

# Evaluating the Built Environment for Children's Active Travel to School

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## Abstract

Active modes of transport for children, such as walking and cycling, have been linked to increased well-being through better health, social connectedness and independence. In order to plan, design and adapt built environments for more active travel to schools, planners require indications of how supportive urban environments are for walking and cycling. One method of evaluating the quality of the pedestrian environment is a walkability audit. This paper reports on the findings from the conduct of a state agency walkability audit of the built environment surrounding a primary school in Western Australia. A comparison of the results of this audit is made with data drawn from a photo collage exercise with school children. Interviews with planning practitioners and community advocates who use audits to inform and legitimise planning for active travel adds a third dimension on current issues of use. The primary purpose of the study is not to test the reliability of the audit, rather to investigate the findings of a publicly available walkability audit in relation to children's evaluations of the same space and explore the comparison in the context of current transport planning practice. The findings indicate a good synergy between the state agency audit and walkability issues raised by the children. Changes to the process of conducting an audit recommended, including the use of visual imagery and a collaborative audit to promote shared understanding.

## 1. Introduction

Audits are being used to evaluate the quality of the walkability of Australian cities. Such audits are promoted by state and local government organizations and groups advocating for a better quality urban environment. Walkability audits provide a formal and detailed process for evaluating the built environment, focusing on a range of factors associated with the activity of walking. One area that has significant relevance to walking is the school environment. Walking and cycling are the primary modes of independent travel for children. The walk to school has the potential to be an important routine active travel activity. The use of an audit in evaluating the school environment for walkability may therefore be an important tool in facilitating more active modes of travel. This paper draws on a number of different perspectives that allow an insight into this important issue. The perspectives are those of a typical audit tool's evaluation of a school environment; a children's perspective on the same space; and consideration of the practical aspects of conducting walkability audits.

This study draws on data from an Australian Research Council funded Discovery project - 'CATCH, Children's Active Travel Connectedness and Health'. The objective of the CATCH project is to examine how factors of the social and built environment influence the independent mobility, active travel and health of Australian children across a range of

environments that broadly represent where the majority of children reside in contemporary Australian society.

## **2. Evaluating Built Environments for Children's Active Travel**

### **2.1 Children's active travel to school**

Walking, cycling and other active modes of travel afford children quality of life in urban environments. Active travel can provide both a means of accessing important places such as schools, parks and social opportunities. Activities within the local environment provide children the opportunities to engage in social and environmental learning and develop social skills and networks (Hart 1979; Moore 1986; Barratt Hacking, Barratt and Scott 2007). The health benefits of everyday travel routines also offer quality of life benefits for children. Active travel has been identified as an important means of children achieving the minimum recommended amounts of physical activity (Mackett and Paskins 2007). Greater levels of active travel also have wider social significance. Children's ability to access places within their local environments is associated with, and can positively influence, a broad range of social outcomes such as safe, lively public places and an enhanced sense of social cohesion (Tranter and Pawson 2001; Witten, McCreanor and Kearns 2003; Roemmich et al 2007).

The school journey is a key travel routine of children. Active travel rates to school have been declining for many decades and there has been considerable inquiry into the factors that have influenced this decline. A number of conceptual models have been developed in order to understand the factors influential in affecting whether children walk or cycle to school (McMillan 2007; Mitra et al 2010; Lang, Collins and Kearns 2011). Amongst these factors are neighbourhood level influences such as the proximity to school; issues of safety; connectivity; pedestrian comfort; and social capital (Mitra 2012). These factors closely associated with the walkability of urban environments. Southworth (2005, 248) provides a definition of walkability as:

“...the extent to which the built environment supports and encourages walking by providing for pedestrian comfort and safety, connecting people with varied destinations within a reasonable amount of time and effort, and offering visual interest in journeys throughout the network”.

The walkability of the school environment is, therefore, a key influence on children's active travel.

### **2.2 Evaluating Walkability with Audits**

An emerging trend within public planning departments in Australia and worldwide is the use of walking audits. Although varied in form and content, the basic purpose of the walking audit is to provide a structured means of evaluating a walking environment. Most often the outcome of the process is a quantitative rating or visualisation that represents the 'walkability' of an area, route or place. In a typology of audits Moudon and Lee (2003) describe three ways audits evaluate the built environment for active modes of travel. These are through analyzing the characteristics of the origin and destinations of travel; the wider urban area; or the routes that people travel.

