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The development and testing of the dementia friendly communities environment assessment tool (DFC EAT)

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Abstract

Background: There is a growing recognition of the need to make the built environment in towns and cities more enabling for people with dementia. This study reports the development of a reliable tool to assess the support provided to people with dementia by public and commercial buildings such as council offices, supermarkets, banks, and medical centers as they approach, use, and leave them.

Methods: A three-step process was carried out to develop and establish the reliability of the tool: (1) a review of principles and available tools informed the development and modification of an environmental audit tool of proven utility, (2) the draft tool was subjected to an iterative process of evaluation by a team of people with expertise in design and town planning, people with dementia and their carers, (3) inter-rater reliability and internal consistency were assessed on a sample of 60 public and commercial buildings.

Results: The review of available tools led to the drafting of a tool that was refined through iterative, experience-based evaluation resulting in a tool that has high inter-rater reliability and internal validity. The data gathered enabled a sample of banks, libraries, shops, medical facilities, supermarkets and council offices to be compared.

Conclusions: The new tool aids the collection of reliable information on the strengths and weaknesses of public and commercial buildings. This information is likely to be of use in the refurbishment of these buildings to improve their support of people with dementia as they use them in their daily life.

The development and testing of the Dementia Friendly Communities Environment Assessment

Tool (DFC EAT)

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Running title

Assessing public buildings dementia friendliness

Introduction

There is a growing interest in fostering the development of Dementia Friendly Communities as a humane and economically responsible response to the rising number of people with dementia. Most of this interest has been focussed on the education of community members, particularly those likely to encounter a person with dementia, e.g. hospitality staff, policemen, shop workers, so that they are better prepared to be able to respond to their needs.

There has also been an increasing appreciation of the role the built environment plays in promoting quality of life of people with dementia. Dementia friendly environments have been defined as those which enable and support personhood (Topo and Kotilainen, 2009) and 'compensate for disability, maximise independence…enhance self-esteem and confidence…and reinforce personal identity" (Marshall, 2001). They facilitate access to public spaces and support the person with dementia as they undertake the ordinary activities of daily living outside their home (Burton, 2012). Davis *et al* (2009) have drawn attention to the need to take into consideration the lived experiences of the person with dementia as central to informing the design of the environments that they use.

The interest in designing for people with dementia began in the residential aged care setting (Fleming *et al.*, 2014; Fleming and Purandare, 2010) and has resulted in the development of a number of tools that enable the quantification of the quality of the built environment used to accommodate people with dementia. One of these tools is the Environmental Audit Tool (EAT)(Fleming, 2011; Smith *et al.*, 2012) which has been used extensively in research and practice in Australia (Chenoweth *et al.*, 2014; Fleming *et al.*, 2014; Low *et al.*, 2013). This paper describes the process and results of modifying the EAT to make it suitable for assessing the support provided to people with dementia by public and commercial buildings. In its original form the EAT comprises 72 items and is organised around ten principles of design (Fleming and Bennett, 2013):-

The principles

Unobtrusively reduce risks

People with dementia require an internal and external environment that is safe and easy to move around in to assist them to lead a full life. The environment needs to be designed to be enabling. Potential risks must be removed or hidden unobtrusively, as obvious safety features and barriers can lead to frustration, agitation and anger.

Provide a human scale

The scale of the environment can have a positive effect on the behaviour and feelings of a person with dementia. The number of people that a person interacts with, the overall size of the building and the size of the individual components (such as doors and rooms) are three key factors that influence scale. A person should not be intimidated by the number of people or the size of the surroundings he or she encounters, or be confronted with a multitude of interactions and choices. Rather the scale should encourage a sense of wellbeing and enhance the competence of a person.

Allow people to see and be seen

The provision of an easily understood environment will help to minimise confusion. It is particularly important for people with dementia to be able to recognise where they are, where they have come from and what they will find if they head in a certain direction. When a person can see key places they are more able to make choices and find their way to where they want to go. It is also important that carers can see the person with dementia to assist them to avoid difficulties. Environments that provide these opportunities are said to have good visual access. Good visual access offers opportunities for engagement and gives the person with dementia the confidence to explore their environment.

Manage levels of stimulation

Reduce unhelpful stimulation - a person with dementia becomes stressed by prolonged exposure to large amounts of stimulation, because dementia reduces the ability to filter stimulation and attend to only those things that are important. The environment should be designed to minimise exposure to stimuli that are not helpful, such as competing noises and images. The full range of senses must be considered. Too much visual stimulation is as stressful as too much auditory stimulation.

