Title:

The Power of Perceptions: Exploring the role of urban design in cycling behaviours and healthy ageing

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Abstract

Good urban design has the power to aid in the provision of inclusive journey environments, yet traditionally neglects the perspective of the cyclist. This paper starts from the premise that more can be done to understand and articulate cyclists' experiences and perceptions, as part of a closer linking of urban design qualities with transport planning and infrastructure interventions. This approach is particularly applicable in relation to older cyclists, a group whose needs are often poorly understood and for whom perceptions can significantly influence mobile behaviours. Currently, knowledge regarding the relationship between the built environment and physical activity, including cycling, in older adults is limited. As European countries face up to the challenges associated with ageing populations, some metropolitan regions are making inroads into widening cycling’s appeal across generations through a combination of urban design, policy and infrastructure initiatives. The paper provides a systematic understanding of the urban design qualities and built environment features that affect cycling participation and have the potential to contribute towards healthy ageing. Urban design features such as legibility, aesthetics, scale and open space have been shown to influence and affect other mobile behaviours (e.g. walking), but their role as a mediator in cycle behaviour remains under-explored. Many of these design ‘qualities’ are related to individual perceptions; capturing these can help build a picture of quality in the built environment that includes an individual’s relationship with their local neighbourhood and its influences on their mobility choices. Issues of accessibility, facilities, and safety in cycling remain crucial, and, when allied to these design ‘qualities’, provides a more rounded reflection of everyday journeys and trips taken or desired. The paper sets out the role that urban design might play in mediating these critical mobility issues, and in particular, in better understanding the ‘quality of the journey’. It concludes by highlighting the need for designers, policy makers, planners and academics to consider the role that design can play in encouraging cycle participation, especially as part of a healthy ageing agenda.

Keywords: Urban Design; Cycling; Ageing
1. Urban Design and Cycling

Urban design research has historically displayed a tendency to focus on human scale, with the goal of creating and encouraging vibrant public spaces and places. Research attempting to better understand or articulate cyclists’ experiences of these places is however sorely lacking (Forsyth et al., 2009). This despite good urban design having the power to aid in the provision of inclusive journey environments (Azmin-Fouladi et al., 2007). One can argue that more can, and should, be done to incorporate a ‘cycle scale’ into urban design discussions, developing more tangible links between urban design and transportation aspects of the built environment (Boarnet and Crane, 2001). What limited research that has been conducted has centred on issues of user safety, cycling facilities (including lanes and parking), or creating comfortable spaces in which to encourage recreational cycling (Forsyth and Krizek, 2011).

Human scale has been key to creating successful urban design, and current accepted criteria and principles are based upon this ‘scale’, with designers focusing on pedestrian movement and flow (Rowley, 1994). The use of the bicycle as a genuine alternative not only to walking, but also motorised transport, has to date not permeated urban design thinking to any significant level (Forsyth and Krizek, 2011). Questions can be asked as to what level of visual detail is appropriate for cyclists and how to incorporate detailing for high-speed motorists, low-speed pedestrians, and the unique characteristics of those who choose to cycle. Studies are required that elucidate the relationship between the attractiveness of cycling conditions and routes, and the use of bicycling as a genuine means of transportation (Titze et al., 2008). The future for cycling, particularly as a commuting option (Wardman et al., 2007), in the absence of measures to make it more attractive, and better understand what makes it so, is bleak.

With cycling remaining relatively underdeveloped in relation to urban design, one particular demographic who may benefit most from a shift in thinking is older adults. Older adults cycle less than any other demographic of the population (Pooley et al., 2013) a problem especially pertinent in the United Kingdom (UK). With ageing populations across Europe it is vital for governments, policy makers, and place makers to promote and provide places and spaces that encourage and facilitate healthy ageing. Physical activity amongst populations, especially when continued into older age, can positively impact upon health services, as well as individual’s quality of life and wellbeing. The built environment has been illustrated to have a significant role in the provision for, and participation in, physical activity (Berke et al., 2007,
De Bourdeaudhuij et al., 2003, Frank et al., 2003, Handy et al., 2002, Humpel et al., 2002, Lopez, 2012, Van Cauwenberg et al., 2011, Van Kamp et al., 2003, Wendel-Vos et al., 2007), as well as directly creating barriers to people engaging in more active lifestyles.