Development of the theoretical nature of built environment audits has been explored by Lewis (2012a; 2012b) who has drawn on the literature of the ethical and moral dimension of the built environment, environmental psychology and the work of planners such as Kevin Lynch. Lewis explains that audits assume a relationship between individuals and collective goods, such walkability. These assumptions are based on differing arrangements in the ways that individuals hold portions of a particular good. According to Lewis, this relationship can be either 'absolute' or 'relative'. Holding an absolute portion means the good can be held in equal measure among all individuals. Therefore a good walkable environment is the same for all individuals in the same way. A relative relationship means that individuals hold differing proportions of the good or an unequal amount. Despite this, the proportion held can be considered equitable because the amount held may be relative to the characteristics of the

individual. Individuals have differing capacities to access collective goods so an equitable audit, according to a relative view, evaluates the built environment from the perspective of differing individual's capability to access that environment. It is this 'relative' perspective of walkability audits that is significant in relation to children. This is because there needs to be a distinction made between adults and children in regards to the decisions to choose active modes of travel and the experience of the phenomena of walking (Mitra 2012).

Enabling a relative evaluation of the built environment is therefore important to developing knowledge children's active travel. Capturing children's perspectives of the built environment around schools provides an opportunity for a relative evaluation. The use of qualitative methodologies has enabled a rich reading of urban environments from the perspective of children. Methods that use photographic images, mapping, and emerging technologies have enabled children to articulate their experience as participants of everyday urban life (Kytta 2004; Veitch, Salmon and Ball 2007). The picture that emerges is that children are actively engaged in shaping their lives through, independent travel and exploration negotiation of licences to travel; and learning through mobility and risk taking (Fyhri et al 2011; Mitchell, Collins and Kearns 2007). These different methods develop knowledge that enables children's experience of place and mobility to be compared and integrated into more technical and formal institutions.

### **3Study Design**

#### **3.1 Study objectives**

The objective of this paper is to evaluate a school environment using a public agency developed walkability audit and explore its findings from two perspectives. The first is from the perspective of children who live within walking distance of the school evaluating the same environment. The second is from the perspective of planning practice that shapes the travel and mobility patterns surrounding the school environment.

Three types of data were collected from a case study primary school in Western Australia.

- 1) A walkability audit
- 2) Interviews with practitioners.
- 3) Children's photographs

#### **3.2 Research Approach**

A single case study school was chosen for this research. Being a single case study, the results must be interpreted with caution; the intent is to explore the relationship between types of evaluation rather than establish general evidence about children's travel activity. The case study school is a primary school serving children between the ages of 6 and 12. It is located in an inner-urban Western Australia suburb approximately 12 kilometres from the Perth CBD. The Western Australian state government has designated the school a local intake area school, meaning that priority is given to students residing with a specified boundary of at most 1.25 kilometres from the school. The built environment surrounding the school is characterized by low to medium residential density, typical of Western Australian suburbs that experienced rapid growth between the 1960s and 70s. Light industrial areas are located approximately one kilometre to the south and east of the school. The road network design is essentially a grid layout with some residential cells consisting of curvilinear road design. An indication of the road network design is illustrated in Figure 1.

A walkability audit (WA Department of Transport 2011) was conducted of the built environment around the case study school. The audit used was developed by the Western Australian Department of Transport and is available on their website. The rationale for using