Enhance helpful stimulation - enabling the person with dementia to see, hear and smell things that give them cues about where they are and what they can do, can help to minimise their confusion and uncertainty. Consideration needs to be given to providing a number of cues to the same thing, recognizing that what is meaningful to one person will not necessarily be meaningful to another.

Support movement and engagement

Purposeful movement can increase engagement and maintain a person's health and wellbeing. It is supported by providing a well-defined pathway or route, free of obstacles and complex decision points, that guides people past points of interest and opportunities to engage in desired activities or social interaction. The pathway should be both internal and external, providing an opportunity and reason to be outside when the weather permits.

Create a familiar space

A person with dementia is more able to use and enjoy spaces and objects that were familiar to them in their early life. The environment should afford people the opportunity to maintain their competence through the use of familiar building design (internal and external), layout, furniture,

fittings and colours. Objects need to be clearly identifiable and recognisable if a person with

dementia is to be enabled to use them.

Provide a variety of places to be alone or with others

In the building - people with dementia need to be able to choose to be on their own or spend time

with others. This requires the provision of a variety of spaces, some for quiet conversation and some

for larger groups, as well as spaces where people can be by themselves. These need to be attractive

and comfortable to encourage people to use them. These internal and external spaces should offer

a variety of experiences and aim to stimulate different emotional responses.

In the community - without constant reminders of who they are, a person with dementia will lose

their sense of identity. Frequent interaction with friends, relatives and the wider community can

help to maintain that identity. Stigma remains a problem for people with dementia. The

environment should offer 'bridges into the community' by providing attractive, de-stigmatising

places that are easily shared by the community, including children, and people with dementia.

Design in response to a vision for way of life

People with dementia need an environment that gives a clear invitation to engage with activities and

events that are meaningful to them. People live differently. Some choose, for example, to focus on

the ordinary activities of daily living such as cooking and gardening. Others focus on a relaxing

lifestyle, while some emphasise a healthy way of life or spiritual reflection. The environment needs

to be designed in response to a clear understanding of the person's interests and abilities and to

enable them to continue a way of life that is meaningful to them.

These principles were developed from the practical experience of designing facilities for confused

and disturbed elderly people (Fleming and Bowles, 1987) and refined by the accumulation of

research findings on desirable characteristics in environments for people with dementia (Fleming and Purandare, 2010). The psychometric properties of the EAT have been investigated (Smith *et al.*, 2012) and found to compare favourably with the most widely accepted environmental assessment tool, the TESS-NH (Sloane *et al.*, 2002)

This project intentionally brought together four sources of information to extend our ability to identify and quantify those supportive features of the buildings that are required by people with dementia. These were the information generated by research on the evaluation of residential aged care facilities for people with dementia as summarised in the EAT, the existing literature on evaluating public spaces and buildings used by people with dementia, the views of potential users of the tool, i.e. professionals likely to be involved in evaluating buildings, and central to 'dementia-friendly' the view of the users of the buildings, i.e. people with dementia and their carers.

Methods

The conduct of this research was governed by the University of Wollongong/Illawarra Shoalhaven Local Health District Social Sciences HREC approval HE14/445.

A 3 step process was followed to develop the tool and establish its reliability.

1. A review of principles and available tools informed the development and modification of an environmental audit tool of proven utility. The search terms (dementia OR alzheimers) AND (neighbourhood* OR neighborhood* OR "environment* design" OR "dementia friendly" OR "public space") were used to identify potentially relevant articles in three data bases – Art and Architecture Complete, Medline and Scopus.

2. The draft tool was subjected to an iterative process of evaluation involving a team of two town planners, architect, graphics designer, psychologist, occupational therapist, physiotherapist, two community development officers and two people with early dementia and their partners who cared for them at home. The professional members of the team were selected to represent potential users of the tool. The town planners and community development officers were

employed by the local council in the town in which the research took place. The remaining professional team members were university based and linked to the town council through a project aimed at developing a dementia friendly community. All members of the team, including the people with dementia with the help of their carers, evaluated each draft of the tool by using it in the evaluation of a public building. Three buildings were evaluated approximately one week apart with the discussion of the results of each evaluation and the experience of using the tool, used by the authors to refine the tool.

