (Yanguas, 2014), Greek (Dikas, 2014) and Welsh (Musselwhite, 2016) and it has also been applied to older people's travel and mobility needs in Australia (Buys et al., 2012; Zeitler, 2013; Zeitler and Buys, 2015), Canada (Campana, 2013), Denmark (Siren et al., 2015), Israel (Vitman Schorr et al., in press), Malta (Mifsud et al., 2017) and Sweden (Berg et al., 2014).

In terms of applying the model wider, it has been mapped to work improving the public realm for older people (Musselwhite, 2018c). The UK's Centre for Architecture and the Built Environment (CABE, 2011) and urban designers (e.g., Shaftoe, 2008) highlight the need to make public spaces both accessible and attractive to the user. As such they highlight the need to address spaces not just in terms of their utilitarian and practical value but also in terms of their aesthetic and affective qualities. In particular urban spaces should have character, continuity and enclosure, be of good quality, allow ease of movement, be legible and adaptable and afford diversity and place. These elements can be placed around three key themes, (1) a safe and accessible space; (2) a legible meaningful space; and (3) a distinctive and aesthetically pleasing space (see figure 2; Musselwhite, 2016, 2018c).

The model has also been applied to bus use contexts (Clayton, 2012, see figure 3). He distinguishes between the three layers and relates them as such: practical needs are fares, reliability and punctuality; psychosocial needs are related to personal space and wider cultural norms of use; and aesthetic needs to ride quality and design of the bus.

The hierarchy of travel and mobility needs mirrors models in other sectors. For example, in studying Information and Communication Technologies (ICTs) in supporting ageing in place, Hopkins (2016) has found that provision and concentration of policy and practice is set

around utilitarian procedures and outcomes of the technology. However, in working in-depth with participants, their affective or psychosocial (e.g., identity, independence, belonging etc.) and aesthetic needs (e.g., hobbies and discretionary activities) are also important mirroring what is found with the model albeit in a different context.



Figure 2: Designing streets for older people based on CABE (2011) principles (adapted from Musselwhite, 2016, 2018c).

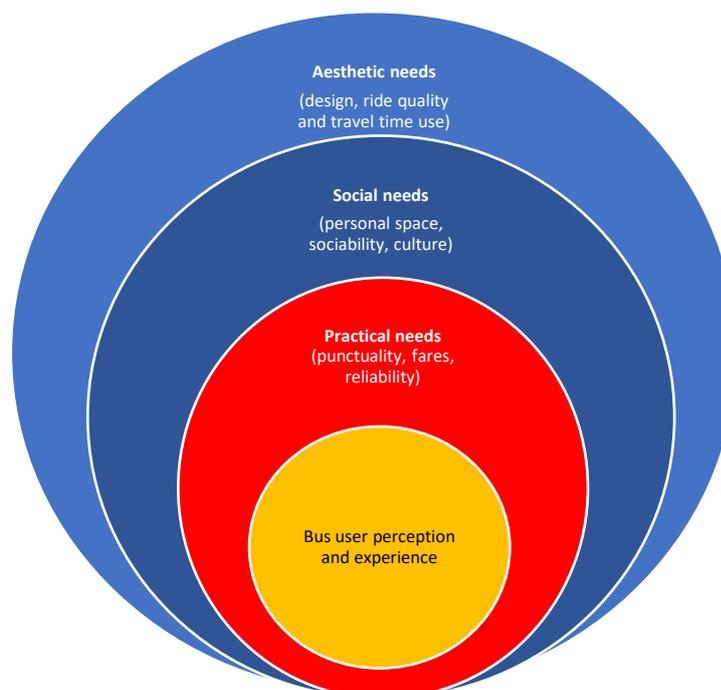


Figure 3: Application of Musselwhite and Haddad (2010b) hierarchy of older people's travel needs to bus user perceptions and experience (after Clayton, 2012).

