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Title: Viewpoints of Adults with and without Autism Spectrum Disorders on Public Transport

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Keywords: Asperger syndrome, bus, train, community mobility, Q-methodology, transportation, tram

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Abstract: Abstract
Background: Public transport is low cost, allows for independence, and facilitates engagement and participation for non-drivers. However, the viewpoints of individuals with cognitive disabilities are rarely considered. In Australia, the prevalence of Autism Spectrum Disorders (ASD) is approximately 1% and increasing. Many individuals with ASD do not possess a driver's licence, indicating that access to public transport is crucial for their independence. However, at present, there is no research on the opinions of adults with ASD on public transport.
Aim: To identify the viewpoints of adults with ASD regarding the barriers and facilitators of public transport usage and their transportation preferences, and to contrast these against the viewpoints of neurotypical adults.
Methods: Q methodology was used to identify the viewpoints of both participant groups on public transport. Participants consisted of 55 adults with a diagnosis of ASD and a contrast group of 57 neurotypical adults. Both groups completed a Q sort task which took place in either Perth or Melbourne, Australia.
Results: The most prominent viewpoint indicated that both groups preferred to use public transport over driving and believed that it supported their independence. This viewpoint also indicated that both groups preferred to use electronic ticketing when using public transport. Interestingly, the second most prominent viewpoint indicated that both groups preferred to drive themselves by private car rather than use public transport.
Discussion: It appears that the viewpoints of adults with and without ASD regarding public transportation were largely similar. However, questions arose about whether the preference for public transport in the ASD group may be more a result of difficulties obtaining a driving licence than a deliberate choice. The only barrier specified by adults with ASD related to crowding on public transport. Safety and convenience in relation to location and timing of services were barriers reported by neurotypical adults.

Perth, Western Australia

Editor in Chief

Transportation Research Part A: Policy and Practice

Via online submission

21st July, 2015

Dear Professor J. de D. Ortúzar and Professor J.M. Rose

Re. Manuscript Submission – *Viewpoints on adults with and without Autism Spectrum Disorders on public transport*

Please consider the above manuscript by Falkmer, Barnett, Horlin, Falkmer, Siljehav, Fristedt, Lee, Chee, Wretstrand and Falkmer for publication in your prestigious journal.

The authors appreciate the reviewers' comments and the manuscript has been edited as per the reviewers' recommendations.

The final manuscript has been seen and approved by the authors who have taken due care to ensure the integrity of the work. The work is original and has not been submitted or published elsewhere and is currently not under consideration by another journal. All authors have had full access to the data, analysis and writing and editing has jointly been done. No conflict of interest exists.

Should you require any further information, please do not hesitate to contact me

Sincerely

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Please consider the above manuscript by Falkmer, Barnett, Horlin, Falkmer, Siljehav, Fristedt, Lee, Chee, Wretstrand and Falkmer for publication in your prestigious journal.
The authors appreciate the reviewers' comments and the manuscript has been edited as per the reviewers' recommendations.
The final manuscript has been seen and approved by the authors who have taken due care to ensure the integrity of the work. The work is original and has not been submitted or published elsewhere and is currently not under consideration by another journal. All authors have had full access to the data, analysis and writing and editing has jointly been done. No conflict of interest exists.
Should you require any further information, please do not hesitate to contact me
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Comments from reviewers	Response from Authors
Prepare manuscript and Figure Source Files (mandatory)	Submitter acknowledged
Highlights (bullet points) (mandatory)	Now added in the submission • the two participant groups do not differ greatly in their general opinions of public transport use versus driving. • a preference for public transport in the ASD group may be as a result of difficulties obtaining a driving licence rather than a deliberate choice. • the primary barrier presented by the ASD group appeared to be related social issues • one way to address inclusiveness in public transport could be to involve

	individuals with cognitive impairments in the process of planning public places including public transport
Graphical abstract (optional)	Not added
1. How one gets from the Table in the Appendix and Tables 2 and 3 to Tables 4 to 11? This is unclear. Perhaps a quick example would assist the reader to grasp the information by columns and by rows. Please clarify if the Q Sort No. in Tables 2 and 3 represents the respondent or the statement/item. The Number of Defining Variables seems to suggest the latter, whereas the demographic information provided in the second column indicates the former. 2. In addition, is it relevant that in the ASD group three respondents (or defining variables?) had high loadings in factor 2 and 16 in the Contrast group?	We have clarified Tables 2 and 3 in the manuscript.by removing the Q sort numbers (they represented the respondent) as they were confusing and did not provide any additional information. Two sections have been added in the manuscript to clarify this on page 16: "Appendix A, presents the 59 statements; their factor arrays and normative factor scores for the different viewpoints obtained in both groups. Factor loadings indicating the degree of correlation between each participant's Q sort and each factor are shown in Table 2 (ASD group) and Table 3 (Contrast group). In addition, characteristics of the participants that loaded significantly ($p<.05$) on each factor are shown in the same tables. It deserves to be mentioned that the four factors are specific for each group, i.e., the ASD and the contrast group. Thus, factor 1 represents similar, but not quite the same viewpoint in the ASD group as in the contrast group." and page 19 "Below, the different factors that signify different viewpoints in the population will be further described, including content-describing denominations. In corresponding tables (Tables 4-11) the most prominent statements are also presented, i.e., the statements that participants sharing a specific viewpoint strongly disagreed or agreed upon." and page 28 "The fact that all participants sharing viewpoint two in both groups had a learner's permit or a valid driving licence may partly explain their preference for driving. This finding also confirms current literature

	surrounding transportation preferences within Australia"
The summaries of consensus statements in Tables 12 and 13 are relevant for policy making and they should receive more attention in the discussion. There are two-three paragraphs but more on the viewpoints, than those specific statements with which the respondents agreed, disagreed, or were indifferent to. Should the analyst give the same "importance" to the items in the "middle of the distribution"/neutral compared to the ends of the distribution?	These aspects have been highlighted more in the discussion, for example on p. 25; "This is clearly important information to guide policy making with regard to the community mobility of this target group. These findings are in contrast to previous research reporting that individuals with other cognitive limitations (post-stroke) experienced a lack of self-confidence, difficulties with understanding timetables and difficulty obtaining information to assist with planning their travel (Risser et al., 2012). However, these two studies were conducted in different contexts and with different populations. Given the design of the present study, participants cannot be taken as a representative of the larger population. Nevertheless, the viewpoints identified in this study may provide a greater understanding of the facilitators and barriers to accessing public transport experienced by this population (Watts & Stenner, 2012). This improved understanding may then, in turn, inform societal planning processes to improve this population's access to their community."
How do we use the demographic information in interpreting the four factors?	The demographics have been included in the result section and discussion of the findings when appropriate, i.e., on page 28 with the following text: "as enhancing their independence. The latter may be supported by the fact participants who shared viewpoints 1 in both groups were a mix of licence holders and non-licence holders. However, it may be of interest to note that the participants with ASD sharing viewpoint one comprised a larger proportion of non-licence holder compared with the participants sharing the contrasting viewpoint 1." And on page 28 with the following text: "The fact that all participants sharing viewpoint two in both groups had a learner's permit or a valid driving licence may partly explain their preference for driving. This finding also confirms current literature

	surrounding transportation preferences within Australia."
The calculation of 55 trips by public transport/person and year in WA is strange, considering that the total annual of public transport journeys reported in the paper is 1,310,000 (when, which year?), but the population of Perth at the last census (2011) was above 1.7 million and continuously growing. Please explain.	Thank you for pointing this out. The section now reads: "As an example; Western Australia (WA) reported a population of approximately 1,740,000 in 2011 (Australian Bureau of Statistics. (2015). The same year, 101,147,000 public transport trips were made per annum[1], which equates to 58 trips per person per year."
The paper still needs good editing and consistency in terms of spelling (US or Australian spelling?), formatting (smalls of capitals for the first work on the viewpoints), citations (titles of the journals in capitals, missing volume numbers, pages, location for conferences).	The paper has been edited for consistency in spelling, formatting and citations.
Editing: Remove the first line of Discussion in the abstract: "Due to the similarity…it appears that" (redundant).	The first line of the Discussion in the abstract has been removed and now reads: **"**It appears that the viewpoints of adults with and without ASD regarding public transportation were largely similar."
Align the way you cite work authored by more than two authors: in most cases, it seems that you include all authors in the first instance, then you cite it as First author et al. But this is not always the case: Falkmer et al., 2003 (p. 3); Mengue-Topio et al., 2011 (p.5); Chee et al., 2014 (p.7); Joshi et al., 2007 (p.27); Howlin et al., 2014 (p.28).	The recommendations according to APA are that: References with multiple authors: cite all authors up to five in the first in-text citation (surnames only). In subsequent citations, use the surname of the first author followed by et al. (not italicized and followed by a period) and the year. With six or more authors, cite only the surname of the first author followed by et al. and the year. Consequently, The references with less than five authors have been cited including all authors in the first instance (for example Mengue-Topio et al., 2011, . However, the references with 5 or less authors have been consistently cited with all authors. However, the following reference have 6 or more than 6 authors, hence is cited with first author and et al. in the first instance: Chee et.al (2014), Falkmer et al.(2013), Almberg et al. (2015), Joshi et al.,.(2007); Howlin et al

[1] Travel data statistics provided by Transperth, a division of the Public Transport Authority of Western Australia, http://www.transperth.wa.gov.au/

	(2014),
Remove first names when you cite Watts and Stenner, 2012 (p. 11).	Now revised
What represents 30032012 in the reference for the Centers for Disease Control and Prevention (p. 30)?	The numbers have been removed.
Chee et al. (2014) is included twice in the reference list (p. 30) Corr (2006) is included twice in the reference list (p. 30) Corr et al. (2003) is included twice in the reference list (p. 30), although the references differ in the order of the authors and the journal title??? Watts and Stenner (2012) is included twice in the reference list (p. 33)	Now revised

Research highlights

- the two participant groups do not differ greatly in their general opinions of public transport use versus driving.
- a preference for public transport in the ASD group may be as a result of difficulties obtaining a driving licence rather than a deliberate choice.
- the primary barrier presented by the ASD group appeared to be related social issues
- one way to address inclusiveness in public transport could be to involve individuals with cognitive impairments in the process of planning public places including public transport

Viewpoints of Adults with and without Autism Spectrum Disorders on Public Transport

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Keywords: Asperger's syndrome, bus, train, community mobility, Q methodology, transportation, tram

Abstract

Background: Public transport is low cost, allows for independence, and facilitates engagement and participation for non-drivers. However, the viewpoints of individuals with cognitive disabilities are rarely considered. In Australia, the prevalence of Autism Spectrum Disorders (ASD) is approximately 1% and increasing. Many individuals with ASD do not possess a driver's licence, indicating that access to public transport is crucial for their independence. However, at present, there is no research on the opinions of adults with ASD on public transport.

