Institute of Transport Studies (Monash)
The Australian Research Council Key Centre in Transport Management

Institute of Transport Studies, Monash University
World Transit Research

World Transit Research

9-1-2011

I can sit but I'd rather stand: Commuter's experience of crowdedness and fellow passenger behaviour in carriages on Australian metropolitan trains

Lily Hirsch

Kirrilly Thompson

Follow this and additional works at: http://www.worldtransitresearch.info/research

Recommended Citation

Hirsch, L., & Thompson, K. (2011). I can sit but I'd rather stand: Commuter's experience of crowdedness and fellow passenger behaviour in carriages on Australian metropolitan trains. Conference paper delivered at the 34th Australasian Transport Research Forum (ATRF) Proceedings held on 28 - 30 September 2011 in Adelaide, Australia.

This Conference Paper is brought to you for free and open access by World Transit Research. It has been accepted for inclusion in World Transit Research by an authorized administrator of World Transit Research. For more information, please contact pauline.forbes@eng.monash.edu.au.

MONASH University

Australian Transport Research Forum 2011 Proceedings
28 – 30 September 2011, Adelaide, Australia
Publication website: http://www.patrec.org/atrf.asp

I can sit but I'd rather stand: Commuter's experience of crowdedness and fellow passenger behaviour in carriages on Australian metropolitan trains

Lily Hirsch[1], Dr Kirrilly Thompson[2]

[1 & 2] University of South Australia/ CRC for Rail Innovation

Email for correspondence: lily.hirsch@unisa.edu.au

Abstract

For many people in Australia, crowding is a major issue and an unavoidable aspect of their daily rail commute. Australian passenger experiences, perceptions of, and their reactions to crowding are not well understood. To gain an understanding of passenger perceptions and tolerance of railway crowding and the impact of passenger behaviour on the crowding experience, qualitative (Stage 1) and quantitative (Stage 2) fieldwork was undertaken between 2009 and 2010 across the five metropolitan railways in Australia. Some results from Stage 1, a two-part qualitative study are given. This involved ethnographic participant observations on trains in five States and 20 focus groups with a total of 179 Australian rail passengers. Focus group participants discussed their reactions to being in close proximity to others in a closed environment and these are examined. This paper will explore the ways in which passengers experience, tolerate and construct perceptions of crowdedness through both avoidance techniques and interactions with fellow passengers.

1. Introduction

Crowding on Australian passenger trains is an issue that is becoming endemic in many metropolitan rail networks (Australian Bureau of Statistics 2008; Currie 2010).For example, in Sydney alone, there has been a 12.4% rise in public transport uptake between 1996 and 2008 (Australian Bureau of Statistics 2008). In 2006, 26% of Sydney's commuting population used public transport, the highest level of public transport use in Australia (Rail Corporation 2009-2010). Since 2006, Sydney's rail passenger ridership has increased by 12% or approximately 32 million passenger journeys per annum. The majority of these passengers were commuters travelling during weekdays. Whilst there was a decline of 0.8% during 2009, a result of the global financial crisis and projections for the next five years forecast a further growth of 7-13% (Rail Corporation 2009-2010, p.36). Similar trends of increasing rail passenger ridership can be seen around Australia. For example, it has been reported that Melbourne's train ridership has increased by 43% from 2005-2010 (Currie 2010, p.36).

These ridership increases are important to note as an issue not only for Sydney and Melbourne's rail operations, but also for all of the metropolitan rail systems in Australia. With many networks already at capacity, running a maximum number of rolling stock and carriages at peak hour and reporting overcrowding of passengers at these times (Currie 2009; Hale and Charles 2009; Rail Corporation 2009-2010), a further increase in ridership and passenger demand, as projected would create significant difficulties for rail authorities.

A number of definitions and measures for crowding exist in Australia and it must be noted that these are not consistent between the five Australian passenger railway industries (situated in Adelaide, Brisbane, Sydney, Perth and Melbourne). Indeed, each of the five Australian rail passenger industries has their own definition of crowding. Definitions and measures for crowding range from the length of time passengers are required to stand, to the number of people standing per metre squared, to the overall percentage of standing passengers to seated passengers[1]. Within each industries' sphere of understanding of what 'crowding' is, they have acknowledged crowding to be an issue on train services, particularly during weekday morning and afternoon peak travel times. The issue of increasing passenger crowding has been acknowledged by passenger rail industries around Australia not only as an issue relating to customer safety, dwell times and service efficiency, but also as an issue affecting customer satisfaction. Indeed, within the sphere of service demand, population increase and rising projections for passenger numbers, there is an often forgotten element; that of the experience of passengers as people, rather than as statistics within the crowd.

In 2009 in Australia, the five metropolitan rail industries in Adelaide, Brisbane, Sydney, Perth and Melbourne supported a study funded by the CRC for Rail Innovation 'A socio-economic study of platform and carriage crowding in the Australia metropolitan railway industry' (R2 104) to investigate the effect of crowding on passengers. The research was designed to evaluate the influence that crowding has on rail passengers' experience of their daily commute and, through a multi-disciplinary qualitative and quantitative approach, to provide a comprehensive understanding of the crowding phenomenon and the passenger experience within this.

This paper will discuss some results from the qualitative phase of that study and examine the behavioural influences on rail passengers that both enhance and mitigate their experiences of crowdedness. An extended methods section will be provided followed by some initial findings from the study. Eight broad and encompassing findings surrounding the overall experience and impact of crowding on rail passengers will be presented in the form of a model of the experience of crowdedness. Following the model, the impact of passenger behaviour on others will be explored in more depth. The exploration into the influence of

[1] In addition to the lack of a standard definition of crowding within Australia, each operator uses different carriage makes and layouts, adding to the complexity of a standard definition.

passenger behaviour on the experience of crowdedness within the carriage environment will also examine passenger decision-making with regards to seating and standing choice.

