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# **On the Road Again: The Barriers and Benefits of Automobility for People with Disability**

The UN Convention on the Rights of Persons with Disability (PWD) has been signed by over 160 nations to achieve greater social participation, with public and private transport clearly identified as an area to improve accessibility. Whilst the majority of scholarly work has focused on public transport needs, less research has examined the barriers or benefits of access to private modified vehicles for PWD. In this exploratory study, a Delphi technique with health experts, researchers, drivers and funding agencies developed an instrument to examine the barriers and benefits of access to private modified vehicles for PWD. An online survey was completed by 287 drivers and carers to report on barriers to private modified vehicles, whilst a sub-set of 190 drivers with access to a private modified vehicle reported on experientially derived benefits. A factor analytic approach identified how financial and informational barriers vary with respect to several characteristics including disability type and level of support needs. Factors relating to independence, social and recreational benefits are perceived as more valued experientially derived benefits relative to benefits relating to employability and ability to enjoy downtime. Benefits in the form of independence are greater among drivers and owners, those with an acquired condition, less complex mobility and everyday support needs, whilst little difference emerged in terms of the social and downtime benefits. The findings inform policy development and funding opportunities to provide insight and evidence into the barriers, but also benefits and variation in private transport needs among PWD.

**Keywords:** private vehicle; access; disability; barriers; benefits; citizenship; automobility

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# **Getting Back on the Road: The Barriers and Benefits of Automobility for People with Disability**

## **ABSTRACT**

The UN Convention on the Rights of Persons with Disability (PWD) has been signed by over 160 nations to achieve greater social participation, with public and private transport clearly identified as an area to improve accessibility. Whilst the majority of scholarly work has focused on public transport needs, less research has examined the barriers or benefits of access to private modified vehicles for PWD. In this exploratory study, a Delphi technique with health experts, researchers, drivers and funding agencies developed an instrument to examine the barriers and benefits of access to private modified vehicles for PWD. An online survey was completed by 287 drivers and carers to report on barriers to private modified vehicles, whilst a sub-set of 190 drivers with access to a private modified vehicle reported on experientially derived benefits. A factor analytic approach identified how financial and informational barriers vary with respect to several characteristics including disability type and level of support needs. Factors relating to independence, social and recreational benefits are perceived as more valued experientially derived benefits relative to benefits relating to employability and ability to enjoy downtime. Benefits in the form of independence are greater among drivers and owners, those with an acquired condition, less complex mobility and everyday support needs, whilst little difference emerged in terms of the social and downtime benefits. The findings inform policy development and funding opportunities to provide insight and evidence into the barriers, but also benefits and variation in private transport needs among PWD.

**Keywords:** private vehicle; access; disability; barriers; benefits; citizenship; automobility

## 1. INTRODUCTION

Accessibility is a central component to the United Nations' *Convention on the Rights of Persons with Disability* including living independently, community inclusiveness and enabling participation in cultural activities such as those relating to leisure, sport and tourism (United Nations, 2006, p. np). However, people with disability (PWD) have significant lower mobility and transport opportunities available to access spaces and places as compared to the general population (Casas, 2007). The specifics and impact of difficulties in transport among various disadvantaged groups has been described as "transport disadvantage" (Currie & Delbosc, 2011; Currie et al., 2009; Currie & Stanley, 2007; Denmark, 1998; Hine & Mitchell, 2003). People who are transport disadvantaged are affected both socially and psychologically (Delbosc & Currie, 2011b). In a review of the transport disadvantage literature, Currie and Delbosc (2011) note that among the few studies considering PWD, disadvantage is more pronounced among them (Currie, 2004; Dodson, Gleeson, & Sipe, 2004; Murray & Davis, 2001; Wixey, Jones, Lucas, & Aldridge, 2005). Such disadvantage compounds the exclusion PWD face every day (Crow, 1996; Kitchin, 1998), affecting all areas of their lives including employment, health, education, social participation and recreation (World Health Organization & World Bank, 2011). The issue speaks to the rights of individuals for equal access to transportation as part of foundational requirements for social participation and citizenship (Meekosha & Dowse, 1997).

Most research on transport disadvantage among PWD has focused on issues relating to the accessibility and experiences of using public transport (Casas, 2007; Hine & Scott, 2000; Jensen, Iwarsson, & Ståhl, 2002; Lindqvist & Lundälv, 2012; Risser, Lexell, Bell, Iwarsson, & Ståhl, 2015). These difficulties are associated with physical accessibility, malfunctioning equipment (e.g. lifts to platforms), lack of audible signalling and changed or cancelled services (Australian Human Rights Commission, 2015; Currie & Stanley, 2007;

Delbosc & Currie, 2011a). This situation can be further compounded for PWD residing in outer-urban, rural, and remote areas with poor or non-existent accessible public transport infrastructure, the need to travel further distances to access employment, services and to participate in activities (Kamruzzaman & Hine, 2012; Rosier & McDonald, 2011).

Many PWD have sought alternative options, including paratransit systems, which are point-to-point systems provided free or subsidised by government to assist PWD. While less flexible than private modified vehicle (PMV) use, such systems offer independence for PWD to travel to places of their choosing, thereby successfully facilitating social participation to employment, health, voluntary, education, social and community engagement activities (Deka & Gonzales, 2014; Fei & Chen, 2015; Nguyen-Hoang & Yeung, 2010). However, there have been multiple problems with these systems depending on the geographic location, governance, delays, effectiveness, efficiency and costs to individuals and to government (Bazaras, Verseckienė, & Palšaitis, 2013; Fitzgerald, Shaunesey, & Stern, 2000; Fu, 2002).

For some PWD, public and para transport options are not available, with Rosenbloom (2007) suggesting that this is the case for one-third of Americans. A 2002 study by the U.S. Bureau of Transportation Statistics (BTS) found that that less than one in five used public transport whilst less than 10 per cent had engaged specialised and ADA paratransit modes (Sweeney, 2004). On the other hand, 78% of PWD aged 25-64 had used a private vehicle with 69% doing so as drivers. The dependence on cars among older persons was found to be even higher (Rosenbloom 2002).

In Australia, in the context of the current study, rates of access to public and private transport among PWD appear higher. One study in Western Australia indicated 96% had access to public transport with 68% making use of it, whilst 92% of those PWD surveyed were a passenger or driver of a private vehicle at least once per month (Haning, Gazey and Woolmer 2012). More broadly, the Australian Bureau of Statistics (ABS 2009) reported that

80% of PWD had either driven or been a passenger in a car upon their last trip, with less than 10% suggesting private transport was sought because of a lack of public transport or preclusions due to their health or disability. However, another variable in the disability ageing and carers survey specifically examines those who use a modified car or car aids in Australia. This equated to 0.4% of people with disability or some 15,600 people (ABS, 2009)

The use of a modified car or car aid varies considerably by impairment type. An analysis of data from ABS (2009) highlights these differences. Amongst those who use modified vehicles or car aids with lower levels of modified vehicle adoption include those with breathing difficulties (8%), nervous of emotional conditions (10%), loss of hearing (20%) or have a mental illness (24%). Groups with a higher proportion of PMV adoption include those with incomplete use of their feet or legs (91%), restricted in their physical activities or work (84%), those with chronic recurring pain (67%) or have difficulty gripping or holding (56%). However, such data does not identify how many of these people would seek the use of a modified vehicle if they had the need and the means. Further, these statistics overshadow the reported difficulties among those with greater severity, who are more likely to encounter a wider range of problems including getting to and navigating transport hubs or getting in and out of vehicles/carriages (Haning, Gazey and Woolmer 2012).

For these reasons, it is important to understand the benefits and barriers to transportation, but also account for differences in how such outcomes are realised at different levels across the population of PWD. Identifying potentially marginalised groups and highlighting which PWD groups can benefit most and on which dimensions informs the design of policies that support the utilisation of transport with respect to various factors such as disability type and level of support. The objective of the current research is to undertake such an investigation in the context of understanding the perceived benefits and barriers of automobilty for PWD in Australia, and how differences in perceptions vary to see whether

benefits are uniform or provide greater opportunities to groups within the PWD community in terms of disability type, level of support need and sociodemographics.