Aim: To identify the viewpoints of adults with ASD regarding the barriers and facilitators of public transport usage and their transportation preferences, and to contrast these against the viewpoints of neurotypical adults.

Methods: Q methodology was used to identify the viewpoints of both participant groups on public transport. Participants consisted of 55 adults with a diagnosis of ASD and a contrast group of 57 neurotypical adults. Both groups completed a Q sort task which took place in either Perth or Melbourne, Australia.

Results: The most prominent viewpoint indicated that both groups preferred to use public transport over driving and believed that it supported their independence. This viewpoint also indicated that both groups preferred to use electronic ticketing when using public transport. Interestingly, the second most prominent viewpoint indicated that both groups preferred to drive themselves by private car rather than use public transport.

Discussion: It appears that the viewpoints of adults with and without ASD regarding public transportation were largely similar. However, questions arose about whether the preference for public transport in the ASD group may be more a result of difficulties obtaining a driving licence than a deliberate choice. The only barrier specified by adults with ASD related to crowding on public transport. Safety and convenience in relation to location and timing of services were barriers reported by neurotypical adults.

1.0 Introduction

Participation in social activities and the formation of social ties, networks and capital are crucial in shaping not only the quality of life and health of an individual, but also in creating socially sustainable communities. To be considered and feel included as a valued member of society, a person maintains a variety of roles within that community that may include being a neighbour, friend, team member or worker. In order to continue with these valued roles, it is imperative that a person is able to engage within the community, (Verdonschot, De Witte, Reichrath, Buntinx, & Curfs, 2008) and some form of transportation is normally needed in order to enhance this engagement (Falkmer et al., 2013; Gentry, Stock, Davies, Wehmeyer, & Lachapelle, 2011; Krishnasamy, Unsworth, & Howie, 2011). Furthermore, the ability to transport oneself independently is likely to increase the number of roles a person can have, as well as the level of community engagement in which they can partake (Backman, 2010; Falkmer et al., 2013).

Overall, public transport offers individuals an affordable opportunity to travel substantial distances and to independently engage within the community without having to drive (Davies, Stock, Holloway, & Wehmeyer, 2010). Despite this, when compared to international counterparts, Australian transport users exhibit a heavy reliance on privately owned cars, due to issues related to convenience, geographical location or underdeveloped infrastructure, even in metropolitan areas (Buys & Miller, 2011; Legacy, Curtis, & Sturup, 2012). Since driving is often not an option for individuals with a disability (Mengue-Topio, Courbois, Farran, & Sockeel, 2011; Risser, Iwarsson, & Ståhl, 2012), public transport is often the most readily available form of transportation for adults with disabilities. This is primarily because public transport does not rely on the availability of family and friends and is cost effective (Bylund, Wretstrand, Falkmer, Lövgren, & Petzäll, 2007; Davies et al., 2010; Gentry et al., 2011). Unfortunately, there is limited research that addresses the viewpoints of individuals with cognitive disabilities and their ability to effectively transport themselves within the community (Risser et al., 2012). Previous research has focused solely on understanding and enhancing the physical accessibility of public transport, rather than addressing the usability of public transport for people with cognitive impairments. It has been reported that residing in a neighbourhood with high-level public transport service positively impacts social satisfaction (Delmelle, Haslauer, & Prinz, 2013). Conversely, poor

availability of public transport, reliance on others for transport and a lack of support or assistance are important factors when defining transportation disadvantage (Delbosc & Currie, 2011).

Access to transport is also an important determinant of health (Fristedt, Dahl, Wretstrand, Björklund, & Falkmer, 2014) as it provides access to health services, the goods necessary for health, as well as the work and education determinants of health and participation in activities that support healthy life (Jones, Goodman, Roberts, Steinbach, & Green, 2013). Although variation in access to transport, and thus services, is a key contributor to health inequalities (Macintyre, Macdonald, & Ellaway, 2008), the intrinsic associations between transport and health are far from receiving necessary policy attention (Jones et al., 2013).

The issue of transport mobility is therefore a significant problem for society, as well as for the individual (Falkmer, 2001). To assess the impact on society, the mobility snake (Figure 1; Hakamies-Blomqvist, Henriksson, & Heikkinen, 1999) is a useful tool to illustrate how an individual's level of mobility influences their engagement in activities and occupations, which in turn impacts on their health (Backman, 2010; Gentry et al., 2011). The impact of good health increases functional capacity and helps to support autonomy (Falkmer, 2001), therefore, the need for public support is decreased, which ultimately saves public funds (Hakamies-Blomqvist et al., 1999).

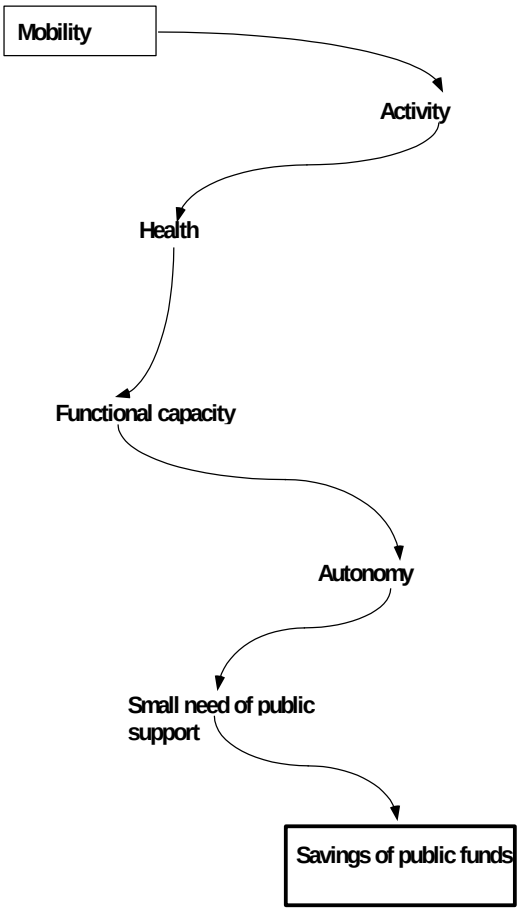

Figure 1. The mobility snake; a model to describe the importance of transport mobility for the individual, as well as society (Hakamies-Blomqvist et al., 1999).

Previous studies that have investigated people with intellectual disabilities have shown that the most significant problems that affect people's ability to utilise public transport include: interaction with the driver and the public, as well as difficulties related to problem solving, spatial perception and the processing of verbal and sensory information (Geller & Greenberg, 2009; Mengue-Topio, Courbois, Farran, E & Sockeel, 2011; Parsons, Leonard, & Mitchell, 2006; Risser et al., 2012). Yet, there remains limited information exploring the transport mobility of individuals with cognitive impairments (Risser et al., 2012). Those diagnosed with an Autism Spectrum Disorder (ASD) are a group with cognitive limitations that have recently seen a dramatic increase in both incidence rates and diagnosis levels (ASD; Australian Bureau of Statistics, 2011). Since 1990, the prevalence rate of ASD has increased (Saracino, Noseworthy, Steiman, Reisinger, & Fombonne, 2010) with a ratio of

11.3 confirmed diagnosis per 1,000 people, reported in 2008 (Centers for Disease Control and Prevention, 2012). The reason for the increase is not fully understood but is partially explained by the changing diagnostic criteria and increased knowledge about the condition, in particular the knowledge of manifestations of symptoms at the high functioning end of the autism spectrum (Volker, 2012). However, most studies report the prevalence for the whole spectrum but not specific conditions (Volker, 2012). In 2009, approximately 153,000 adults in Australia were diagnosed with an ASD with the majority between the ages of 16-64 years (Australian Bureau of Statistics, 2009). This number is expected to exceed 181,000 by 2019. As the incidence of children diagnosed with ASD increases, it is likely that the number of adults with ASD requiring the use of public transportation will also increase.

According to the Diagnostic and Statistical Manual for Mental Disorders – fourth edition (DSM- IV) (American Psychiatric Association, 2000), ASD is a comprehensive 'umbrella' term that includes the diagnoses of Autistic disorder, Asperger syndrome (AS), Childhood Disintegrative Disorder, Rett Syndrome and Pervasive Developmental Disorder Not Otherwise Specified (PDD NOS). The term high functioning Autism Spectrum Disorders (HFA), typically refers to individuals on the autism spectrum with a mean IQ score within or above the normative average range (Volker, 2012). All individuals diagnosed with an ASD exhibit impairments in at least two of the following three categories according to DSM-IV; social interaction, communication, and impairments resulting in restricted or repetitive behaviours. These impairments can present as difficulties understanding facial expression and body language, difficulty with group interaction, presenting as disengaging, and being resistive to change. Another common domain of impairment is hypersensitivity (increased responsiveness to stimuli) or hyposensitivity (additional input required for it to be noticeable) of the senses (Dunn, 1997). Neurotypical individuals are usually able to self-regulate or adapt their behaviour based on the sensory information received to ensure that they can function in the environment. For individuals with ASD, hyper or hyposensitivity could result in over-arousal or under-arousal, which contributes to the inability to discern significant sensory information from the environment (Dunn, 2007). For example, the tactile input from other service users in public transport during peak hours may overload the sensory systems of some individuals with ASD who have hypersensitivity. This inability to

filter sensory information may also lead to significant distress and impaired general function.