2. Conceptual background

Within studies of crowded environments and people's behaviour in any public setting, a key premise discussed by theorists is the creation and maintenance of personal space. Sociologist Erving Goffman viewed society as a series of different contexts, rather than a homogenous fixture. He claimed that people construct identities and they emphasise this identity in a particular arena as emotional compensation for who they otherwise may be. This is understood as 'the practice of everyday life' (Goffman 1959). In the context of the railway carriage where a 'diversity of unacquainted bodies' (Bissell 2010, p.276) are brought together in close proximities, discomfort is often the result. Edward Hall (1966) theorised that in a crowded situation, people's set levels of personal space are invaded, breaking their personal comfort boundaries. In the environment of the railway carriage therefore, Goffman argues that the concept of 'civil inattention' (1959) would ensue. Here, passengers avoid contact or engagement with each other in order to maintain their own personal space. Thus, in the overstimulating environment of the crowded carriage, passengers may present themselves in a disengaging manner to avoid excessive stimulation and interpersonal contact. The common practice of avoiding conversation and engagement with fellow passengers (Evans and Wener 2007; Bissell 2010) has been widespread since the invention of commuter travel. Indeed, both *The Railway Traveller's Handy Book* (Unknown Author, 1862 in Simmons 1971) and Simmell (1950) indicate that limited verbal communication on trains has been preferable since the mid-1800s as it promotes passenger comfort. Bissell agrees and adds that if conversation does ensue, passengers often avoid particular topics and, when possible, withdraw into themselves (2010).

Common commuting pastimes enable passengers to ignore their surrounds and focus on personal activities. By creating, maintaining and defending one's personal space on the train, following Goffman and Hall's passenger behaviour norms, passengers engage with a number of inanimate objects (both part of the carriage structure, and carried on by the passengers) and create an interactive environment for their sole purposes of engagement (Holmes and Reeves 2003; Lofgren 2008). These include the makeover of the immediate environment into 'a temporary office' (O'Dell, 2006 in Lofgren 2008) where commuters may work on their laptops, read, or listen to their audio devices, such as ipods (Holmes and Reeves 2003). The ability to 'transform a crowded train into private spaces' (O'Dell in Lofgren 2008, p.341) is reflected by de Certeau (1980) who discusses how passengers must develop a series of skills and strategies known as the 'tactics of travelling', which allow them to become more reflexive and less attentive towards a potentially overstimulating experience.

Whilst the majority of passengers may engage within the aforementioned parameters, it has been suggested by Conradson and Latham (2007) that the repetitive nature of commuting may exacerbate small frustrations towards fellow passengers due to the everyday monotony and discontent of the travel experience. Indeed, as a method of dismissing negative feelings, or indeed justifying certain behaviours, Brennan discusses the treatment, perception and ultimate objectification of fellow passengers. In doing so, the traveller may 'assume that she does not feel as I do' (Brennan, 2004, p.19 in Bissell 2010, p.279) and therefore one may feel less culpable for acting in a way that would normally be seen as rude, but which on many railway journeys are common, such as pushing through doorways and not offering a seat to a more needy passenger. Bissell too recognises that personal space may be maintained through 'a blasé attitude towards others' (2010, p.273). These attitudes and resultant behaviours will be discussed further in the findings section.

A measure of crowding levels that is used by a number of rail industries around the world, and by some industries in Australia is passenger density per metre squared of floor space (Turner, Corbett et al. 2005). This metric, which measures the number of standing people in

a defined meter squared area, is useful, as it can establish a quantitative passenger threshold, which can be measured during passenger counts. An example of where this measure is utilised can be seen in the London Underground, which employs the meter squared metric coupled with a unique crowding measure. Passengers in Excess of Capacity (PIXC) is a measurement where the number of passengers exceeding the recommended capacity of the train are counted and converted into a percentage. This percentage can also be converted to the metre square measurement (London Assembly Transport Committee 2009). In 2009, the London Assembly Transport Committee reported a 'normal' PIXC score of 40%, which equated to 'five passengers per square metre of available standing space' (2009, p.15). Whilst this number has been reported to be 'normal' for London's underground, the Tipping Point Institute argues that a nominal space of 0.88m^2 per passenger is required for a comfortable journey (2009, p.11).

Whilst the number value of 'comfortable' and 'crowding' may vary between countries or even industries [for example, in Mumbai, India crowding is reported to be measured at a super-dense-crush-load of 14-16 standing passengers per metre square (Nair and Kumar 2005, p.34)], the same method behind the measurement of crowding by calculating the number of bodies in a given amount of space (Baum and Paulus 1991) is nonetheless a popular density measurement. This measurement may be a sole crowding measure, or may be coupled with other determinants, depending on the industry.

This brief review has examined common passenger practices regarding the avoidance of engagement with fellow passengers in rail carriages. The literature has primarily drawn on the psychological theories surrounding the creation and maintenance of personal space. In addition, the rationale for using a metrics-based system for measuring crowding levels has been examined. It has shown that metrics are important for industries to ensure an accurate quantitative measure of their patronage levels. Whilst these measures are necessary, the literature also illustrated the value of understanding passenger choices and behaviours in crowded situations to better understand the emotional and behavioural context of the crowd.

3. Methods

a. Background to methods

Density measurements, which were discussed in Section 1, allow industries to set a definition of crowding that can be related to figures and statistics. For industry, the advantage of using density is that they can limit their reference to the physical (Stokols 1972), thereby encapsulating their definition in an objective and quantitative manner. The disadvantage of understanding passenger crowding from a metrics perspective alone is that an in-depth understanding of how passengers feel in the crowded space is lacking. The methods employed in our study and described in this paper were designed to assess the passenger experience beyond the measured number of people in space.