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#### *4. Understanding the relationship between travel needs and health and wellbeing*

The hierarchy proposes that if needs are met, this would result in better health and wellbeing. Deliberately, the authors originally captured health and wellbeing through a self-report measure. This was done to deal with a multi-faceted concept while remaining true to a co-productive, bottom-up, person-centred approach fostered in that initial study. This was noted by practitioners as problematic, who are looking for something more objective they can place a numerical value on and is often mentioned by them as a limitation to the approach needed. Being more certain about the relationship between travel needs, health and wellbeing would help practitioners' position transport provision within wider social policy contexts. Debates in the National Assembly for Wales' Senedd, for example, suggest that transport provision could then be aligned to Well-being of Future Generations (Wales) Act 2015 or the Public Health (Wales) Act 2017, moving it away from just residing with transport and infrastructure policy.

Academic critique also has noted this as an issue. Nordbakke and Schwanen (2014) outline different approaches given to wellbeing in relation to the needs of older people, including critiquing the hierarchy from its self-reported, undefined stance. They suggest, perhaps there is a need to offer a more certain definition of wellbeing. However, attempts to relate needs to health and wellbeing are still problematic. First, how could you show a relationship devoid of other intervening variables? Accessibility to transport is confounded with a multitude of other factors that could be influencing health and wellbeing. Examining the literature that links driver cessation to health and wellbeing identifies that it is fraught with methodological problems that make the relationship less linear than it first appears. Hence, given the methodologies adopted, the possibility that driving cessation and depression are both consequences of some other common factor (e.g., declining health), cannot be completely ruled out. Interestingly, Boggatz (2016) applied concept analysis to the literature, searching for what makes up quality of life in later life and found three overarching categories, which are similar to those used in our model; satisfying life conditions (similar to utilitarian needs), subjective general well-being (often relating to affective/ psychosocial needs) and subjective fulfilment of dimensions in later life (similar to aesthetic needs). However, they also conclude as the authors do within this paper: there are problems of definition of quality of life and noise surrounding factors influencing them.

#### *5. Fitting our model to future changes in transport and social policy*

In the last ten years, private mobility among older people in the UK, as in many high income countries, has continued to grow at a faster rate than it has for other age groups. In Great Britain in 2008, 53% of those aged over 70 years held driving licence, in 2015 (latest figures) the figure has risen to 64% (females 36% to 50%; males 75% to 81%). Overall miles travelled have increased for over 70 year olds by 8% between 2008 and now (DfT, 2016, 2009). Mileage travelled across most modes have increased per person per year for the over 70s, most notably as car drivers (risen from 1,774 to 2,197 miles per year, over 23% increase), car passengers (risen from 1,367 to 1,549 miles/person/year - just over 13%), as train passengers (up 10% from 195 to 209 miles/person/year) and riding bicycles from 9 miles to 15 miles per person per year (DfT, 2016, 2009). Buses (from 485 to 455 miles/person/year) and taxis (from 48 to 39 miles/person/year) are down in miles for the over 70s between 2008 and 2015 (DfT, 2016, 2009). The increase in driving and being a passenger in the car requires further investigation as to why it is so pervasive and the notion that the car satisfies all three levels of need is commensurate with this.

There has been a growth in technology supporting mobility (Metz, 2018). Driverless cars, or autonomous vehicles, are often viewed as the panacea to older driver's issues, allowing older people to "drive" longer and later on in life safely, prolonging safe mobility for this age group later on in life than is currently seen. With regards to the model, automated vehicles might well help people meet the utilitarian and aesthetic needs (Musselwhite, in press, a). However, it is unlikely that they would meet affective needs, which often relate to the affective outcomes based on individuals driving themselves, especially if the driverless

