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

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### Abstract

At this historic half-century celebration of UTSG, we wanted to reflect on a model of older people's travel and mobility needs first presented a decade ago at [UTSG in 2008 \(Musselwhite and Haddad, 2008a\)](#). The work, exploring travel and mobility transport issues in an ageing society, was based on a series of focus groups, interviews and travel diaries with 26 older drivers and interviews with 31 older people who had given up driving, producing a hierarchy of travel or mobility needs. It comprises three levels, grouping together responses based upon when in the conversation they had emerged. At the primary level, needs initially discussed were *practical needs*, the need to get from A to B, as quickly, reliably, cheaply as possible. This was followed by the secondary level: termed affective (or *psychosocial*) *needs*, comprising of the need for independence, roles, status, self-esteem and impression management that mobility affords. The model concluded with a tertiary level of need that emerged towards the end of conversations; the need for mobility for its own sake, just to get out and about and to see the world, a need we termed as *aesthetic needs*. Since then, the model has been translated into different languages and been cited 116 times across different formats. Using 10 years of feedback that included article citations; discussions with academics, policymakers and practitioners; as well as from older people themselves, we will reflect on our model around five key themes: (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) fitting the model to future changes in transport and social policy; and (5) understanding the relationship between travel needs and health and wellbeing. The paper concludes by offering a way forwards for studying travel needs of older people, examining how the model might need amending and implications of this for policy and practice.

### 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 mobility with least physical exertion, which is door-to-door and runs on demand, 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, 2017a). Driver cessation is linked to poorer mental and physical health and associated with depression, anxiety and is linked to loneliness and isolation (see Musselwhite, in press, d for review). Hence, mobility is vitally important in later life.

*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, we 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, based on how early on 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. 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.

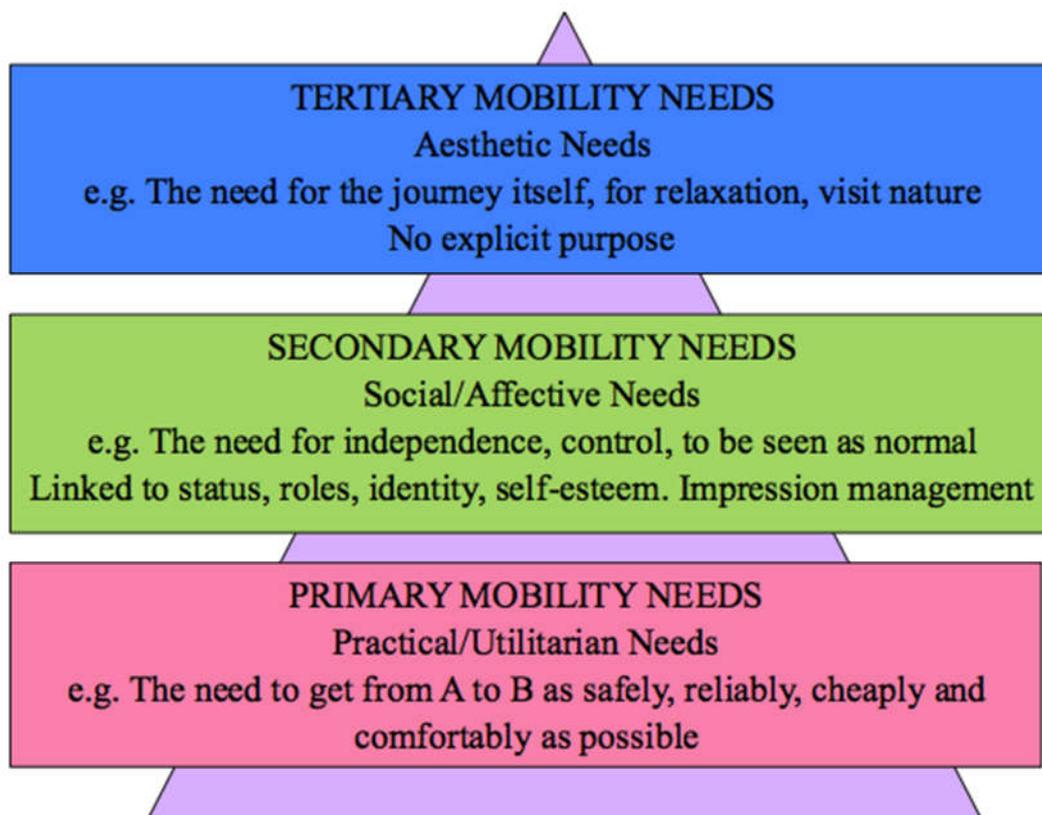


Figure 1. Musselwhite and Haddad's (2010b) Hierarchy of Travel Needs of older people

Musselwhite and Haddad (2010b) suggest that travel or mobility in later life is important at all three levels, yet they have differing ways of being addressed. 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 the 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. In our hypermobile world, driving a car readily fulfils all three level of needs.