2. Physical Activities and the Built Environment

Physical activities, like any other human behaviours, are the product of reciprocal interactions between people and their environments (Lawton and Nahemow, 1973). A myriad of research, for example, has identified key urban and environmental variables influencing activities such as walking (Ball et al., 2001, Carnegie et al., 2002, Ewing and Handy, 2009, Forsyth et al., 2009, Foster et al., 2004, Gallagher et al., 2010, Owen et al., 2004, Lovasi et al., 2008). Whilst contact with nature has also been identified has having a positive influence of peoples health and propensity to engage in some form of physical activity (Kaplan, 1995, Maller et al., 2006, Hartig et al., 2003). Questions are being asked about the design of communities from an environmental and health perspective (Frumkin, 2002), such questions require professional groups within health and design to consciously aid the promotion of health enhancing environments for people (Giles-Corti, 2006). There is ample evidence to indicate that places facilitate or impede physical activity, such as cycling, in part due to the level of supportive infrastructure (King et al., 1995), but a number of other features can play a significant role facilitating or impeding activity, such as access to green open spaces (Sugiyama and Ward Thompson, 2008); urban aesthetics (Ball et al., 2001); land use diversity (Gidlow et al., 2010); vacant or high rise buildings (Borst et al., 2008); tidiness (Ewing and Handy, 2009); quality housing (Barton et al., 2002); graffiti (Coleman, 1985); and the presence of human activity (Borst et al., 2009). Different aspects of the residential environment may even incite different types of physical activity (Stronegger et al., 2010), with some providing the ideal conditions to engage in walking, yet perhaps simultaneously creating barriers to cycling for example.

These studies that highlight built environment features most likely to influence physical activity do not focus exclusively on cycling, either as a form of leisure activity or transportation option, with a strong research focus on walking behaviours amongst communities (Booth et al., 2000, Cervero and Kockelman, 1997, Michael et al., 2006, Pikora et al., 2006, Saelens et al., 2003, Van Lenthe et al., 2005, Borst et al., 2009). The evidence
from these types of studies suggests that “the places where people live, work, and play, and the quality of those places, may be important determinants of walking” (Giles-Corti, 2006, p363). A neighbourhood that elicits more barriers and fewer resources for encouraging physical activity for example, can potentially speed up the ageing process (Bortz, 1982) negatively impacting upon people’s health and quality of life. A person’s relationship to their environment is crucial in attempting to better understand their behaviours, and their personal wellbeing and quality of life associated to these behaviours (Moser, 2009). One must assess not only the relationship between objective facilities and services, but also perceptions and evaluations people themselves place on their immediate surroundings.

3. The Power of Perceptions

“The influence of residential environments is believed to be greater for older adults than for younger adults. Older adults usually spend more time at home (increased exposure to the environment) and they are more vulnerable to environmental constraints (increased environmental docility)” (Wang and Lee, 2010), p1268). Whilst it remains true that one’s perceptions may not truthfully reflect reality (Ding and Gebel, 2012), Gale et al (2011) do deem it plausible that characteristics of neighbourhoods and the built environment in general may have a more noticeable impact upon the wellbeing of older people, as they are less likely to go out to work and have increased risk of mobility limitations. Older adults who illicit a stronger sense of place within their local communities for example, have been shown to record more positive levels of mental health “independently of their socioeconomic status, income, state of health and perceived social support” (Gale et al., 2011), p873). Gidlow et al (2010) concur that socio-economic factors cannot satisfactorily explain the associations between neighbourhood perceptions and health, but what can be argued is that we spend a great deal of time and resources in our local places, so it is important to understand how we evaluate and rate these locales (Greenberg and Crossney, 2007).