The research investigating driving habits in adults with ASD is scarce, however for individuals with ASD, obtaining a drivers licence reportedly involves a magnitude of challenges (Chee et al., 2014; Cox, Reeve, Cox, & Cox, 2012; Almberg, Selander, Falkmer, Vaz, Ciccarelli, et al., 2015). Due to the high level of cognitive demand it requires, it is possible that many adults with ASD rely on other means of transportation rather than driving their own car. Hence, public transport offers an alternative mode of transport for this population. As an example; Western Australia (WA) reported a population of approximately 1,740,000 in 2011 (Australian Bureau of Statistics. (2015). The same year, 101,147,000 public transport trips were made per annum[1], which equates to 58 trips per person per year. The number of trips and the experiences of public transportation usage by adults with ASD remain unknown. However, it is likely that many adults with ASD are members of a vulnerable group whose needs are underserved and tend to suffer as a consequence of transport inequalities (Lucas, 2012). Given the aforementioned impact of mobility on health and wellbeing, an exploration into how adults with ASD perceive public transport is necessary and overdue. Moreover, to date, much of the research on public transportation involves only children with ASD, or individuals with other diagnoses (Denson, 2000; Falkmer, 2001).

Therefore, the current study aimed to identify the viewpoints and preferences of adults with ASD with regard to public transport and to gain a preliminarily understanding of any perceived underlying barriers and facilitators to public transport usage. Furthermore, the study aimed to contrast the viewpoints of those with ASD to a group of neurotypical adults, in order to set the finding in a proper context.

2.0 Methods

2.1 Participants

[1] Travel data statistics provided by Transperth, a division of the Public Transport Authority of Western Australia, http://www.transperth.wa.gov.au/

Using purposive sampling through non-government organisations in Melbourne and Perth (Australia), 54 adults with ASD were recruited. A contrast group of 57 neurotypical adults were recruited in Perth. Demographic details for both groups are outlined in Table 1.

Table 1: *Description of study participants.*

Group	Male	Female	Age Mean	Age SD	Driver's licence	Learner's permit	No licence or permit
ASD[1,2]	44	10	24.6	10.3	14	12	28
Contrast[3]	41	15	24.7	8.4	40	13	4
Statistical Comparison	X^2=1.1 p=0.3		t=0.42 p=0.97		X^2= 30.5 p <0.001		

[1] Gender was not recorded for 1 ASD participant

[2] Age was not recorded for 3 ASD participants

[3] Gender was not recorded for 1 contrast participant

To be eligible for participation, adults with ASD were required to be over 18 years of age, diagnosed with AS or HFA, live within metropolitan areas, and be able to understand written and spoken English. Similarly, neurotypical participants were required to be over 18 years of age, live within a metropolitan area, and be able to understand written and spoken English. Participants were excluded from both groups if they had been diagnosed with any other cognitive or developmental delays or had any significant physical impairment according to their self-report.

2.2 Design

The Q method was employed to investigate the viewpoints and experiences of adults with ASD and neurotypical adults when using public transport. The Q method is an inductive, as well as deductive, in-depth procedure that is used to investigate and explore the multiplicity of subjective experiences, views and opinions on a specific topic (Shinebourne, 2009). Using the Q method, correspondences and categories within phenomena can be detected (Corr, 2001).

The Q method involved obtaining each participant's viewpoint by conducting a Q sort. As part of the Q sort, participants would sort previously defined statements related to public transport and would rank them on a grid from strongly agree to strongly disagree (see figure 2). Factor analysis was then used to extract common viewpoints within the group, by identifying a particular number of participants who hold a certain viewpoint (Corr, Phillips, & Capdevila, 2003; Fristedt, Wretstrand, Björklund, Corr, & Falkmer, 2012). Q method has previously been employed within the fields of transportation and disability research (Chee

et al., 2014; Corr, Capdevila, & Phillips, 2003; Fristedt et al., 2012). The method does not rely on extensive verbosity to express viewpoints (Kaland, Mortensen, & Smith, 2011) and therefore is particularly useful in ASD research as it provides a means to circumvent possible communication difficulties commonly experienced by the ASD population. Q method also requires active participation in the sorting of statements, thus enabling discrimination between viewpoints that may not be possible to identify in a questionnaire or interview (Corr, 2001). Q-method involves five stages, details of which are outlined in section 2.3.

2.3 Procedure

Steps involved in using Q methodology (Corr, 2006):

1. Development of the concourse;
2. Identification of the Q sort statements that will be used;
3. Administering the Q sort;
4. Data analysis; and finally;
5. Interpretation of the factors, i.e., the viewpoints.

2.3.1 Development of the concourse

The development of the concourse was achieved through a search of statements from the literature, as well as from seeking expert opinion (Corr, 2006; McKenzie, Braswell, Jelsma, & Naidoo, 2011; Portney & Watkins, 2009). Initially, a literature review was conducted using ProQuest, Science Direct and CINAHL databases, which resulted in a total of 36 journal articles. This highlighted the limited research available that investigated public transport use by adults with ASD. Therefore, the search was expanded to include studies on public transport usage of people with disabilities other than ASD (Davies et al., 2010; Denson, 2000; Forsman & Falkmer, 2006). To further expand the development of the concourse, interviews were conducted with two experts in the research fields of transport and disability, both of whom had particular expertise in ASD.

2.3.2 Identification of the Q sort statements

Statements consisted of possible barriers and facilitators relating to the traditional triad of ASD symptomatology (American Psychiatric Association, 2000). Originally, 63 statements were created and trialled with ten neurotypical adults who had professional experience of ASD and two adults with ASD. These trials ensured the readability, usability and rigour of the Q sort. Duplicate or ambiguous statements were removed. Ideally, a Q sort pack should contain between 40-60 statements (Corr, 2006; Portney & Watkins, 2009; Watts & Stenner, 2012). In the current study, 59 statements (see Appendix A) formed the final Q sort pack, and these were printed on cards. A "grid" (Figure 2) was developed on which to rank the statements which consisted of 59 normally distributed squares.

2.3.3 Administering the Q sort

The Q sort was conducted in a quiet, distraction free environment that was selected by the participant, for example, the participant's workplace, home or in the research facility. A standardised script of instructions was developed and read by the researcher to maintain consistency across participants. Participants were asked to rank the 59 statements in preference of opinion from 'strongly disagree' to 'strongly agree' on an ordinal scale using the "grid" (Corr, 2006). Each point of the scale (shaded red: 'strongly disagree'; shaded white: 'neutral'; shaded green: 'strongly agree') were limited to a specific number as illustrated in Figure 2. Only one statement was allowed per square and the ranking was horizontal, (i.e., the placement at the top or bottom was not important to the analysis). In order to decrease possible anxiety, participants were reassured there were no correct or incorrect answers as the sort was a reflection of their individual experiences, views and opinions. Completion of the grid ranged from six to 50 minutes. Once the 59 statements were sorted onto the grid, participants were asked if any statements in the Q sort were missing according to their opinion. Some participants in both groups reported that further statements on public transport during peak traffic hours could have been added.

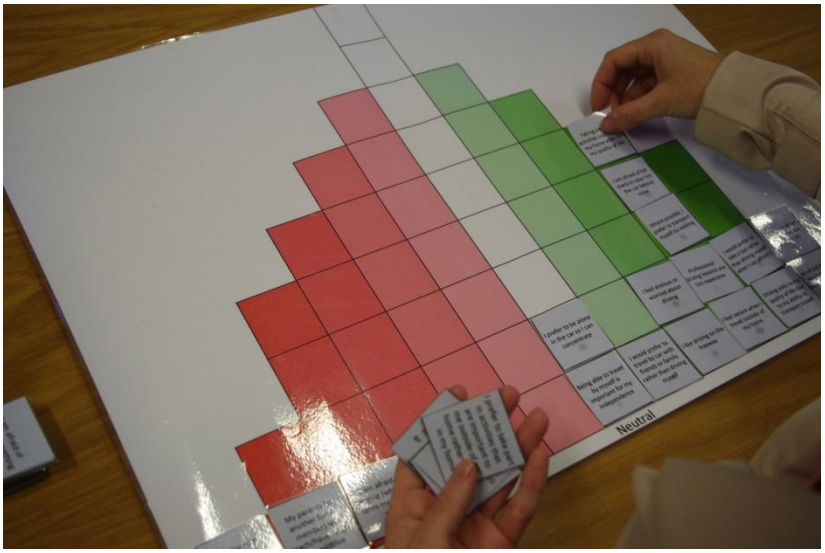

Figure 2. A participant completing a Q sort.

2.3.4 Data analysis

The placement of each card was recorded and entered into the PQ Method computer program (Schmolck, 2013). In PQ software, factor analysis generated viewpoints are analysed by participant, not by statement. This procedure has demonstrated high rigour in multiple studies (Chee et al., 2014; Corr, 2006; Fristedt et al., 2012; Simons, 2013; Wagman, Håkansson, Jacobsson, Falkmer, & Björklund, 2012). Consequently, the factor analysis grouped individuals and their Q sorts as opposed to grouping individual viewpoint statements (Corr, 2006; McKenzie et al., 2011). This procedure involved correlating each participant's response with the response of all other participants (Corr, 2006). Varimax rotation was applied, in order to maximise the number of sorts included within a factor (Corr, 2006; McKenzie et al., 2011). A factor was made up of a number of statements that a group of participants both agreed and disagreed with (Dennis, 1986; McKenzie et al., 2011).

Using the recommended guidelines for Q method, five steps of analysis were utilised to determine the number of factors retained (Chee et al., 2014; Fristedt et al., 2012; Simon Watts & Paul Stenner, 2012):

- The Kaiser-Guttman Criterion was applied and involved retaining all factors with an eigenvalue greater than 1.0 (Watts & Stenner, 2012).
- 'To comply with the magic number seven' criterion (Watts & Stenner, 2012), the PQ Method software program ran factor analysis using eight factors (Schmolck, 2013).

- At least two significant factor loadings per each retained factor was confirmed (Watts & Stenner, 2012). A significant factor loading refers to a statement that is sorted in a similar position by the majority of participants who hold that viewpoint.
- Humphrey's rule was applied. The rule states that the multiplication of the two highest significant factor rankings (ignoring whether it is positive or negative), must be greater than twice the standard error (Watts & Stenner, 2012).
- The scree test was applied, which denotes that all factors displayed prior to the scree plot 'levelling out' should be retained (Watts & Stenner, 2012). The scree plots are presented in Figures 3 and 4.