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model is one of shared vehicles (Musselwhite, in press, a). In the original study Musselwhite and Haddad (2008b) discussed the potential for automated systems in providing support or taking over elements of the driving for older people. Automated systems that increased information for the driver were liked by older people, such as automatic gears, parking sensors and head-up displays but totally automated systems were largely disliked and the concept of autonomy and “doing it for themselves” was viewed as important by the participants. The offering is likely to be detrimental to other factors too, such as feelings of safety, reduced ability to walk and cycle, reduction in social aspects of public or community travel that older people value. However, if the utilitarian needs are met well, maybe none of this will matter? Based largely on utilitarian needs, Shergold et al (2016) suggest autonomous vehicles have the potential to provide a mobility resource for all older people, but especially for those most likely to experience mobility deficits – the older old, older women (especially those who outlive their spouse), and those living in more diffuse populations (i.e. rural and suburban locations). More research is needed examining the role of automated vehicles and the needs of individuals away from utilitarian needs. In terms of the sharing economy and potential futures, older people already tend to move towards more public mobility away from individual private transport. The negatives of this are often noted in terms of losing independence and freedom and reducing the potential for travelling where someone wants, when they want (Metz, 2000, 2018; Musselwhite, in press, a; Musselwhite and Haddad, 2010b, 2018). This is, sometimes, mitigated when individuals can create a third space out of the public or community transport offering, creating a social environment for interaction (Andrews et al., 2012; Musselwhite 2018a). This would not be mimicked unless the automated vehicles were large in size and small shared vehicles are unlikely to have the social element, so perhaps automated public transport will be more beneficial to older people than individual vehicles.

## **Conclusions**

There is strong evidence that the original travel needs model remains much the same as when conceptualised in 2008 (Musselwhite and Haddad, 2008 a, b, 2010b). It can be adapted for differing contexts within transport and mobility, yet retains its three levels of need. For example, the three levels of need are consistently found in rural and urban environments (Musselwhite, in press, a), but are met differently between the two contexts; with urban areas having their utilitarian needs satisfied better than their aesthetic needs, and rural areas vice versa. The model has also been applied to the built environment and neatly fit the CABE (Centre for Architecture and the Built Environment) principles for good design (Musselwhite, 2018c) and to bus users experiences and perceptions (Clayton, 2012). It also fits well with models outside of travel and transport, including ICT, technologies and ageing in place (Hopkins, 2016). As such it has some face validity and consequently the authors conclude the structure should largely remain as it is.

The highest level of category, aesthetic needs, could be further split into two, including imaginative mobility and mobility for leisure and pleasure. Since the latter includes mobility for its own sake, for example the kinaesthetic property of movement (Clayton and Musselwhite, 2013) and of being mobile, but also for being surrounded by and of reaching beautiful destinations then this could further be re-categorised. Perhaps being mobile for what is largely thought of as being for discretionary purposes, is actually found in Musselwhite (2017b) not to be discretionary at all but vitally important, could be a form of utilitarian need. However, given the model was originally positioned around when people articulated the need, it is proposed to keep such needs as a tertiary level of need. It is therefore proposed that the model stays the same, but that aesthetic needs be split into three new parallel categories (see figure 4); (1) kinaesthetic mobility; mobility for its own sake, for example the kinaesthetic property of movement and of being mobile; (2) Immersive mobility; Mobility to visit and immerse in beauty, encompassing being surrounded by and of reaching beautiful destinations and; (3) Imaginative mobility, for example watching and observing movement of others and reminiscing and discussing prior mobility and movement.

