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WALKABILITY MEANS WHAT, TO WHOM? DIFFICULTIES AND CHALLENGES IN DEFINING WALKABILITY

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ABSTRACT

There has been considerable growth in public health research investigating the influence of the built environment on physical activity. Simultaneously, transport and planning professionals have been promoting a change from inactive to active transport modes to reduce traffic congestion and air pollution. A core concept in both areas of research is 'walkability'. Walkable areas are varied and professional opinion on the level of walkability of an area can be contradictory. This study used a researcher-developed questionnaire to assess the environmental factors that influence walking behaviour. Professionals working within the areas of planning, architecture, politics, advocacy, public health and engineering were invited to complete the online questionnaire. All professions agreed that the presence of local quality functional walking routes, the availability of numerous destinations within walking distance and the perception of safety were all key factors that influence the walkability of an area. However, professions disagreed on the role of aesthetic factors; visual interest along a route was given a higher priority by some professions than others. It was concluded that different professions have different understandings of the concept of walkability, and future research should employ qualitative methodologies to investigate these differences further.

Keywords: Walking, Walkability, Smarter travel, Urban environment

1 INTRODUCTION

In recent years there has been considerable growth in public health research investigating the influence of the built environment on physical activity [1-5]. Simultaneously, transport and planning professionals have been promoting a modal change to active transport modes to reduce traffic congestion and air pollution [6-8]. A core factor in both areas of research is the concept of the 'walkability 'of an area.

International literature suggests that walkable areas are favourable to good health and sustainable transport [2-9]. The factors used to identify or define an area as walkable are varied and often contradictory. This is due, in part, to the different opinions held by those responsible for designing and building theses 'walkable' areas [10-14].

2 WALKABILITY

Words commonly used to describe how conducive an area is to walking are 'walkable' or it's 'walkability'. An area which is pedestrian friendly can be deemed to be more walkable than one which is not. Walkability is a multidisciplinary concept which means different things to many different people depending on the context in which it is being investigated. Lo [14] notes that considering the question of 'what is walkability?' it seems that who you are asking is as important as the question.

2.1 Walkability stakeholders

Previous research on walkability and the determinants of walking behaviour has included the views of architects, landscape architects, urban planners, urban designers, transport planners, academics, government decision makers, social ecologists, public health professionals and user advocacy groups [4,12,15].

This multidisciplinary expert opinion was sought in order to develop an understanding of the built environment factors which influence walking. Allender [15] found that public health research relating to walking determinants was reflected in the "accepted wisdom" of those involved in the design process. Lee [16], a spatial planner, found that research in the urban/ transportation fields was "complementary" to the public health research and he recommended that "future multidisciplinary research is likely to promise a better understanding of both the behavioural and environmental aspects of physical activity and physically active travel"(pp167). However, no research was identified that compared how the concept of walkability differed between professionals from various fields of expertise. These professional groups include planners, architects and designers, public health and advocacy professionals, public representatives and engineers. The purpose of this research was to explore the multidisciplinary nature of 'walkability' that exists among these groups and to examine any common ground or contradictory practices that might exist.

Planners

In relation to 'walkability' planners can be divided into two categories, spatial planners and transport planners. Spatial planners are concerned with land uses, they ensure that new developments have access to services, they plan and enforce sustainable development, urban renewal and the diversity of destinations. Spatial planning has two primary functions, forward planning and development control. Forward planners plan for future growth and decide the variety of land uses. Development control planners manage physical development by processing planning applications and enforcing planning law [17,18].

Transport planners provide for the movement of people including the design, routing and provision of roads, public transport, footpaths and bicycle lanes. They measure and project the demand for transport modes and design systems to suit and inform decisions on transportation investment [19]. Their role is fundamental in generating trips. The built environment factors which planners and transport planners consider as tools to encouraging walking are densities, land use mix and the formation of the street network [2,20]. Transport for London has a walkability index [11] which treats walkability solely as a framework for walking. It outlines factors and instructions for the provision of pedestrian infrastructure in a format similar to motorised transport design manuals.