## **2. Automobility for PWD**

To date, research in transportation on private transport options using automobiles for PWD has received less attention relative to issues of transport disadvantage in public transport and alternatives such as paratransit options. This is surprising given the considerable opportunities that exist for PWD given the right support, assistive technology and engineering modifications to motor vehicles. In contrast, the medical and allied health research literature explores at length the assessment and interventions for assisting people with impairments to drive (e.g. Legh-Smith, Wade, & Hewer, 1986). Not surprisingly, both areas of study of PWD consistently highlight costs as a barrier to PMV (Woodbury, 2013, p. ii). However, not all PWD are transport disadvantaged to PMVs, with the variation in costs affected by a person's disability type and their level of support needs (Australian Bureau of Statistics, 2009). For example, vision impaired require no modifications PMVs whereas wheelchair users require significant modification for independent access.

Few production vehicles are made for people with mobility disability. Instead, standard production vehicles must be specially modified to cater for drivers and passengers with disability. Modifications can range from simple additions (e.g., steering wheel spinner knob) to more complex modifications to the vehicle body structure, such as extending a vehicle's length or altering its roof line (Roads and Traffic Authority, 2007; van Roosmalen, Paquin, & Steinfeld, 2010). The cost of such modifications varies from a median as low as \$US50 for a steering wheel spinner knob, \$US2,600 for a roof mounted hoist, to \$US25,000 for body modifications. In the case of wheelchair users with the highest support needs, the combined cost of lowering a vehicle's floor or raising its roof to allow a wheelchair user to drive from their wheelchair together with electronic driving aids may cost as much as

\$US190,000 (Bourke-Taylor, Cotter, & Stephan, 2014; Darcy & Ely, 2014; Denmark, 1998; Ely, 2016). Among families with children with cerebral palsy, it was identified over half spent \$US22,000 on vehicle modification (Bourke-Taylor et al., 2014). Hence, household income can also affect transport disadvantage since PMV ownership is restricted through the cost of purchasing modified vehicles as well as maintaining PMVs such as the cost of petrol, registration, insurance, servicing and repairs of vehicles. This can lead to “transport poverty” among those with lower rates of disposable income and employment such that ongoing costs of car ownership create financial stress (Gleeson & Randolph, 2002).

In general, government approaches to PMV ownership have been ad hoc at best with few countries offering schemes to redress the inequity of PMV ownership for PWD including UK, Germany and Australia (Darcy & Ely, 2014; Layton & Wilson, 2009). Most schemes offering assistance to PWD to drive or gain access to a modified vehicle are only available to those who were eligible for compensation via workplace or motor vehicle accident. Government programs vary by country (the vast majority having no assistance programs), whilst approaches to modification approval, assistance, assessment and licensing of drivers with disability further vary by jurisdiction or by regional government. For example, in Australia, State and Commonwealth government programs give not only money but also support including occupational therapist and workplace assistance (National Disability Insurance Scheme, 2015b; NSW Lifetime Care and Support Authority, 2016). These resources are both information and assessment based and complement an eligible person’s access to financial resources. In other schemes, access is dependent on the individual being employed. The neoliberal agenda of employment and citizenship being closely aligned flows through to PMVs, whereas access to automobility for PWD without employment can increase employment prospects by extending their opportunities for social participation. These opportunities include volunteering where PWD are exposed to human capital development



that are critical to, and transferable, to employment (Bates & Davis, 2004; Lindsay, 2016).

For those without a motor vehicle license living in a car culture, such as the US, Australia and Canada (Flink, 1975), significant social disadvantages occur (Featherstone, Thrift, & Urry, 2005; Hendricks, 2014; Lucas, Blumenberg, & Weinberger, 2011). Critiques of automobility identify that whilst PWD able to access the benefits of automobility (e.g., mobility, status, independence, employment and pleasure), society accrues the costs (e.g. negative externalities of pollution, crowding etc.) and how through new notions of transport sustainability there is an increased emphasis on social sustainability (Wells & Xenias, 2015).

Consideration of transport disadvantage, however, must move beyond a simplistic understanding that it affects PWD stemming from being “unable to drive” (cited in Currie & Delbosc, 2011; Murray & Davis, 2001). Study of opportunities for PWD must recognise the social structure to which they are embedded. For example, PWD are presented many opportunities by the household or family to which they belong. As such, studying barriers and benefits of private transport must recognise that where PWD are unable to drive there is an increased role of household members in transporting individuals with disability that creates a dependency and extra hidden cost of disability to the household through either lost to the cost (lost paid employment through a voluntary transporting of PWD) and lost independence of PWD that affects social participation (Deka, 2014).

In conceptualising transport disadvantage, Currie and Delbosc (2011, p. 21) identifies that there are three major considerations: urban form; transport options; and, types of people. As such, it is important to consider that the travel chain is made up of all elements of a journey including pedestrian access, the vehicles themselves and transfer points, and if any link is inaccessible the entire trip becomes difficult (World Health Organization & World Bank, 2011, p. 179). These elements of the urban environment further create barriers for all transport options, including those using PMVs. The personal mobility of the individual, their

access to or limitations with assistive technology may further affect their local mobility. This may occur through: lack of curb cuts, continuous part of travel, ramps, lifts, tactile ground surface indicators, clear signage, the type surface, the gradient, cross camber, inclement weather, parking, accessible toilets and a myriad of other access considerations (Bromley, Matthews, & Thomas, 2007; Meyers, Anderson, Miller, Shipp, & Hoenig, 2002).

With respect to benefits derived from personal transportation, some studies have linked mobility among PWD to a range of improvements including quality of life stemming from a sense of freedom, and the control over their participation in the community (van Roosmalen et al., 2010). Among drivers, Ellaway et al. (2003) found higher levels of benefits relating to perceptions of protection, autonomy and prestige in their mobility over those who were passengers or public transport users; a link between PMV ownership, longevity of life and better health was also found (Ellaway, Macintyre, Hiscock, & Kearns, 2003).

Freund (2001) discusses the social organisation of space-time practices that create significant disadvantage for PWD requiring accessible transport options. Drawing on sociology and disability studies connections are made between the social organisation of space and time in society, the embodied ontology of PWD and the notion of embodied agency. This theoretical examination has significant implications for transport (public and private) that have been structured without consideration of disability. The social construction of the transport environment creates a series of “disabling barriers” imposed on top of a person’s impairment that results in transport disadvantage (Aldred & Woodcock, 2008; Barnes, Mercer, & Shakespeare, 2010). While public transport and para-transport options have been examined through social constructionism, there has been a dearth of studies examining automobility and access to private modified vehicles. This paper will seek to address this gap in the literature by applying a social constructionist and socio-ecological model to the barriers and benefits of automobility (Devereux, Bullock, Gibb, & Himler,

2015; Simplican, Leader, Kosciulek, & Leahy, 2015).

### **2.3 Summary**

Social exclusion from transport can be discussed in terms of the social and human capital an individual is able to develop to challenge their disadvantage or if unable to challenge their disadvantage how it perpetuates the inequality and discrimination that they face (Schwanen et al., 2015). As the aforementioned studies have noted, the link between social participation and the development of social and human capital for PWD has been shown to be closely connected. Schwannen et al (2015) notes the embodied process for PWD where dependency in transport becomes an internalised dependency for all areas of social participation. In doing so, those experiencing transport disadvantage (in this case, PWD) are socially excluded beyond just social participation to those areas that manifestly develop in social capital through bridging (current relationships) and networking (beyond their current social circles) that provide opportunities for volunteering and employment. To date, the few that consider PWD in terms of PMV suggest a range of barriers, but also benefits that can be realised, but these may vary across different groups. However, implicit to social capital is an understanding of the social constructionism and the social ecological model that categorises the dimension of barriers/benefits across the following levels: individual; interpersonal; organisational; community; and the sociopolitical. In the next section, the research approach is described in more detail that was used to explore these questions.

### **3. RESEARCH DESIGN**

The background literature and UN human rights social model theory guided the research design generally and the survey instrument design specifically to examine the benefits and barriers in PMV access and to explore disparity across PWD on various dimensions of disability, support needs and demographics. A social model of disability approach focuses on

the lived experience of PWD, the barriers they face and the transformative solutions to creating enabling environments and attitudes (Oliver, 1990). The results and discussion draw upon a social constructionist approach to understanding disability in the PMV context. Further, to assist in analysing the results and discussion, a social ecological model (individual/intrapersonal; interpersonal; organisational; community; and, sociopolitical and public policy) is utilised to better understand the PMV ecosystem (Simplican et al., 2015).