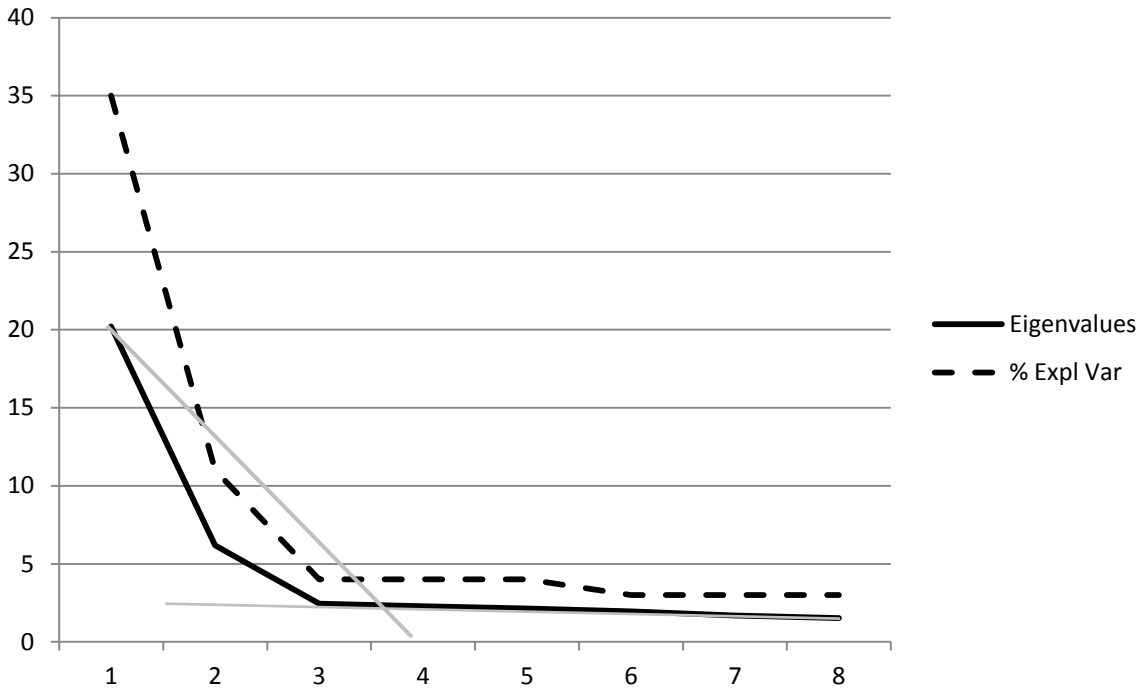

Figure 3. Scree plot for ASD group. Thin grey lines display inflection points for the 4 factor solution.

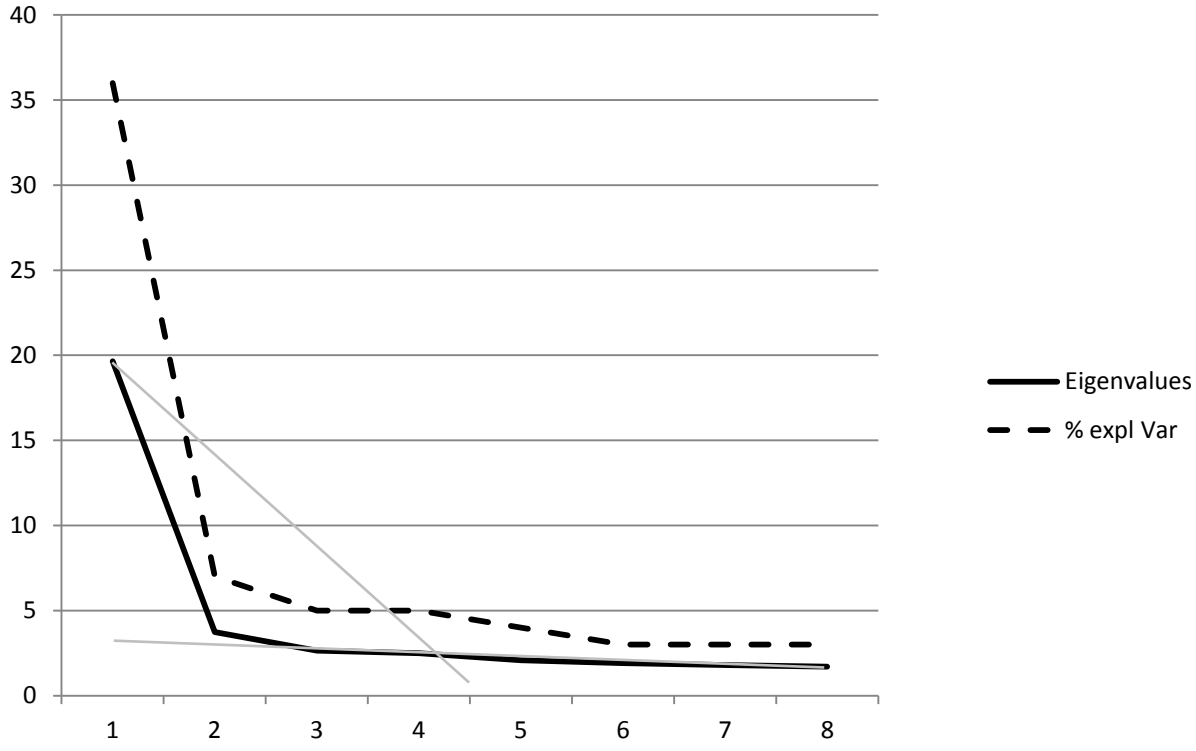

Figure 4. Scree plot for Contrast group. Thin grey lines display inflection points for the 4 factor solution.

2.3.5 Factor Interpretation

The findings were interpreted and content-describing titles were ascribed to the factors that from this step were defined and named as viewpoints. This was done by four researchers experienced in ASD and transport research. Each researcher started by independently ascribing a title to the viewpoints. During the following discussion, confirmation procedures were utilised, in order to reach a consensus and agree on titles that accurately described each viewpoint, which limited possible researcher bias (Corr, 2006; McKenzie et al., 2011).

2.4 Ethical considerations

Ethical approval was obtained from Human Research Ethics Committee (HREC) at Curtin University (HR 61/2012) in Perth, WA, Australia and the HREC at La Trobe University (4261) in Melbourne, Victoria, Australia. The research also conformed to the Declaration of Helsinki. Participants were provided with an information sheet outlining their role in the research and that they were able to withdraw at any time without incurring any negative consequence. Participants then provided informed written consent and were provided with a cinema ticket as a thank you for their participation. All study data were confidentially stored and maintained in line with Declaration of Helsinki and the Western Australian University Sector Disposal Authority.

3.0 Results

Using the criteria presented in section 2.3.4, there were four factors, i.e., viewpoints, identified for each group. Although the scree plots in Figure 3 and 4 display that a three factor solution could have been retained in each set of results, the fourth factor was found to fit all other criteria and was included within the results (Chee et al., 2014; Fristedt et al., 2012; Watts & Stenner, 2012). The factors retained within the ASD group's Q sorts explained 47% of the variance; factor 1 (26%), factor 2 (7%), factor 3 (5%), and factor 4 (9%). The factors retained within the contrast group's Q sort data explained 54% of the variance; factor 1 (20%), factor 2 (17%), factor 3 (7%), and factor 4 (10%). The eigenvalues of each factor were provided by PQ method prior to factor rotation. Once varimax rotation was applied, factors appearing subsequent to the number of factors identified (i.e., four) were rotated so that they optimally fit within the top four retained factors, thus explaining the difference in explained variance between the scree plot and the explained variance as listed

above (Watts & Stenner, 2012). Due to varimax rotation optimising the number of Q sorts subsequent to factor 4 being included, factor 4 in both groups explained greater variance than factor 3, since factors 5, 6 etc. were optimally rotated in order to fit in the top four factors (Watts & Stenner, 2012). Appendix A, presents the 59 statements; their factor arrays and normative factor scores for the different viewpoints obtained in both groups. Factor loadings indicating the degree of correlation between each participant's Q sort and each factor are shown in Table 2 (ASD group) and Table 3 (Contrast group). In addition, characteristics of the participants that loaded significantly ($p<.05$) on each factor are shown in the same tables. It deserves to be mentioned that the four factors are specific for each group, i.e., the ASD and the contrast group. Thus, factor 1 represents similar, but not quite the same viewpoint in the ASD group as in the contrast group.

Table 2: *Significant (<.05) ASD group factor loadings (Bold numbers indicate sorts loading highly on each factor)*

	Factor			
Gender / Driving Status / Age	1	2	3	4
Male, Learners' Permit, 20	**0.81**	0.09	0.06	0.07
Male, No Licence, 21	**0.78**	0.00	0.10	0.38
Female, Licence, 21	**0.76**	0.29	0.28	0.10
Male, No Licence, ?Age	**0.76**	-0.11	0.26	0.25
Male, No Licence, 21	**0.75**	0.02	-0.07	0.13
Female, Licence, 37	**0.73**	0.01	0.28	-0.03
Male, No Licence, 55	**0.73**	0.06	-0.03	0.26
Male, Licence, 24	**0.68**	0.18	-0.06	0.10
Male, No Licence, 26	**0.68**	0.10	0.23	0.07
Male, Learners' Permit, 22	**0.68**	0.33	0.14	0.32
Female, No Licence, 21	**0.68**	0.07	0.21	0.23
Male, No Licence, ?Age	**0.67**	-0.10	-0.08	0.44
Male, No Licence, 21	**0.66**	0.12	-0.07	0.19
Male, Licence, 19	**0.66**	0.24	-0.09	0.18
Female, Learners' Permit, 20	**0.65**	0.30	-0.15	0.28
Male, Learners' Permit, ?Age	**0.64**	0.09	0.16	0.20
Male, No Licence, 20	**0.62**	0.02	0.37	0.12
Male, No Licence, 21	**0.62**	0.03	0.06	0.39
Male, No Licence, 18	**0.61**	-0.00	-0.03	-0.15
Male, No Licence, 23	**0.59**	0.01	0.19	0.34
Male, Learners' Permit, 18	**0.59**	0.48	0.02	-0.00
Male, Licence, 21	**0.59**	0.26	-0.02	-0.05
Male, No Licence, 21	**0.54**	0.34	-0.08	0.25
Male, Learners' Permit, 23	-0.02	**0.70**	0.12	-0.03
Female, Licence, 22	0.06	**0.67**	-0.15	0.01
Male, Learners' Permit, 19	0.48	**0.63**	-0.02	0.05
Female, Licence, 22	-0.01	-0.12	**0.75**	0.21
Male, No Licence, 22	0.20	0.13	**0.74**	-0.15
Male, No Licence, 18	-0.00	-0.20	0.17	**0.80**
Male, Learners' Permit, 19	0.46	-0.00	-0.15	**0.59**
Male, No Licence, 19	0.28	0.10	0.04	**0.59**
20 Male, No Licence, 24		0.42	0.21	-0.03 **0.57**
% Explained Variance		26	7	5 9
Number of Defining Variables		23	3	2 4
Factor Score Factor 1		1.00	0.35	0.25 0.49
Correlations Factor 2		-	1.00	0.04 0.08
Factor 3		-	-	1.00 0.16
Factor 4		-	-	- 1.00

