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# OUTCOMES OF AGE-FRIENDLY CHANGES TO BUS SYSTEMS: AN AUSTRALIAN CASE STUDY

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## SUMMARY

Previous consultation with, and observation of, older people identified seven (7) priorities for an age-friendly bus system. The aim of this study is to identify whether implementation of age-friendly changes improves bus use, useability and social activity outcomes for older people. A number of age-friendly changes were introduced to the bus system in Hervey Bay, Australia over a three year intervention period. Concurrently, the bus system in Brisbane, Australia underwent few age-friendly changes as a result of usual practice. Pre/ post measures with a volunteer sample of community-dwelling older people (aged 60 and over) were used to measure the impact of age-friendly changes on bus use, useability and social activity. One hundred (100) older people took part in the survey both before and after the intervention period. The majority of Hervey Bay participants reported an improvement in the bus system, whilst the majority of the Brisbane sample reported no improvement. Self-rated ease of bus use remained the same for Hervey Bay participants, whilst Brisbane participants experienced a significant decrease in self-rated ease of bus use. Neither Hervey Bay nor Brisbane participants reported a significant change in frequency of bus use. There was no significant difference in Hervey Bay participants' social activity participation, whilst Brisbane participants reported decreased participation in 7 out of 20 activities. In Brisbane, participants experienced a decline in ease of bus use and social activity participation over a three year period. This is consistent with a natural decline in function associated

with ageing. Age-friendly changes in Hervey Bay may have allowed older users to maintain ease of bus use and social activity participation. Sensitivity to changes in frequency of bus use may have been restricted by use of a three point scale. Future research will compare the outcomes of on-board surveys across the intervention period.

Keywords: older people; age-friendly, buses, evaluation

## **PURPOSE OF THE STUDY**

Many older people, especially those who do not drive, experience difficulty using buses and other forms of public transport. Consequences of poor bus useability are reduced community mobility and participation, limited access to healthcare and reduced quality of life [Broome, McKenna, Fleming, & Worrall, 2009]. This study investigates the development and evaluation of age-friendly guidelines for public buses as a potential means to improve the community participation of older people.

It has previously been identified that ease of bus use for older people may be influenced by a range of barriers and facilitators within the bus system [Broome, et al., 2009]. These include physical aspects (such as the height of bus steps), social aspects (such as the behaviours of bus drivers), cultural aspects (such as time pressure) and institutional aspects (such as how often buses run) [Broome, et al., 2009; World Health Organization, 2007]. It is important, however, to consider which aspects of the bus system have the greatest influence on bus useability so that interventions can be targeted accordingly.

An investigation into the priorities for an age-friendly bus systems [Broome, Worrall, McKenna, & Boldy, 2010] used both the nominal group technique and participant observation with stimulated recall interviews to establish which barriers and facilitators had the highest impact on bus useability. The combination of complementary methodologies allowed for synthesis of the perceived view of useability of the bus system (nominal group technique) with the experience of actually catching a bus (stimulated recall interview). Both bus users and non-users were included. The outcome was the development of seven (7) priorities for an age-friendly bus system, from most important to less important, which included;

- 1) all vehicles should have accessible entries with no steps, facilities to lower the floor closer to the curb and no obstructions in the entrance/exit,
- 2) bus drivers should be friendly and helpful, specifically having good communication skills, understanding the needs of passengers with varying abilities, waiting until passengers are seated before driving and pulling in close to the curb;
- 3) timetables and scheduling should provide frequent buses that are available in the morning, evening and on weekends, and should connect well with other buses / transport;
- 4) bus stop locations should be close to homes and destinations with few hills along the route;

- 5) pedestrian infrastructure including footpaths and pedestrian crossings should be established and age-appropriate;
- 6) older people should be given appropriate and relevant training and information on how to use buses; and
- 7) bus routes and destinations should match the needs and interests of older people.

The aspects of the bus system identified were in line with barriers and facilitators to bus use for older people identified in the World Health Organization's [World Health Organization, 2007] Age-friendly Cities Guide. Additionally, the priorities provide guidelines on which factors to address first.

The present study focuses on the evaluation of implementation of these guidelines. The evaluation focuses on the case study of Hervey Bay, Queensland, Australia. Brisbane, Queensland, Australia is used as a comparison site. Both Hervey Bay and Brisbane bus systems are typical of bus systems in minority, Western world countries with lower population density, for example Canada and the United States of America. The aim of this study is to identify whether implementation of age-friendly changes improves bus use, useability and social activity outcomes for older people.