### **3.1 Instrument development**

As no previous quantitative studies had been developed to examine the benefits of ownership of a PMV, this exploratory study also used a Delphi technique to assist with questionnaire and development (Hasson, Keeney, & McKenna, 2000; Linstone & Turoff, 1975). The Delphi group consisted of 15 expert advisers from across government, not-for-profit and commercial suppliers, chosen for their relative expertise in disability, industry knowledge, access, occupational therapy, policy or advocacy. Nine of the group had lived experience of driving with disability across the all levels of support needs from relatively independent with low-tech driving requirements (e.g. spinner knob) through to the highest level quadriplegic drivers using specialist electronic equipment. Two were also passengers with disability. All members were involved in initial conversations about the project and the series of four rounds of questionnaire instrument development and pilot testing that occurred over a six-week period. The questionnaire instrument changed over this time period as did the wording of individual items. Once the questionnaire testing was complete, the Delphi group remained involved and received a draft report for comment. The pilot examined: survey completion time; identifying duplication; typographical errors; establishing clarity and validity of questions and items; and obtaining suggestions for additional questions or omitted areas that would add value to understanding the issues.

The finalised 12 items referring to barriers to ownership, accessing and modifying

PMVs were evaluated by respondents on a five point scale with respect to how strongly a subject agreed with whether each was perceived to impede PMV access (“strongly disagree” to “strongly agree”). The finalised 22 items to measure for benefits of having access to PMVs were presented on a 5-point scale of importance (“not at all important” to “very important”). The items cover a broad spectrum of aspects relating to barriers and benefits of PMV. As outlined in the next section, this motivated the reduction of variables to a smaller number of common factors to aid comparisons with respect to a number of underlying enabling and inhibiting factors and to understand whether these loomed significantly larger for one PWD group over another. The patterns of responses on the items were considered in terms of how the data could be categorised into various unknown, but underlying themes. Specifically, exploratory factor analytic (EFA) approach was used to uncover any complex factors in the data followed by confirmatory factor analysis (CFA) (Anderson & Gerbing, 1988; Hair, Black, Babin, & Anderson, 2010) using Mplus version 7.3 (Muthén & Muthén, 1998-2012) to make comparisons of groups of PWD on these underlying dimensions.

### **3.2 Survey Participants and Procedure**

As there is no complete Census list of PWD in Australia, an electronic snowballing technique was used to contact a radiating sample based on organisational member lists to contact PWD and family members (Veal & Darcy, 2014), a technique successfully used in previous studies of PWD [references withheld]. A database of over 100 disability organisations was used to contact PWD across Australia from April 2014 through to August 2014. The organisations communicated information about the research with a link to the questionnaire to members on their websites, by direct e-mail or within electronic or hard-copy newsletters, and supplemented using social media and blog posts. Qualtrics online survey platform was utilised for its accessibility features including for people with vision impairment and its robustness in previous studies ([withheld for anonymity]).

Qualifying subjects were those who were either a PWD, their family or carers who owned or would like to own a modified vehicle for the purposes of providing private transport for a PWD. A total of 413 persons commenced the survey with 86 subjects being screened out or terminating the survey themselves. Out of this, 87.8% of respondents responded to the questions relating the issues and barriers that were critical of them owning, accessing or modifying a PMV. A further 58% qualified and responded to questions relating to the experientially derived benefits of owning or having access to a PMV. Among this group, 28% were family or carers who owned the vehicle with modifications to cater for the needs of another PWD. Among PWD undertaking the survey, 56% were those who were also able to drive. Other sociodemographic characteristics are presented in Table 1.

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Insert Table 1 on sample characteristics about here  
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## **4. RESULTS**

### **4.1 Measure of Barriers**

The first analysis focused on issues that all survey participants regarded as critical to gaining ownership, access and modification to private vehicles, with 287 providing data for analysis. The distribution of ratings and summary statistics for each of the 12 items are presented in Appendix 1. EFA performed on these barriers showed the presence of three underlying components; one construct, however, was described by a single item. Subsequently, the CFA was performed in Mplus for two remaining latent constructs, namely, financial barriers and information barriers. Items that dropped from the analysis were a measure relating to the costs of lessons being prohibitive and another difficulty in locating information about an appropriate vehicle for a person's access needs. Both had low correlations with other items.

The model fit of the final CFA is acceptable (CFI=.947>0.9), along with both the

SRMR of 0.042 and the RMSEA of 0.098 below 0.10 as required (Steiger, 1989; Browne and Cudeck, 1993). With respect to internal consistency reliability of the reflective multi-item constructs, the composite reliability (CR) (Werts, Linn, & Jöreskog, 1974) exceeds .7 for both constructs were thereby considered satisfactory (see Table 2). The loading of one item for financial barrier construct was 0.472, thereby affecting internal consistency in the form of Cronbach Alpha (Cronbach, 1951). However, this item was retained in the model as it improved overall model fit, offered suitable internal consistency based on composite reliability, and improved discriminant validity from the financial barrier construct.

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Insert Table 2 on CFA Barriers about here  
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The average variance extracted (AVE) is often used as common measure of convergent validity at the construct level and should be greater than 0.50 in this regard (Hair et al., 2010); as such, the measures of both constructs relating to barriers achieve high levels of convergent validity. Discriminant validity, the extent to which each construct is sufficiently different from other constructs, is established by confirming the correlation between the two constructs is lower than the square root of the AVE of the two constructs (Fornell & Bookstein, 1981; Fornell & Larcker, 1981). In the current instance, this is established (.773 for financial; .750 for information; correlation,  $r=.319$ ).

Overall, the results show financial factors present more as a significant barrier to PMV when compared to barriers relating to information requirements ( $M_{\text{fin}}=4.12$ ;  $M_{\text{info}}=3.31$ ;  $t=11.44$ ;  $p<.0001$ ). The result is as expected; particularly when 80% of respondents do not qualify for compensation for vehicle modification, more than 51% have high or very high levels of support needs in their everyday living and living costs often loom larger among PWD and their carers relative to people without a disability (Australian Bureau of Statistics,

2012; Cullinan, Gannon, & Lyons, 2011). Whether these and other differences are significant to how perceived barriers to PMV modification vary across respondents with respect to several indicators including their level of support needs, type of disability, and other sociodemographic characteristics were formally tested using ANOVA. In the case of significant differences, a post-hoc tests using Tukey-Kramer honest significant difference (HSD) were performed (Tukey, 1949) with the results presented in Table 3.

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Insert Table 3 Barriers by Characteristics about here  
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In summary, the perception that financial and information were barriers was found to be more significant amongst: a) PWD or carers who currently do not own a modified vehicle; b) people with a congenital disability (i.e., from birth); c) have higher levels of support needs in everyday living; d) those not eligible for compensation with motor vehicle purchase modification or purchase; e) those PWD who do not currently drive. In addition, information barriers were significantly higher among females, whilst those with multiple disabilities were significantly more likely to have financial considerations as a barrier to PMVs.

#### **4.2 Measure of Benefits**

The distribution of ratings and summary statistics for responses to each of the 22 benefits are presented in Appendix 2. Focusing on the experience of owners and benefits they have derived through their direct experiences as an experiential measurement was thought to be more valid and reliable rather than considering the anticipated benefits of non-owners meant that the analysis focused on a subset of the sample, namely 190 respondents. Once again a combination of EFA and CFA was used to identify underlying themes in the data and to provide parsimony in exploring differences across the sample. EFA indicated the presence of six factors, however, two of these factors were dropped on the basis that they were



constructed as single-item measures and found to have high cross-factor loadings with other constructs. As such, the final CFA reported upon consists of the four remaining latent constructs. Other items were dropped on the basis of low factor loadings.

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Insert Table 4 Benefits CFA about here  
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The CFA shows an acceptable model fit ( $RMSEA=0.059<.1$ ;  $CFI=.956>.9$ ) (Browne & Cudeck, 1993; Steiger, 1989). The four constructs recognised were ‘social and recreational benefits’, ‘employability benefits’, ‘downtime’ and ‘independence’. These constructs had acceptable values of Cronbach’s Alpha, Composite Reliability (CR) and Average Variance Extracted (AVE) as seen in Table 3. Discriminant validity is also established with the inter-correlation between any two latent factors less than the square root AVE of the individual constructs (Fornell & Bookstein, 1981; Fornell & Larcker, 1981) as seen in Table 5.

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Insert Table 5 Discriminant Validity (Benefits) about here  
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At an aggregate level, the mean estimates of each latent construct, show the perceived benefits are all extremely valued; however, benefits relating to independence and improving access to social and recreational activities are significantly higher relative to the other benefits of downtime and employability derived from PMV ownership (see Figure 1).