Note: ?Age means age not recorded

Table 3: *Significant (<.05) contrast group factor loadings (Bold numbers indicate sorts loading highly on each factor)*

Gender / Driving Status / Age	Factor			
	1	2	3	4
Male, Licence, 30	**0.82**	-0.19	0.13	0.14
Female, Learners' Permit, 24	**0.79**	0.02	-0.08	0.15
Female, Licence, 25	**0.79**	0.11	0.27	0.05
Male, No Licence, 27	**0.71**	0.03	0.10	0.24
Male, Learners' Permit, 18	**0.69**	0.22	0.18	0.06
Male, Licence, 30	**0.68**	0.15	-0.14	0.12
Male, Licence, 22	**0.68**	0.07	0.29	0.12
Male, Learners' Permit, 19	**0.64**	0.43	0.12	0.26
Male, Learners' Permit, 18	**0.62**	0.01	0.08	0.50
Male, Licence, 19	**0.60**	0.22	0.20	0.48
Male, No Licence, 23	**0.60**	0.30	0.02	0.42
Male, Learners' Permit, 20	**0.58**	0.34	-0.18	0.09
Male, Licence, 26	**0.58**	0.11	0.01	0.46
Male, Licence, 18	**0.57**	0.24	0.25	-0.09
Female, Licence, 29	**0.57**	0.16	0.12	-0.09
Male, Licence, 62	**0.55**	0.02	-0.41	-0.02
Female, No Licence, 21	**0.51**	0.29	-0.01	0.09
Male, Learners' Permit, 19	**0.50**	0.06	0.07	0.18
Male, Licence, 37	**0.44**	0.34	0.06	0.21
Male, Licence, 20	0.25	**0.79**	0.22	0.20
Male, Licence, 24	0.06	**0.74**	0.40	0.11
Male, Licence, 23	0.18	**0.72**	-0.04	0.37
Male, Licence, 34	0.15	**0.72**	0.20	0.16
Male, Licence, 21	0.14	**0.68**	0.31	0.19
Female, Licence, 19	0.32	**0.67**	0.03	0.39
Male, Licence, 19	0.52	**0.66**	0.13	0.14
Female, Licence, 19	0.29	**0.62**	-0.27	0.20
Female, Licence, 19	0.23	**0.62**	0.26	0.30
Female, Licence, 24	0.08	**0.62**	-0.01	0.43
Male, Licence, 19	0.49	**0.61**	0.13	0.04
Female, Licence, 27	-0.33	**0.59**	0.42	-0.09
Male, Licence, 24	-0.20	**0.56**	0.09	0.02
Male, Licence, 18	0.28	**0.55**	0.06	0.19
Male, Licence, 26	0.36	**0.54**	0.07	0.38
Male, Licence, 24	0.09	**0.41**	0.26	0.25
Male, Licence, 18	0.30	-0.02	**0.72**	0.29
Male, Licence, 19	0.06	0.33	**0.61**	0.03
Female, Learners' Permit, 24	0.28	0.10	**0.51**	0.29
Female, Learners' Permit, 18	-0.17	0.42	**0.51**	-0.10
Male, Licence, 60	-0.11	0.10	**0.27**	0.14
Male, Licence, 28	0.24	0.14	0.25	**0.65**
Male, Licence, 21	0.39	0.21	0.05	**0.62**
Female, Licence, 25	-0.16	0.32	0.33	**0.61**
Male, Licence, 30	0.24	0.34	0.03	**0.57**
Female, Learners' Permit, 23	0.13	0.38	0.14	**0.44**
% Explained Variance		20	17	7	10
Number of Defining Variables		19	16	5	5
Factor Score Correlations	Factor 1	1.00	0.46	0.31	0.48
	Factor 2	-	1.00	0.48	0.65
	Factor 3	-	-	1.00	0.51
	Factor 4	-	-	-	1.00

Below, the different factors that signify different viewpoints in the population will be further described, including content-describing denominations. In corresponding tables (Tables 4-11) the most prominent statements are also presented, i.e., the statements that participants sharing a specific viewpoint strongly disagreed or agreed upon.

3.1 ASD viewpoint 1:"comfortable using public transport"

Overall, the strongest viewpoint in the ASD participant group was that they were "comfortable using public transport". The group was characterised by those who were frequent and comfortable users of public transport. In total, 23 participants shared this view including five participants who held valid driving licences and five who held a learner's permit, while 13 had no licence. The general belief of the group was that electronic ticketing made their public transport journey easier and that the ability to transport themselves was important for their independence. The most prominent viewpoints of this group are presented in Table 4.

Table 4: *ASD Viewpoint 1 "Comfortable using public transport"*

Statements		Viewpoint			
		1	2	3	4
53	Using a Smartrider makes my journey easier	6	0	1	3
34	I often use public transport	5	-1	0	5
12	Travelling by myself is important for my independence	5	4	-1	4
31	I am frightened of using public transport	-5	-1	-2	-1
33	I seldom use public transport	-5	-1	4	-2
32	I have never used public transport	-6	-3	-5	-6

3.2 Contrast viewpoint 1: "comfortable and happy using public transport"

Overall, the strongest viewpoint held by the neurotypical participants in the contrast group was that they were "comfortable and happy using public transport" (Table 5). Similarly to the ASD group, the contrast group was characterised by those who often used public transport to participate in activities outside of their home and believed that the use of electronic ticketing supported their journey. In total, 19 neurotypical adults in the contrast group shared this viewpoint; 10 held a valid driving licence, six had a learner's permit, but three were neither learner drivers, nor licensed drivers.

Table 5*: Contrast/neurotypical viewpoint 1 "comfortable and happy using public transport"*

Statements		Viewpoint			
		1	2	3	4
34	I often use public transport	6	-5	0	0
53	Using a smartrider makes my journey easier	5	4	4	2
30	Taking part in activities outside of my home adds to my quality of life	5	5	2	4
31	I am frightened of using public transport	-5	-4	-3	-5
33	I seldom use public transport	-5	4	-2	4
32	I have never used public transport	-6	-5	-6	-6

3.3 ASD viewpoint 2: "prefer to drive"

The second most prominent viewpoint within the ASD group was that they "prefer[ed] to drive" rather than use public transport (Table 6). This group also reported that taking part in activities outside of their home added to their quality of life, but agreed most strongly with the statement "I prefer to drive a car rather than use public transport". This group was characterised by those who prefer to travel by private car rather than public transport and preferred not to increase their public transport usage. These three persons were licence holders or had a learners' permit.

Table 6: *ASD viewpoint 2:"prefer to drive"*

Statements		Viewpoint			
		1	2	3	4
13	I prefer to drive a car rather than use public transport	-1	6	0	-5
30	Taking part in activities outside of my home adds to my quality of life	3	5	5	0
16	I prefer to travel by private car than take public transport	-1	5	-3	3
35	I would like to use public transport more than I currently do	1	-5	5	-1
58	I find the train line map inside the train confusing	-2	-5	-5	0
14	I prefer to take public transport rather than drive	2	-6	2	6

3.4 Contrast viewpoint 2: "driving is important and supports independence"

The second most prominent viewpoint in the contrast group was that "driving is important and supports independence" and this suggested that in general, driving, rather than using public transport, as the preferred method of transport for the neurotypical participants.

Participants in the contrast group most strongly agreed with the statement "I prefer to drive a car rather than use public transport" and most strongly disagreed with "I prefer to take public transport rather than drive" (Table 7). Despite the propensity for using private vehicles, the contrast group also believed that public transport enhanced independence and quality of life. This viewpoint was held by 16 participants, all licensed.

Table 7: *Contrast/neurotypical viewpoint 2 "driving is important and supports independence"*

Statements		Viewpoint			
		1	2	3	4
13	I prefer to drive a car rather than use public transport	1	6	5	6
12	Being able to transport myself is important for my independence	4	5	2	3
30	Taking part in activities outside of my home adds to my quality of life	5	5	2	4
32	I have never used public transport	-6	-5	-6	-6
34	I often use public transport	6	-5	0	0
14	I prefer to take public transport rather than drive	0	-6	-3	-4

3.5 ASD viewpoint 3: "competent, but uncomfortable when crowded"

The viewpoint "competent, but uncomfortable when crowded" was reflective of the group who wished to use public transport more than they currently did and believed that taking part in activities outside of their home added to quality of their life (Table 8). However, the participants disliked being touched by other people on public transport. This group also held the opinion that they were able to learn new routes easily and were not confused by train line maps. One person in this group held a licence, the other did not.

Table 8: *ASD viewpoint 3: "competent but uncomfortable when crowded"*

Statements		Viewpoint			
		1	2	3	4
52	I dislike being touched by other people on public transport	1	0	6	4
30	Taking part in activities outside of my home adds to my quality of life	3	5	5	0
35	I would like to use public transport more than I currently do	1	-5	5	-1
32	I have never used public transport	-6	-3	-5	-6
58	I find the train line map inside the train confusing	-2	-5	-5	0
50	Learning a new route using public transport is difficult for me	0	2	-6	1

3.6 Contrast viewpoint 3: "public transport is unsafe and inconvenient"

Viewpoint 3 for the contrast group was determined to be that "public transport is unsafe and inconvenient". The neurotypical participants' viewpoint suggested that they preferred driving compared to travelling on public transport due to the inconvenience of services on public holidays and weekends (Table 9). This viewpoint was also characterised by participants who preferred not to travel on public transport during peak hours when the buses/trains were full of people. In addition, they also reported that they did not feel safe when travelling outside of peak hours. Five participants, all licenced or with a learners' permit, held this viewpoint.