To gain an understanding of passenger perceptions and tolerance of railway crowding and the impact of carriage design and passenger behaviour on the crowding experience, qualitative (Stage 1) and quantitative (Stage 2) fieldwork was undertaken between 2009 and 2010 across the five metropolitan railways in Australia.

Stage 1 of data collection involved five days of ethnographic participant-observation in carriages during morning and afternoon peaks. Ethnography is a research method used by cultural anthropologists which aims to provide a thorough, detailed and in-depth description and understanding of everyday life and practice (Garfinkel 1967). In this instance, the ethnography was carried out on peak time rail users. Benefits of using an ethnographic method in this study were to clearly understand the rail user's perspective of crowding from an 'insider's point of view', or an emic perspective. Thus, the research design allows themes to emerge and be generated from the research encounter as opposed to traditional etic, or analytical research models, which impose themes on the research design from the outset.

Following carriage observations, four focus groups in each site with passengers were held to clarify observations. The combination of participant-observation followed by focus groups was designed to gain a comprehensive understanding of not only what passengers say, but also what they do (i.e. attitudes and behaviours). This methodology is based on the assumption that experiences of crowding are more than physiological; they are psychological (Baum and Paulus 1991; Evans and Wener 2007), social (Epstein 1981; Kaya and Weber 2003) and cultural (Whiting and Nakos 2008; Kim and Lee 2010). The results of this component of the study fed into Stage 2, the quantitative and analytical phase which was conducted in the second half of 2010 through a national online stated preference choice experiment survey. By employing ethnographic methodological approaches prior to the survey, the researchers were able to identify themes surrounding the crowding experience which emerged from rail passengers and which otherwise would not have been included in the survey. This paper is based on specific findings from Stage 1 and thus the methodology and outcomes of Stage 2 will not be discussed in this paper. For more information surrounding the methodology and results of Stage 2, please see Mueller et al. (forthcoming, 2011) and Thompson et al. (2011).

b. Participant observations in carriages

Prior to fieldwork, the researchers met with a representative of the rail industry in each site. Through an interview with the representative, the researchers were able to glean information surrounding morning and afternoon peak travel times, key stations for peak travel, and the major issues that the industry faces around crowding. These meetings used the industry representative's local knowledge of the site to identify anomalies in the service provision that may differ from other sites, especially considering that the definition of crowding between States differs. In addition, the State Representative was able to provide information about special events, such as school holidays and sporting events that may disrupt data collection by distorting the average crowding experience[2]. As a result of this meeting, the dates for the fieldwork were finalised with the State Representative and a fieldwork schedule was designed to concentrate observations in typically crowded areas. In addition to the target areas, the fieldwork schedule also included other, less busy lines so that a range of experiences of over and under-crowding in each State could be established.

Observations in carriages, on platforms and in stations[3] were undertaken in Adelaide, Brisbane, Sydney, Perth and Melbourne respectively for five consecutive days during morning and afternoon peak times by the lead author (referred to here as field researcher). The same field researcher conducted observations in each site to ensure the consistency and accuracy of data collection and to avoid multi-observer bias. Where necessary, clarification observations were undertaken after focus groups. These occurred if focus group members mentioned specific details that had not been observed by the field researcher.

The 'research' carriage was chosen through three pre-devised criterion. These were in place to ensure consistency in data collection as the number of carriages on rolling stock varies, not only between States but also within individual rail operations. Thus, the three strategies for carriage selection were important for a reliable method base. They are listed below:

1. The carriage to which most of passengers entered from the platform, or
2. In the absence of passengers on the platform, the most crowded carriage, or
3. In the absence of other cues, the middle carriage

[2] It must be noted that our study looked only at typical every day crowding and not special event crowding

[3] Whilst observations were conducted in carriages, on platforms and in stations, this paper will specifically detail results surrounding crowding in carriages.

To ensure the focus remained on the issue of crowding, strategies one and two were necessary. Strategy three ensured consistency for data collection when the other two cues were absent. In addition to carriage selection, the researcher's location varied within the carriages, for example, when the field researcher was standing in a carriage vestibule, this immediate environment was examined above other areas of the carriage. In the one location where double decker carriages were used, the researcher's location within these carriages was also varied to include the upper and lower decks as well as the vestibule area. This ensured that a thorough understanding of the crowding experience in each section of the carriage was gained first hand by the researcher and not simply observed from a distance.

Observations were systematically recorded by the field researcher and included the time of day, the line and the estimated number of people in the researcher's section of the carriage. They were orientated around:

- People's behaviour on trains (individual and social),
- Physical structures of carriages (environmental factors).

The purposes of the observations were:

- To understand crowding in the context of each site
- To identify behaviours around crowding
- To gain a contextual understanding for focus groups (the incorporation of focus groups with passenger attitudes, observations of passengers and the field researcher's personal observations allowed for an understanding of passenger experience from more than one point of view.)
- To experience crowding first hand (auto-ethnographic approach)

Observations followed a number of pre-devised topics, relevant to the original project aims. However, they were not restricted to those topics to allow for unanticipated findings. These pre-devised topics include:

- People: Identification of units of behaviour and description of patterns of behaviour for using carriages and platforms at peak and interpeak times.
- Environment: Environmental factors (weather conditions, season, special event)
- Identification of options available to and used by passengers (standing areas, moving up train, waiting for next train, etc)
- Physical: Physical factors and artefacts (number of carriages, seating arrangements, position of doors, location, design and material of handholds. These factors changed both within and between each metropolitan field site.)
- Identification of barriers and enablers to crowding behaviours (behavioural, social, physical)
- Information provided by rail authority to passenger (signs about where to put luggage, wait for next train, capacity of next train, overhead announcements etc)