Older people can be particularly sensitive to the characteristics of urban form (Dannenberg et al., 2003, Tranter et al., 1991, Lovasi et al., 2008), with urban design championed as a principal component in the bid to increase physical activity in older generations (Berke et al., 2007, Patterson and Chapman, 2004, Li et al., 2005). This sensitivity has been attributed to a range of variables unique in older adults, such as physical and mental decline associated with age, reduction in social networks and support, and increased fragility (Yen et al., 2009, Shaw et al., 2007). In addition older people are more susceptible to the direct influence of
individual perceptions, especially on issues such as safety, neighbourhood design, and aesthetics (Forsyth and Krizek, 2011; Townshend and Lake, 2009). This is perhaps due to the notion that older adults are viewed as more vulnerable to the influences of their immediate physical environment as they tend to travel outside of these areas less frequently than younger adults (Glass and Balfour, 2003). Previous studies into cycling have persistently highlighted the power of perceptions with regards to safety, with the perception of safety often displaying more meaningful influence on mobile behaviours than the factual recorded safety data. Perceived neighbourhood safety for example is most associated with lower prevalence of physical activity among adults aged 65 years and older (Troped et al., 2001, p197). Perceptions can mediate between physical features and mobile behaviour, with these features influencing the quality of the environment both directly and indirectly through the sensitivities of individuals. Wang and Lee (2010) recommend further studies on the relationship between the urban environment and activity amongst the older population, considering in more detail the features that can act as activity promoters or barrier at both the site and neighbourhood levels.

Perceptions of place from the people who populate them can be one of the key definers for neighbourhoods and towns, what is expected from a place and how it is identified will differ from person to person (Jenks and Dempsey, 2007). It is therefore critical that local views and perceptions are reflected in research that attempts to better understand or improve aspects of neighbourhoods. The US National Commission on Neighbourhoods argue that a neighbourhood or local place can actually be defined as “what the inhabitants think it is” (cited in Hallman, 1984).

Perceptions can mediate between physical features and mobile behaviour, with these features influencing the quality of the environment both directly and indirectly through the sensitivities of individuals. It is in the combination of these physical features, the urban design qualities, and individual perceptions, that we can assess relevant influences that affect people’s travel patterns and behaviours. One must measure these variables sufficiently to better articulate the relationship between the physical urban form of place and mobile behaviour. “Studies based on a variety of models have shown the importance of attitudes, motives, perceived benefits and barriers, self-efficacy, social influence of family and friends and the intention to change behaviour for participation in general physical activity” (de Geus et al., 2008), p698).
The ‘ecological model’ (Blanco et al., 2009) has the potential to aid in discerning factor scales, from the policy scale (including physical features) to the individual scale (including education programmes etc.). This model incorporates three strands, individual factors, social-environmental factors (highlighted by (Wendel-Vos et al., 2007) as critical), and physical environmental factors.

- Individual factors – attitudes, preferences and beliefs – also confidence (self-efficacy)
- Social-environmental factors – the cultural norms of the community, collective behaviours etc.
- Physical environmental factors – the type of land-use patterns, urban design features, and transportation infrastructure

(Wumpel et al., 2002) concur that both perceived and objectively determined environmental attributes particularly aesthetics, convenience, and access, are associated with an increased likelihood of physical activity. It is likely that there will be different environmental influences on different types of activity (Owen et al., 2004); with a growing need emerging to better understand the influences, particularly within urban design, on cycling as a physical activity.

It may actually be the case that environmental interventions do not increase physical activity across the whole population, but in the less healthy, the unemployed, and the retired, as these demographics are often more affected by neighbourhood characteristics (Forsey et al., 2009). In any study of older age groups such information can be invaluable in designing and implementing a research agenda that is best suited to make tangible differences in both policy production and improving cycling numbers. Urban design principles can play a key role when aligned with ecological health models to increase physical activity (Badland and Schofield, 2005), even if only incidentally.