3. Inter-rater reliability and internal consistency were assessed. This involved two people, familiar with carrying out assessments using the Environmental Audit Tool (Fleming, 2011) carrying out independent assessments on a convenience sample of public and commercial buildings. The sample comprised 10 sets of six types of buildings, 60 buildings in total. The locations of the sets of buildings were selected to cover the range of metropolitan areas to small regional towns. Each set comprised a bank, shopping mall, medical facility, council building, small shop and a supermarket. The results were used to evaluate each question in the tool and the tool as a whole. The data were analysed using IBM SPSS Statistics 19. Inter-rater reliability was assessed using the intra-class correlation coefficient and internal consistency with Cronbach's alpha.

Results
Informing the development of the tool

A total of 360 potentially relevant articles were identified. Duplicates were eliminated and the titles and abstracts of these articles were read to screen out articles that were anecdotal in nature or not relevant to the topic of measuring the quality of dementia friendly communities. The remaining 28 articles were read thoroughly to identify articles that provided information of direct relevance to the construction of a tool for auditing the quality of public buildings and spaces likely to be used by people with dementia. Fifteen such articles were identified (Andrews, 2006; Blackman *et al.*, 2003; Boex and Boex, 2012; Brorsson *et al.*, 2013; Brorsson *et al.*, 2011; Burton, 2012; Burton *et al.*, 2004;

Crampton and Eley, 2013; Keady *et al.*, 2012; McCabe and Sim, 2006; Mitchell and Burton, 2010; Mitchell *et al.*, 2004; Mitchell *et al.*, 2003; Topo and Kotilainen, 2009; van Schaik *et al.*, 2008) including a review of the literature by Keady *et al* (Keady *et al.*, 2012).

The Keady review and our search of the literature both pointed to the pre-eminence of the work of Mitchell and Burton and their colleagues (Burton, 2012; Burton *et al.*, 2004; Mitchell and Burton, 2010; Mitchell *et al.*, 2004; Mitchell *et al.*, 2003). It is methodologically pioneering, utilising walking interviews with people with dementia and has resulted in a clear statement of the desirable aspects of the streetscape of a dementia friendly community. These aspects are described in relation to six principles (Mitchell and Burton, 2010):-

Familiarity - familiar surroundings enable people to recognise and understand their surroundings, which helps to prevent and alleviate spatial disorientation and confusion and to aid short-term memory

Legibility - people can understand where they are and identify which way they need to go, helping to prevent and alleviate spatial disorientation, confusion and anxiety

Distinctiveness - people's attention and concentration are captured by the distinctiveness of the various parts of the neighbourhood, which aids orientation and wayfinding

Accessibility - people are able to reach, enter, use and move around the places and spaces they need or wish to visit, regardless of any physical, sensory or cognitive impairment

Comfort - people feel at ease and are able to visit, use and enjoy places and spaces of their choice without physical or psychological discomfort

Safety - people are able to use, enjoy and move around the neighbourhood without fear of coming to harm

These principles were utilised to produce a checklist of the enabling characteristics of outdoor environments (Burton *et al.*, 2004).

The use of the walking interview in the development of this checklist hints at the need for a dynamic understanding of the environment, an understanding based on movement through the environment and the opportunity the environment provides for positive or negative possibilities. The latter theme is developed in the work of Topo and Kotilainen (2009) who use the term affordance to describe the enabling and restrictive qualities of a living environment and explores how a knowledge of these can be used to produce an environment that supports a full and meaningful life.

The work of van Schaik (2008) has shown, by the use of a virtual environment, that navigability, legibility, safety and environmental attractiveness are the key elements for successful way-finding and enjoyment of outdoor spaces. A key message from this research was that real town centres offered relatively few obstacles for people with mild to moderate dementia, and that sometimes relatively straightforward changes, such as improvements to signage, could lead to measurable differences in way-finding and thereby improve quality of life and well-being.
He also highlights the advantages of involving the person with dementia in evaluating the environments through, for example, the accompanied walks used by Mitchell and Burton (2004). This strategy has revealed valuable insights into the sensory experience of getting out and about for people with dementia. The research found that noise, smells and a multitude of visual stimuli had an influence on how participants negotiated journeys around their neighbourhood. This research also helped to identify the strategies that people with dementia used in order to navigate outdoor spaces and highlighted the importance of access to a local familiar neighbourhood for wellbeing.