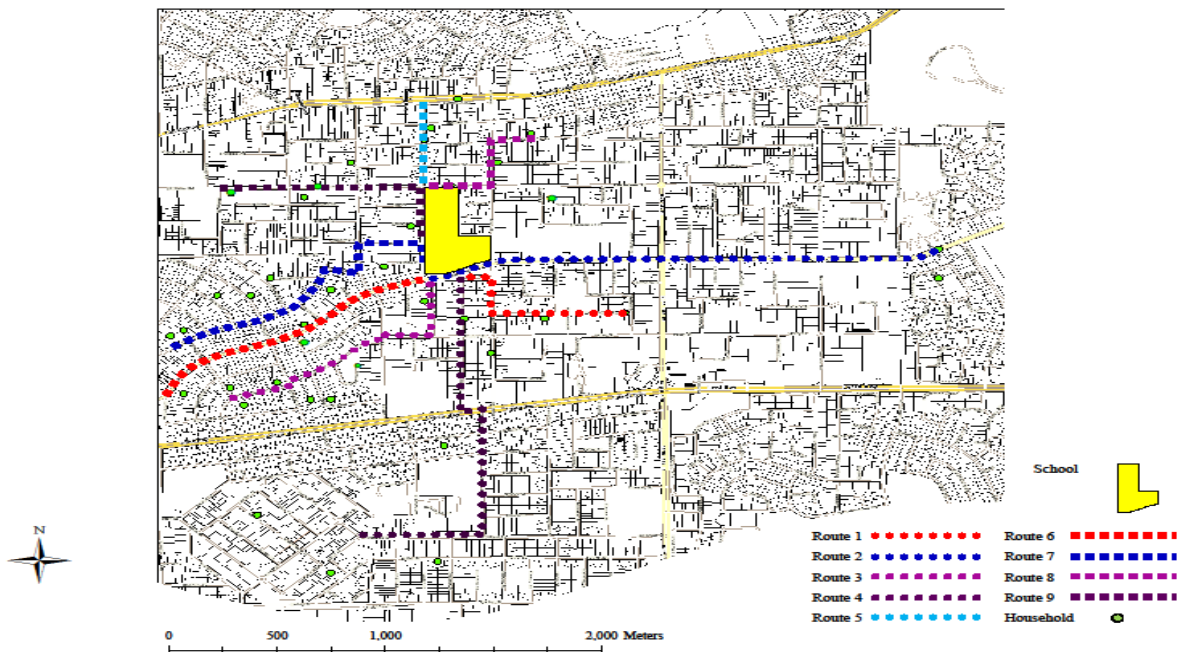
this tool was to audit the built environment with a typical evaluation tool readily available to planning practitioners or community members within the case study context. The tool is based on the standards for pedestrian and road infrastructure outlined in Austroads Guides to Traffic Management and Road Design and Australian Standards (Austroads 2009a; 2009b; WA Department of Transport 2011). According to Moudon and Lee's (2003) typology, the audit tool evaluates the quality of the walking routes within an area. A search of Australian and New Zealand transport department and partner organization websites found a selection of route based audits. Table 1 provides a brief overview of the walkability audits outlining the categories that make up the evaluation and the means the built environment is evaluated. There are clear similarities between the audit used in this study and other audits available.

**Table 1: Overview of Route Based Walkability Audits**

<b>Name</b>	<b>Author</b>	<b>Evaluation Categories</b>	<b>Means of Evaluation</b>
Community Street Review	New Zealand Transport Agency	Safety from traffic; safety from falling; obstacle free; secure; pleasant; efficient; delay; and direct.	Rating from very bad to very good. Response to statements. Provision for example statements.
Walking Audit Form	Victoria Walks	Footpaths; facilities; crossing the road; traffic; safety (personal); and aesthetics	Rating from 0 to 3. Provision for auditor observation.
Neighbourhood Walkability Checklist	Heart Foundation	Walker friendliness; comfort; safety; and convenience and connectedness.	Yes or no responses. Positive responses are accumulated.
Bikeability Toolkit	Australian Government Travelsmart	Coherence; directness; comfort and convenience; safety; intersections; off-road paths (if applicable); and end-of-trip facilities.	Three types of cycling: commuting; recreation; and primary school student. For each of these there is an option to rate as satisfactory, identify issues, or NA.
Walkability Audit Tool	Western Australian Department of Transport	Overall impression; pathways; crossings; street furniture and signage; personal safety; adjacent traffic; and aesthetics.	Combination: 1) Yes or no. 2) Rating of unsatisfactory/unsatisfactory but acceptable; and satisfactory.

Nine routes within the school's catchment area were selected to be audited. The routes were selected based on the location of households participating in the CATCH project. 9 clusters of households were identified and walking routes to the school from the centre of each cluster were identified. These routes were based on shortest distance measures calculated by the Network analyst tool in ARCGIS and modified by features such as school crossings and footbridges identified during site visits.

Figure 1: Map of Walking Routes (Source: Authors)



The audit was conducted by one of the authors. Each of the routes was audited on separate days during January, February and March in 2013. The audits were carried out at various times between 8am to 3pm in order to reflect the times the children travel to school. Inter-rater reliability tests were not carried out and as such are noted as a limitation of the current study. However, the primary purpose of the current study is not to test the reliability of the audit, rather to investigate the findings of a publicly available walkability audit in relation to children's evaluations of the same space.

A photo-collage exercise was conducted with 51 children participating in the CATCH research project. The children participating in the exercise were aged between nine and twelve years old as this age is considered to be when children are capable of engage in active travel to school independent of adults. In the exercise the children were given disposable cameras and asked to take photographs of what they liked and hated about their neighborhood. They were asked to take the photographs where possible when walking around their neighborhood, including their journey to and from school. After collecting the cameras, developing the photographs and returning them to the children, a photo-collage exercise was conducted in class. The children were asked to construct three collages using their photographs and drawing. Three themes of collages were used entitled: "What I love about my neighbourhood"; "What I hate about my neighbourhood"; and "What I think my perfect neighbourhood is especially if I was exploring it without any adults". The children were asked to annotate their collages to provide further explanation about their use of photographic images.