Table 9: *Contrast/neurotypical viewpoint 3: "public transport is unsafe and inconvenient"*

Statements		Viewpoint			
		1	2	3	4
42	Public transport is not convenient for me on public holidays/weekends	1	3	6	5
39	I do not travel at peak times when the bus or train is full of people	-1	1	5	0
13	I prefer to drive a car rather than use public transport	1	6	5	6
23	I feel safe using public transport outside of peak times	0	1	-5	1
15	I prefer to take a taxi rather than use public transport when I can afford it	0	-1	-5	3
32	I have never used public transport	-6	-5	-6	-6

3.7 ASD viewpoint 4: "prefer public transport for essential travel"

The viewpoint "prefer public transport for essential travel" was put forward by those who preferred public transport over driving, but did not like travelling when the bus/train was full of passengers (Table 10). This group of participants preferred to perform social activities inside their homes, but would utilise public transport for all necessary travel outside of their homes. Three persons without a licence and one with a learner's permit shared this viewpoint.

Table 10: *ASD viewpoint 4:"prefer public transport for essential travel"*

Statements		Viewpoint			
		1	2	3	4
14	I prefer to take public transport rather than drive	2	-6	2	6
34	I often use public transport	5	-1	0	5
39	I don't travel at peak transport times when the bus or train is full of people	0	0	-4	5
4	I prefer to perform social activities outside of my home rather than inside of my home	2	2	2	-5
13	I prefer to drive a car rather than use public transport	-1	6	0	-5
32	I have never used public transport	-6	-3	-5	-6

3.8 Contrast viewpoint 4: "public transport is impractical"

The viewpoint "public transport is impractical" was characterised by those who preferred to drive a car rather than use public transport and who found public transport services impractical, due to the location of bus/train stops and the availability of services on public holidays and weekends (Table 11). All five participants sharing this viewpoint were licensed or held a learners' permit.

Table 11: *Contrast/neurotypical viewpoint 4: "public transport is impractical"*

Statements		Viewpoint			
		1	2	3	4
13	I prefer to drive a car rather than use public transport	1	6	5	6
42	Public transport is not convenient for me on public holidays/weekends	1	3	6	5
25	The nearest bus stop/train station is too far from where I live	-4	-4	2	5
31	I am frightened of using public transport	-5	-4	-3	-5
48	I find the signs at the bus/train station confusing	-2	-2	-1	-5
32	I have never used public transport	-6	-5	-6	-6

3.9 Consensus statements in the group of participants with ASD

Consensus statements refer to the statements that were ranked similarly by participants within a group (Watts & Stenner, 2012). Amongst individuals with ASD, 12 consensus statements arose (Table 12). These included four statements that were strongly agreed with by all ASD participants, four statements that all ASD participants felt indifferent towards and four statements that all ASD participants strongly disagreed with.

Table 12: *Summary of consensus statements in ASD participants.*

Strongly Agree	Indifferent	Strongly Disagree
I usually travel alone when using public transport (7)	I prefer to perform necessary activities outside of my home rather than in my home (3)	I find that the bus or train timetable is difficult to understand (26)
It is important for me to be able to transport myself outside of my home without using a car (11)	Where possible, I prefer to transport myself by riding a bicycle (18)	I find it difficult to know when I should get off the bus or train(27)
Public transport helps me to participate in more activities outside of my home (20)	I feel very anxious when the buses/trains are late (37)	I find the colours and patterns on the buses and trains overwhelming (54)
I feel safe using public transport outside of peak times (23)	I dislike the texture of the seats on public transport (56)	I find the sign at the bus stop difficult to understand (59)

Overall, these results indicate that it was important for individuals with ASD to transport themselves without the use of a car and that they usually travel alone when using public transport. Participants with ASD were content to perform necessary activities either inside or outside of their home, felt untroubled if transported themselves by bicycle, reported that they only occasionally felt anxious when services ran late and felt indifferent to the texture of the seats. They generally found the bus or train timetable easy to understand and were aware when they needed to exit the vehicle and easily understood the signs at the bus stop. They did not find the colours/patterns on the buses and trains overwhelming.

3.10 Consensus statements in the contrast group

Within the contrast group, only seven consensus statements arose (Table 13). The contrast group members preferred to participate in leisure activities outside of their home and found that the announcement on the train detailing the next station was helpful. They were happy to perform important and essential activities either inside or outside of their home and felt proficient in reading signs at the bus stop, and in knowing when to press the buzzer in order to exit the vehicle.

Table 13: *Summary of consensus statements in contrast/neurotypical participants.*

Strongly Agree	Indifferent	Strongly Disagree
I prefer to participate in leisure activities outside of my home rather than in my home (2)	I prefer to perform activities that are important to me outside of my home rather than in my home (1)	It is difficult to press the buzzer on the bus at the right time so it stops at the correct stop (49)
The announcement on the train for each station is helpful to me (57)	I prefer to perform necessary activities outside of my home rather than in my home (3) I feel comfortable asking for help if I need to (51)	I find the sign at the bus stop difficult to understand" (59)

3.11 Consensus statements of all participants

In both the ASD and contrast groups, two statements were sorted similarly in all four factors. In both groups participants felt indifferent towards the statement *"I prefer to perform necessary activities outside of my home rather than in my home"* (3) and strongly disagreed with statement *"I find the sign at the bus stop difficult to understand' (*59).

4.0 Discussion

Overall, the results from the current study indicate that participants with ASD acknowledged the importance of being able to transport oneself without using a car and that public transport promoted their independence in community mobility. These findings are in line with previous research that reported access to bus travel positively affected wellbeing for young people (Jones et al., 2013). The participants with ASD in the current study expressed that they felt competent when using public transport and reached a consensus regarding the importance of being able to use public transport. They all reported a strong belief in their ability to understand signage and timetables, as well as being proficient in knowing when to get off the bus. This finding supports the idea that public transport acts to assist individuals with an ASD in community engagement. This is clearly important information to guide policy making with regard to the community mobility of this target group. These findings are in contrast to previous research reporting that individuals with other cognitive

limitations (post-stroke) experienced a lack of self-confidence, difficulties with understanding timetables and difficulty obtaining information to assist with planning their travel (Risser et al., 2012). However, these two studies were conducted in different contexts and with different populations. Given the design of the present study, participants cannot be taken as a representative of the larger population. Nevertheless, the viewpoints identified in this study may provide a greater understanding of the facilitators and barriers to accessing public transport experienced by this population (Watts & Stenner, 2012). This improved understanding may then, in turn, inform societal planning processes to improve this population's access to their community. Despite the commonly reported hyper-sensitivity to sensory stimuli in ASD (American Psychiatric Association, 2000), the participants with ASD in the current study did not report specific sensory aspects as barriers for their public transportation use. However, the tendency to avoid peak hours could perhaps be linked to possible sensory and/or anxiety issues within this group.

Both participant groups reported the use of electronic ticketing as a facilitator for public transport usage. Therefore, for travellers with and without ASD, both convenience and simplicity are important when providing payment for travel. These results also support the importance of the CIVITAS II policy note (CIVITAS GUARD, 2010), which states that in order to enhance the use of public transport, cities should aim to make the ticketing system attractive and user-friendly for everyone. Hence, this policy note could be considered as promoting inclusive strategies also appreciated by the travellers with ASD in the current study.

Technological developments and service enhancements are likely to be a key contributing role in the removal of barriers to public transport usage for travellers with ASD. It is clear that travellers are increasingly focused on the role that technology can play in order to enhance the public transport experience. Consequently, "smartcards" and the availability of real-time passenger information for journey planning and trip recovery are now considered a requirement by many travellers. This is especially true of cities in Australia where the low density structure means that public transport services often are less frequent than in, for example, European cities of comparable size (Nelson & Mulley, 2013).

Integrated smartcard ticketing provides an opportunity to simplify fare payments and can play a significant role in creating a convenient service (Nelson & Mulley, 2013). The relative merits of upgrading the fare collection system as a measure to reduce travel times could be viewed as being on par with the commonly suggested policy of segregating buses from car traffic by implementing bus lanes or busways (Tirachini, 2011). Smartcard data collection also enables network operators to obtain maximum value from their infrastructure investments in support of expanded access to all users (Ferrari, Berlingerio, Calabrese, & Reades, 2013). Research has also showed that smartcard technologies reduce the amount of time it takes to board a transit vehicle and therefore improve operational efficiency (Chow, 2014), as well as make the driver's job easier (Pelletier, Trépanier, & Morency, 2011). In the current study, both sets of participant groups agreed on this consensus statement however, it is likely that the rationale for each group was different. For example, in the case of travellers with ASD, the fact that integrated smartcard technology reduced the need for stressful social interactions may be more significant than the convenience aspects. In general, any public transport service provider (more or less consistent) aims to provide a certain level of quality for their customers. The quality, in turn, is influenced by the level of quality sought by the customers, external and internal pressures, budgetary and technical constraints and competitors' performance. A British study (Stradling, Carreno, Rye, & Noble, 2007) reported on items that actually discourage people from using the bus. Eight underlying factors were reported: feeling unsafe; preference for walking or cycling; problems with service provision; unwanted arousal; preference for car use; cost; disability and discomfort; and self-image. Six of these items relate to perceived service quality, while only two relate to physical aspects and supply (problems with service provision; preference for car use).

In the present study, the first viewpoints of both groups were markedly similar. The group of individuals with ASD held the viewpoint that public transport promotes independence, and the contrast group held the viewpoint that public transport enhances quality of life. These viewpoints displayed the preference of public transportation over driving for both the ASD and contrast groups. However, it can be hypothesised that the subtle difference between the groups may indicate that public transport is more of a choice in the contrast group than in the group of participants with ASD, since the contrast group did not view public transport

as enhancing their independence. The latter may be supported by the fact participants who shared viewpoints 1 in both groups were a mix of licence holders and non-licence holders. However, it may be of interest to note that the participants with ASD sharing viewpoint one comprised a larger proportion of non-licence holder compared with the participants sharing the contrasting viewpoint 1.