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Insert Figure 1 Average Benefits comparison about here  
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These identified constructs were further considered in terms of mean differences with respect to the characteristics of the respondents (see Table 5). The results show independence and social and recreation were important benefits of access to PMV, considered highly by all the

groups in question. In summary, there were no significant differences across the various individual measures considered with respect to social benefits that are associated with access to a modified private vehicle for PWD. In contrast, benefits relating to independence and employment were more significant amongst owners who: a) are PWD as compared to family or carers; b) have lower levels of support needs in their everyday living; and, c) are PWD who are drivers themselves rather than passengers. The perceived benefits arising from access to a modified vehicle in the form of independence, but not those relating to social, employment, or downtime, was perceived to be a more significant benefit among those with an acquired condition (i.e., a disability as a result of trauma or illness as opposed to congenital condition), but significantly less among those requiring the use of a power wheelchair. Perceived benefits relating to employment were found to be more significantly lower those with multiple disabilities and those currently employed. Finally, those who perceived access to a modified vehicle had provided greater benefits relating to the ability to experience downtime (i.e., escapism) were more significant amongst those with a trade qualification or apprenticeship as compared to those who had completed University study.

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Table 6: Benefits by Covariates about here  
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The benefit of escapism was also found to be significantly higher amongst those who did not provide information about their household income as compared to those respondents who did. Finally, benefits from PMV varied with respect to required levels of support in everyday living; whilst all PWD perceived high levels of social benefit, those with very high levels of support were significantly less likely to nominate value with respect to independence and employment. These effects are illustrated in Figure 2. Since a person in this group required assistance throughout the day, this indicated that owning a modified vehicle would not

provide similar value of independence benefits as compared to that of a person with lower support needs who may be able to drive. In addition to that, a person with high and very high support needs is also less likely to travel to work and therefore will not gain benefits in terms of employment when it comes to having access to a PMV (Australian Bureau of Statistics, 2009).

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Insert Figure 2 Plot Benefits by Everyday Support  
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## **5. DISCUSSION**

The results of the exploratory study provide important insights into barriers and benefits of automobility for PWD who require PMV ownership. The results provide understanding based on social constructionist and socio-ecological approaches to the issue. The results highlight considerations with respect to groups of PWD and policy implications, as are now discussed.

### **5.1.Barriers**

The findings identified two key components to barriers of ownership to PMV, namely financial considerations and information provision. The significance of financial issues associated with PMV modifications confirms the qualitative work by Woodbury (2013) that identified the initial purchase cost of a car and modification, along with ongoing costs of petrol, vehicle maintenance, insurance and breakdowns, as substantial barriers. Quantitatively this work is also supported by the equipment and costing outlined in other studies (Bourke-Taylor et al., 2014). Not surprisingly, this study supports the finding that the cost of vehicle modification was the most significant barrier. The component explores the notion of “owning a private motor vehicle is a financial burden”. This reinforces work on transport disadvantage and subsequent transport poverty where people are forced to own a car for social participation and are then burdened by the ongoing financial and other costs associated with car ownership

in a disability and PMV context (Currie, 2004; Gleeson & Randolph, 2002). Given that PWD have lower levels of employment and income than the general population (ABS, 2009), this could explain the disabling nature of car ownership on the financial position of PWD. Whilst financial barriers were also evident among those who wanted to own a PMV but were unable to, this was also particularly significant among those with congenital disability, power wheelchair users, those with multiple disabilities, higher support needs, those without compensation, and those who don't drive themselves. As such, these individuals experiencing cumulative disadvantages face significantly higher impediments to owning PMVs. Such groups already experience additional costs of care, which often fall upon families over and above the standard costs of living (Baldwin, 2015) and linked to a lower levels of employment and, hence, incomes (ABS, 2009). The inhibiting costs of PMV transport are not only higher, but sit alongside ongoing costs including disability specific equipment, medical support, care, in-home support, education and therapy.

This study has contributed a new component of information provision as a major barrier to private vehicle modification. Reviewing the items under this component examined how information about PMV modification is non-existent in relation to schemes, reputable suppliers, assistance and advice and generally difficult to locate up-to-date information for their access needs. This suggests that knowledge management systems about PMV modifications leave a lot to be desired by the group. In particular the combination of being a person who wanted to own a modified vehicle, those who did not own a modified vehicle, power wheelchair users, those with multiple disabilities and males regarded the lack of information as more critical to their situation. This component suggests that authorities need to improve knowledge management systems to lower the barriers for PMV access.

## **5.2.Benefits**

The benefits of automobility for PWD have been identified in the findings as a significant

outcome and quantitatively builds on the qualitative work of Woodbury (2013). The components of social and recreational, independence, downtime and employability were all valued highly by PWD. However, it was benefits relating to social and recreational outcomes, and increased independence that were most highly valued. This suggests that while policy considerations favour employment as an area that current funding support programs are targeted at, our study highlights the personal benefit for PWD in increasing independence, and the general social and recreational participation. As outlined in the background literature, this can contribute towards social and human capital development including volunteering, which in turn may provide employment opportunities for PWD (Bates & Davis, 2004; Lindsay, 2016; Schwanen et al., 2015). By not providing financial support for PMV outside of the strict neoliberal employment policy criteria, governments may be foregoing medium and long-term benefits of social and human capital development, which may include employment. Even without employment, PWD who are more socially and recreationally connected by levels of social and human capital, and much higher levels of quality of life (Chenoweth & Stehlik, 2004; Helliwell & Putnam, 2004).

While the study did not examine the emotions arising from automobility, the items associated with independence as an indicator of transport disadvantage affecting an individual's freedom, their dependence on others and a loss of control in their lives suggest associated emotional outcomes. Their improved automobility gave them an increased sense of agency over all areas of their life. This is directly connected to their social and recreation activities, opportunities to escape from everyday life and unwind (downtime), and increased employment opportunities. Quite simply, automobility provides the participants of this study with an increased disability, citizenship in all areas of their life (Meekosha & Dowse, 1997).

As noted in the results, employment and those with higher education levels perceived less benefits in downtime, and social and recreation participation. Whilst counter intuitive,

Guryan, Hurst, and Kearney (2008) found that time allocated to leisure falls sharply as education and income rises whilst higher-educated parents spend more time with their children. One explanation is that those with education qualifications utilise their PMVs to undertake an array of social, educational and related activities at the expense of those activities they perceive as enabling them to provide opportunities to unwind.

### **5.3. Individual differences in perceived benefits and barriers of PMV**

Differences in the perceived benefits and barriers of ownership and access to PMVs were identified across a wide array of variables including: congenital/traumatic disability; whether they had multiple disabilities; compensatable/non-compensatable; owners/did not own; drivers/non-drivers; education; employment; income; and gender. This social milieu adds a further complexity to understanding an individual's intrapersonal, interpersonal and social context. The lived experience of the group, the barriers that they face and the transformative solutions to assist with automobility can be best understood through a combination of the social constructionist approach and the social ecological model. In understanding social constructionist approaches through a disability studies, a person's impairment becomes a socially constructed "disability" (see Oliver, 1990) through the disabling environment, discourses and hostile attitudes within the private vehicle access and modification ecosystem. The opportunities that individuals have within their socially constructed environment, requires an understanding of the "embodied ontology" (Shakespeare & Watson, 2001). The matrix of disadvantage requires enabling practices to assist individual's in human capital development to overcome their lack of knowledge or skills that people without disability develop as a natural part of their life course. Unless somebody knows which PMV modifications are available how can they even imagine driving? Without access to a vehicle with the requisite modifications, how can they or their support network provide them with the same opportunities as their nondisabled peers? Unless government policy programs are in

place then how can the extra costs of disabilities be moderated for equity considerations?

While PWD have been recognised as a group experiencing transport disadvantage (Currie, 2004; Dodson et al., 2004; Murray & Davis, 2001; Wixey et al., 2005), there has been no exploration of the individual differences of the group's complexity as a multilayered construct. This study extends Currie and Delbosc (2011) understanding of the importance of the urban form, transport forms and types of people by providing a richer understanding of the complexities of PMV access and modification. With respect to types of people, the research indicates how the type of disability and their support needs affect the barriers they face and the benefits they receive from access to a PMV. Others have called the impact of these variables on participation of the group as creating an "inherent complexity" (Darcy, 2010). This study has reinforced previous findings that identified the importance of both disability and support needs as key constructs for understanding access to PMV ownership and modification, while others examined other forms of social participation (Darcy, Lock, & Taylor, 2016). When considered with the noted problems in accessing public transport and travel more generally due to the urban form and transport types, this "complex interplay" (Packer, McKercher, & Yau, 2007) between PWD and the contextual environment of transport disadvantage, the reasons for the potential benefits become more pronounced.