4. Facilitating Cycling: Facilitating Physical Activity

So what characteristics of the built environment best facilitate physical activity, with a specific focus on increasing the propensity of the population to cycle? A range of environmental attributes are deemed of moderate or high importance (Owen et al., 2004), they include aesthetics; distance; neighbourhood environment; traffic; access; open spaces; amenities; safety; pleasurable experience; age of home; practical environment; infrastructure;
convenience; neighbourhood quality; land use mix; ease; street lighting; crime; cycle lanes.

Whilst Forsyth and Krizek (2011) attempt to break down some of the finer elements of detailed design, highlighting the need to be aware of the principles of proportion, transparency, building complexity, character, landscaping, materials, textures, speed and height of cyclist. The question remains as to what level of detail is necessary to increase cycle journeys and facilitate people to engage in a physical activity which in turn leads directly to healthy ageing and improvements in individual wellbeing and quality of life. If our environments are geared towards vehicular usage and pedestrian flow, then cycling can be classified as the ‘forgotten middle’. An opportunity therefore presents itself to begin the process of rearticulating places from a cycle perspective, improving the quality of potential journeys and increasing enjoyment levels.

It is in the combination of the physical features of the built environment, the urban design qualities, and individual perceptions, that we can assess relevant influences that affect people’s travel behaviours. The visual appeal of a place or cycle route can have a powerful affect, individuals reactions to ‘aesthetics’ for example is a key aspect of how people view and perceive their surroundings, which can significantly impact upon mobility and physical activity (Saelens et al., 2003, Humpel et al., 2002, Ball et al., 2001, Nasar, 1994, Hoehner et al., 2005). Even less tangible attributes such as sense of community and place can be a significant driver in increasing physical activity (Burgoyne et al., 2008). People are more likely to cycle in, or too, places they enjoy visually, whilst conversely avoiding places they perceive as unpleasant (Nasar, 2008). Michael et al. (2006) made a critical finding that suggests for older adults maximising attractiveness or safety of a path, in this instance related to walking, is more important than minimizing the distance to destination, with these design related issues perceived as critical in promoting activity and mobility in later years.

What can be derived from this is that it is equally imperative to have a firm grasp of the purpose of cycling, mobility for travel or leisure plays a role in relation to the physical features and qualities of places (Forsyth et al., 2008).

Cycling can explicitly impact on people’s health and physical activity, but correspondingly important is ‘quality of life’ and wellbeing, which extends to include issues such as personal enjoyment and pleasure. Despite the importance of built environment characteristics for individual wellbeing, few studies assess health related quality of life with the built environment and physical activity (including cycling) (Sarmiento et al., 2010). Built
environment characteristics not only potentially influence quality of life, but it must also be recognised that it is possible that quality of life may directly impact upon physical activities, such as cycling. Cycling should not only be promoted to increase physical fitness and encourage regular active lifestyles, but should assist in delivering a positive interaction with the urban surroundings for all those who choose to cycle or exercise outdoors. Borst et al (2008) argues that perceived attractiveness can cover a myriad of details and features, proffering three main attributes related to walking as tidiness, scenic value, and the presence of activity or other people. There is also a social aspect to quality within the built environment that is particularly critical for older adults and their wellbeing (Bowling et al., 2003, Glass et al., 2006). Walking for example is often associated with more frequent contact with friends and neighbours (Bertera, 2003), and the attractiveness of a setting or locale can encourage this social element, as such places represent good opportunities to engage with others (Sugiyama and Ward Thompson, 2008). Factors such as attractiveness have significant power therefore to deliver an environment conducive to active and healthy ageing in place. Providing communities with the infrastructure where activities such as cycling become genuine options and where people can socialise together outdoors in an active and positive manner, impacting directly upon quality of life and having an influence on individual’s wellbeing.