The photographs and collages were scanned inputted into Hyper-research Version 3.5.2 for analysis. The program allowed each image within the collages to be assigned codes or multiple codes. The coding process was also derived from Boyatzis' (1998) work on thematic coding and analysis. The framework employs four conceptual categories to group codes that emerged during the analysis stage. The categories were: the place or setting where the photograph was taken; the agents or objects framed within the photograph; the activity or behaviour evident or referred to in the photograph; and the attitudes of children reflected in the annotations.

Interviews were carried with seven professionals with some knowledge of walkability audits. The interviewees were transport planners (2), travel behaviour change officers (2), a traffic engineer (1) and advocates for walking (2). Each of the interviewees had developed, used or were considering developing audits that evaluated the quality of the built environment for walking. All interviewees were concerned with issues of walkability at the metropolitan scale as opposed to a small local government authority. Interviewees were based in three Australian cities. The intent of the interviews was to gather generalised knowledge of the practical contexts of walkability audits. The interviews lasted from 45 minutes to an hour each and questions were asked concerned the reasoning behind the selection of different types of audits; the identification of the range of stakeholders involved in auditing; evaluation of the outcomes of audits; and gathering knowledge of the application of audits in school environments.

## **4 Findings-Walkability Audit**

The walkability audit tool was separated into six categories: general information; paths; road crossings; safety; traffic; and aesthetics and amenities. The findings of the audit are organized according to these categories below.

### **4.1 General Information**

The types of land uses were recorded, indicating the area was primarily residential, with a limited number of small commercial sites. Parks and playgrounds were identified on four of the nine routes. Some light industrial land uses were noted along route two. A general comments box picked up the main features of the audits. These features, discussed in further detail below, included the absence of paths along the route or on streets linking to the route, physical obstructions along the path, high volumes of traffic and the presence of steep hills.

### **4.2 Paths**

The audit revealed the types, widths, conditions, obstructions present and connectivity of paths along each of the audit routes. Although each of the routes had good quality paths present along the route, five of the nine routes had a path on only one side of the street for a section of the route. More significantly four out of the nine routes had a section of the route with a pedestrian path absent from the street altogether. The general comments revealed that another route, although having good pedestrian infrastructure, had several streets linking to the walking route that did not have any pedestrian paths.

The average width of paths along each of the routes ranged from 1.3 metres to 2.1 metres. 1.3 metres is marginally above the minimum recommended pedestrian path width for single wheelchair use (WA Department of Transport 2011). Minor issues related to path conditions were noted, including uneven surfaces, debris and sand, however these were noted as not significant enough to create a barrier for walking, cycling or other forms of mobility such as wheelchairs and prams. Some permanent partial obstructions in the form of shrubs that had overgrown the path were noted along two of the routes. However, the most significant barriers to movement were noted in the temporary obstructions categories. Temporary obstructions were noted along five of the nine routes. In four cases these were cars that were parked either partially or fully across the pedestrian path. In the other case, rubbish bins left out on the street for collection formed either partial or total barriers.

### **4.3 Road Crossings**

The school is located on a main road and on five of the nine routes a significant road crossing was required. Each of the identified main road crossings had a measure included to assist the crossing, either a signalized traffic light crossing or a temporary warden controlled school crossing. Of the routes that did not cross the main road, most minor roads had some form of crossing infrastructure such as a refuge island.

The audit identified that the crossings were of good quality. No hazards or design issues were apparent. Significant crossing conditions were of good quality with directional and

warning Tactile Ground Surface Indicators; acceptable kerb gradients; and grab rails. At the signalized crossing the time provided to cross was more than sufficient for the auditor. However, the auditor was an able, bodied adult and noted within the audit that the crossing would need to be evaluated in relation to pedestrians with differing capabilities, such as children and mobility impaired.

#### **4.4 Street Furniture and Signage**

The audit contained a series of questions regarding the presence of street furniture, shade and signage. These related to the comfort and legibility of the walking routes. The audit evaluation found that whereas most routes did not have street furniture, there was a range of benches, low walls to sit on and public toilets associated with a public park adjacent to the school. These areas were shaded by trees. Half of the routes audited were found to have long sections of the walkable paths unshaded. Street signage and road markings were present and were well maintained and clearly visible.

#### **4.5 Personal Safety**

Issues of personal safety were captured in questions relating to the auditors' perception of how safe the route felt according to the presence of people in the street, surveillance from surrounding properties and the presence of street lighting. Street lighting was present, however the audit took place during the day and actual lighting was not verified. All walking routes were visible from the majority of surrounding houses.