One important variation among PWD with respect to experientially derived benefits from PMV was found relation to independence, which was significantly higher among PWD who were owners as compared to their carers, family members or attendants. Perceived benefits relating to independence were also significantly lower among those who required the use of a power wheelchair as opposed to other forms of mobility classification, lower among those with higher levels of support required in everyday living and lower among those PWD who are passengers rather than drivers. In contrast, people using manual wheelchair or require no aid can easily be accommodated in a vehicle by folding the chair or with less

assistance from others in a standard vehicle that does not require a high level of modifications. Therefore this group requires lower financial resources and information on schemes to access PMV. As such, one important takeaway from the research is recognise that access to PMV provides greater forms of independence, but the realisation of this depends on the individual circumstances for the PWD to realise such benefits. That is, in many cases power wheelchair owners, passengers, and those with high levels of support are often still reliant on another person to drive the vehicle; on a positive note, other differences relating to social benefit and escapism were less varied across these same individuals.

In Australia, about two thirds of people are born with their disability and one third acquired their disability such as through illness or accident (ABS, 2009), with the latter in this study reporting significantly higher perceived benefits relating to independence. One explanation is that those who acquire disability at a later stage in life are familiar with the independence they had when living without a disability. Indeed, Bogart (2014) finds that social group identity and development of self-identity among those acquiring their disability result in differences in the development of self-concept and satisfaction for life.

#### **5.4. Implications for Policy and Practice, and Disability Citizenship**

The implications for policy and practice are threefold: in car-dependent societies access to PMVs for PWD should be regarded as a need not a want; policy must recognise that for this group PMV ownership is more than employment and is an important contributor to quality of life; targeted policy solutions need to recognise both the costs associated with the purchase of a vehicle and the cost of access modifications. Each of these considerations is now discussed.

In car dependent societies access to PMVs should be regarded as a need not a want as all areas of social organisation are affected by “car culture” (Flink, 1975; Hendricks, 2014). This is accentuated for PWD who face a double whammy of transport disadvantage through public transport as well as PMVs. As Hendricks (2014) notes this can have a detrimental



effect in neoliberal societies where those with transport disadvantage are less likely to be employed, are restricted socially and are less independent. As noted in Article 9 of the UN CRPWD access to public and private transport including modifications is regarded as a right. Yet, very few countries have policy to assist PWD to overcome their higher likelihood of living in poverty and purchase a PMV (Currie & Stanley, 2007; Darcy & Eley, 2014).

The findings on barriers clearly indicate that policy needs to address information issues to do with the provision and location across all aspects of driver assessment, licensing, suppliers, comparative consumer information and financial assistance. The provision of this information as a public good in one consolidated location would assist not just PWD, but allied health professionals, driving assessors and the modification suppliers market. Indeed, evaluation of individual transportation needs can be complex and often requires a team of qualified professionals with the necessary medical background and specialty experience to adequately address the needs of passengers or drivers (Pierce, 1997).

Foremost, information must be readily available and easily accessible so that consumers can make an informed choice as to whether they have an option to drive, understand what types of vehicles are appropriate (drivers and passengers) and how to go about locating options to make assessments. There are a variety of possible outcomes with respect to information provision: traditional media, online information, social media and the use of specialist forums. While formal production of knowledge and information has been the tradition in medical, allied health and rehabilitation, consumer to consumer tacit knowledge has been growing in the disability space with the sharing of information first on older style forums, and now newer social media platforms (Goggin & Newell, 2003; Goggin, 2015).

In neoliberal states, financial assistance with vehicle purchase and modification has been heavily linked to employment. While from a policy perspective this may be regarded as an important consideration for rationing expenditure, it belies a social understanding of

disability citizenship (Darcy & Taylor, 2009; Meekosha & Dowse, 1997). As this paper has shown, people have rated the benefits of PMV ownership more highly for social and recreation, and independence over employment. While employment has been shown to be an important outcome for many, those without employment can contribute in many other ways to society and provide a higher quality of life (van Roosmalen et al., 2010; Park et al. 2002; Petry et al. 2005). For example, within a social and recreational context recognising the importance of creating social capital through their social engagements can be a starting point to leading onto other opportunities (Schwanen et al. 2015). For example, volunteering is a valuable social activity, important avenue for people to develop their social and human capital, and as a first step for increased social participation. From these beginnings, people may go onto employment as an outcome of these other avenues of social participation that they would not otherwise be able to undertake without access to a PMV.

Transport poverty (Currie, 2004; Gleeson & Randolph, 2002) combined with the extra costs of vehicle purchase and the cost of modifications (Park et al. 2002) create a vicious cycle for individuals and families of children with disabilities. As was shown by Park et al. (2002), this impacts heavily on the developmental aspects of children with disability and can become a lifelong issue. As such, finance was identified as a significant barrier to PMV access and modification, but its consideration varies by individual requirements. For example, those with multiple disabilities often face a more complex set of circumstances with respect to meeting a range of needs and the involvement of families, carers and support services (Petry, Maes, & Vlaskamp, 2005). For this reason, this criteria is often reflected in funding (e.g. National Disability Insurance Scheme, 2015a), compensation and other settings such as meeting teaching and learning requirements in schools (Turnbull, 1995). Similarly, the current research supports such considerations in funding for PMV access.

The results and discussion can be understood when considered in terms of the social

ecological model offered by Simplican et al. (2015). This application is summarised in Figure 3. Social constructivists approach discusses in terms of aggregation of barriers and enablers, whereas social ecological approach breaks this further down in terms of individual, interpersonal, organizational, community and macro-policy level. As such, when considering the results and discussion using in the social ecological model, a more nuanced understanding of barriers and enablers of the PMV ecosystem emerges.

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Insert Figure 3 Social Ecological Model of PMV access

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At the individual level, apart from standard sociodemographic characteristics (age, gender, employment status, etc.), a person's disability type and level of support needs are important considerations for the type of PMV. At the interpersonal level, where an individual's ability to communicate with others is important so is the type of communication required beyond processes including alternative information provision (e.g. Braille or screen readers for blind/vision impaired) together with the attitudes of others towards PWD. At the organisational level, individual organisations play their role to identify the relative attitudes and approaches to PWD within the identified stakeholder groups. Are they reflective of a culture of inclusion through a whole of organisation approach together with other factors such as individual access practices (e.g. inclusive information provision)? At the community level, do stakeholders come together as an identifiable community for PMV? Further at this level, do advocacy and information providers exist that have the requisite knowledge in relatively specialised area, together with geographic and virtual connection, and access to transportation services in the broader sense? The advocacy and information organisations provide a coordinating role for the other stakeholder groups to act as an intermediary between suppliers and consumers. Finally, at the socio political and public policy levels does government have programs that recognise transport disadvantage for PWD? This includes the

existence and enforcement of overall legal frameworks, ideology of government (e.g. neoliberalism), and whether there is a history of service delivery in PMV. Together these five levels provide a social ecological model of private motor vehicle access and modification.

## **7. CONCLUSIONS**

Transport disadvantage and transport poverty resulting from disadvantage are serious social issues for PWD, reflected in the UN *Convention on the Rights of Persons with Disabilities* that specifically identifies access to public and private transport as essential for disability citizenship. Yet, for PWD who require the use of PMVs, their transport disadvantage and poverty is compounded by the significant barriers to ownership. This study has found that across all groups financial barriers were the most significant of the barriers. Whilst varying in its impact across groups of PWD, access to information about the supply chain of the private vehicle modification market and services created further barriers to ownership.

While policy in neoliberal states is focused on benefits of access to PMV in terms of employment, this study has determined PWD valued the social and recreational benefits, and the independence auto mobility creates above the instrumentality of employment. Quite simply, automobility gives back what many PWD have lost: an active life that is independent and socially fulfilling, which ultimately improve quality of life outcomes as other studies have shown. Those who participated in the study nominated the employment benefits stemming from automobility, which provides a way to challenge the 'poverty cycle' given PWD have lower income and less access to employment opportunities. However, while policy supporting access to private vehicles has focused on those in the employment, policy makers could learn a lot from social and human capital where people who are socially engaged, undertaking volunteer roles or other community works are in a much better position to gain human capital which could be translated into employment.