Architects and Designers

Professionals involved in the design of streetscapes are primarily urban designers, architects and landscape architects. Urban designers have been advocating walkable communities for decades [21]. Lynch [22], Gehl [23] and Cullen [24] suggest that successful, comfortable and safe places encourage people to walk and explore on foot. Similar to spatial and transport planners, urban designers emphasise nearby destinations with quality routes to access them as factors to encourage walking trips. However, they go a step further than the planers and highlight the need for routes to offer comfort and visual delight in order to make the trip enjoyable [10,24,25]. Architects and landscape architects design for comfort and visual delight.

Public Health and Advocacy Professionals

Advocates can be divided into two groups, those whose main purpose is to promote health through walking, and those who want to promote walking for its own sake as a pleasurable activity.

Studies from public health researchers include those to determine the hierarchy of factors that influence walking [4], differentiate between perceptions, and actual measures of neighbourhoods [26], and those that determine how different cohorts of society are influenced [2,27].

Walking advocate Les Burden defines Walkability as "the extent to which the built environment is friendly to the presence of people walking, living, shopping, visiting, enjoying or spending time in an area" [28]. Community based walkability advocates produce a more holistic definition of walkability as they are not confined to a particular research areas or limitations determined by their professional training.

Public Representatives

In Ireland, local government planning, engineering and transportation planning departments oversee urban and rural development, the design of which is sometimes undertaken by private design consultancies. Local governments are advised and informed by national policies and strategies developed by government departments and agencies such as the Department of Transport; the Department of the Environment, Heritage and Local

Government; the Department of Community, Rural and Gaeltacht affairs; and the National Transportation Authority. The policies, plans and budgetary spending proposals of these government agencies or departments are approved by elected national or local government officials. In this role they have the potential to influence the financial resources allocated to walkable environments.

Engineers

Whilst the transport planners decide the routes, engineers are tasked with designing, building and maintaining of the pedestrian infrastructure and road crossings along the route. In the absence of street design standards, the design of such infrastructure is guided by standards such as the Design Manual for Roads and Bridges (DMRB) written for large highways. In the DMRB priority is given to motorised vehicles and infrastructure for pedestrians is often only considered "where the perceived level of usage by pedestrians justifies their inclusion" [29] (pp. 4/1).

2.2 Summary

In summary, walkability is a complex issue. Many descriptions or definitions are used by individuals, professionals or groups to articulate what they mean by the concept of walkability. Evidence suggests that walkability definitions to date are a combination of the hierarchy of factors relevant to the person defining, and reflecting the needs of their target group. It was also noted that some factors can be more or less influential on walking behaviours depending on climate and cultural factors. The purpose of this research was to explore the multidisciplinary nature of 'walkability' that exists among these professional groups.

3 METHODOLOGY

3.1 Questionnaire development

The international research team consisted of individuals qualified in the areas of public health, exercise science, transport planning, sociology and political science. A review of literature on walkability and on the built environment determinates of walking was undertaken by the research team, and over a 9-month period a list of factors known to influence the 'walkability' of an area was generated. An additional number of exploratory items were also included in the final list.

Factors

This list of environmental (physical and social) factors (47 items) was converted into a web-based questionnaire. The questionnaire used a 5-point Likert scale from 1 – very bad for walkability to 5 – very good for walkability for items like 'Cul-de-sacs' or 'Poor air quality/ presence of air pollution'. Negatively worded factors were reverse coded to allow for comparative analysis on a continuous scale.

Study hypotheses

Respondents were asked 'to what extent do you agree with the following statement', each statement reflected a study hypothesis. Statement 1: 'Human health is affected by the way we plan and design our communities and transport systems and Statement 2: Carbon emissions are effected by the way we plan and design our communities and transport systems'. Responses were measured on a 5-point Likert scale from 1 – Strongly Disagree to 5 – Strongly Agree.