#### **4.6 Adjacent Traffic**

Traffic safety was evaluated in a number of ways. The presence of traffic management infrastructure and signage, such as speed humps, chicanes, projecting kerbs and school speed zones, were recorded in all routes. However it was noted that these were primarily in the area immediately surrounding the school. The volume and speed of traffic was evaluated in the audit. Whereas overall this was rated as appropriate for pedestrian safety and amenity (speed limits were conformed to and intervals between traffic allow timely road crossings) there was a spike in the volume of traffic recorded at school start and end times. The area immediately surrounding the school became heavily congested during two of the audits conducted at these times.

#### **4.7 Aesthetics and amenities**

The audit contained four questions relating to the aesthetics and amenities of the routes. These related to the overall attractiveness of the route; whether the route was free of graffiti or rubbish visible; whether it was free of excessive air pollution; and whether there was no excessive noise. Each of the routes was found to be positive in regards to these factors, except route four. Route four briefly followed and required the crossing of a major highway with large volumes of freight traffic, and therefore both noise and air pollution from vehicle fumes were noted.

## **5 Findings-Children's Photographic Evaluation**

### **5.1 Paths**

Footpaths were included as positive features in many of the children's photo-collages. Paths were places to walk, to ride and to access places such as parks and the school. One child noted that their perfect neighbourhood would have "lots of pavement and trees" (See Figure 2 below). Another child expressed a desire for "lots of footpaths and nice places to walk" in their perfect neighbourhood. Many photographs in the 'love' and 'perfect' collages are taken from the footpath perspective. One child photographed the footpath extending through the frame of the photograph, the annotation reading: "How peaceful it is".

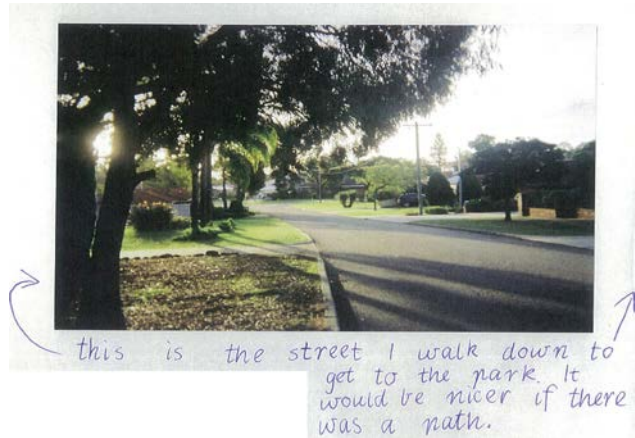
Interestingly, the two main features of paths identified by the audits were key themes in the children's photo-collages. Children were cognisant of obstructions along their paths. One

child's hate collage contains a photograph of a truck that was parked across the footpath. The annotation read: "House getting built. Truck parked in the middle of the footpath ☹️". Children also frequently noted the lack of footpaths. One child noted in their hate collage that the streets had no footpaths, and in their perfect collage included a photograph of a street with good pedestrian infrastructure, annotating it: "More Footpaths!" A collage highlighted the lack of pedestrian infrastructure in one street, the annotation reading: "The only house outside our street to have pavement". Furthermore, one child included in her hate collage a photograph of a streetscape with the annotation: "This is the street I walk down to get to the park. It would be nice if there was a path." (See Figure 3 below).

**Figure 2: Footpath example from a 'love' collage**      **Figure 3: Footpath Example from a 'hate' collage**



lots of pavement and trees.



this is the street I walk down to get to the park. It would be nicer if there was a path.

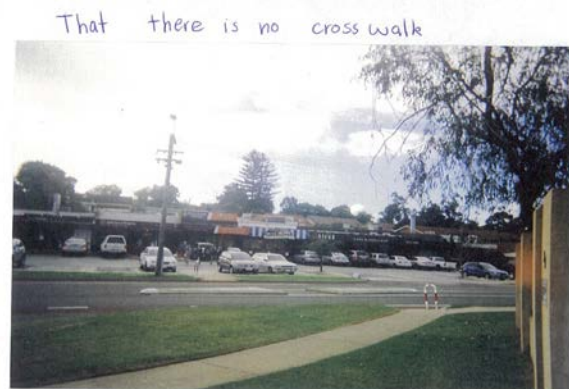
## 5.2 Road Crossings

Children evaluated the quality of crosswalks and road crossings within their photo-collages. The ability to cross roads safely was identified by children as a positive characteristic of the walk to school. In a 'perfect' collage a child included a drawing of children crossing the road at a designated crossing, the photograph labelled: "zebra crossing with traffic lights". Children noted when road crossings were inadequate: "I hate that there is no crosswalk". In another 'hate' collage a child included a photograph of a busy highway. Just out of frame there is a footbridge visible. "I don't like (this) Highway because it makes me feel scared. But I like the footbridge".