The second viewpoints of both groups were in contrast to their first. The participants representing these viewpoints (i.e., viewpoint 2 in both groups) expressed a preference for using cars over public transportation, reflecting that this is indeed a strong discouraging factor limiting the usage of public transport (Stradling et al., 2007). The fact that all participants sharing viewpoint two in both groups had a learner's permit or a valid driving licence may partly explain their preference for driving. This finding also confirms current literature surrounding transportation preferences within Australia (Buys & Miller, 2011; Legacy et al., 2012; Redman, Friman, Garling, & Hartig, 2013), both secondary viewpoints suggested that promotion of the advantages of public transportation may be required to increase usage and decrease the dependence on private cars for transportation within the Australian population. Furthermore, the fact that this was the second strongest viewpoint among the participants with ASD raises questions about whether the preference for public transport in this group may be less of a deliberate choice and more likely a result of difficulties obtaining a driving licence.

The third viewpoint of the participants with ASD relates to disability and discomfort, one of the eight underlying factors previously mentioned reported to discourage people from using buses (Stradling et al., 2007). This viewpoint can also be explained by the DSM-IV-defined triad of ASD symptomatology (American Psychiatric Association, 2000). Social and communication difficulties may be compounded when public transport services are crowded, which increases the likelihood of social interactions in a public transport setting and possibly increasing anxiety, a condition that is frequently comorbid in individuals with ASD (Joshi et al., 2013; Lugnegård, Hallerbäck, & Gillberg, 2011; Moseley, Tonge, Brereton, & Einfeld, 2011).

Individuals with ASD advocating viewpoint 4 may primarily travel out of necessity and not view public transport as a means to enhance their social participation. These participants

may be representative of individuals with ASD with extensive social difficulties. Consequently, crowded vehicles were avoided by this group. As a result, in order for public transport usability to be enhanced for this ASD population sub set, options such as adding extra carriages need to be considered to decrease crowding. Another option could be to ensure there are set 'disability seats' or even 'zones' or areas with reduced/controlled sensory environments for individuals with social and communication difficulties and sensory impairments. The trend to enhance social accessibility for individuals with impairments has to date focused primarily on providing physical access (Sanchez, Vazquez, & Serrano, 2011). However, there are very few studies exploring barriers caused by the built environment for individuals with cognitive and sensory impairments. One way to better address these issues could be to involve individuals with different impairments in the process of planning public places, including public transport (Heylighen, Neyt, Baumers, Herssens, & Vermeersch, 2010).

The third and fourth viewpoints in the neurotypical group reflected the problems with service provision and inconvenience of public transport (Stradling et al., 2007). There was much agreement with the statement that related to the distances involved (i.e., the distance from the participants' residence to the nearest bus stop/ train station), this is indicative of the underdeveloped public transportation system and the widespread geographical housing developments within Australia (Legacy et al., 2012). The participants in the neurotypical group also agreed that safety is a key aspect that may discourage usage of public transport (Stradling et al., 2007). The group reported that they did not feel safe using public transport outside of peak transport times. However, the third viewpoint in this group also illustrates the complicated relationship that exists between over-crowding on public transport and potential safety issues on public transport with minimal passengers. Interestingly, the participants with ASD did not report safety issues as a barrier to public transport usage. This could indicate their focus on the advantage of travelling outside of 'peak hour' (i.e., less crowded trains and buses). However, for the neurotypical participants in the current study, continuous measures to enhance safety and security on public transport services outside of peak transport times appeared to be crucial in order to promote their usage of public transport.

This study is not without limitations. Due to the nature of Q method, only a limited number of statements could be utilised. As a result, not all viewpoints held by the participants in the two groups may have emerged. In order to decrease the impact of this limitation, an extensive literature review was conducted and information was gained from experts within the fields of disability research and transportation research to develop the range of statements. It should also be noted that a Q sort can never be completely comprehensive but must comprise of a "representative condensation of information." (Watts & Stenner, 2012, p. 75). Furthermore, the only area that participants suggested should contain more statements, related to public transportation use during peak transit times. However, the Q sort pack contained two statements explicitly related to peak time traffic (statements 23, 39 in Appendix A), indicating that the chosen statements were representative.

The use of purposive sampling, including convenience and snowball techniques, may have resulted in testing a sample of individuals with ASD that are not entirely representative of the wider ASD population. However, this issue is prevalent throughout research of adults with ASD given the voluntary nature of research (Howlin et al., 2014). There are likely to be slight trait and cognitive capacity differences between some individuals with ASD and those who are willing to take part in an unusual activity with a stranger for the purposes of research. Thus, the current findings may not extrapolate to individuals with ASD with severe socio-communicative deficits or intellectual impairment.

Although there were no statistical differences between gender and age of the ASD and contrast groups, there was a large difference in licensing status which, as discussed, may have resulted in a more favourable view on public transport among participants with ASD. However, this difference is reflective of the real prevalence of drivers versus non-drivers in the two participant groups and thus should be considered representative of the wider population. Furthermore, the public transport systems differ slightly between Perth and Melbourne, but it was not the aim of the current study to examine these differences between public transport systems. Instead, it was to explore the participants' viewpoints on using existing public transport systems. Hence, the statements included in the Q sort aimed at capturing viewpoints related to generic issues of public transport irrespective of specific location.

5.0 Conclusions

Both the individuals with ASD and the neurotypical adults advocated the use of, and their relative comfort with, public transport. The two participant groups appear not to differ greatly in their general opinions of public transport use versus driving. However, questions arose about whether a preference for public transport in the ASD group may be as a result of difficulties obtaining a driving licence rather than a deliberate choice. The primary facilitator for both groups in public transport usage was the use of electronic ticketing. The primary barrier presented by the ASD group appeared to be related social issues resulting in not wanting to use public transport when it was full of passengers.

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6.0 References

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Table

Appendix A. Factor arrays for the viewpoints including ranking and normalised factor scores (z-scores) for both groups

	Statements	Viewpoints; Ranking (z-scores)							
		ASD 1	CON 1	ASD 2	CON 2	ASD 3	CON 3	ASD 4	CON 4
1	I prefer to perform activities that are important to me outside of my home rather than in my home [d]	1 (0.41)	1 (0.53)	4 (1.26)**	2 (0.58)	-4 (-1.56)**	1 (0.47)	0 (0.01)	2 (0.68)
2	I prefer to participate in leisure activities outside of my home rather than in my home [d]	1 (0.41)	2 (0.83)	4 (1.52)	2 (0.66)	2 (0.90)	2 (0.65)	-3 (-1.28)**	3 (1.13)
3	I prefer to perform necessary activities outside of my home rather than in my home [a, c]	1 (0.45)	2 (0.75)	1 (0.35)	2 (0.82)	0 (0.22)	1 (0.30)	-1 (-0.21)	1 (0.33)
4	I prefer to participate in social activities outside of my home rather than in my home	2 (0.72)	2 (0.74)	2 (0.77)	3 (0.91)	2 (0.89)	-1 (-0.34)**	-5 (-1.60)**	3 (0.91)
5	I prefer to perform activities outside of my home without help from someone	3 (1.18)	1 (0.47)	3 (0.96)	1 (0.50)	-2 (-0.67)	-1 (-0.36)*	-3 (-1.11)	1 (0.40)
6	I prefer someone to join me when travelling outside of my home	-3 (-1.02)	-1 (-0.50)	4 (1.33)*	0 (0.13)	-1 (-0.66)	0 (0.25)	1 (0.52)*	-1 (-0.42)
7	I usually travel alone when using public transport [b]	4 (1.32)	3 (0.97)	3 (0.90)	0 (0.13)	3 (1.12)	1 (0.49)	4 (1.61)	2 (0.81)
8	I have someone to ask for help about travelling on public transport if I need to	0 (0.26)	0 (0.30)	2 (0.81)	1 (0.23)	3 (1.12)	3 (1.09)	3 (1.01)	2 (0.70)
9	I don't feel comfortable when leaving my home	-4 (-1.30	-4 (-1.18)	-3 (-0.97)	-4 (-1.74)**	2 (0.67)	-1 (-0.39)	3 (1.11)	-2 (-0.85)
10	I feel secure when I travel outside of my home	3 (1.25)	3 (0.91)	3 (1.05)	3 (1.01)	0 (0.21)	-2 (-0.79)**	-3 (-1.06)**	3 (1.06)
11	It is important for me to be able to transport myself outside of my home without using a car [b]	2 (1.03)	4 (1.47)**	2 (0.46)	-1 (-0.38)*	2 (0.89)	0 (0.19)	2 (0.83)	1 (0.56)
12	Being able to travel by myself is important for my independence	5 (1.65)	4 (1.32)	4 (1.29)	5 (1.77)*	-1 (-0.45)**	4 (1.16)	4 (1.22)	2 (0.86)
13	I would prefer driving a car rather than using public transport	-1 (-0.65)	1 (0.52)**	6 (2.70)**	6 (2.53)	0 (0.00)	5 (1.29)**	-5 (-1.65)**	6 (2.39)
14	I would prefer to take public transport (e.g. bus, train) rather than drive, ride a bike or walk	2 (0.92)	0 (0.35)**	-6 (-2.57)**	-6 (-1.99)**	2 (0.68)	-3 (-0.87)	6 (2.06)**	-4 (-1.23)