It has been stated that the decision to cycle can be largely personal (Moudon et al., 2005), rather than solely based on more objective environmental correlates, with many who cycle doing so irrespective of a supportive transport infrastructure. Those who may consider cycling are not necessarily a homogenous group (Tilahun et al., 2007), intimating that improvements to the urban environment with the express purpose of facilitating cycling and other physical activities, and improving health and wellbeing, must take into consideration a wide range of quality measures and individual perceptions. It is perhaps unsurprising that those who cycle do so despite the lack of a quality environment or infrastructure, given the main cycling demographic (particularly in the UK) is males aged 25-35 (Pooley et al., 2011) or those who already possess high levels of fitness, or have a regular active routine in place (Bull et al., 2000). The drop off in numbers into older age is startling, and it is this demographic whose behaviours are influenced more by their neighbourhood design, and as such a better understanding and subsequent improving of design may change the cycling dynamic, providing older cyclists with a viable option to bicycle regularly in towns and cities.
5. Towards a Better Quality

Future research should focus on attempts to better understand the ‘quality of the journey’ for cyclists, looking at the vibrancy and aesthetics that add to the cycle experience (Blanco et al., 2009), as well as unlocking both the perceived and environmental conditions that contribute to the likelihood of cycling (Moudon et al., 2005). Little work has been done to provide a more systematic understanding of neighbourhood context and urban form that aids successful ageing in place, with knowledge regarding the relationship between the built environment and general physical activity in older adults limited (Van Cauwenberg et al., 2011). Urban design provides an ideal platform from which to assess cyclist experiences, as many of the identified and quantifiable qualities cover the gamut of variables that have in the past been shown to influence and affect other mobile behaviours (e.g.- walking), and could be argued to play a role in cycling behaviours. Ewing et al (2006) produced a comprehensive list of perceptual urban design qualities related to walking that are objectively measurable, a number of which are immediately transferable to a study of cycling (with extensive testing). These urban design qualities are associated with the physical features of the urban environment and can be assessed with a degree of objectivity. Individual features are then influenced by these features and qualities, but importantly they are based upon perceptions of them, which must be measured on an individual basis and can incorporate high levels of subjectivity, requiring a well-reasoned robust methodology that aims to explore, understand, and articulate the perceptions of individuals.

List of perceptual qualities highlighted cover 9 key issues (Ewing et al., 2013):

- **Imageability** (distinct / memorable / evoking feeling / capturing attention / sense of place / vernacular architecture?)
- **Legibility** (spatial understanding and ease of navigation / sense of orientation)
- **Enclosure** (streets etc. visually defined by buildings, walls, trees etc. / includes heights and widths and proportions)
- **Human Scale** (size / texture / articulation of physical elements in relation to humans – on a bicycle? Building and street detail important)
- **Transparency** (Degree to which people see and perceive what lies beyond / and human activity)
- **Linkage** (physical and visual connection from building to street etc.)
- **Complexity** (visual richness of a place – architectural / landscape / streets / signage / human activity)
- **Coherence** (Visual order – consistency in scale, character and arrangement)
‘Human scale’ is identified as a critical principle within urban design thinking and practice (Ewing et al., 2006). The challenge exists for urban design to insert a cycling scale into these ‘perceptual qualities’. How best can the views, perceptions, and the unique characteristics of a cyclist be successfully integrated into creating places that prove to be genuinely inclusive, wherein people have the option not only to drive, use public transport, or walk, but also to cycle. A cyclist moves at a different speed, occupies a different space, views and engages with the built environment from a different height to both motorists and pedestrians, can urban design rise to the challenge and design sites that recognise and cater for all three? By doing so urban design has the opportunity to not only provide a more enjoyable environment for cyclists, but also improve the health of the population who take up this option, and impact positively on the wellbeing of individuals and indeed the whole community.

6. Conclusions

“More research is needed to expand the understanding of aspects of neighbourhood environments influencing the quality and quantity of outdoor activities and consequently people’s health status” (Sugiyama and Ward Thompson, 2007), p174).