3.2 Validity testing

Nine researchers evaluated the validity of the questionnaire, by completing it and then discussing the validity of each question and its corresponding responses. These discussions were facilitated by a single researcher (Leyden) and took place in face-to-face meetings or on the telephone. All of the validity testers, worked in relevant areas (universities or government), had PhDs and were based in Ireland (n=6), the United States (n=2), or Spain (but from France) (n=1). Most had considerable experience with questionnaire design and analysis and most had conducted research related to walkability or the built environment. All input was discussed and recorded and used to improve the design, validity and quality of the instrument used in this study.

3.3 Reliability testing

A 7-day test - retest reliability analysis was carried out on the questionnaire with exercise science, transportation planning and spatial planning students (N=66, 58% male, average age 21.2yrs ± 1.28). Level of agreement at time one in comparison to time two was assessed using Statistical Package for Social Sciences (SPSS) statistics software, version 17.0. Level of agreement was acceptable ranging from 40%

to 74% for built environment factors and 52% to 84% for demographical factors.

3.4 Recruitment and distribution

The stakeholders identified for this study were professionals and academics from the areas outlined in section 2.1. The questionnaire was hosted on www.surveymonkey.com and the survey link was distributed by email.

Lists of potential research participants were generated from a number of strategies. The entire population of elected public representatives for urban regions of the Greater Dublin Area were targeted. The delegates attending relevant conferences hosted by the Department of Transport, the Irish Sports Council, the Health Service Executive and the Engineers Ireland were selected. A systematic identification of relevant third level courses was undertaken to identify academics. Individuals from the identified stakeholder fields were contacted from listings from the golden pages telephone directory and from an internet search using the google search engine.

Once this list of potential participants was generated, two recruitment methods were employed. Firstly, emails with the survey web link were sent directly to individuals and secondly emails were sent to companies and institutions for wider distribution.

3.5 Ethics

Ethical approval for this study was obtained from the Dublin City University Research Ethics Committee.

3.6 Data Analysis

All data were stored, cleaned and analysed using Statistical Package for Social Sciences (SPSS) version 17. Means, standard deviations and proportions were used to describe the data where appropriate. For each professional group, variations in data on level of agreement with study hypotheses and on factors influencing walkability were examined using a one-way independent ANOVA, with Games-Howell post hoc tests. Only factors found to be significantly different between groups are reported in the results.

4 RESULTS AND FINDINGS

4.1 Response rate

A response rate of 28% (N=173 out of 609) was obtained from the individual emails recruitment method. An additional 46 surveys were completed by the second recruitment method, giving a total of 216 responses. Independent samples distribution analysis was carried out to assess differences in the age, gender, profession or level of streetscape design experience between respondents recruited from both survey links. No significant differences were found between the samples on any of these variables, and so both datasets were combined for full analysis.

Area of work

Respondent numbers, grouped by area of work are shown on Table 1. Geographers were grouped with spatial planners and environmental policy professionals were grouped with public health and advocacy professionals.

Table 1: Survey response distribution by professional group

Professional Group	Number	%
Spatial Planning (SP)	33	15
Transport Planning (TP)	39	18
Architecture & Design (AD)	36	16
Public Health & Advocacy (PHA)	28	13
Public Representative (PR)	38	17
Engineering (E)	42	19
Total	216	100

4.2 Agreement with hypothesis

The mean and standard deviation score for agreement with the study hypotheses were 4.66 $\pm$ 0.6 for human health, and 4.64 $\pm$ 0.6 for carbon emissions. The group statistics are presented on Table 2.