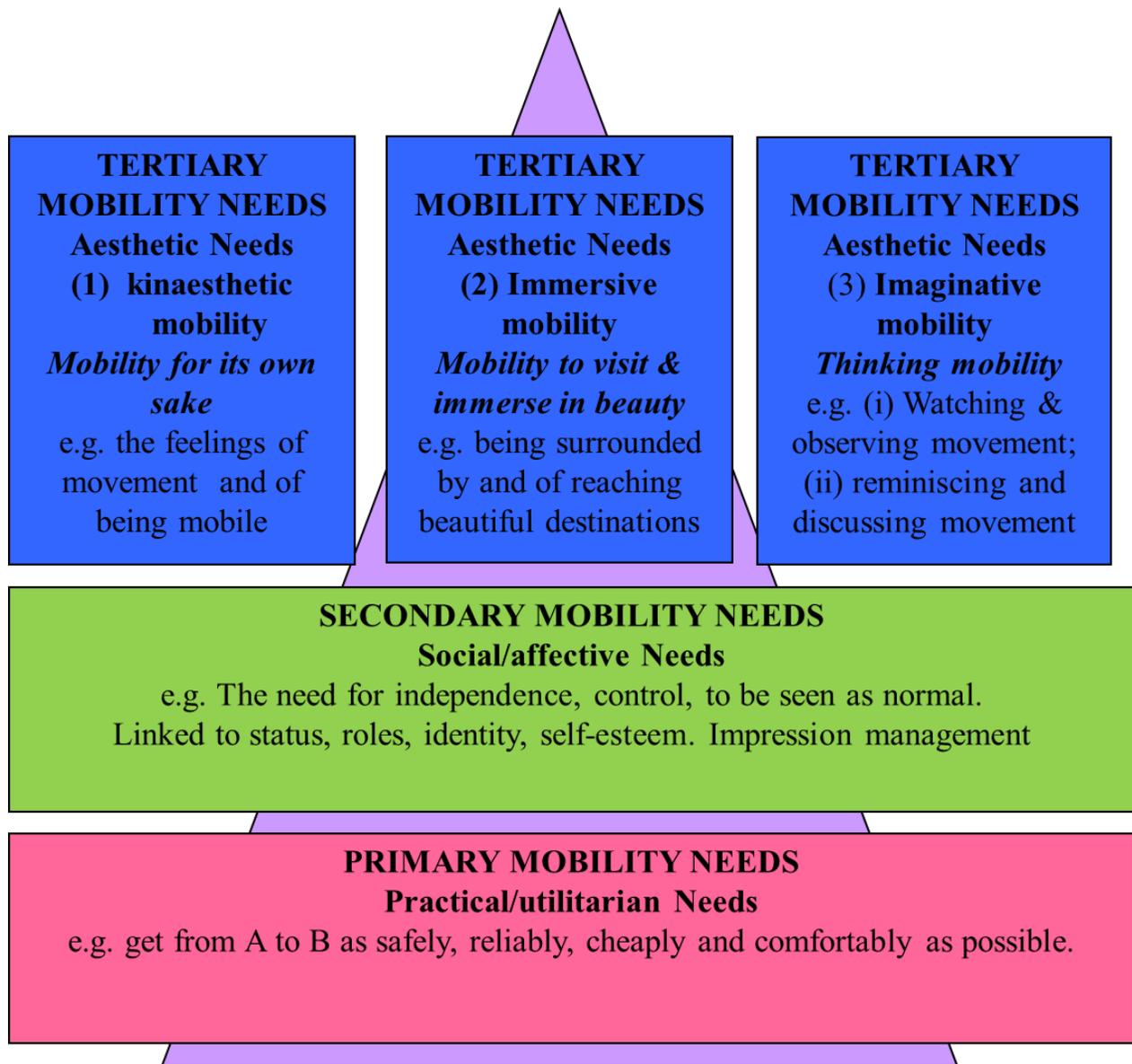


Figure 4: Updated model of Musselwhite and Haddad's (2010b) hierarchy older peoples' travel needs.

Next stages for the model involve standardisation and enumeration, examining the model in different cultures, with different age groups and with people living with dementia. We advocate a future research project can develop quantitative measures (e.g. to be administered within a survey) to test the robustness of the categories and develop a numerical value to judge how far needs are met. This could help policy and practice make better use of the hierarchy and could form the basis of a cost-benefit analysis or return on investment model. Finally, the enumeration could help identify areas of transport or mobility deprivation and help allocation of resources, especially if combined with a GIS style heat-map, identifying areas of good and poor transport provision, potentially identifying areas of transport exclusion for older people.