15	I prefer to take a taxi rather than public transport	-3 (-1.08)	0 (-0.04)**	0 (-0.17)	-1 (-0.50)**	-1 (-0.44)	-5 (-1.98)**	-4 (-1.43)	3 (1.05)**
16	I prefer to travel by private car rather than take public transport	-1 (-0.43)	2 (0.77)	5 (1.65)	4 (1.29)	-3 (-1.11)	4 (1.25)	3 (1.03)	0 (-0.04)**
17	Where possible, I prefer to transport myself by walking	2 (0.78)	1 (0.56)**	-1 (-0.21)*	0 (-0.06)	-4 (-1.13)*	-2 (-0.57)	2 (0.54)	0 (-0.23)
18	Where possible, I prefer to transport myself by riding a bicycle	-1 (-0.56)	0 (-0.13)	-1 (-0.21)	-2 (-0.75)*	-3 (-1.12)	-4 (-1.65)**	-1 (-0.19)	0 (-0.12)
19	I am satisfied with my participation in activities outside of my home	2 (0.74)	4 (1.24)	1 (0.31)	3 (0.93)	-3 (-0.89)*	0 (0.04)**	0 (-0.01)	3 (1.03)
20	Public transport helps me to participate in more activities outside of my home [a]	3 (1.04)	3 (0.97)**	3 (0.86)	-2 (-0.71)	0 (0.22)	0 (0.30)**	1 (0.39)	-3 (-0.99)
21	I find local public transport convenient for me	3 (1.23)	4 (1.19)**	1 (0.11)	-1 (-0.49)*	-1 (-0.46)	-4 (-1.31)	4 (1.24)	-4 (-1.12)
22	I find local public transport comfortable to use	4 (1.37)	1 (0.64)**	0 (0.00)*	-1 (-0.31)	3 (1.12)	-1 (-0.31)	2 (0.97)	0 (-0.10)
23	I feel safe using public transport outside of peak times [a]	2 (0.83)	0 (0.34)	3 (1.22)	1 (0.50)	1 (0.24)	-5 (-1.93)**	1 (0.40)	1 (0.26)
24	The nearest bus stop or train station is too far from where I want to go	-2 (-0.74)	2 (-0.78)*	-3 (-0.94)	-1 (-0.45)*	0 (-0.23)	4 (1.27)	-4 (-1.47)	4 (1.51)
25	The nearest bus stop or train station is too far from where I live	-4 (-1.30	-4 (-1.26)	-4 (-1.50)	-4 (-1.21)	-1 (-0.45)*	2 (0.60)**	-4 (-1.55)	5 (1.93)**
26	I find that the bus or train timetable is difficult to understand [a]	-3 (-0.97)	-3 (-1.04)	-4 (-1.31)	-2 (-0.51)	0 (-0.22)	-1 (-0.40)	-2 (-0.79)	-2 (-0.57)
27	I find it difficult to know when I should get off the bus or train [b]	-2 (-0.79)	-2 (-0.86)	-2 (-0.71)	-2 (-0.34)	-1 (-0.45)	0 (-0.00)*	-3 (-1.06)	-2 (-0.71)
28	I do not travel by public transport because it is too complicated (e.g. have to change bus or train too many times, too much walking etc.)	-4 (-1.28)	-4 (-1.43)	-2 (-0.45)	1 (0.19)	-4 (-1.57)	0 (0.21)	-2 (-0.93)	-3 (-1.09)
29	Using public transport adds to my quality of life due to my ability to transport myself	4 (1.33)**	3 (0.95)**	2 (0.46)	0 (-0.17)**	0 (0.00)	-3 (-1.20)	0 (0.12)	-3 (-0.90)
30	Taking part in activities outside of my home adds to my quality of life	3 (1.07)*	5 (1.48)	5 (1.95)	5 (1.71)	5 (1.78)	2 (0.74)**	0 (0.09)**	4 (1.58)
31	I am frightened of using public transport	-5 (-1.70)**	-5 (-1.69)	-1 (-0.26)	-4 (-1.32)	-2 (-0.67)	-3 (-1.16)	-1 (-0.55)	-5 (-2.14)
32	I have never used public transport	-6 (-2.24)	-6 (2.64)	-3 (-0.93)*	-5 (-1.94)	-5 (-1.80)	-6 (-2.73)	-6 (-2.15)	-6 (-2.31)
33	I seldom use public transport	-5 (-1.33)*	-5 (-1.69)**	-1 (-0.22)	4 (1.63)	4 (1.34)**	-2 (-0.43)**	-2 (-0.71)	4 (1.14)

34	I often use public transport	5 (1.74)	6 (2.07)**	-1 (-0.43)	-5 (-1.82)**	0 (-0.21)	0 (0.24)	5 (1.85)	0 (-0.24)
35	I would like to use public transport more than I currently do	1 (0.49)**	-1 (-0.66)**	-5 (-1.78)**	-3 (-1.19)**	5 (1.80)**	1 (0.58)	-1 (-0.43)**	1 (0.29)
36	My friends/family help me to use public transport	-1 (-0.65)	2 (-0.82)	1 (0.37)	0 (0.01)**	-3 (-0.89)	-4 (-1.77)*	2 (0.88)	-3 (-1.03)
37	I feel very anxious when the buses/trains are late [a]	0 (0.06)	0 (0.23)	1 (0.40)	0 (0.14)	1 (0.45)	3 (1.10)**	2 (0.67)	-2 (-0.62)**
38	It is important to me that there is someone able to assist me with any problems I may have (e.g. bus driver, transit officer)	0 (-0.23)	0 (0.11)**	2 (0.68)	1 (0.57)	1 (0.23)	2 (0.75)	1 (0.34)	-1 (-0.55)**
39	I don't travel at peak transport times when the bus or train is full of people	0 (0.13)	-1 (-0.67)*	0 (0.02)	1 (0.37)*	-4 (-1.56)**	5 (1.67)**	5 (1.75)**	0 (-0.17)*
40	I find the financial cost of public transport reasonable	1 (0.59)	2 (0.69)	-2 (-0.64)	2 (0.84)	0 (0.01)	-3 (-0.95)*	2 (0.73)	-1 (-0.25)*
41	I would use public transport more often if it was cheaper	0 (0.32)	0 (0.34)	1 (0.15)	-3 (-0.81)**	-3 (-0.90)	0 (0.13)	-1 (-0.24)	1 (0.18)
42	Public transport is not convenient for me on public holidays or weekends	0 (-0.31)	1 (0.57)*	1 (0.21)	3 (0.94)*	-2 (-0.67)	6 (2.02)	3 (0.98)*	5 (1.79)
43	I have difficulties when purchasing tickets for public transport	-4 (-1.32)	-3 (-0.91)	-4 (-1.37)	-3 (-1.14)	2 (0.68)**	-2 (-0.42)	-1 (-0.59)*	-1 (-0.41)
44	I dislike the smell inside trains and/or buses	-1 (-0.46)	0 (-0.25)	-2 (-0.47)	2 (0.59)	4 (1.34)**	3 (0.95)	0 (0.21)	0 (-0.11)
45	I dislike the noise inside trains and/or buses	-2 (-0.79)*	-1 (-0.55)	0 (0.02)	0 (0.16)	3 (1.12)*	0 (0.14)	0 (-0.18)	-2 (-0.75)
46	I dislike the smell of bus stations and/or train stations	0 (-0.15)	-1 (-0.31)	-2 (-0.49)	1 (0.27)**	4 (1.57)**	3 (1.08)**	1 (0.26)	-1 (-0.43)
47	I dislike the noise at bus stations and/or train stations	0 (-0.42)	-1 (-0.67)	0 (0.02)	-1 (-0.25)	4 (1.34)**	1 (0.38)*	0 (0.18)	0 (-0.23)
48	I find the signs confusing at the bus stations and/or train stations	-2 (-0.74)	-2 (-0.79)	-3 (-1.05)	-2 (-0.59)	1 (0.23)*	-1 (-0.01)*	-1 (-0.60)	-5 (-1.39)*
49	It is difficult to press the buzzer on the bus at the right time so it stops at the correct stop [d]	-1 (-0.55)	-3 (-1.14)	0 (0.04)	-4 (-1.22)	-2 (-0.67)	-4 (-1.47)	-3 (-0.97)	-4 (-1.35)
50	Learning a new route using public transport is difficult for me	0 (-0.27)*	-3 (-1.01)	2 (0.47)	-1 (-0.38)	-6 (-2.00)**	1 (0.37)**	1 (0.41)	-2 (-0.74)
51	I feel comfortable asking for help if I need to [c]	4 (1.25)**	2 (0.86)	-2 (-0.72)	2 (0.57)	-1 (-0.24)	1 (0.33)	-2 (-0.73)	1 (0.65)

52	I dislike being touched by other people on public transport	1 (0.59)	3 (0.96)	0 (0.02)	4 (1.55)	6 (2.01)	3 (0.95)	4 (1.26)	4 (1.28)
53	Using a Smartrider/ Myki makes my journey easier	6 (1.93)**	5 (1.71)*	0 (0.04)	4 (1.16)	1 (0.44)	4 (1.15)	3 (1.17)	2 (0.81)
54	I find the colours and patterns on the buses and trains overwhelming [a]	-2 (-0.77)	-1 (-0.65)	-3 (-0.99)	-3 (-1.20)	-2 (-0.67)	-2 (-0.65)	-4 (-1.44)	-3 (-0.92)
55	I dislike the noise of the doors and brakes on the bus	-3 (-0.98)**	-2 (-0.70)	0 (-0.11)	0 (-0.12)	3 (1.33)*	-1 (-0.28)	1 (0.30)	-1 (-0.49)
56	I dislike the texture of the seats on public transport [b]	-1 (-0.68)	-2 (-0.81)**	-1 (-0.32)	0 (0.11)	0 (-0.22)	2 (0.72)*	-2 (-0.75)	0 (-0.06)
57	The announcement on the train for each station is helpful to me [c]	1 (0.69)	1 (0.63)	-1 (-0.26)	3 (1.05)	1 (0.45)	2 (0.91)	0 (0.07)	2 (0.88)
58	I find the train line map inside the train confusing	-2 (-0.86)**	-4 (-1.18)	-5 (-1.99)	-2 (-0.74)	-5 (-1.78)	-3 (-1.17)	0 (0.16)**	-1 (-0.48)
59	I find the sign at the bus stop difficult to understand [a, c]	-3 (-1.24)	-3 (-1.13)	-4 (-1.33)	-3 (-1.21)	-2 (-0.67)	-2 (-0.60)	-2 (-0.71)	-4 (-1.19)

Note: * Within group distinguishing statements significant at $p<0.05$. ** Within group distinguishing statement at $p<0.01$.

[a] ASD Consensus statements non-significant at $p>0.01$. [b] ASD Consensus statements non-significant at $p>0.05$.

[c] CON Consensus statements non-significant at $p>0.01$. [d] CON Consensus statements non-significant at $p>0.05$