Field notes were 'written up' immediately after each peak's observations and the emerging trends in the data were identified. Using a snowballing technique, these trends were further explored during the next set of observations. The field researcher also kept auto-ethnographic notes about her own experiences as a passenger on trains. Auto-ethnographic studies on trains can also be seen in work by David Bissell (2009; 2009). These auto-ethnographic notes acknowledged the experiential dimensions of crowding and gave the field researcher an insight into the typical commuter's crowding experience. By combining these two methods of observations and auto-ethnography, the field researcher's ability to create rapport with focus group participants was enhanced.

c. Focus Groups

In the week following observations in individual sites, focus groups in that site were held with passengers to gain a regular commuter's perspective on crowding and the rail service during peak travel. Four focus groups were held in each site with the following demographical breakdown:

- younger males (13-17 years of age);
- older males (18 years and over);
- younger females (13-17 years of age);
- older females (18 years and over)

Participants were enlisted through a private recruiter in each site and were representative of regular school and business commuters. In total, 179 rail users participated across Australia with ages ranging from 13-64 years of age. Participant ridership ranged from 10 trips per week to 4 trips per week and covered the majority of the metropolitan train lines across Australia, including some outer suburban participants. The groups were divided by age and gender to ensure a balanced perception of crowding from various sectors of the community. The separation of age and gender in focus groups ensured high levels of engagement from each participant without the potential of intimidation from other demographics. This was useful as it allowed participants to freely discuss their experiences regarding commuting with particular age and gender groups without the possibility of offending others. Along with the experiences of older passengers, our study design aimed to elicit passenger experiences from a wide age demographic. For this reason our groups included children from 13-17 years of age. Whilst their trip share as opposed to older commuters is significantly less, there is nonetheless a daily earlier PM shoulder peak of younger rail users. The focus groups were based on a qualitative methodology and were not designed to produce statistically significant results; rather we aimed to garner passenger attitudes towards crowded rail travel to feed into the quantitative section of the research, which was statistically significant. For this reason, the ages and genders in our focus groups were divided evenly.

The focus groups were held in private focus group rooms in each site and were equipped with a double-sided viewing mirror and were enabled with audio and video recording devices. An audio recording was made so that transcripts of the groups could be made and video was important for data analysis because the nature of the groups included descriptive hand movements and exercises which required participants to move about the room.

The aim of the focus groups was to gain an in depth understanding of everyday Australian rail passengers, their perceptions of crowding and their own and other's behaviour when in a crowded environment at the 'grass roots' level. Additionally, the focus groups were to ensure that the Stage 2 quantitative survey questions were not based on researchers' assumptions, but on the reality of rail passenger's experiences. Whilst participant demographics and ridership was diverse, the majority of views expressed in the final focus groups at the last site raised little new data regarding the crowding experience (local issues excluded), indicating that we had reached saturation in data collection. This suggests that an increase in the sample size of focus group participants would have yielded little benefit.

Focus group participants were engaged in a guided conversation for approximately 90 minutes around their train use in each site. The issue of crowding was not initiated in discussion by the moderators, as an aim of the groups was to determine if crowding was seen as an issue of concern by rail users. Interestingly, despite this approach, in every focus group, the topic of crowding was initiated by group members. The groups were interactive and engaging and included the following:

- A written activity where passengers listed the three most important factors (positive and negative) that influence their enjoyment of travelling by train;
- Discussion surrounding passenger's perception of the rail service and crowding with reference to their individual daily ridership;

- In a hypothetical carriage-filling exercise participants were asked to mark on an aerial-view diagram of an empty, then crowded carriage where they would like to be located and why. This exercise was designed to assess passenger reasons behind seating choice;
- A written activity which was designed to determine changes that passengers would like to see made to their rail service;
- In the final two sites, a crowdedness perception and tolerance exercise was carried out. Participants were asked to stand in a metre square area and talked through their 'feelings of being crowded'. Gradually the number of people in the square was increased until all of the focus group participants were in that area. They were continually asked to alert the moderators to their levels of comfort, discomfort and thresholds of crowding. This exercise was effective as focus group participant's reactions to crowding were based on immediate reactions, rather than reflections on their typical commute, and in this way, the emerging emotions were described more accurately than if they had been discussed from memory.

d. Data Analysis

Following observations and focus groups, the data from field notes from the carriage observations and from transcripts and videos of the focus groups were analysed. This analysis was carried out systematically and rigorously, following Green et al's (2007) hierarchical four stages of qualitative data analysis: data immersion, data coding, creating categories and identifying themes.