Yet it must be stressed that the model can be used by practitioners now, as a way of understanding travel and mobility needs. All three levels must be captured when having conversations with older people and interventions must be planned around all three levels of need. For example, provision of primary and secondary health services must understand transport and travel barriers to attendance. These must go beyond simply providing services at a utilitarian level. People may be experiencing anxiety, exhaustion and distress getting to and from their hospital appointments and transport interventions need to reflect that (Age

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UK, 2017). Community based services or interventions to help people stay connected with others need to consider transport needs too. At present, transport is something that is still too often forgotten or left to the individual to organise. Practitioners working with older people must consider mobility and travel issues alongside health and community interventions. In rural areas the focus is often on connecting older people with shops and services, but connection with aesthetics and affective mobility issues are just as important. In urban areas, it is too easy to ignore transport as an issue as there is an abundance of services and destinations within short distances, but these can appear larger than they are and inapproachable for older people if all three levels of mobility needs are not taken into account.

The model has been applied to different countries and cultures and the model remains the same. However, it could be argued, that the countries where the model has been applied are similar to the United Kingdom with regards to ageing and social policy and transport policy and use. Countries in the developing world and in more collectivist cultures, for example, could be very different,.. Some low to middle income countries are urbanising at extreme rates and the instrumental need for cars along with the affective desire for cars is increasing (Le Loo et al., 2015; Van et al., 2014). Older people once at the heart of communities are becoming isolated as social and familial communities become further dispersed and people become reliant on the car.

How far the model is appropriate for any age group needs further consideration. Traditionally, research suggests the affective and symbolic aspect of mobility, and especially the car, is seen more in younger people, especially young males (e.g. the boy racer). However, this research suggests affective notions of mobility exist in older people too. Further research is suggested addressing how far the model might be applicable for all age groups. This would further strengthen the model for older adults; what is distinctive about mobility and transport needs for older people that differ from younger people? What causes such differences? How might such differences manifest themselves in the future? Ashmore et al. (2017) remind us too that this can be culturally specific. In nations defined as collectivist (putting society first), the younger, and better educated, are more likely to be individualistic (putting themselves and family before society) and aspire to a behaviour that shows distinction, such as purchasing and using a car (although in some cultures traditional values can still be very pervasive).

The model has also not been applied to people living with dementia, although such individuals were not excluded from the research (or any of the research underpinning this analysis), the self-selection method of recruitment probably means the number of people living with dementia taking part is likely to be low. However, given the prevalence of dementia in older people, and the difficulty of people living with dementia to be mobile, it would be useful to examine this group in further research.

How far will the model be changed in another 10 years' time? There will be increasing numbers of older people and more older people as a percentage of the population. How far will technology be influencing mobility needs for older people and how will that affect the hierarchy? Projecting forwards, debates on sharing economies and automated technology (e.g. the mobility as a service movement and driverless cars) could dramatically alter the hierarchy, potentially changing the structure.. We look forward to reporting back again in another ten years!

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Appendix 1: List of conferences, seminars and workshops the hierarchy of transport needs has been presented at (bold: academic; italics: mixed; normal: policy and practice)