The sense of a journey to a destination and the ability of that destination to support the desired activity is captured in a very practical way in the work of Boex and Boex (2012). They have introduced the idea of 'touch points' that can be used to map the physical journey taken by a person with dementia. The first touch point in a typical journey may be the car park, followed by the entrance to the building, then the entry space (perhaps a waiting room), corridors (or aisles in a supermarket) and finally the work area (the counter in a bank , the interior of a library the shelves in a supermarket). This approach leads to the recognition that a tool that is intended to assess the quality of the environment encountered by a person with dementia interacting with their community must sample that environment at points along the journey. A one off, cross sectional assessment is likely to miss critical elements and strip the dynamism from the experience.

The Boex work also clearly shows the need for an approach that will accommodate a movement from the outside to the inside (and vice versa). This is reinforced by the work Brorsson *et al* (2013; 2011) who chart the problems encountered by people with dementia as they negotiate the various stages of shopping. This highlights the advantages of developing a tool able to provide data on the internal aspects of buildings as well as on their external context.

The review identified the work of Mitchell and Burton (Burton, 2012; Mitchell and Burton, 2010; Mitchell *et al.*, 2004; Mitchell *et al.*, 2003) and Boex and Boex (2012) as providing rich sources for additional items to be used in the modification of the EAT.

Iterative tool development

A set of 79 potential items were identified from these sources and presented one by one to the team for a decision to be made on their inclusion in the first draft of the tool. The first draft of the tool was produced by adding these items to those EAT items that were not obviously only relevant to a residential environment. Table 1 provides examples of the original items and their source.

The first draft of the tool was tested by the team using it on a walk-through of a council building in a small town on the south coast of New South Wales, Australia. They then carefully considered the results of the assessment and the useability of the tool. This led to significant changes including the clarification of the desirability of the tool being formatted to enable the assessment of the impact of the building on 8 stages experienced during the journey from the car park, the approach to the entrance, the entrance area, the journeys from the entrance to the destination, from the destination to the exit, the exit area and the journey back to the car park.

The draft was significantly revised and the process repeated, this time by walking through a shopping mall. This resulted in changes and these were evaluated by assessing a library and discussing the experience and the findings. This resulted in the final draft that was then subjected to the evaluation of its inter-rater reliability and internal consistency.

Testing Inter-rater Reliability and Internal Consistency

The analysis showed that the inter-rater reliability was poor when the assessors were assessing the journey from the car park to the building (ICC 0.54) and the internal space around the exit of the building (ICC 0.57), see Table 2. These levels of inter-rater reliability were considered to be too low to support the inclusion of these stages in the final tool. The exclusion of journey through the car park to the building led to the conclusion that it would be illogical to include the journey back through the car park stage. The final tool therefore comprises stages 2 to 6.

The retention of the individual items was determined by the calculation of the Kappa coefficient (Landis and Koch, 1977) and the percentage of absolute agreement. An item was retained if Kappa>0.2 and absolute agreement exceeded 70%. This resulted in the exclusion of one item resulting in the final scale comprising 37 items. The mean percentage of absolute agreement on these items was 83%.

The data collected in the inter-rater reliability study provides an opportunity to compare the support provided to people with dementia by the six types of buildings assessed, as shown in Table 3. Banks, shopping malls, medical clinics and small shops appear to be more supportive of people with dementia than council buildings and supermarkets.

Discussion

The trajectory of dementia can take a long time and it is only in the latter stages that people with dementia are admitted to residential care. Even then many people choose, in so far as they are able or allowed to, to stay at home. While experience in Australia has shown that it is possible to provide care in the home to a greater extent than was expected even ten years ago there is no room for complacency. The number of people with dementia in Australia, as in the rest of the developed world, is very likely to double in the next thirty years and it is very unlikely that the provision of residential aged care will keep pace. It is therefore essential that careful consideration is given to all aspects of life in the community so that even more people with dementia can be supported in it and lead satisfying lives. This must involve the development of a greater understanding of the supportive role that the built environment can play.

It is anticipated that the availability of tools that allow us to begin the quantification of the supportive features of the built environment will enable us to improve our understanding of what it means to have a dementia friendly community. This work has been started by the seminal contributions of Mitchell and Burton and their colleagues (Burton, 2012; Mitchell and Burton, 2010;

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Mitchell *et al.*, 2004; Mitchell *et al.*, 2003) however as far as the authors could determine there was no environmental assessment tool designed for this type of work that has undergone a rigorous examination of its inter-rater reliability and internal consistency and includes the collection of data on the internal, as well as external, experience of the buildings. Furthermore, the authors were unable to find any data that allowed a comparison of different types of buildings to be made.