4. Findings

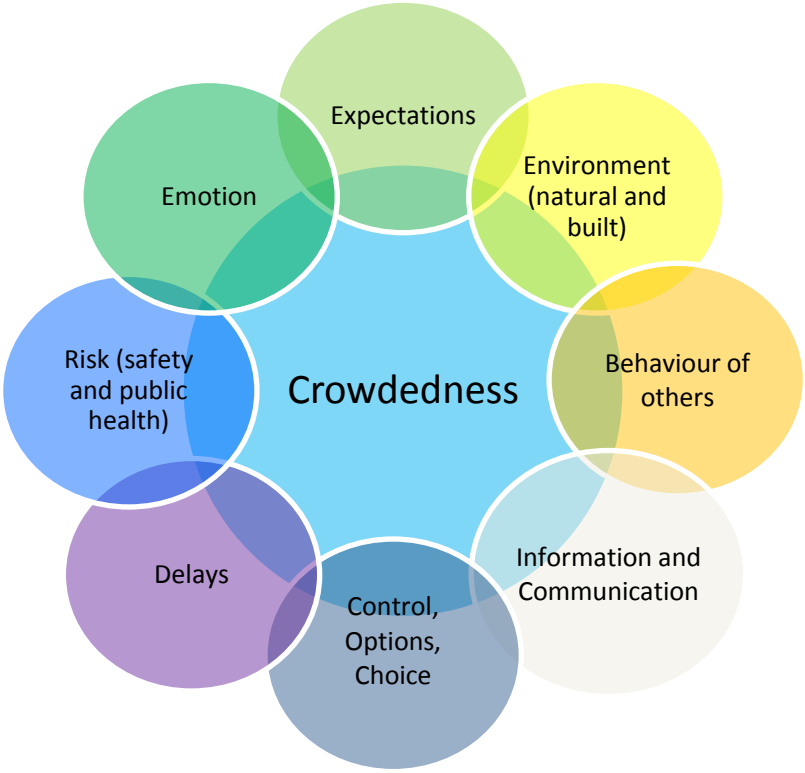
a. Crowdedness model

This paper will focus on one of the eight themes identified in the study that influence the Australian metropolitan rail passenger's commuting experience and induce a feeling of crowdedness. These eight themes were originally described in a model by Thompson, Hirsch and Rainbird (forthcoming, 2011) in their report 'A socio-economic study of carriage and platform crowding in the Australian railway industry: Qualitative research summary' for the CRC for Rail Innovation on project R2.104 (see Figure 1 below). These themes were identified during data analysis of the focus groups, observations and to some extent, the literature review.

The following section will briefly discuss the eight themes in the model before elaborating on the element of passenger behaviour. The model is a simple depiction of the eight influencing themes that affect passenger experiences of crowdedness. It demonstrates that a variety of factors influence passenger perception and tolerance of crowding. It must be noted that whilst not pictorially depicted, the themes listed in the model are not isolated, each influences the others, and therefore it is important to achieve an understanding of each theme before delving into the specifics of one. Therefore this section will provide the reader with a concise explanation of each theme in the model. This understanding will enhance the reader's comprehension of 'passenger behaviour', not as an isolated theme, but as a theme intertwined with a number of other issues.

Each passenger is an individual and therefore each theme depicted in the model will influence and affect individual passengers differently, yet it was found that as a group, all passengers are somewhat affected by each theme depicted in the model to a degree.

Figure 1: Thompson et al's (forthcoming 2011) crowding experience model



The model's eight themes vary from the physical and controlled environment to more transient matters, such as a passenger's emotion or expectations of the service. A brief summary of these is given below:

1. Expectations: Are based on a passenger's prior rail experiences. If their past experiences were poor, they would assume that future rail experiences would also be inadequate. Conversely, if their prior experiences were positive, their expectations of the service would remain high. Passenger choices regarding their time of travel are often based on their expectations of the service based on prior experiences. Thus a passenger may chose to take an earlier train in the afternoon to avoid a later train which they expect will be crowded.
2. Environment (natural and built): This encompasses not only the weather (natural) but also carriage, platform and station design (built). Passengers indicated that they felt more crowded in rainy conditions as the carriage surfaces often became wet and was unpleasant to commute in. In terms of the built carriage environment, a number of factors were discussed, including the quality of the air conditioning system and air flow within the carriage, which was an issue particularly in summer, the presence and design of handholds for standing passengers, the seating layout and arrangement, the cleanliness of the carriage and, with regards to under crowding and safety at night, the quality of lighting in carriages and at stations.
3. Communication: This related to the quality of information supplied by the rail provider to passengers. Effective communication was particularly important regarding the management of delays and cancellations of the service. Participants indicated that they quickly became frustrated when timely and accurate information regarding the situation was not provided. In these cases, passenger feelings of crowdedness increased with the frustration that they felt towards the service that they were receiving. Participants also discussed the useability of timetables and the quality of the overhead speakers on platforms and in carriages.
4. Control/ options/ choice: Participants indicated that the more perceived control they had to make choices, the more positively they would view their rail experience. They claimed that

having multiple choices available to them made them feel more in control over their situation as they could make their own decisions over their travel experience. Areas where having choices were important included being able to take an earlier train or having the option to reach a stable and clean handhold once on the train.

5. Delays: Interruptions to rail travel inevitably leads to an increase in the number of people on the platform and in carriages. Therefore, delays were resented by passengers not only because it meant their control over the situation was lost, but crowding was also increased. In the focus groups, delays were identified as the primary factor that influenced passenger perceptions crowdedness.
6. Risk (safety and public health): In terms of public health, participants reported feeling exposed to unhygienic people and objects, particularly in winter when there are higher rates of infectious diseases. This related strongly to the perceived cleanliness of the carriage environment, especially the holds and the seat coverings. Many participants indicated an aversion to touching some of the holds or placing their bags on the floor as they believed the surfaces of the carriage were unclean. In terms of safety, female passengers in particular regarded crowded carriages as opportunities for men to surreptitiously take advantage of them.
7. Emotion: Not only did passenger's emotions prior to embarkation influence their perception and tolerance of the crowded environment, but the actual state of crowding was demonstrated to have strong negative influences on passenger's emotional states. Crowding increased feelings of frustration, annoyance and resentment towards both the operator and fellow passengers.
8. Behaviour of others: Participants indicated that their feeling of crowdedness and their tolerance to their rail journey was significantly influenced by fellow commuters. Within these parameters, participants mentioned loud phone conversations, the odour of unclean passengers, noisy school children, and a general lack of etiquette. The effect of these behaviours seemingly became exacerbated the more crowded the conditions.

Each theme mentioned in Figure 1 describes one aspect of the overall crowding experience and must therefore be approached with this in mind. The themes are not isolated and many act in conjunction or have influence over each other to impact passenger experience and tolerance of crowdedness. Thus, if one aspect is altered, it will have an effect on other factors in the model and ultimately on crowdedness itself.