Table 2: Agreement with hypothesis statements

Profession Group	Human Health (p<0.05)	Carbon Emissions (p<0.05)
Spatial Planning (SP)	4.64 (.5)	4.70 (.5)
Transport Planning (TP)	4.62 (.7)	4.64 (.5)
Architecture & Design (A&D)	4.83 (.6) [1]	4.78 (6)
Public Health & Advocacy (PHA)	4.89 (.3) [2]	4.71 (.5)
Public Representative (PR)	4.68 (.7)	4.68 (.5)
Engineering (E)	4.38 (.8) [1,2]	4.38 (.8)

Note: Values are means (standard deviations). ANOVA $p<0.05$. Games-Howell post hoc, [1] E vs A&D, $p<0.05$, [2] E vs PH&A, $p<0.01$.

A significant difference was recorded between professional groups on their level of agreement with the human health hypothesis (F(df)=3.04(5), p<0.011), and post-hoc tests revealed that this difference was due to the mean score of engineer group being significantly lower than either public health and advocacy, or architecture and design groups (Table 2). A borderline between group difference was found on the carbon emissions hypothesis (F(df)=2.3, p<0.046), however this difference was not substantiated in the post hoc analyses. Factors influencing walkability

The top five environmental factors that influence the walkability of an area according to the respondents were i) well maintained footpaths, ii) services (e.g. shops, schools) within walking distance of peoples homes, iii) well designed pedestrian crossings, iv) crime rate, and v) access to parks or other green spaces (Figure 1). The factors with the least influence were building height, residential density and pedestrian bridges.

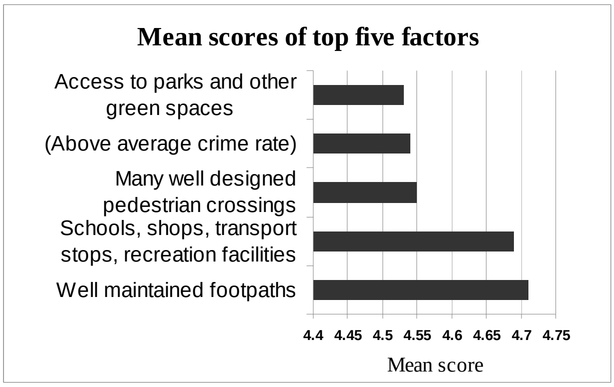

Figure 1: Mean scores of top five most influential factors

A significant difference was recorded between professional groups on the contribution of seventeen of the forty seven factors to the walkability of an area. These factors are shown on Table 3. Spatial planners rated destinations, pedestrian crossings and well maintained footpaths as their top three influential factors. They rated attractive gardens, people begging and footpath congestion significantly lower in their influence on walkability than architects and designers, engineers and public representatives respectively.

Transport planners rated well maintained footpaths, destinations and cul-de-sacs as their top three influential factors. They rated seven factors significantly lower than architects and designers; these included overlooked routes, unique characteristics of the area, attractive gardens and mixed age profile of people living in the area. They rated four factors lower than public health and advocacy professionals; these included the presence of benches and mixed age profile of people living in the area. They rated the influence of pedestrian bridges significantly lower than either public representatives or engineers.

Architects and designers rated walkability factors higher, on average, than all other professional groups. Specifically, they rated destinations, well maintained footpaths and green spaces as their top three most influential factors. On only one factor, the presence of pedestrian bridges over roads, did they rate its influence significantly lower than any other professional groups (these were public representatives, public health and advocacy professionals).

Public health and advocacy professionals and public representatives rated well maintained footpaths and destinations as their top two, while public health placed proximity to green spaces as number three and crime rate was the third influential factor for public representatives. Both groups rated the overlapping functions of an area and if walking routes were overlooked significantly lower than architects and designers

Engineers rated walkability factors lower, on average, than all other professional groups. They ranked the crime rate of an area ahead of well maintained footpaths and pedestrian crossings in their top three factors. They rated eight factors significantly lower than architects and designers, and four significantly lower than spatial planners. These factors included proximity to services, proximity to friends and family homes, availability of public spaces for people to gather and residential density.