Crossing attendants were identified in a couple of the collages. One child noted in their 'love' collage: "Having a crossing guard is great because we can cross the road safely". In another there was a drawing of children crossing the road with the figure of a crossing guard holding up a stop sign included. One child included a photograph of a smiling crosswalk attendant in their 'love' collage writing: "School cross walk guy- Helpful." Another child notes the absence of a crossing guard on her street in her 'hate' collage: "The road I have to cross is too steep and busy and there's no lollipop man (crossing guard)." Two perspectives of road crossings are evident in Figure 4 and 5.



**Figure 4: Crossing example from a 'love' collage**      **Figure 5: Crossing example from a hate collage**



### 5.3 Safety

The safety of the neighbourhood was a theme that was evident in some of the photographs. Safety was noted as a feature of a 'perfect' neighbourhood. One child noted next to a photograph of a street: "I could go around and not have to worry about anything bad." Safe road crossings were noted as being a positive aspect of the neighbourhood. Streets and cul de sac road designs were considered safe by some children because they were perceived to be places to play or be active without worrying about cars. Children also identified streets or places that were not safe. For example, one child refers to the "the dodgy corner that we live next to".

### 5.4 Traffic

Traffic was featured in many of the collages. One child included a number of comments regarding traffic such as "I hate this road because people speed down it." Another child annotated a drawing of a car in their 'hate' collage: "Less fast cars!" Some other children used the photo-collages to express their love for street spaces such as cul de sacs that don't allow through traffic: "It's a quiet and calm cul de sac with not a lot of cars making any noise". Another child includes two photos in her 'hate' collage, one of some cars with the annotation: "So much traffic".

Cars themselves were also featured in the photographs and are evident in all the three types of collages. The family car is often referred to as "My Car". Its inclusion in the love collages may be because of the association with family. One Love collage (Love 101) shows a photograph of a car with a caption: "Seeing family after school". Alternatively, they may just be loved for being a good car. One child writes: "My favourite car. Awesome!" Many of the photographs were taken by children whilst children were passengers in cars. This aspect of the photographic method proved problematic for interpreting the photographs that evaluated traffic negatively. In many cases it was unclear why traffic was hated when children were passengers. Two examples of different perspectives of traffic are evident in Figures 6 and 7.

Figure 6: Pedestrian evaluation of traffic

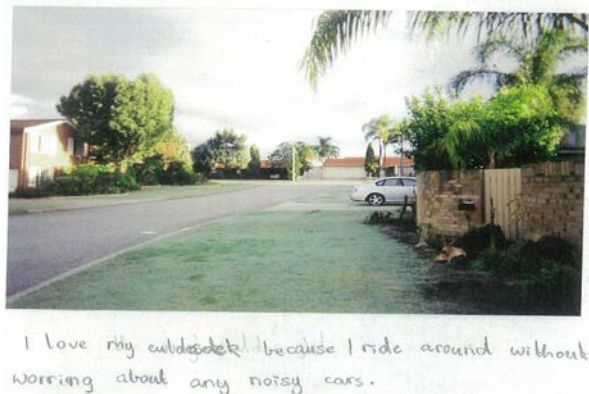


Figure 7: Car passenger evaluation of traffic



Parked cars and car parks featured several times in the collages. One of these featured a car parked over a footpath near the entrance to the primary school: “Not much parking” the caption reads. One child has included three photographs of full car parks at a small neighbourhood shopping centre in his ‘hate’ collage. Although he doesn’t refer to the car park explicitly, he writes “I hate all the traffic” and “I hate rubbish” in various places on the collage. The language to describe traffic in some of the photographs is emphatic. “The petrol stinks!” reads on annotation, referring to a photograph of a petrol pump.

Children expressed in their collages ideas about how the neighbourhood should be without cars or how it could be improved in relation to traffic. One child included in his ‘perfect’ collage a drawing of a road with a 50km/hour traffic speed sign and a speed hump, writing “more speed signs” and “more speed humps” next to each of them. As noted above, improvements such as zebra crossings and traffic signals were put forward by the children as ways to improve the quality of their neighbourhood.

## 6. Findings- Practitioner perspective

The interviewees provided an overview of the current practice of auditing walkability. What was noted was that there was a range of knowledge and experience of the use of walkability audits. Four interviewees promoted walkability audits or training of auditing through their organisation’s websites. The remaining interviewees had general knowledge of walkability audits and expressed an active interest in developing or promoting audits as part of their professional practice. None of the interviewees used audits themselves nor reported any formal evaluation or monitoring of the use of walkability audits by others.