Macro policy in this area needs to recognise the broader social outcomes of having an

active disability citizenship whether employed or not. The policy implications need to go beyond assisting those who are employed already because it is those who are not in employment who are at a double transport disadvantage through the lack of financial ability to purchase or modify a vehicle or for the modifications. Policy development must in the first instance offered direct and indirect financial assistance to PWD, their family, attendants and their carers to assist them in purchasing and modifying private vehicles so that there is a more level playing field with accessing the benefits of automobility. In recognising this point, there is also a major public policy concern that even with financial support transport provision becomes privatised for those PWD who can afford the extra costs. Whereas efficient and accessible public transport options provide an affordable solution for all people.

Secondly, as a public good to alleviate problems of fragmentation in information provision and access, the whole supply chain of driver assessment, training, licensing, supplier information and other contributing knowledge systems needs to be centrally located into a continually updated repository. These two simple policy development strategies would address the findings and discussion presented in this study. While the findings of this study supported previous research related to public transport access, this study has extended the knowledge of automobility to understanding that once barriers are removed, the benefits are valued through their re-creation of their independence, their social and recreational lives, and the instrumentality that employment brings to the individuals and to the community at large.

As an exploratory study, there are a series of improvements to be made in future work to address various study limitations. One improvement relates to the measures themselves. Specifically, in the case of financial barriers a two-item measure was employed as opposed to a three-or-more multi-item measure; as such some criticism regarding an accurate assessment of reliability is appropriate (Eisinga, Grotenhuis, & Pelzer, 2013). In relation to financial barriers, distinguishing between entry-costs associated with modifications relative to ongoing

costs of ownership may address concerns regarding face-validity and reliability. In addition, the snowballing sampling technique and online survey method lends itself to obvious criticisms in terms of representativeness. Whilst the online survey method was employed to minimise costs, maintain respondent anonymity and reduce the burden on respondents relative to a paper-based survey, it raises questions of sample representativeness despite allowing carers to complete the survey and utilising survey software that met with industry and international best practice for W3C compliance for inclusive online interactions with PWD. As such, to assess the generalizability of the findings, the research would benefit from additional studies that involve a larger sample size and consider other populations. This includes investigating potential variation in the effect of government policies across countries, which vary greatly in terms of the eligible items that are subsidised with respect to assistive devices relating to vehicle modifications (Layton & Wilson, 2009).

Finally, it is important to recognise that the landscape for PMVs is also subject to continual innovation, presenting opportunities for further research to better understand the barriers and benefits for PWD. For example, it will be increasingly important to acknowledge the use of automobiles within the framework of a shared economy, such as ride sharing/car sharing, and in terms of the introduction of autonomous vehicles (Ronald et al., 2017). Whilst some authors have begun asking questions about the impact on social and behavioural outcomes of these innovations (e.g. Janasz & Schneidewind, 2017), our study further supports the need to account for the experiences of PWD in these evaluations. Some authors have begun to do so; for example, Cavoli, Phillips, Cohen, and Jones (2017) notes that PWD can experience delays in realising the benefits of new technologies alongside other minority groups, and in the case of autonomous vehicles, costs may be prohibitive (Thomopoulos & Givoni, 2015). Consistent with our research, the benefits of shared mobility could be greater flexibility and independence (Bohm, 2015; Begg, 2014). However, as our research suggests,

PWD are likely to have varied experiences with respect to a range of factors affecting their ability to realise the benefits in the advent of such innovations in transport.

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**Table 1: Characteristics of respondents completing survey**

<b>Respondent Characteristic</b>	<b>Entire sample (n=287)</b>		<b>Owner drivers (n=190)</b>	
	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>
<b><i>Driver-Owner of private motor vehicle with modifications</i></b>				
PWD owner a private motor vehicle with modifications	153	53.3	121	63.7
Family/carer owner for other PWD	60	20.9	56	29.5
Non-owner	74	25.8	-	-
<b><i>Congenital or acquired condition</i></b>				
A congenital condition (from birth)	124	43.2	83	43.7
An acquired condition (a result of trauma / illness)	163	56.8	107	56.3
<b><i>Mobility based classification of disability</i></b>				
Mobility- requiring the use of a Power Wheelchair	118	41.1	86	45.3
Mobility- requiring the use of a Manual Wheelchair	78	27.2	55	28.9
Mobility- use of other mobility aids (e.g., scooter)	64	22.3	30	15.8
Others (include limited mobility no aid required)	27	9.4	19	10.0
<b><i>Identify as having multiple disabilities</i></b>				
Yes – person has multiple disabilities	121	42.2	70	36.8
No	166	57.8	120	63.2
<b><i>Level of support needs in everyday living</i></b>				
None (Independent)	27	9.4	19	10.0
Low	57	19.9	38	20.0
Medium	56	19.5	32	16.8
High (twice daily)	61	21.3	41	21.6
Very High (requires full-time assistance/attendance)	86	30.0	60	31.6
<b><i>Eligibility for compensation</i></b>				
Yes (for motor vehicle purchase/modification)	57	19.9	42	22.2
No	229	80.1	147	77.8
<b><i>PWD who drives</i></b>				
Yes	107	56.3	106	56.1
No	83	43.7	83	43.9
<b><i>Gender</i></b>				
Male <sup>^</sup>	144	50.2	84	47.7
Female	111	38.7	92	52.3

<sup>^</sup> One respondent identified themselves as transgender; no significant differences between two samples were identified (p>.05).

**Table 2: CFA Results Examining Barriers in Modified vehicle ownership**

<b>Financial Barriers</b>	<b>Est</b>	<b>CA</b>	<b>CR</b>	<b>AVE</b>
Owning a private motor vehicle is a financial burden	0.472	0.635	0.725	0.597
The cost of vehicle modifications for my disability is too expensive	0.986			
<b>Information Barriers</b>				
Information about vehicle modifications schemes is non-existent	0.616	0.881	0.716	0.556
I don't know where to find information about reputable vehicle modification suppliers	0.787			
I don't know who to go to get assistance and advice on vehicle modification	0.846			
I cannot locate information about modifications most appropriate for my access needs	0.859			
Up-to-date information about new driving technology is difficult to find	0.695			
Information about an appropriate vehicle for my access needs is difficult to locate	0.634			

CA=Cronbach alpha ( $\alpha$ ); CR=composite reliability; AVE=average variance extracted;

**Table 3: Differences in perceived barriers**

Respondent Characteristic	Financial			Information	
	n	Mean (Stdev)	F-stat (p-value)	Mean (Stdev)	F-stat (p-value)
<b><i>Driver-Owner</i></b>					
PWD who own a private motor vehicle with modifications	153	3.853 (.947) <sup>ab</sup>	14.32 (.000) **	3.155 (.952) <sup>a</sup>	5.58 (.004) **
Family/carer owning PMV for other PWD	60	4.339 (.830)		3.394 (.893)	
PWD or family/carer who would like a PMV	74	4.439 (.678)		3.587 (.928)	
<b><i>Congenital or acquired condition</i></b>					
A congenital condition (from birth)	124	4.207 (.846)	2.77 (.097) *	3.395 (.936)	1.52 (.219)
An acquired condition (a result of trauma / illness)	163	4.029 (.935) <sup>a</sup>		3.256 (.957)	
<b><i>Main disability</i></b>					
Mobility- requiring the use of a Power Wheelchair	118	4.415 (.706)	11.35 (.000) **	3.433 (.866)	4.14 (.007) **
Mobility- requiring the use of a Manual Wheelchair	78	4.074 (.876) <sup>a</sup>		3.171 (.951) <sup>a</sup>	
Mobility- other mobility aids (including scooter)	64	3.670 (1.06) <sup>a</sup>		3.103 (1.03) <sup>a</sup>	
Others (include limited mobility no aid required)	27	3.880 (.861) <sup>a</sup>		3.732 (.852)	
<b><i>Identify as having multiple disabilities</i></b>					
Yes – person has multiple disabilities	121	4.310 (.771)	11.13 (.001) **	3.370 (.932)	.66 (.418)
No	166	3.957 (.959) <sup>a</sup>		3.277 (.961)	
<b><i>Level of support needs in everyday living</i></b>					
None (Independent)	27	3.522 (.994) <sup>ab</sup>	9.64 (.000) **	2.746(.985) <sup>abcd</sup>	2.84 (.025) *
Low	57	3.839 (.977) <sup>ab</sup>		3.355 (.954)	
Medium	56	3.951 (.960) <sup>a</sup>		3.342 (.945)	
High (twice daily)	61	4.219 (.760) <sup>a</sup>		3.431 (.882)	
Very High (requires full-time assistance/attendance)	86	4.487 (.681)		3.372 (.942)	
<b><i>Eligibility for compensation</i></b>					
Yes – for purchase/modification	57	3.853 (.947) <sup>a</sup>	6.26 (.013) **	2.961 (.915) <sup>a</sup>	10.43 (.001) **
No	229	4.180 (.865)		3.407 (.939)	
<b><i>PWD who drives</i></b>					
Yes	107	3.876 (.996) <sup>a</sup>	14.80 (.000) **	3.142 (.980)	1.57 (.211)
No	83	4.363 (.661)		3.315 (.887)	
<b><i>Gender</i></b>					
Male	144	4.114 (.882)	.53 (.466)	3.492 (.910)	7.62 (.006) **
Female	111	4.031 (.937)		3.170 (.941) <sup>a</sup>	