1. **Musselwhite, C. B. A. (2006). [Prolonging safe driving behaviour through technology: attitudes of older drivers](#). Presented at 26th International Congress of Applied Psychology, Athens, Greece. 16th - 21st July (International, academic audience)**
2. *Musselwhite, C. and Haddad, H. (2007) [Putting your foot down](#). Invited to present at the Older People on the Move workshop, University of Reading. (National, mixed audience)*
3. **Musselwhite, C. B. A. and Haddad, H. (2008). [A Grounded Theory exploration into the driving and travel needs of older people](#). Proc. 40th Universities Transport Study Group Conference, University of Southampton, Portsmouth, January (national, academic audience)**
4. **Musselwhite, C. and Haddad, H. (2008) [Travel and well-being. Travel independence and car dependence: An exploration of older drivers travel and driving needs](#). *British Society of Gerontology Conference*, Bristol, UK, September 2008. (National, academic audience)**
5. Musselwhite, C B A. (2010). [Driving into old age: How harnessing technology can help prolong safe driving for older drivers](#). Invited presentation at the Parliamentary Advisory Council on Traffic Safety (PACTS) Conference on “How can technology help the vulnerable road user?” Birmingham University, UK, March 10 (national, policy and practice audience)
6. Musselwhite, C.B.A. (2011). [We Need to Talk - the role of family, friends and social networks](#). Invited presentation at Parliamentary Advisory Committee on Transport Safety (PACTS) Conference Older, Wiser, Safer: the Challenge of an Ageing Population. October 13th, Royal Society of Medicine, London.(national, policy and practice audience)
7. **Musselwhite, C.B.A., Edge, S., Shergold, S. and Parkhurst, G. (2012). [The role of mobility in maintaining independence, health and wellbeing in later life](#) Symposium at the British Gerontology Society Conference, Keele University, 12th July. (national, academic audience)**
8. **Musselwhite, C.B.A. and Shergold, I. (2013). [Missed journeys: The importance of discretionary and social travel](#), Symposium on Travel, transport and mobility at the British Society of Gerontology, Keeble College, Oxford University, 13th September. (national, academic audience)**
9. *Musselwhite, C.B.A. (2013). [Successfully giving-up driving: Positive experiences beyond the car](#) Invited presentation to [OPAN Cymru Conference 2013, Environments and Communities: Supporting the next generation of ageing research](#), Village Hotel, Swansea, 23rd July. (national, mixed audience)*
10. **Musselwhite, C.B.A. (2014). [The role of emotional and practical support and locus of perceived control in maintaining health and wellbeing following driving cessation in later](#)**

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**life [28th International Congress of Psychology, Paris, 13 July](#) (international, academic audience)**

11. Musselwhite, C.B.A. (2014). [Setting the Scene - where are we now, where do we want to go? Community Matters: are our communities ready for ageing: Getting out and about](#) Invited presentation to the Future of Age, Quality of Life Conference AGE UK, London, 11th March (international, policy and practice audience)

12. Musselwhite, C.B.A. (2015). [Understanding mobility and wellbeing in older age](#), Keynote address *Design for Wellbeing: Innovative research methods for understanding older people's everyday mobility conference*, Oxford Brookes University, UK. 21 April. (national, mixed audience)

13. Musselwhite, C.B.A. (2015). [Providing for fun for functional mobility in later life](#). Invited presentation at [ILC-UK Report Launch: The Future of Transport in an Ageing Society](#). House of Lords, Westminster, London, UK. 18 June. (international, policy and practice audience)

14. Musselwhite, C.B.A. (2015). [Innovation in transport and mobility provision: Functional transport solutions](#) Invited presentation to Community Transport Association's Annual Westminster Conference, Institute of Civil Engineers, One Great George Street, Westminster, UK. 25th November (national, policy and practice audience)

**15. Musselwhite, C.B.A. (2016). [Auto-mobility, community connections and independence in later life](#). Invited presentation to Ageing in Place Symposium, British Psychological Society, Annual Conference, East Midlands Conference Centre, Nottingham, 28th April. (national, academic audience)**

16. Musselwhite, C.B.A. (2016). [Auto-mobility, community connections and independence in later life](#). Invited speaker to British Psychology Society seminar series *Beyond Boundaries: Exploring Psychologies of Ageing. Research Seminar 3 - Ageing in Place: Independence and communities*. Keele Hall - Keele University, 10 February (national, mixed audience)

17. Musselwhite, C.B.A. (2016). [Auto-mobility, driver safety and life beyond the car in later life](#) Invited presentation to [Transportation Research Laboratory Academy Seminar Series](#), Wokingham, 11th April. (national, mixed)

**18. Musselwhite, C.B.A. (2016) [From transport and utility to understanding mobility and wellbeing as we age](#) at the Everyday geographies of ageing (1): (im)mobility, independence and ageing 'well' symposium at the Royal Geographical Society Conference, Sherfield Room 10, Royal Geographical Society, London. 1st September. (international, academic audience)**

19. Musselwhite, C.B.A. (2016). [The Drive for Life](#). British Science Festival public lecture. Main Lecture Theatre, Faraday Building, Swansea University. 6th September 2016 (National, mixed audience)