The interviewees from transport planning, travel behaviour change and engineering professions described walkability audits and auditing processes as being closely associated with design codes and standards for transport infrastructure and urban infrastructure. The purpose of audits was to evaluate the built environment in relation to how it conformed to good standards of design. One interviewee noted:

“The standards were the basis for how the (audit) tools were developed. The criteria that the audit tool assessed fitted within the design standards” (transport planner 1).

This standards- based approach to auditing was connected to training sessions run by that particular organisation, where professional and stakeholders were trained in the using audits as a way of evaluating the built environment against existing standards. These interviewees also referred to the potential of audits to measure the walkability of urban environments.

“(We) lack measurement tools. So the tool developed out of the need to measure walkability, as well as a way of identifying what needs improvement” (transport planner 2).

A differing, though not mutually exclusive, perspective was highlighted by advocates for walking and those involved with travel behaviour change. From this perspective audits were not tools to measure walkability or assess standards but rather tools that added weight to arguments for changes within the built environment. The interviewees saw audits as a way of formalising an evaluation of the built environment by ordering categories or areas relevant to walking. Audits presented evidence of a rational assessment that held weight in political or discursive realms. One interviewee used the following example to express this point:

“You can say the trees in the street in this location, well, there hasn’t been one for twenty metres. You know exactly what you’ve got. You’re not making subjective judgements, which for us are quite hard to defend” (transport planner 2).

Similarly, another interviewee noted the importance of audits for community groups that formed around issue of walking:

“Audits are really key for an organisation like us because they enable us to punch above our weight” (walking advocate 1).

There was not one type of ideal walkability audit identified. The interviewees described a flexible approach where different types of walkability audits were selected or adapted to particular uses. One interviewee noted:

“There are a number of walkability audits available. It is a case that if someone’s not happy with the audit available, they can tweak it” (transport engineer 1).

One interviewee (walking advocate 2) distinguished between a technical, standards-based audit approach and a community-based approach. The interviewee considered the combination of two approaches as an ideal way of achieving improvements to walkability. The technical audit combined with a more “pedestrian perception” type of evaluation was considered by the interviewee as leading to more holistic overall evaluation, with the strengths of each type of audit addressing the weaknesses in the other.

Another key theme noted in the interviews was that, through conducting walkability audits, the auditors became engaged in the experience of being a pedestrian in the environment and were able to learn directly about issues relevant to the quality of the built environment for walking. In this sense auditing was part of a broader process of evaluation. One interviewee noted:

“...you can use walking audits and get people to start to think...actually doing this route, you know this pavement is no good. You know these cars are going fast. This is ridiculous- why’s this area 60 km/h when it could be 40 km/h” (walking advocate 1).

Conducted as a collaborative process, auditing for walkability had the potential to enable a range of stakeholders to engage in a learning experience focussed around a formal process of evaluation. One interviewee expressed an intention to develop a formal program of auditing for walkability, one that brought community and civic leaders together. The audits would be conducted in a selected area:

“We would invite local people, invite the local councillor. And then we would walk a five hundred metre segment or a one kilometre segment. We could get several

groups to walk along the streets and basically come back and pull it together as an audit" (walking advocate 2).

Another interviewee (travel behaviour officer 1) noted a similar intention for the future use of audits referring to an audit as a "social event". This collaborative approach, combined with reference to standards and codes, was seen to be a way that audits could be strategically used to validly reflect the quality of the walkable environment and argue the case for improvements in the built environment for walking.

## 7. Discussion

The comparison between practitioner walkability audits and children's photographic evaluations of the neighbourhood area surrounding a primary school provides insight into, what Lewis (2012) refers to as a relative built environment audit. Comparing children's own evaluations of the built environment with a walking audit's evaluation of the same space enables two things. Firstly it allows an assessment to be made of the relevance of audit instruments to active modes of travel as experienced by children themselves. Secondly, it allows us to better understand children as evaluators of the spaces that planners are involved in shaping and designing. By introducing the perspective of planners who have knowledge of walkability audits, potential strategies and directions for auditing that are more relevant to the everyday experience of children may be identified.