Ten years on, this paper re-examines the hierarchical needs model of older peoples' travel and mobility needs developed by the authors; updating to include any subsequent findings, challenges to the model from changes in society while reflecting upon it with 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. The projects all involved discussions on transport and travel in later life, though did not directly ask about transport needs in general. Hence, a simple mapping of collected data against the three categories of the model took place. The data examined derived from the following research projects:

(i) *Grey and Pleasant Land (Parkhurst et al., 2012). 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 & 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.

(iv) *Modal Differences Research (Musselwhite, 2017, in press).* 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 all cases described above, a thematic analysis of the findings in relation to original model was investigated. Themes that matched and did not match what was to be expected were captured and noted.

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

These were taken from questions asked or discussions raised when the model was presented at 22 academic conferences crossing disciplines that included gerontology, transport, psychology, sociology, geography and design. These also included feedback from

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reviewers of submitted papers (Musselwhite 2017; in press, b; Musselwhite and Haddad, 2010a,b) and also in informal conversations and discussions.

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

Feedback from 11 presentations and workshops given by the authors to policy and practice audiences, 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 an additional 5 presentations to charity and third sector workers including presentations and discussions with the International Longevity Centre and AGE UK.

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

Feedback from 7 public engagement conferences or workshops, including 2 British Science Festivals (2008 and 2016) and more local events such as the Vale of Glamorgan Older People's Forum (2010), Art House Café Southampton (2012), as well as numerous appearances on TV and radio and feedback from public via email (n = 6) and handwritten letters (n = 3).

### 5. Academic papers citing the model

The model has been cited by 116 different papers. These papers were identified through Google Scholar and the abstracts were read and the citation cross referenced. citation read. Where the citation contained substantial commentary (18 papers) about the model, this was then analysed in more detail using a narrative review approach (Jones, 2004).

## Findings

Using the feedback from academics, policy makers and practitioners and older people themselves, findings could be structured around five key themes: (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) fitting our model to future changes in transport and social policy; and (5) understanding the relationship between travel needs and health and wellbeing.

### 1. The validity of the model

On reflection, one thing that has not really been addressed is unpicking exactly what needs are. 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) postulate that there are different 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, 2012). 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 or related, for example, not literally being mobile within a beautiful place, but remembering, reminiscing about a beautiful place or journey.

Musselwhite (2017b) concludes the car, and especially driving oneself, was seen among older people as their best way to meet their discretionary travel needs. Mollenkopf et al (2011) also addressed affective needs in more detail, explaining the importance of out-of-home mobility as an emotional experience, to note physical movement as a basic human need to stress that mobility should be seen as 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.

Finally, it is not known if needs actually affect 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 we aren't perhaps capturing.

## 2. The utility and usefulness of needs in understanding travel behaviour and turning them into policy or practice

One of the important aspects of the model is, if we do retain its three layers, is what does this mean for practice? We, Musselwhite and Haddad (in press), have recently revisited the model in terms of how far different modes of transport meet each of the needs. Driving one's own car easily meets all three levels of need.

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 in particular took place that are worthy of further investigation. First, the model is applicable for any age groups and is not limited to only older people, in which case further research is needed about whether the model should and can look different for older people compared to younger people. Again 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). Second, since the model shows that the car answers all the levels of needs easily (Musselwhite and Haddad, in press; Musselwhite, in press, b), 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 answering the first point, 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. 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, for example (Musselwhite, in press, a). 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). Finally, there is a need 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. 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, in press; Musselwhite, 2017, in press, b). Musselwhite (in press, b) suggests that, walking satisfies

aesthetic needs, somewhat social or affective needs but lesser so utilitarian needs. Using the bus and getting lifts can satisfy aesthetic and utilitarian needs but not affective needs.

Another comment from practitioners over the time 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 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.com](http://www.operat.com)), the tool, at present, does not include transport and travel.

### 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. Though the work was qualitative, the participants were not representative in a numerical and statistical sense. The model can be applied to rural and urban participants (albeit with small numbers utilising depth rather than breadth techniques). 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 they 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? 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 translated and applied to older people in Spain (Janguas, 2014; Figure 2), Greece (Dikas, 2014), disability and community transport in Toronto, Canada (Campana, 2013), and used as basis to study older people's travel needs in Israel (Vitman Schorr et al., 2017), Malta (Mifsud et al., 2017) and Australia (Zeitler, 2013).



Figure 2. Spanish version of Musselwhite and Haddad (2010b) hierarchy of older people's travel and mobility needs (Yanguas, 2014)

In terms of applying the model wider, it has been mapped to work improving the public realm for older people (Musselwhite, in press, c). 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 Table 1; Musselwhite, 2016, in press, c).

The hierarchy of travel and mobility needs mirrors models in other sectors. For example, in studying 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 our model albeit in a different context.

Table 1: Designing streets for older people based on CABE (2011) principles (adapted from Musselwhite, 2016, in press, c).