## **METHODS**

A number of age-friendly changes were introduced to the bus system in Hervey Bay, Australia over a three year intervention period. Concurrently, the bus system in Brisbane, Australia underwent few age-friendly changes and can be considered as usual practice. Pre/ post measures with a volunteer sample of community-dwelling older people were used to measure the impact of age-friendly changes on bus use, useability and social activity.

### **1. Sampling**

The sample of older people in this study was drawn from a larger sample from a previous study that established the priorities for an age-friendly bus system [Broome, Worrall, et al., 2010]. The sample sites were Hervey Bay, Queensland, Australia and Brisbane, Queensland, Australia. Hervey Bay is a regional coastal town with a higher than average proportion of older people. Brisbane is a metropolitan city. The previous study used convenience volunteer sampling to recruit both users and non-users of the bus system to the study. Advertising of the study was through community group newsletters, newspapers, radio interviews and leaflets. Of these participants, 100 participants agreed to take part in both pre- and post-intervention surveys on their bus use, useability and community participation. Inclusion criteria were that participants were community-dwelling older adults (aged 60 and over), with sufficient cognitive and language skills to complete the survey.

### **2. Intervention**

The research team worked alongside Wide Bay Transit (the local bus company in Hervey Bay) and Queensland Transport (the statutory government body) to enact and evaluate a variety of age-friendly changes in Hervey Bay. Some changes also occurred in Brisbane as a result of usual practice and the requirements of the Disability Standards for Accessible Public Transport 2002 [Williams, 2002]. The changes took place over a three year intervention period. The changes are summarised below in table 1.

*Table 1: Age-friendly changes in bus systems during the intervention period*

<b>Priority</b>	<b>Changes in Hervey Bay</b>	<b>Changes in Brisbane</b>
1. Low floor buses	Increased percentage of lower floor buses	Increased percentage of lower floor buses
2. Friendly and helpful bus drivers	Age-awareness training for all bus drivers (Broome, Fleming, Boldy, & Worrall, 2010)	Nil
3. Timetables and scheduling	Increased frequency of buses (all routes)	Increased frequency of buses (some routes)
4. Bus stops and shelters available and close to home and destinations	Replacement of one fixed route with a flexible route service (Broome, McKenna, Fleming, Boldy, & Worrall, 2010)	Nil
5. Accessible pedestrian infrastructure	Council plan for pedestrian infrastructure upgrade was in line with age-friendly principles	Nil
6. Training and information	Bus buddy program introduced (but minimal uptake)	Nil
7. Routes and destinations	Replacement of one fixed route with a flexible route service (Broome, McKenna, et al., 2010)	Nil

### **3. Outcome measures**

Prior to the intervention period, participants completed a demographic questionnaire, questionnaire on their bus use and useability and the Social Activities Checklist (SOCACT) [Cruice, Worrall, & Hickson, 2005]. Demographic information included their age, gender, sample site (Brisbane or Hervey Bay), driving status, reliance on another driver and length of residence in the area. Bus use and useability questions included frequency of bus use (frequent, occasionally, rarely/never) and ease of bus use (10cm visual analogue scale). The SOCACT measured frequency of participation (not at all,

rarely, monthly, fortnightly, weekly) in 20 activities including leisure, informal and formal activities. Higher scores indicate greater frequency. Measures were completed by the participant during the nominal group technique sessions with assistance from the researchers where required.

The measures were repeated after the intervention period, with additional questions asking whether participants thought the bus system was the same, better or worse and whether they were using the buses the same amount, more frequently or less frequently. Follow-up measures were completed via a postal survey, with telephone surveys offered if required.

#### **4. Data analysis**

The data were analysed using descriptive and non-parametric inferential statistics. Statistical analysis was conducted using the Statistical Package for Social Sciences v12.0.0.

## **RESULTS**

### **1. Participants**

One hundred (100) older people took part in the survey. Demographic characteristics are summarised in table 2.