There are several significant points highlighted in the comparison between the walkability audit tool, children's photographic evaluation and insight from the practical realm of walkability auditing. In regards to evaluating the quality of walkability for children in school environments the findings highlighted above show that there is a correspondence evident between the walkability audit tool and the evaluation of the built environment by the children. The absence of paths and the presence of physical barriers such as parked cars were the most significant issues noted by the audit tool. Both these issues were reflected within the children's photographic evaluations. Children identified the lack of footpaths as one aspect they didn't like about their neighbourhood. Good quality footpaths, with shade and places to walk were what they liked. Similarly, children responded negatively when access along footpaths was blocked by cars and trucks. Being able to walk unimpeded and safely along pathways was a key feature of quality neighborhood environments for children.

Despite the correspondence between the methods, there were some aspects of the children's photographic evaluations that were not picked up by the walkability audit. Some of the spaces that children identified as the best places to play and be active through riding and walking were those spaces that the audit tool evaluated as 'unsafe'. Pedestrian access ways and parks with areas of remanent bush had little visibility from surrounding houses and no evidence of lighting, yet they were highlighted as special places by children in the collages. The audit also highlighted the connectivity of routes as a positive feature of walkability. Whereas this may be important for children's access to school, the photo-collages showed spaces provided by cul-de-sac design streets served a function as safe play and social places for children.

The research findings do identify some important aspects of the process of auditing that may influence the quality of the evaluation. One is that attention needs to be paid to the timing of auditing the built environment around schools. Several walking routes were conducted at various times during the school day. Some of the audits identified negative aspects of the walkable environment at particular times that were not evident at other times. The short period of time at the start and end of the school day was one example. The congestion of traffic around the school was reflected in some of the audit instruments qualities, such as obstructions to a walkable path (parked cars) and the volume of traffic on the road. Outside these times the quality of the area was evaluated by the audit as excellent. Similarly, on one day of the week the rubbish bins created a hazard for pedestrians. These aspects highlight that audits are less successful in capturing potentially significant barriers to walking that may occur irregularly or only briefly.

The insight provided by the interviewees gives some insight into possible strategies to address some of the audits' blind spots. One suggestion is that audits be adapted or augmented by other methods according to particular situations. The interviewees were aware that there were limitations with particular audits and that by combining different audits these limitations could be addressed. For instance, a transport planner (1) considered that a combination of auditing techniques or outputs would be useful: "You can have a look at the photos, you can have a look at the standard of a particular location....there are a few different audit processes out there, so if we have that data for each of them- it is so much easier."

A further strategy is suggested in the interviews is that audits may bring different groups together in the process of conducting an audit. Freeman and Vass (2010) suggest that better participation processes can both gather direct knowledge of children's everyday experience and include children in the planning processes that shape the urban environment. Audits potentially can play a role in this process of children's participation. The photo-collage exercise showed that children are active and acute evaluators of the built environment. Audits are also valid tools that capture children's experience of walking within school environments. Participatory planning processes may utilize audit tools as a means of formalizing an evaluation of school environments for active travel, capitalizing on children's enthusiasm for evaluation and resulting in valid and planning relevant outcomes. As noted by some interviewees, the role of audits as a collaborative tool creates the possibility of successful integration of children's concerns in the planning processes. The photo-collages also inform how issues of walking can be weighted in evaluations of school environments. The collages highlighted that crossings were particularly important places to the children, as were cul-de-sacs and clearly the presence of foot paths on both sides of the street. These issues could be an important focus for future planning and infrastructure interventions within the case study school.

## **8. Conclusion**

In recent years there has been a steady increase in the number of walkability audits being designed and used in planning and transport practice. It is evident from our research that there is support both from transport and planning professionals and community advocates for this type of tool. Audits provide a rational framework to identify the most critical issues regarding the quality of pedestrian environments. In doing so they provide a means of 'making public' the concerns of pedestrians; which sometimes may be at odds with the efficiency and function of motor vehicles. This point is critical for children who rely on the pedestrian environment for active and independent travel and therefore whose travel needs require articulation.

It has not been the purpose of this paper to test the reliability of individual audits or to use the audit to evaluate the existing performance of the road and pedestrian environment. Instead our interest is in the relationship between an audit and children's evaluations of the same space. For the state government walkability audit tool that we used we found considerable synergy between the observations arising from the use of the audit tool and the observations arising from the children's photo collage exercise. As the research progresses we intend to employ other types of audit tool including ped shed audits using Geographic Information Systems and desktop remote sensing audits. What is emerging from our research is the value of using qualitative methods such as photographs, sketches or collages are an important tool within the audit process. Photographs can be a way of visually recording a particular issue; it can also be a useful device for debate and discussion. Some of the interviewees favoured the idea of a collaborative audit which from our experience of conducting the photo collages with children would suggest a good way forward. The findings here suggest that walkability audits may play an important role within a broader process of

built environment evaluation; one that has the potential to better match the active travel needs of children.

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