Significance level at \*\* p<0.01 and \* p<0.05; 'a' denotes significantly different to group with highest mean, 'b' significant difference compared to next highest mean (Tukey HSD; p<. 05

**Table 4: CFA results for perceived benefits of access to a private modified vehicle**

<b>Social and Recreational Benefits</b>	<b>Est.</b>	<b>CA</b>	<b>CR</b>	<b>AVE</b>
Keeps me connected to family and friends	0.795	0.825	0.827	0.616
Opportunities to socialise with others	0.849			
Provides access to leisure and recreation activities	0.704			
<b>Employability</b>	<b>Est.</b>	<b>CA</b>	<b>CR</b>	<b>AVE</b>
Gives access to employment	0.746	0.833	0.845	0.735
Allows me to do my job better	0.956			
<b>Downtime</b>	<b>Est.</b>	<b>CA</b>	<b>CR</b>	<b>AVE</b>
Get away from daily life	0.797	0.862	0.868	0.769
Provide opportunities to unwind	0.950			
<b>Independence</b>	<b>Est.</b>	<b>CA</b>	<b>CR</b>	<b>AVE</b>
Experience freedom to go anywhere at any time	0.791	0.843	0.843	0.576
Increases independence	0.842			
Not dependent on others	0.717			
Have control over my life	0.674			

CA=Cronbach alpha ( $\alpha$ ); CR=composite reliability; AVE=average variance extracted;

**Table 5: Correlations between perceived benefits construct**

	<b>Social</b>	<b>Employment</b>	<b>Downtime</b>	<b>Independence</b>
<b>Social</b>	0.785			
<b>Employment</b>	0.350	0.857		
<b>Downtime</b>	0.489	0.399	0.877	
<b>Independence</b>	0.686	0.458	0.544	0.759

Note: Diagonal entries represent sqrt(AVE); off-diagonal elements represent correlations

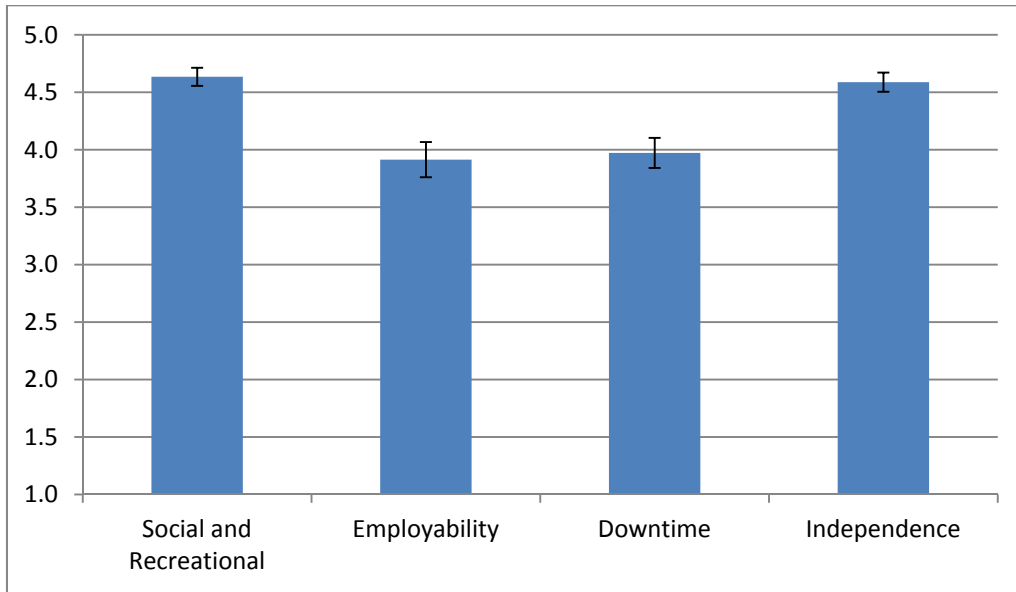
**Table 6: Differences in measures of perceived benefits**

Variable	Social		Independence		Downtime		Employment		
	n	Est. (SD)	F (p-value)	Est. (SD)	F (p-value)	Est. (SD)	F (p-value)	Est. (SD)	F (p-value)
<i>Owner with a disability or owner-driver-carer</i>									
Owner of modified vehicle with a disability	121	4.682 (.443)	1.554 (.214)	4.697 (.471)	<b>13.659</b> <b>** (.000)</b>	3.943 (.939)	.384 (.536)	4.062 (1.092)	<b>7.221</b> <b>** (.008)</b>
Family or carer owning modified vehicle	56	4.571 (.727)		4.356 <sup>a</sup> (.743)		4.035 (.878)		3.595 <sup>a</sup> (1.035)	
<i>Condition of person with a disability</i>									
A congenital condition (from birth)	83	4.585 (.648)	1.19 (.28)	4.457 <sup>a</sup> (.704)	<b>7.45</b> <b>** (.007)</b>	3.968 (.947)	0.003 (.957)	3.891 (1.038)	0.061 (.804)
An acquired condition	107	4.673 (.460)		4.688 (.458)		3.975 (.903)		3.930 (1.112)	
<i>Mobility based classification</i>									
Mobility- Power Wheelchair	86	4.609 (.502)	0.440 (.725)	4.451 <sup>ab</sup> (.580)	<b>3.326</b> <b>(.021)*</b>	3.980 (.932)	0.664 (.575)	3.897 (1.055)	0.538 (.657)
Mobility- Manual Wheelchair	55	4.673 (.440)		4.697 (.454)		3.915 (.843)		4.024 (1.028)	
Mobility- other mobility aids	30	4.695 (.555)		4.777 (.439)		3.888 (.909)		3.719 (1.100)	
Others (limited mobility; no aid required)	19	4.544 (.943)		4.585 (.963)		4.234 (1.107)		3.970 (1.309)	
<i>Identify as having multiple disabilities</i>									
Yes – person has multiple disabilities	70	4.608 (.636)	0.248 (.619)	4.531 (.683)	1.026 (.313)	3.963 (.939)	0.009 (.923)	3.617 <sup>a</sup> (1.148)	<b>8.695</b> <b>(.004)**</b>
No	120	4.650 (.495)		4.620 (.525)		3.977 (.913)		4.086 (1.000)	
<i>Level of support needs</i>									
None (Independent)	19	4.666 (.577)	0.376 (.825)	4.804 (.497)	<b>3.749</b> <b>(.006)**</b>	4.224 (.838)	1.640 (.166)	4.362 (.969)	<b>2.546</b> <b>(.041)*</b>
Low	38	4.677 (.428)		4.817 (.316)		3.844 (.917)		4.099 (1.086)	
Medium	32	4.586 (.526)		4.622 (.475)		3.736 (.878)		4.059 (.986)	