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20. Musselwhite, C.B.A. (2016) [Going beyond transport statistics in research with older people: When stats aren't quite enough. Mobility for Older People, Transport Statistics User Group Seminar](#). Invited presentation for Transport for London. 16<sup>th</sup> November. (national, policy and practice audience)
21. Musselwhite, C.B.A. (2017) [Older drivers in a physical context](#). Invited presentation to Highways England Road Safety Behaviour Symposium. Coombe Abbey, Warwickshire, 15th March. (national, policy and practice audience)
22. *Musselwhite, C.B.A. (2017). [Is the car really necessary for successful ageing?](#) Invited Presentation to the Transport Studies Seminar Series on Mobilities for an Ageing Population, Hilary Term, Oxford University, 21st February. (national, mixed audience)*
23. Musselwhite, C.B.A. (2016). [A vision for an age friendly transport system in Wales](#). Key note invited presentation to the Senedd, Cardiff Bay, Wales. Launch of AgeCymru Envisage report. 13<sup>th</sup> December. (national, policy and practice audience)
- 24. Musselwhite, C.B.A. (2017). 7 things working with older people and transport & mobility has taught me. Invited Symposium of the Special Interest Group on Transport & Mobility in Later Life, British Society of Gerontology Conference, Swansea University, 7<sup>th</sup> July. (national, academic audience)**
25. Musselwhite, C.B.A. (2017). [Driving in later life: opportunities and risks. Who's qualified to advise older drivers?](#) Invited paper at the International TISPOL Conference, Manchester Airport. 4th October (international, policy and practice audience)

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**Appendix 2: 8 public engagement events involving large numbers of older people:**

1. March 2008 – March 2010 – part of the ESRC Older People and Learning Seminar Series group, Lifelong learning initiative, Leicester University
2. September 2008. [Older men and their cars](#). BA Festival of Science, Liverpool, UK.
3. February 2009. Invited and took part in EPSRC public engagement event with older people, Swindon.
4. November 2009: Invited to present at The Older People's Forum - Health Sub Group - part of the Welsh Assembly Government's Strategy for Older People, Barry Island.
5. September 2012. The seductiveness of the car. Talk at the Climate Cafe, Art House Cafe, Southampton.
6. September 2016. [The Drive for Life](#) British Science Festival. Swansea University.
7. November 2017: Discussant at Public Toilets and Social Justice, community event Maindee Library, Newport, Wales.
8. November 2017: [Environments of Ageing](#) presentation at ESRC Festival of science, Waterfront Museum, Swansea.

Appendix 3:

List of the 19 articles that discuss in detail Musselwhite and Haddad's (2010) model of older people's travel needs

Paper	Country of data collection	Application of Musselwhite and Haddad's (2010) hierarchy of needs
Buy, L., Snow, S., van Meegen, K., & Miller, E. (2012) Transportation behaviours of older adults : an investigation into car dependency in urban Australia. <i>Australasian Journal on Ageing</i> , 31(3), pp. 181-186.	Australia	Used to inform study
Berg, J., Levin, L., Abramsson, M., and Hagberg, J.-E., (2014). Mobility in the transition to retirement – the intertwining of transportation and everyday projects. <i>Journal of Transport Geography</i> . 38, 48–54	Sweden	Added a geo-spatial layer to needs and found walking more prominent than in Musselwhite and Haddad (2010) especially in undirected or aesthetic travel
Boggatz T. (2016) Quality of life in old age – a concept analysis. <i>International Journal of Older People Nursing</i> 11, 55–69	Review	General quality of life similar to the hierarchy of travel needs model.
Campana, S. (2013). Accessibility and transportation: A spatial analysis of Go Transit. MSc in professional practice thesis. Ryerson University, Toronto, Canada.	disability and community transport in Toronto, Canada	Used to inform study
Clayton, W. (2012) <i>Bus Tales: Travel-time use, technologies, and journey experiences on the bus</i> . PhD, University of the West of England.	Bus use in UK	Used to inform a model of bus user needs
Dikas, G. (2014). <i>Paratransit services under normal and emergency conditions using public transport resources</i> (Doctoral dissertation, Πανεπιστήμιο Αιγαίου. Σχολή Επιστημών της Διοίκησης. Τμήμα Μηχανικών Οικονομίας και Διοίκησης). Submitted for PhD in University of the Aegean Department of Financial and Management Engineering	Greece	Used to inform study
Hjorthol, R. (2013). Transport resources, mobility and unmet transport needs in old age. <i>Ageing</i>	Denmark, Norway and Sweden	Discuss the joining together of psychosocial and aesthetic needs together.