The following section of this paper will focus on results surrounding the individual theme of passenger behaviour and will be discussed in two parts. The first will focus on the individual's behaviour, outlook and experience and their construction and defence of space within the crowded railway carriage. The second will discuss the impact and influence of other passengers on the individual, and reasons behind seating and standing choices.

b. Passenger behaviour

As shown in section 3 of this paper, numerous studies and theorists, particularly in the psychological field have examined the behavioural responses of people in confined spaces. The rail carriage is a prime example of such a space and yet it is also unique in that it is experienced as a mundane, moving, everyday environment by millions of people all over the world, making it an important space to study.

Many attitudes presented in the focus groups were interpretable through much of the psychological literature, particularly Goffman's 'practise of everyday life' and Hall's examination of interpersonal proximities. A significant theme that emerged from the focus groups was the importance of both the individual's attitudes and the physical manifestation of these attitudes in terms of behaviour. Focus group participants discussed the importance of maintaining their "*personal bubble*" (older male) as it was this space, defined by them, protecting them from engagement with others that "*stops me being crowded*" (older male). However, in doing so, they admitted to acting differently and changing their everyday behaviour to specific commuter-style behaviours: *"...I don't want to talk to people. It is my*

time." (older female). Coupled with these attitudes, participants reported a marked change in their behavioural patterns in order to create and then defend what they claimed as their personal space. The majority of participants reported to purposely ignore others in the carriage by appearing busy so that they did not have to engage with them and, in doing so, passengers were able to maintain a level of privacy and personal comfort, and avoid crowdedness.

Participants discussed a variety of behaviours that they commonly engaged in to avoid any potential discomfort that may result from engagement with a stranger. These behaviours and activities applied to passengers experiencing both comfortable patronage levels, over-crowding and under crowding. However, these behaviours were seen to be more important to perform during high levels of crowding, particularly during morning and afternoon weekday peak times. These measures were understood to be effective against crowding because, by withdrawing themselves from the public sphere, participants were able to retreat into a private setting, thereby ignoring or '*…blocking out…'* (older male) everything else in their surrounds. Thus, their engagement with others removed, and overstimulation negated, they were able to mitigate their feelings of being crowded.

Engagement with fellow passengers immediately invalidates the perception of personal space that many are so careful to maintain, often resulting in a negative emotional reaction that is exacerbated by the confinement of the carriage. Focus group participants were clear in their dialogues that engagement with others in carriages was unwanted and made them uncomfortable. Participants indicated that engagement may occur through a variety of simple actions, including making eye contact, overhearing a conversation, participating in a conversation and accidentally touching someone. All of these examples given by focus group participants were confirmed by participant observations on trains. Exceptions to this trend occurred mainly with younger participants who saw the train as a social environment where they would travel with their friends: "*On the train when you are with your mates you don't notice the crowding"* (younger male); "*It is like having a party on the train"* (younger male); "*Travelling with your friends makes the train ride heaps better"* (younger female).

The literature suggests that passengers regularly create personal spaces for themselves in carriages through a mixture of body language, such as averted eyes or hunched shoulders and the use of personal items, such as reading books or listening to audio devices such as ipods. This was confirmed by both observations on carriages and comments by focus group participants. Indeed, both the observations and focus groups gave a richer understanding of the plethora of techniques passengers employ to ensure disengagement with others. Innocuous avoidance activities that were not discussed in the literature but which were observed in carriages and mentioned in focus groups included reading the free newspapers provided in Sydney, Melbourne and Brisbane, the application of makeup, using a mobile phone to text or play games, fiddling and staring at one's hands, fleetingly looking at other passengers, sleeping, daydreaming and looking out of the window.

Mobile phones in particular were discussed as devices that promoted disengagement with immediate others and provided personal entertainment during the commute, devices that "*…help pass the time"* (younger female). The advantages of this time-utilization technology was reported by focus group participants to be particularly beneficial when standing in crowded carriages as passengers were still able to engage with their phones when the situation was too crowded to hold a newspaper or book. Younger participants in particular celebrated the gaming, text and movie functions on their mobile phone devices and, when travelling alone, they felt a connection with their friends: "*When I'm alone on the train, it's pretty boring, so I text people."* (younger female). In under crowded situations, both older and younger female participants indicated that their mobile devices enhanced their feeling of safety. One younger female participant stated: "*When I'm travelling home at night I call a friend so that at least someone knows where I am"*. This was reiterated by another younger female participant: "*At night there are a lot of weirdos on the trains. Sometimes I just pretend to be on the phone so I don't have to talk to other people…"*

Participants indicated that often the simple avoidance techniques described above were pre-meditated, not only to avoid interacting with other passengers, but also in an attempt to pass time on the train. In addition to these behaviours, participants in the focus groups discussed further methods that they purposely engaged in to ensure that they could maintain their personal space, avoid crowdedness as much as possible and thereby maximise their enjoyment of the overall travel experience. Many of these behaviours were confirmed during observations and ranged from inoffensive and discrete, such as the direction that they faced: "*If there are heaps of people I stand with my back to people so I don't have to look at them and my backpack to people so I don't have to touch them*" (younger female), to more obvious behaviours, such as olfactory and behavioural defences. One younger male indicated that he purposely used too much deodorant to ensure that other passengers would maintain a distance from him. Some participants claimed that they would make a conscious and active effort to ensure they achieved a larger area around them. One younger male mentioned a friend whom *"...just starts coughing to get people away*", an older female, who identified as having an autism spectrum disorder said, "*I act crazy so that I can get out of the train when it is really crowded. I just shout at people and like wow, it's like Moses. Easy.*" She claimed that her behaviour was purposely exaggerated in this environment in an attempt to improve her comfort and to prevent an uncontrollable outburst that could be induced by the stress of crowding. Other space-encroaching and passenger avoidance behaviours noted during observations included placing bags on an empty seat and cutting one's toenails.