Any study of bicycling must attempt to innovate beyond the obvious, beyond a previous obsession with junctions, cycle lanes, and safety. All vital issues, but issues that have been researched and discussed at length, with reasonable consensus across the board. Rather what must be attempted is a more collaborative approach across various fields that takes on board all the relevant dimensions of urban design with regards this particular form of transport or activity. One can train their attention on function (complete cycling network); morphology (buildings and landscape define space at scale of cycle); perception (detailed design is cycle scaled as well as human scaled); social issues (clusters of cyclists / interaction); the visual/aesthetic (balance complexity and diversity with need to understand environment at cyclists speed); time (plan for evolution of facilities; different seasons; adaption and redesigns) (Forsyth and Krizek, 2011). By achieving this aim findings can contribute to current knowledge in ways never before conceived, adding a new layer of understanding on what is an emerging research arena.
The key professions (such as transport, urban design, environmental protection, planning, and health) must collaborate not only to accomplish their individual targets, but to create a balanced environment that promotes active transport and improves the health of communities (Giles-Corti, 2006). For such collaborations to be successful in action, each must recognise and appreciate the needs and aims of the others, assisting each other in reaching targets and realising the range of ambitions for place-making (Sallis et al., 2004). This collaborative approach to planning and design is, according to Giles-Corti (2006) “essential to avoid piece meal development” (p364). What will be required is a research agenda that seeks to address issues across these disciplines (Sugiyama and Ward Thompson, 2007). This paper champions the currently neglected and undeveloped arena of urban design, but other disciplines must share a common vision if the realities of our built environment are to change people’s health, wellbeing and quality of life through exercises such as cycling. It is in the targeting of these arenas that future research can equip professionals and policy makers across health, design, and planning, to have proper consideration for modifying places and the built environment to create more liveable communities and promote active and healthier lifestyles into older age (Li et al., 2005).

Future studies require a quality and clarity of measures and methods that are critical to understanding potential connections of urban environment features with activities such as cycling (Brownson et al., 2009). It is necessary to be continuously improving the reliability and validity of both objective and perceived measures (Ding and Gebel, 2012; Owen et al, 2004) and to be combining the use of both in robust and well-rounded methodologies. Giles-Corti (2006) argues that any effective increase in physical activity across local communities will require a targeting of both people and place. The quality of an environment can be evaluated from two distinct perspectives; the technical experts assessment, and the subject based laypersons assessment (Bonaiuto, 2004). Moser (2009) classifies the expert led as ‘objective’ as it involves general measures about the qualities of the built environment, whilst the laypersons is deemed ‘subjective’ as it relies on self-reporting tools through which individual observations and evaluations are expressed. Good urban design that seeks to be inclusive and forward thinking should always recognise the power and usefulness of both types of quality measure.

The drive towards more inclusive environments that facilitate cycling and healthy ageing is also vital in the face of a rising obesity endemic. Obesity is on the rise and reaching critical
levels in a number of developed nations (Mokdad et al., 2001), with populations increasingly overweight. The number of older adults who are overweight is continuing to increase year on year (Flegal et al., 2002, Arterburn et al., 2004), and associated health problems include cardiovascular disease, diabetes, arthritis, and depression – all of which have a significant negative impact upon wellbeing and general health (Johnston et al., 2004, Mehrotra et al., 2004). Physical activity is one of the critical determinants of health (Berke et al., 2007) and as such plays a major role in promoting healthy ageing, which is increasingly a critical agenda for governments and communities. This paper has indicated that the role the built environment can play in facilitating and influencing the activity of older adults, and the importance in getting this right has never been more vital. The cost of doing nothing and allowing lack of exercise and rising obesity levels to continue is significant. Action is required today – and the responsibility lies not only with politicians and individuals, but with those tasked with designing and maintaining the built environment. It is also the responsibility of those who undertake the crucial research that helps shape the places of the future. The gauntlet has been laid, the onus is upon us all to make whatever difference possible, and time is running out to truly affect the necessary change.

References


BULL, F., MILLIGAN, R., ROSENBERG, M. & MACGOWAN, H. 2000. Physical activity levels of Western Australian adults 1999. *Published by the Health Department of Western Australia and Sport and Recreation Way2Go, Western Australian Government, Perth: Western Australia*.


DING, D. & GEBEL, K. 2012. Built environment, physical activity, and obesity: What have we learned from reviewing the literature? Health & Place, 18, 100-105.