5 DISCUSSION

5.1 Findings on Study Hypotheses

This study represents the views of numerous stakeholders from different professional groups involved in designing and building walking environments or promoting walking behaviour. This group agreed that the way we plan and design our communities and transport systems affects human health. The level of endorsement was significantly lower among engineers than other professionals, indicating a potential lower

Table 3: Mean scores and standard deviations for factors by area of work

	Professional Groups						
Walkability Factors	**SP**	**TP**	**AD**	**PHA**	**PR**	**E**	**Games Howell Post Hoc**
Schools, shops, transport stops, recreation facilities and other services within walking distance from people's homes	4.85 (.4)	4.59 (.8)	4.92 (.3)	4.75 (.4)	4.68 (.6)	4.45 (.6)	E<AD[2] E<SP[1]
Friends/ family's homes within walking distance	4.52 (.5)	4.32 (.6)	4.63 (.5)	4.46 (.70	4.35 (.6)	4.24 (.5)	E<AD[1]
Public spaces where people can gather	4.18 (.5)	4.00 (.6)	4.31 (.8)	3.88 (.8)	4.11 (.7)	3.59 (.8)	E<AD, SP[2]
Mixed land use (variety of shops, residences, amenities and other uses)	4.31 (.6)	4.14 (.7)	4.33 (.5)	4.23 (.7)	4.07 (.6)	3.95 (.5)	E<AD[2]
(Low residential density)	3.38 (.8)	3.27 (1.0)	3.59 (.8)	3.12 (.9)	3.03 (.8)	2.80 (.9)	E<AD[2] E<SP[1]
Over lapping day and night functions in an area	4.34 (.5)	4.11 (.7)	4.67 (.5)	4.04 (.6)	4.18 (.5)	4.20 (.6)	E, PHA, PR, TP< AD[2]
Route overlooked by occupied buildings, shops and residences	4.42 (.6)	4.16 (.7)	4.64 (.6)	3.70 (.9)	3.84 (1.0)	3.66 (.9)	E<SP[2] E, PHA, PR <AD[2] TP < AD[1] PHA < SP[2]
(High walls surrounding properties)	4.09 (.7)	3.94 (.7)	4.42 (.7)	3.89 (.8)	4.03 (.7)	3.83 (.7)	TP<AD[1] E<AD[2]
Unique areas with personality and character	4.24 (.7)	3.92 (.6)	4.51 (.6)	4.48 (.6)	4.19 (.7)	4.27 (.5)	TP<AD[2] TP<PHA[1]
(Cul de Sac's)	4.25 (1.0)	4.54 (.7)	4.50 (.6)	3.96 (1.0)	3.89 (.9)	4.17 (.9)	PR<AD, TP[1]
Attractive gardens & trees along route	4.09 (.6)	3.95 (.6)	4.50 (.5)	4.25 (.6)	4.38 (.6)	4.17 (.7)	SP<AD[1] TP<PR[1] TP<AD[2]
Benches to stop and rest	4.24 (.7)	3.92 (.5)	4.39 (.6)	4.33 (.5)	4.25 (.6)	4.15 (.6)	TP<AD, PHA[1]
(People begging)	3.72 (.7)	4.19 (.7)	3.72 (.8)	4.00 (.8)	4.17 (.8)	4.20 (.7)	SP<E[1]
(Congestion on footpaths)	3.67 (.8)	3.89 (.6)	3.81 (.7)	4.08 (.6)	4.29 (.7)	4.00 (.8)	SP<PR[1]
(Large flat carparks)	3.91 (.7)	3.74 (.8)	4.19 (.8)	3.41 (.8)	3.91 (.8)	3.90 (.7)	PHA < AD[2]
Mixed age profile of people living in the area	3.74 (.9)	3.47 (.6)	4.03 (.8)	4.08 (.6)	3.61 (.6)	3.70 (.7)	TP<AD[1] TP<PHA[2]
Pedestrian bridges over roads	3.52 (1.1)	2.94 (1.1)	3.25 (1.1)	4.04 (.8)	4.04 (.9)	3.73 (.9)	TP<PHA, PR[2] TP<E[1] AD<PHA, PR[1]