The development of the tool described here, now known as the Dementia Friendly Communities Environmental Assessment Tool, the DFC EAT, was undertaken to assist those people who can make a difference to the quality of the built environment to evaluate their buildings, i.e. the owners, managers and designers of public and commercial buildings. It followed the key principles of tool development, literature review, iterative development with potential tool users and tool testing.

Consistent with the principles of the 'dementia friendly' movement, people with dementia were involved in the drafting and development of the tool to ensure that the 'lived experience' was also informing the tool (Davis *et al.*, 2009). This part of the project was undertaken in collaboration with a local dementia consumer advisory group which has been formed as part of the Dementia Friendly Kiama project (Phillipson and Rees, 2014) and shows the value of the creation of such groups to enable the 'civic participation' of people with dementia.

Consistent with the principles of good tool development – potential users of the tool were also involved in its initial drafting and development including town planning staff and an architect. Whilst the literature has previously emphasised the value of this process for improving tool usability, particularly in the development of software (Lieberman *et al.*, 2006) we reflect that the process also had other outcomes. For many of those involved in the process, whilst familiar with the conduct of environmental audit it was the first time they had considered it from the perspective of the person with dementia. In this way, being involved in the drafting and testing of the tool, especially in a process that also involved people with dementia, achieved the additional outcome of enhancing their knowledge of the 'lived experience' of the person with dementia and thus becoming more

'dementia friendly'. This suggests that the inclusion of a person with dementia and their carer in the actual assessment of a building with the new tool would enhance the assessors understanding of the results.

The final version of the DFC-EAT is available, see table S1 published as supplementary material online attached to the electronic version of this paper at http://journals.cambridge.org/ipg . Its inter-rater reliability is substantial in all stages of the journey through the building with minimum ICC being 0.652. This is supported by the very high percentage of absolute agreement between the raters on the majority of items and the high average absolute agreement of 83%.

The internal validity, as measured by Cronbach's alpha, is greater than the commonly agreed minimum of 0.7 (Nunnally, 1970) when the tool is used in three of the five stages. The scales assessing two stages of the journey, Approaching the Entry and being at the Destination, have lower than desirable internal validity, Cronbach's alpha, 0.66 and 0.59 respectively. Alpha could be improved in these scales by deleting some items however it was decided that, at this stage in the development of our knowledge, it would be better to retain the items until more experience is gained in the use of the tool. They appear to the authors to be providing information that is important to those planning refurbishments.

The data collected for the inter-rater reliability evaluation has enabled a start to be made on comparing the 'dementia friendliness' of different types of buildings. While the samples are small and no generalisations are justifiable, it is interesting to note that the tool indicates that the hardest places to get out of are supermarkets. Perhaps there is a vested interest in keeping people in. Banks appear to provide more support for people with dementia than do council buildings. This may be the result of the very specific purpose of visiting a bank as compared with the more generic nature of council buildings. It is probably easier to design a building that will meet one specific need, to have access to a bank teller, than to design one that will be used by people with various needs, e.g to pay rates, get information, visit a library.

It is too early to make comparisons, a much larger data base is required to enable us to do that. It is hoped that the DFC EAT will be used by others who will, subject to ethical considerations, share their data and contribute to a data base that will help us to explore the current state of the friendliness of buildings used by people with dementia. They will be able to do this by uploading their data to the Alzheimer Australia WA web site www.enablingenvironments.com.au where they will also be able to access more information on the development and use of the DFC EAT, including a spreadsheet that will assist with the scoring.

Conclusion

The combination of the literature review, experience gained from the development of tools for the evaluation of residential care environments, the insights of a team containing experts in design and users of public buildings who are, or are caring for, people with dementia provided a good foundation for the first draft of the new tool. The experience of refining the draft tool by walking through buildings with the team and reflecting on the experience of using it was invaluable. The final stage of evaluating its inter-rater reliability and internal consistency not only provided confidence in the tool but began the collection of data that will be useful in promoting discussions on what makes a dementia friendly building.

Conflict of interest

None

Description of authors' roles

R.Fleming designed the study, supervised the data collection and wrote the paper.

K. Bennet collected the data and contributed to writing the paper.

T. Preece collected the data and contributed to writing the paper

L. Phillipson contributed to data collection and writing the paper

Supplementary Material

Table S1: The Dementia Friendly Community Environmental Assessment Tool (DFC EAT)

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