*Table 2: Demographic characteristics prior to the intervention period*

<b>Priority</b>	<b>Hervey Bay (%)</b>	<b>Brisbane (%)</b>
Percentage of total sample	48.0	52.0
Gender - male	22.9	19.2
Length of residence – over five years	72.3	76.9
Driving status		
- current driver	60.4	55.8
- retired driver	20.8	21.2
- never driven	18.8	23.1
Reliance on other drivers	45.7	42.0

Following the intervention period all participants were three years older, 11 participants who were current drivers retired from driving (Hervey Bay n=6, Brisbane n=5) and five (5) participants lived in a different suburb at follow-up (Hervey Bay n=2, Brisbane n=3).

### **2. Changes in bus use and useability**

Prior to the intervention there were significantly more (Chi-square,  $p=0.001$ ) frequent bus users in Brisbane (57.7%) than Hervey Bay (27.7%). There were similar proportions of occasional users (approximately 35%) in both Hervey Bay and Brisbane prior to the intervention. Prior to the intervention there was also a significant difference in self-rated ease of bus use, with Brisbane participants reporting greater ease of bus use (mean = 7.19, SD = 2.701) than Hervey Bay participants (mean = 5.58, SD = 3.520).

Prior to the intervention period, there was a significant association between ease of bus use and frequency of bus use ( $p=0.005$ ) with those who never use buses experiencing more difficulty than those who use buses occasionally or frequently. There was also a significant association between driving status and frequency of bus use ( $p=0.002$ ) with those who have never driven using the bus more frequently than retired drivers, who use the bus more frequently than current drivers. All participants who had never driven used the bus at least occasionally, while 14.3% of retired drivers never used the bus.

Following the intervention period 12.2% of participants in Hervey Bay had increased their frequency of use compared to their pre-intervention responses, while 13.1% had decreased their frequency of bus use. When participants reported their self-rated change in bus use over the past 3 years, 25.0% reported they used the buses more frequently, 61.4% the same and 13.6% less frequently. Following the intervention period, there was no change in self-rated ease of bus use for Hervey Bay participants ( $p=0.651$ ). Despite the lack of change in self-rated ease of bus use, 61.0% of Hervey Bay participants reported that buses had improved over the past three years, 34.1% said they remained the same and 4.9% stated they found buses more difficult.

Following the intervention period 9.6% of participants in Brisbane had increased their frequency of use compared to their pre-intervention responses, while 13.4% had decreased their frequency of bus use. When participants reported their self-rated change in bus use over the past 3 years, 30.8% reported they used the buses more frequently, 51.9% the same and 17.3% less frequently. Following the intervention period, there was a significant decrease in self-rated ease of bus use for Brisbane participants from to a mean of 7.19 (SD = 2.701) to a mean of 6.21 (SD=3.064). At the follow-up, 29.4% of Brisbane participants reported that buses had improved over the past three years, 82.7% said they remained the same and 7.8% stated they found buses more difficult. The proportion of participants who felt that the buses had improved was significantly higher in Hervey Bay, while the proportion of participants who felt that buses had become more difficult was higher in Brisbane ( $p=0.010$ ).

### **3. Changes in frequency social activity participation**

There were a small number of significant associations between frequency of bus use and social activity participation, ease of bus use and social activity participation, and driving status and social activity participation both before and after the intervention period. These associations are shown below in table 3.

*Table 3: Associations between transport variables and social activity participation*

<b>Factors</b>	<b>Significance of association (p-value)</b>	<b>Nature of association</b>
<b>Before the intervention</b>		
Frequency of bus use – playing cards or other indoor games	0.037	Occasional users had more frequent participation
Ease of bus use – visiting/helping friends or relatives	0.020	Positive association
Driving status – frequency visiting exhibitions, museums and libraries	0.031	Drivers had more frequent participation
Driving status – going to restaurants	0.035	Drivers had more frequent participation
Driving status – visiting or helping friends/relatives	0.038	Drivers had more frequent participation
Driving status – going to classes or lectures	0.048	Drivers had more frequent participation
<b>After the intervention</b>		
Ease of bus use – playing sports	0.006	Positive association
Ease of bus use – travelling/going on tour	0.012	Positive association
Ease of bus use – playing cards or other indoor games	0.005	Positive association
Ease of bus use – playing with or helping children/grandchildren	0.013	Positive association
Driving status – participation in community voluntary organisations	0.014	Drivers had more frequent participation
Going to classes or lectures	0.015	Drivers had more frequent participation