Note: Values are means (standard deviations). $^{1}p<0.05$, $^{2}p<0.01$. Due to reverse coding range of scale 3-5, where 3 = no influence and 5 = influential. Reverse coded items are in parenthesis priority of this area. No group differences were recorded on the level of agreement on how the way we design our communities and transport systems affects carbon emissions. All groups strongly agreed with this hypothesis.

5.2 Findings on walkability factors

Respondents indicated that a common understanding exists on the importance of well maintained footpaths which is consistent with the literature across disciplines [1-5,10-12,14,20-28]. Analysis of data revealed that beyond the functional path professional groups think differently about walkability. Strategic planners and architects and designers rate the proximity to services/destinations top of their list of influential factors consistent with their professional descriptions [10,18].

Architects and designers rate significantly higher on more factors than any other profession and gave the highest mean score to the majority of factors suggesting a greater understanding of walkability consistent with statements by Forsyth and Southworth (2008) [21].

Engineers display a functional perspective on walkability which lends support to Lo (2009) [14] who highlighted the tendency of engineers and traffic planners to treat pedestrians like motorised vehicles with little consideration for factors not relating to the functional route. Engineers generally rate walkability factors lower than other professions. This would suggest that engineers are less aware of the impact that the built environment can have on an individual's decision to walk. Consideration of the fact that engineers and public representatives rated overlapping day and night functions of an area, overlooked routes and the influence of high walls significantly lower than architects and designers and rated crime in their top three factors influencing walkability would imply a lack of understanding of the functional purpose of these factors on the safety of an area.

Traffic planners were high on connectivity factors (the influence of cul-de-sacs) and proximity to destinations, but significantly lower than architects and designers on aesthetics (unique areas, gardens and trees) which supports the methods recommended by Frank and colleagues (2008) [2] and Cervero and Kockelman (1997) [22] to measure walkability.

This study found that residential density rated second lowest on influence on walkability out of forty seven factors. This is contradictory to many studies [1-5,20,26,27]. These studies suggest that higher densities result in closer proximities to services. The high ranking of proximity to destinations and the low ranking of residential density would suggest that density itself is not an issue provided services are nearby.

The results also highlighted potential differences between the ideal theoretical perspectives and the actualities that exist. Public representatives and public health and advocacy professionals rated the influence of pedestrian bridges significantly higher than transport planners and architects and designers. There is an accepted understanding among designers that pedestrian bridges do not always function as intended, as outlined in Räsänen and colleagues (2007) [30], this research suggests that this may not be apparent to public representatives and public health and advocacy professionals. Similarly, public representatives rated the influence of cul-de-sacs significantly lower than transport planners and designers; this highlights a potential conflict of understanding of the influence of cul-de-sacs/ closed off estates, which have been popular in recent years, on the walkability of the area.

Public health and advocacy professionals rate green spaces as the third most influential factor on the walkability of the area. The also rated unique areas with personality and character, benches to stop and rest and a mixed age profile recognising the recreational and social aspects to walkability.

6 CONCLUSIONS

The findings suggest that all professions agree that the presence of quality functional routes, destinations within walking distance and perceptions of safety on the walkability of an area. However the importance of aesthetic factors, the visual interest along a route, the presence of cul-de-sacs, the availability of benches, and having people of mixed age profile in an area received a higher priority for some professions than others. Ultimately, this difference in opinion could affect what is included in an area or what is excluded. Our challenge is how to communicate the key factors influencing walkability to the key decision makers who design and build our environments.

7 ACKNOWLEDGEMENTS

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