As discussed in section 1, the repetitive and monotonous nature of everyday commuting in a crowded carriage may exacerbate the impact of minor irritations caused by fellow commuters. In doing so, individual reactions to these behaviours may appear more severe and extreme than in a less crowded situation. It must be noted that these reactions are usually personal and present as psychological frustrations rather than verbal and physical reactions. Comments from the focus groups confirm these statements. One example related to the forced change of behaviour towards others that participants felt they had to adopt to ensure a place in the carriage during embarkation. Focus group members discussed how it was often difficult to board an already crowded train due to the sheer number of fellow passengers also wanting to enter a carriage. Many claimed that they had developed tactics to ensure they were able to enter the carriage, however often these tactics were detrimental to other passengers. Participants admitted to acting "*rude*" and feeling ashamed of this, however, as one older female claimed "*...you have to change your behaviour or you won't get on. No one cares or looks out for you*". This comment was reiterated by participants in every focus group.

Whilst the majority of participants did not indicate that they would employ extreme measures to maintain their personal space, to some degree, all focus group participants claimed that they did use crowding mitigation behaviours as a necessary method to help create and preserve their feelings of personal space; this was confirmed by carriage observations. Crowding was only seen to be an unpleasant experience when their strategies to avoid social interaction were impeded.

c. Behaviour and choice: Is a seat important?

This section will discuss some passenger preferences for seating and standing choices that are made in crowded, comfortable and under-crowded carriage situations. During observations and in focus groups, it was found that these choices were primarily made based on the personal assumptions of the passenger and on the behaviour and actions of their fellow passengers.

From observations, it was ascertained that passengers strove to acquire a seat as soon as possible. In this competitive environment, passengers may act in a more aggressive manner to improve their comfort. The benefits of gaining a seat, particularly a window seat was explained by participants as a way of reducing crowding; "*I can ignore everything around me*" (older female), *"...just watch everything going by it is like I'm not on the train..."* (younger

female). In addition to social avoidance, for the majority of participants gaining a seat improved the overall comfort and experience of the journey as passengers did not have to continually maintain balance or stand in close proximity to others.

Whilst sitting was reported as being ideal, there were a number of examples given by participants emphasising the benefits of standing over seating in particular situations. These are listed below:

- Cleanliness: In sites where food and beverages were allowed on trains, participants commented on the cleanliness of the seats. One older woman claimed to have once sat on a damp seat and other participants discussed how other passengers often left not only newspapers but also food remains on the seats. Therefore, for reasons of cleanliness, participants indicated that they may choose to stand over sitting on a dirty seat.
- Access and egress: When high levels of crowding were known to be expected, some participants chose to stand in the vestibule and near the door, rather than moving to an available seat in the middle of the carriage. This tactic was used by those who had experienced situations when they could not disembark at their station due to being stuck behind other people.
- Safety: In under crowded situations, participants in all focus group demographics discussed their safety concerns in under crowded carriages, particularly at night time. Many participants claimed that they would prefer to stand in the vestibule in these situations for easy movement within the carriage and efficient egress if necessary.
- Ventilation: An issue discussed by many participants, and experienced during observations was the quality of ventilation in some carriages. Younger male focus group members indicated a preference for standing in the vestibule near the doors when the carriages were at a high crowding level, so that they could experience fresh air at every station when the doors opened.
- PM peak: For those travelling during PM peak, the level of crowding within the carriage declines over time. Some participants claimed that they would not take a seat half way through their journey if one because available: "*What's the point? I'm about to get out soon anyway"* (older male).
- Avoidance of fellow passengers: Having a seat was not always synonymous with comfort. Focus group participants discussed examples where they had chosen to stand rather than sit due to the behaviour or hygiene of the person seated next to them. In these instances participants claimed to feel more crowded when seated and would prefer to stand.

Whilst seating is often depicted as the ideal situation for a passenger to achieve when on a crowded carriage, the aforementioned examples demonstrate that this is not always the case. Indeed, from focus groups, it was established that passengers base their seating and standing preferences on their perceived safety within the carriage as well as their physical, social and emotional comfort. These results display the advantage to the rail industry of using ethnographical research techniques, whereby in-depth passenger opinions are sourced that may not be revealed in surveys alone. Coupling both qualitative and qualitative research methodologies therefore are key in producing passenger-informed research outcomes.

5. Conclusions

Whilst passengers may experience situations individually, most are unknowingly governed by their own motivations and outside influences, which are often very similar to those of other passengers. Rail passengers typically interact and engage with the carriage environment in a private manner, changing their everyday behaviour and personality to retreat into their personal 'bubble' so they may be more psychologically and emotionally comfortable in a situation where overstimulation and the possibility of engagement with strangers is high. When interaction with strangers occurs, in the majority of reported cases, it leads not only to

a feeling of irritation and annoyance which, in turn impacts on passenger etiquette but also crowdedness.

This paper has examined some of the decision-making processes behind seating choice and passenger attitudes towards the benefits and drawbacks of acquiring a seat. For rail industries, these identified behaviours, motivations and choices are important to understand so that initiatives may be designed to target passenger behaviour where necessary.