A comparison of the frequency of the social activity participation before and after intervention was conducted for both Hervey Bay and Brisbane. In Hervey Bay, there was no change in frequency of participation in all twenty activities measured with the SOCACT. Similarly, there was no significant change with the level of satisfaction with activities. In contrast, Brisbane participants experienced a significant decrease frequency of participation for 7 of the activities, including visiting exhibitions, museums and libraries ( $p=0.036$ ), going to restaurants ( $p=0.015$ ), exercise of playing sports ( $p=0.051$ ), travelling or going on tours ( $p=0.035$ ), playing with or helping children/grandchildren ( $p=0.030$ ), participant in community or voluntary organisations



( $p=0.005$ ) and going to classes or lectures ( $p=0.047$ ). These significant changes in Brisbane are shown below in table 4. Between a third and a half of Brisbane participants experienced a reduction in their frequency of use in the aforementioned activities, depending on the activity. Again, there was no significant change in satisfaction with activity levels.

*Table 4: Participation in social activities in Brisbane before and after intervention*

	<b>Before Intervention</b>		<b>After Intervention</b>		<b>Mean Difference</b>
	<b>Mean (SD)</b>		<b>Mean (SD)</b>		
visit exhibitions, museums, libraries	1.84	(1.302)	1.51	(1.160)	0.33
go to restaurants	1.96	(1.183)	1.61	(1.239)	0.35
exercise or play sports	3.25	(1.354)	2.70	(1.768)	0.55
travel or go on tours	1.75	(1.007)	1.39	(0.953)	0.36
play with or help children/grandchildren	2.16	(1.599)	1.67	(1.569)	0.48
community voluntary organisations	2.24	(1.380)	1.67	(1.477)	0.57
go to classes or lectures	1.46	(1.501)	1.02	(1.234)	0.44

## DISCUSSION

Findings suggest that the age-friendly changes in Hervey Bay resulted in minimal change in frequency of bus use, self-rated ease of bus use and social activity participation. This was in spite of findings that the majority of participant in Hervey Bay felt that the buses had improved across the intervention period.

In Brisbane it was noted that, despite minimal changes during the intervention period, participants reported decreased ease of bus use, minimal change in frequency of bus use and decreased frequency of participation in a third of activities studied. While this may seem unusual, it is important to consider that the time between the initial measures and follow-up was approximately three years. During that time, participants aged three years, and it was likely that some experienced changes associated with ageing that restricted their ease of bus use and ability to participate in social activities. The measure of frequency of bus use may have been limited by the sensitivity of the instrument, which measured frequency as only “frequent”, “occasional” or “never”. The overall findings may suggest that the implementation of age-friendly guidelines to buses in Hervey Bay assisted participants to maintain their bus use, while participants in Brisbane experienced a decline in bus useability as a result of ageing.

The social activities that reduced in frequency in Brisbane following the intervention were all activities which were associated with either ease of bus use or driving status. This would suggest that an age-friendly approach to transport provision does benefit participation in a range of social activities, including visiting exhibitions, museums and libraries, going to restaurants, exercise or playing sports, travelling or going on tours, playing with or helping children/grandchildren, participation in community voluntary organisations and going to classes or lectures.

Following the intervention period at both sites, the most important reported barriers to bus use by participants were similar to those from before the interventions period, including timetables and scheduling of buses, poor vehicle accessibility and distance to the bus stop. Replacement of some older buses with new lower floor buses, as well as an increase in frequency of buses, occurred at both sites to different degrees. The increase in the proportion of lower floor buses was in line with the requirements of the Disability Standards for Accessible Public Transport 2002 [Williams, 2002]. This highlights that, while increases in proportion of lower floor buses and frequency of buses may take place, the full impact of implementing age-friendly guidelines may not be experienced until all 100% compliance is reached. Therefore, a graded approach to improving accessibility may have limited effectiveness until the end goal is reached.

## CONCLUSION

In Brisbane, participants experienced a decline in ease of bus use and social activity participation over a three year period. This is consistent with a natural decline in function associated with ageing. Age-friendly changes in Hervey Bay may have allowed older users to maintain ease of bus use and social activity participation. Sensitivity to changes in frequency of bus use may have been restricted by use of a three point scale. Future research will compare the outcomes of on-board surveys and patronage levels across the intervention period.

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