Transport & mobility need	CABE principle	Description
1. Safe and accessible space – feel you are safe there	Ease of movement	Movement mixed with ability to pause and dwell through adequate provision of benches and toilets.  Space should be well looked after to facilitate movement, allowing people to have room to share the space, to move safely with other users with special provision for walking and cycling provided as appropriate
	Legibility	Area should be designed utilising affordability criteria. It should be easy to decipher what the user is supposed to do in the space. This can be achieved through signage but also other points in the environment. Space should be clearly designed to show where movement is to take place and where spaces to relax are created, for example places to sit, perch or lean. Focal points to commune at should be included at appropriate junctures, including fountains, works of art, sculptures, memorials or trees, gardens and other greenery
2. Legible place Psychological attachment and legitimacy - feel you should be there	Adaptability	The place must take into account changing needs of the population and should be designed to adapt or be easily adapted to new users, policy and legislation over time
	Diversity and choice	Area must be designed to carefully consider all user groups needs are met and that people from certain groups are not excluded from using spaces
	Character	Local public realm should have clear character that reflects local identity, culture and history. Utilising local art and architecture can help enhance distinct and unique character and identity
3. Distinctive and aesthetically pleasing – somewhere you want to go and spend time – feel you want to be there	Continuity	Spaces should be designed to carefully show where one type of activity starts and another ends. Movement spaces can look and feel differently to spaces to dwell in, for example. Spaces for use by pedestrians must clearly start and end when spaces dominated by vehicles begin. Use of gateway style features and changes in textures can enable this to be clearly realised
	Quality public realm	The public realm must be made from good quality, distinctive and easy to maintain material

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

So far we have looked at how our model has adapted from the perspective of the model itself. What changes has there been over the past ten years in terms of ageing and transport that may mean the model needs revisiting.

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 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 has increased for over 70 year olds by 8% between 2008 and now (DfT, 2016, 2009). Mileage travelled across most modes have increased in miles per person per year for the over 70s, most notably as car drivers (risen from 1774 to 2197 miles per year, over 23% increase), car passengers (risen from 1367 to 1549 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. 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. Huge 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.

Simultaneously, there has been a huge growth in technology. Driverless cars, or autonomous vehicles, are often viewed as the panacea to older driver's issues, allowing them to "drive" longer and later on in life safely, prolonging safe mobility for this age group later than is currently seen. With regards to our needs model, automated vehicles might well help people meet the utilitarian and aesthetic needs. However, it is unlikely that they would meet many affective needs, which often relate to the affective outcomes based on individuals driving themselves, especially if the driverless model is one of shared vehicles. 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. Totally automated systems were largely disliked and discussion of autonomy and "doing it for themselves" was discussed 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 certainly 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; Musselwhite & Haddad, 2010b, in press). 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 in press, a). This would not be mimicked unless the automated vehicles were large in size and small shared vehicles are unlikely to have the social element.

#### 5. 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, we position health and wellbeing as a self-report measure. This has been a deliberate way to deal with a multi-faceted concept while remaining true to a co-productive, bottom-up, person-centred approach. Despite obvious advantages, both practically for researchers but also in terms of gaining an understanding of what makes people feel better themselves, it is naturally problematic again to practitioners who are looking for something to place more of a numerical value on and is often mentioned by them as a limitation to the approach needed. Taking a health economics perspective, perhaps utilising a return on investment approach is a way of overcoming this, but it would require enumeration of needs and costs and benefits of meeting those needs, something beyond the

model for the time being. 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 Senedd with the Welsh Government, 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.

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, but attempts to relate needs to health and wellbeing is problematic. First, how could you show a relationship devoid of other intervening variables and noise? Accessibility to transport is confounded with a multitude of other factors that could be influencing wellbeing and health. Examining the literature that links driver cessation to health and wellbeing identifies that it is fraught with methodological problems and difficulties 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 we do within this paper: there are problems of definition of quality of life and noise surrounding factors influencing them.

## Conclusions

We are satisfied that our travel needs model is much the same as when originally 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, 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 well and neatly fits CABE guidelines. It fits well with models outside of travel and transport, including ICT and ageing in place (Hopkins, 2016). As such it has some face validity and we suggest the structure 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, then this could be a form of utilitarian need.

There are calls for enumeration: perhaps a further stage 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 how far needs are met. This could help policy and practice to make better use of the hierarchy and could form the basis of the hallowed cost-benefit or return on investment requirement. Finally, the enumeration could help identify areas of transport or mobility deprivation and help allocation of resources, especially if combined with a GIS map.

How far will the model be changed in another 10 years' time? There will be more older people and more older people as a percentage of the population. How far will technology be supporting or hindering mobility needs for older people and how will that affect the hierarchy? Projecting forwards, debates on sharing economies and automated technology leading the changes in provision and purchasing of mobility, the mobility as a service movement and driverless cars could well alter the hierarchy and offer changes in terms of how well transport needs the level of needs. The middle level, the affective/ psychosocial, is less likely to be met with such technologies. How far this presents an issue or a problem remains to be seen. Could that level of needs be met elsewhere? Perhaps through virtual mobility with social media as has been mooted as important with youngest not getting in their

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cars. How will increases in vehicles in low to middle income countries affect transport needs among older people? We look forward to reporting back again in another ten years!

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