It is important for industry to have a sound understanding of the choices that people make within the crowded carriage and why they do this in addition to measurements of crowding based on metrics. With passenger ridership levels expected to increase in Australia and no measures for alleviation in sight, the issue of crowding and passenger reactions to the same are important to understand. As discussed, eight influencing themes were indentified in the Thompson et al. (forthcoming, 2011) study. Each theme has a strong effect on the overall crowdedness, but it is also important to note that these factors act in conjunction with each other to impact on passengers and therefore they cannot simply be expressed or resolved as isolated features only. Thus, a thorough understanding of each of these themes is important so that industry may better appreciate the reactions of their clients to the service. Whilst all eight of these themes have not been described in detail in this paper, it has expanded upon one theme, that of passenger behaviour. Passenger decisions, motivations and behaviours within the context of the crowded carriage have been discussed, particularly in relation to interactions with fellow passengers.

Acknowledgments

The authors are grateful to the CRC for Rail Innovation (established and supported under the Australian Government's Cooperative Research Centres program) for the funding of this research; Project No. R2.104 'A socio-economic study of platform and carriage crowding in the Australian metropolitan railway industry'.

For more information, see www. http://www.railcrc.net.au/project/r2104

References

Australian Bureau of Statistics. (2008). "4102.0- Australian Social Trends." [http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Chapter10102008 accessed 10-4-2011].

Baum, A. and P. Paulus (1991). Crowding. Handbook of environmental psychology. D. Stokols and I. Altman. New York, John Wiley & Sons. **1**.

Bissell, D. (2009). "Conceptualising differently-mobile passengers: geographies of everyday encumbrance in the railway station." Social & Cultural Geography **10**(2): 173-195.

Bissell, D. (2009). "Travelling vulnerabilities: mobile timespaces of quiescence." Cultural geographies **16**(4): 427.

Bissell, D. (2010). "Passenger mobilities: affective atmospheres and the sociality of public transport." Environment and Planning D: Society and Space **28**: 270-289.

Conradson, D. and A. Latham (2007). "The Affective Possibilities of London: Antipodean Transnationals and the Overseas Experience." Mobilities **2**(2): 231-254.

Currie, G. (2009). Research perspectives on the merits of Light Rail vs Bus. BITRE Colloquium. Canberra, BITRE Colloquium.

Currie, G. (2010). "Quick and effective solution to rail overcrowding: free early bird ticket experience in Melbourne, Australia." Transportation research record **2146**(1): 35-42.

de Certeau, M. (1980). The practice of everyday life. Translated by Steven Rendall, 1984. Berkely, University of California Press.

Epstein, Y. (1981). "Crowding stress and human behavior." Journal of Social Issues **10**: 370-383.

Evans, G. and R. Wener (2007). "Crowding and personal space invasion on the train: Please don't make me sit in the middle." Journal of Environmental Psychology **27**: 90-94.

Garfinkel, H. (1967). Studies in Ethnomethodology. Englewood Cliffs, Prentice-Hall.

Goffman, E. (1959). The presentation of self in everyday life. Chicago, Knopf Doubleday Publishing Group.

Green, J., K. Willis, et al. (2007). "Generating best evidence from qualitative research: the role of data analysis." Australian and New Zealand Journal of Public Health **21**(6): 545-550.

Hale, C. and P. Charles (2009). Managing peak demand for passenger rail: A literature review. 32nd Australasian Transport Research Forum (ATRF). Auckland, New Zealand, ATRF.

Hall (1966). The Hidden Dimension. Garden City, Doubleday.

Holmes, A. and M. Reeves (2003). Pains on Trains: A commuter's guide to the 50 most irritating travel companions. Chichester, Capstone Publishing Limited.

Kaya, N. and M. Weber (2003). "Cross-cultural differences in the perception of crowding and privacy regulation: American and Turkish students." Journal of Environmental Psychology **23**(3): 301-309.

Kim, D.-Y. and K.-H. Lee (2010). "Cultural differences in the customer perception of crowded restaurant: emotions, intolerance and perceived price." International Journal of Revenue Management **4**(3-4): 420-431.

Lofgren, O. (2008). "Motion and emotion: learning to be a railway traveller." Mobilities **3**(3): 331.

London Assembly Transport Committee (2009). The Big Squeeze: Rail overcrowding in London. London, England, Greater London Authority.

Mueller, S., K. Thompson, et al. (forthcoming, 2011). A socio-economic study of platform and carriage crowding in the Australian railway industry: Quantitative research summary. Brisbane, Australia, CRC for Rail Innovation.

Nair, P. and D. Kumar (2005). "Mumbai urban transport project- Development and challenges." The ICFAI Journal of Infrastructure **March**: 34-42.

Rail Corporation (2009-2010). Annual Report. Sydney, Rail Corporation.

Simmel, G. (1950). The metropolis and mental life. The Sociology of Georg Simmel. K. Wolff. New York, The Free Press.

Simmons, J., Ed. (1971). The Railway Traveller's Handy Book. Bath, Adams and Dart.

Stokols, D. (1972). "On the distinction between density and crowding: Some implications for future research." Psychological Review **79**(3): 275-277.

The Tipping Point Institute (2009). CBD Metro Environmental Assessment. Sydney, The Tipping Point Institute.

Thompson, K., L. Hirsch, et al. (2011). A socio-economic study of platform and carriage crowding in the Australian metropolitan railway industry. World Congress on Rail Research. Lille, France, WCRR.

Thompson, K., L. Hirsch, et al. (forthcoming, 2011). A socio-economic study of carriage and platform crowding in the Australian railway industry: Qualitative research summary. Brisbane, CRC for Rail Innovation & University of South Australia.

Turner, S., E. Corbett, et al. (2005). Health and safety effects of crowding: Hazard identification (T307). London, Health & Safety Laboratory.

Whiting, A. and G. Nakos (2008). "Functional density and its impact on retail satisfaction in cross-cultural contexts: Can crowded stores be a good thing for retailers?" Research, Teaching and Practice **2**(1): 1-11.