<i>and Society</i> , 33(7), 1190-1211.		
Hjorthol, R. J., Levin, L. and Siren, A. (2010) Mobility in different generations of older persons: The development of daily travel in different cohorts in Denmark, Norway and Sweden. <i>Journal of Transport Geography</i> 18(5), 624–633.	Denmark, Norway and Sweden	Discussing relationship of needs to wellbeing and welfare from different perspectives.
Mifsud, D., Attard, M. & Ison, S. (2017). To drive or to use the bus? An exploratory study of older people in Malta, <i>Journal of Transport Geography</i> , 64, 23-32.	Malta	Used to inform study
Musselwhite, C.B.A. (2018c). Creating a Convivial Public Realm for an Ageing Population. Being a Pedestrian and the Built Environment, in Charles Musselwhite (ed.) <i>Transport, Travel and Later Life (Transport and Sustainability, Volume 10)</i> Emerald Publishing Limited, pp.129 - 137	UK	Applicability of the model to the built environment and public realm
Musselwhite, C.B.A. (2017b) Exploring the importance of discretionary mobility in later life. <i>Working with Older People</i> , 21, 1. 49-58.	UK	Discussion and examination of aesthetic or discretionary need in more detail.
Musselwhite, C.B.A. (in press) Older people's mobility, new transport technologies and user-centred innovation in Muller, B., Wenninger, D. (eds.) <i>Towards user-centric transport in Europe</i> . Lecture notes in Mobility Series. Springer.	UK	Applying the model to future transport innovations.
Musselwhite, C.B.A. and Haddad, H. (2017) The Travel Needs of Older People and What Happens When People Give-Up Driving, in C.Musselwhite (ed.) <i>Transport, Travel and Later Life (Transport and Sustainability, Volume 10)</i> Bingley,. UK: Emerald Publishing Limited, pp.93 - 115	UK	Relating the needs in more detail to non-car mobility.
Nordbakke, S. and Schwanen, T. (2014) Wellbeing and mobility: a theoretical framework and literature review focusing on older people. <i>Mobilities</i> , 9(1): 104-129.	Review	Discussion of the issues with bottom-up self-report wellbeing and challenges of understanding the relationship of wellbeing with needs.

Siren, A., Hjorthol, R. and Levin, L. (2015) Different types of out-of-home activities and well-being amongst urban residing old persons with mobility impediments, <i>Journal of Transport &amp; Health</i> , 2(1), 14-21.	Denmark	Distinguishes between utilitarian and discretionary needs (similar to practical and aesthetic needs) Psychosocial needs were related to both levels of need and not distinguished as separate
Vitman-Schorr, A., Ayalon, L. and Khalaila, R. (2017). Perceived Accessibility to Services and Sites Among Israeli Older Adults, <i>Journal of Applied Gerontology</i> .	Israel	Used to inform study.
Yanguas, J. (2014). Gerontologia y conducción en Europa (Gerontology and driving in Europe). Presented at Herritarren Zahartzea eta bide Segurtasuna (Citizen ageing and road safety) conference, Bilbao, 8 May 2014.	Spain	Used to inform study.
Zeitler, E. (2013). <i>Older people's mobility within the community. The impact of built environment and transportation on active ageing</i> . PhD thesis Design School, Queensland University, Australia.	Australia	Used to inform study.
Zeitler, E., & Buys, L. (2015). Mobility and out-of-home activities of older people living in suburban environments: 'Because I'm a driver, I don't have a problem'. <i>Ageing and Society</i> , 35(4), 785-808.	Australia	Used to inform study.