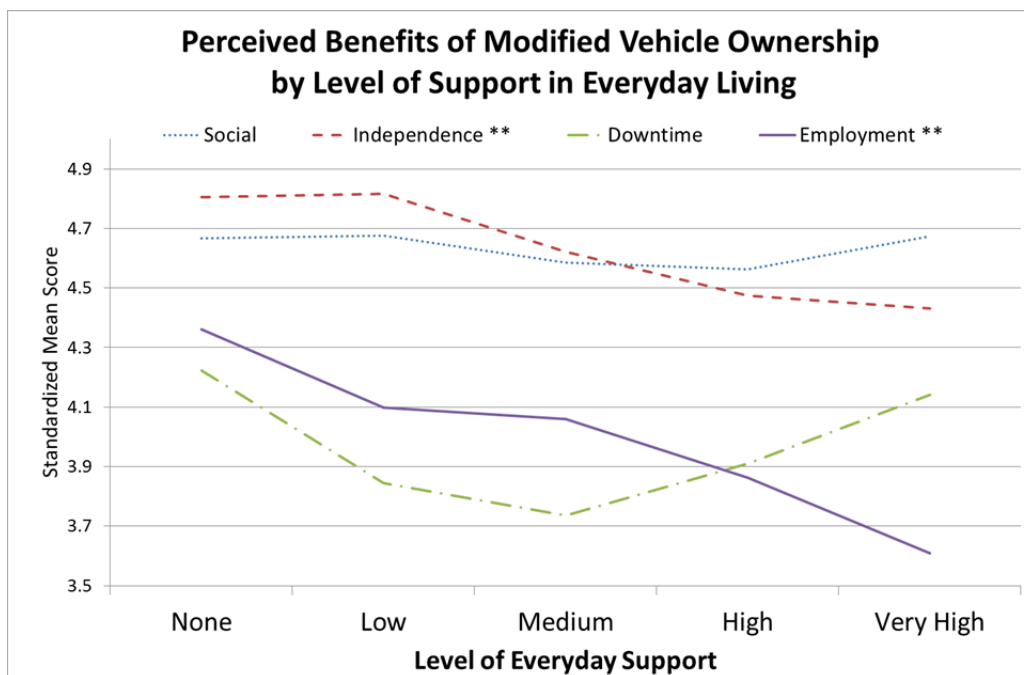


High (twice daily)	41	4.562 (.499)		4.474 <sup>ab</sup> (.579)		3.911 (.882)		3.863 (.902)	
Very High (requires full time assistance/attendant)	60	4.673 (.656)		4.432 <sup>ab</sup> (.735)		4.141 (.971)		3.609 <sup>ab</sup> (1.199)	
<b><i>Person with disability who drives themselves?</i></b>									
Drive themselves	106	4.670 (.487)	0.272 (.603)	4.767 (.387)	<b>25.146</b> <b>(.000)**</b>	4.005 (.896)	0.088 (.767)	4.235 (.972)	<b>22.602</b> <b>(.000)**</b>
Passenger	83	4.633 (.480)		4.401 <sup>a</sup> (.610)		3.966 (.903)		3.536 <sup>a</sup> (1.043)	
<b><i>Highest educational qualification completed</i></b>									
University	71	4.556 (.658)	1.150 (.330)	4.484 (.747)	1.869 (.137)	3.778 <sup>a</sup> (1.061)	<b>2.488</b> <b>(.062)*</b>	3.934 (1.175)	0.503 (.681)
Diploma( undergraduate or associate)	21	4.513 (.553)		4.463 (.627)		3.814 (.882)		4.170 (.905)	
Trade qualification or apprenticeship	40	4.699 (.479)		4.725 (.433)		4.220 (.753)		3.847 (1.109)	
Other (including school)	45	4.703 (.463)		4.652 (.416)		4.099 (.842)		3.847 (.981)	
<b><i>Current employment status?</i></b>									
Employed	89	4.582 (.531)	0.896 (.345)	4.540 (.579)	0.797 (.373)	3.894 (.955)	0.979 (.324)	4.174 (.951)	<b>10.226</b> <b>(.002)**</b>
Not currently working	87	4.663 (.598)		4.622 (.628)		4.034 (.921)		3.666 <sup>a</sup> (1.151)	
<b><i>Total income of person with a disability</i></b>									
Refused to answer	31	4.818 (.391)	1.888 (.133)	4.750 (.501)	1.426 (.237)	4.513 (.554)	<b>4.75</b> <b>(.003)**</b>	4.311 (.878)	1.592 (.193)
Under \$21,000 per year	42	4.644 (.467)		4.625 (.505)		3.954 <sup>a</sup> (1.056)		3.871 (1.192)	
\$21,000 -\$52,000 per year	52	4.623 (.527)		4.592 (.539)		3.844 <sup>a</sup> (.933)		3.819 (1.066)	
More than \$52,000 per year	50	4.554 (.526)		4.498 (.586)		3.814 <sup>a</sup> (.841)		3.894 (1.026)	

\*\* p<0.01 and \* p<0.05; 'a' denoting significantly different to group with highest mean, 'b' significant different compared to next highest mean, etc. (Tukey HSD; p<. 05)



**Figure 1: Mean estimates of four benefit measures**



**Figure 2: Perceived Benefits by Level of Everyday Support Required**



#### **Sociopolitical Public Policy**

- Human rights conventions; nationally enacted human rights laws; political ideology (e.g. neoliberal);
- Government macro policy; Social Security payment eligibility; service delivery history on private vehicle access and modification

#### **Community**

- Citizenship – social participation by all members of society;
- Membership of advocacy groups
- Access to appropriate transport services

#### **Organisational**

- suppliers; driving assessors; driving instructors; licensing organisations; etc.
- other associated organisations in disability advocacy and information provision;

#### **Interpersonal**

- information search; alternative information provision; attitudes of others towards disability;
- relationships and networks with others in rehabilitation or PMV

#### **Individual/ intrapersonal**

- Physical, cognitive, sensory etc. ability; level of support needs; independence in communication;
- Sociodemographic characteristics

**Figure 3: Social Ecological Model of Private Motor Vehicle access and modification**

### Appendix 1: Ratings of all barriers relating to private modified vehicles

Evaluation of Barrier	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	SD
The cost of vehicle modifications for my disability is too expensive	3%	5%	17%	23%	52%	4.17	1.12
The process to obtain assistance for private vehicle modifications is too complex	4%	9%	28%	23%	36%	3.77	1.32
Owning a private motor vehicle is a financial burden	5%	11%	22%	30%	32%	3.73	1.37
Up-to-date information about new driving technology is difficult to find	3%	16%	26%	33%	22%	3.57	1.16
Information about an appropriate vehicle for my access needs is difficult to locate	5%	18%	21%	32%	24%	3.53	1.37
Cost of lessons is prohibitive	2%	7%	52%	17%	23%	3.52	0.94
Information about vehicle modification schemes is non-existent	5%	21%	20%	25%	28%	3.49	1.55
Locating driving instructors with disability expertise is difficult	3%	6%	53%	19%	20%	3.47	0.92
I don't know where to find information about reputable vehicle modification suppliers	8%	28%	21%	21%	21%	3.19	1.64
I don't know who to go to, to get assistance and advice on vehicle modification	6%	28%	23%	26%	17%	3.19	1.43
I cannot locate information about modifications most appropriate for my access needs	7%	26%	33%	17%	17%	3.10	1.39
There is plenty of information on government assistance schemes for private vehicle modifications (R )	11%	8%	19%	26%	36%	2.34	1.79

R = results following reverse coding are presented.

### Appendix 2: Ratings of all benefits relating to private modified vehicles

Benefit	Not at all important	Not important	Neutral	Important	Very important	Mean	SD
Experience freedom to go anywhere at any time	1%	0%	5%	20%	75%	4.67	0.41
Increases independence	1%	0%	7%	20%	72%	4.63	0.46
Opportunities to socialise with others	1%	0%	4%	27%	68%	4.61	0.41
Keeps me connected to family and friends	1%	0%	7%	24%	69%	4.60	0.46
Not reliant on public transport	2%	0%	7%	18%	73%	4.60	0.64
Provides access to leisure and recreation activities	1%	0%	7%	26%	66%	4.57	0.47
Feel less tension and stress in relation to other transport options	1%	2%	7%	23%	68%	4.55	0.57
Not dependent on others	1%	0%	12%	19%	68%	4.53	0.58
Provides opportunities to experience new things	2%	0%	10%	32%	57%	4.43	0.61
Have control over my life	1%	0%	17%	26%	57%	4.38	0.66
Provide opportunities for me to contribute to society	2%	2%	18%	26%	53%	4.26	0.86
Improved self-esteem	4%	4%	11%	27%	54%	4.23	1.09
Allows me to do things for others	1%	0%	23%	29%	47%	4.23	0.71
Much cheaper than wheelchair accessible taxi	2%	5%	20%	21%	53%	4.18	1.03
Have a sense of the future	2%	2%	22%	27%	47%	4.14	0.95
Achievement	2%	1%	24%	28%	45%	4.13	0.90
Gives access to employment	7%	2%	23%	20%	49%	4.02	1.40
Provide opportunities to unwind	2%	2%	26%	32%	37%	4.00	0.92
Gives access to education	3%	4%	26%	33%	35%	3.93	1.01
Allows me to do my job better	4%	4%	33%	18%	41%	3.88	1.26
To feel like I belong	4%	2%	33%	28%	34%	3.85	1.06
Get away from daily life	2%	7%	37%	25%	31%	3.77	1.02

