



Provided by the author(s) and University College Dublin Library in accordance with publisher policies. Please cite the published version when available.

Title	Urban green space for health and well-being: developing an 'affordances' framework for planning and design
Authors(s)	Lennon, Mick; Douglas, Owen; Scott, Mark J.
Publication date	2017-06-19
Publication information	Journal of Urban Design, : 778-795
Publisher	Taylor and Francis
Item record/more information	http://hdl.handle.net/10197/8518
Publisher's statement	This is an electronic version of an article published in Journal of Urban Design, 22 (6): 778-795 (2017). Journal of Urban Design is available online at: www.tandfonline.com/doi/abs/10.1080/13574809.2017.1336058 .
Publisher's version (DOI)	10.1080/13574809.2017.1336058

Downloaded 2022-08-11T15:46:54Z

The UCD community has made this article openly available. Please share how this access benefits you. Your story matters! (@ucd_oa)



Urban green space for health and well-being: developing an 'affordances' framework for planning and design

Mick Lennon¹, Owen Douglas, Mark Scott

School of Architecture, Planning and Environmental Policy,
University College Dublin, Belfield, Dublin 4, Ireland.

Abstract

A vast literature exploring environmental influences on human health and well-being has provided renewed interest in connecting planning for the built environment with health initiatives. In response, planners and urban designers have been tasked with translating this knowledge into spatial planning and design schemes. This paper responds to an identified need for a conceptually-informed framework for green space planning and design for health and well-being that moves beyond attribute-descriptive studies. The notion of an 'affordances star' is proposed as a means to maximise the functionality and inclusivity of green space for health and well-being.

Keywords

Planning and design; green space; health; well-being; affordances; conceptual framework

Introduction

The consequences of living in a world of fast food and technological conveniences has prompted growing concern about the emergence of poor physical and psychological health which are increasingly seen as resultant from the inadvertent development of obeseogenic and psychologically demanding environments. 'Lifestyle illnesses' such as heart disease, obesity, diabetes, osteoporosis, mental illness and some cancers are ever more attributed to the poor quality of the environment we inhabit (Corkery 2015, Barton 2010, Berke

¹ Corresponding author: michael.lennon@ucd.ie

et al. 2007, Gast et al. 2007, Lake and Townshend 2006, Frank, Andresen, and Schmid 2004, Latkin and Aaron 2003, Gregg, Pereira, and Caspersen 2000, Coutts 2016). Indeed, many of the nineteenth- and early twentieth-century thinkers who laid the foundations for modern planning drew intuitive links between green space and human health, and how it should be provided, such as Howard's Garden City movement or the US City Beautiful and urban parks movement (Carpenter 2013, Ward Thompson 2011, Arthurson, Lawless, and Hammet 2016, Howard 1965 (1902), *Anonymised reference*). However, modern decision makers in urban planning demand evidence for the benefit of allocating scarce urban land for public open space and a clear design framework to guide its provision. Moreover, given the array of environmental, economic and social issues with which planning is expected to deal, it cannot be taken for granted that better health outcomes will be a leading planning policy priority (Rydin 2012).

In this context, reviews of existing scientific research generally support the intuitive assertion that green spaces contribute positively to improve the physical and mental health of individuals (see for e.g. Mensah et al. 2016, Croucher, Myers, and Bretherton 2007, Renalds, Smith, and Hale 2010). Numerous studies have examined how the design of the public realm encourages people to be more physically active, if it contributes to improved health outcomes, or if it attracts people to be more active (Ord, Mitchell, and Pearce 2013, de Vries et al. 2003). The majority of such studies have found that living in proximity to urban green space generally encourages increased physical activity, positive health behaviours and improved health outcomes (Gascon et al. 2016, Sugiyama et al. 2010, Kaczynski and Henderson 2007, Tzoulas et al. 2007, Giles-Corti et al. 2005, Ellaway, Macintyre, and Bonnefoy 2005a, Giles-Corti and Donovan 2003). The greater part of this research remains focused on issues of 'proximity' and objective measures of accessibility. This may be attributable to both the ease with which this can be quantified and the ways in which the dominant approach to green space provision has been normatively constituted as a matter of spatial equity grounded in an environmental justice paradigm.

The dominance of distribution and accessibility concerns has in turn stimulated a focus within planning on the promotion of green space access standards as a means to translate positive correlations between green space proximity and health into implementable planning policy (Sallis, Bauman, and Pratt 1998, Natural England 2009, 2010, National Trails Office 2012). However, such planning endeavours frequently emphasise 'equitable provision of access' at the expense of the 'quality' of those green spaces accessed. Where the issue of quality is given weight, this regularly focuses on the provision of features such as walkways, benches and sporting facilities selected from a menu of standardised interventions (Cohen et al. 2009, Veitch et al. 2012, Cohen et al. 2006, Norman et al. 2006, Goličnik and Thompson 2010, Owens 2002, Abraham, Sommerhalder, and Abel 2010). While some research has sought to address the deficit of attention allocated to 'quality' in green space planning and design (Ward Thompson 2014a, Ward Thompson and Aspinall 2011, CABE 2005, Fuller et al. 2007), the general lack of emphasis given this issue is an understandable phenomenon given that the concept of 'quality' doesn't easily lend itself to the formulation of policy or design that is applicable across an administrative area of varying socio-economic and/or environmental attributes. Indeed, the principal difficulties with negotiating the concept of 'quality' are that it is perceived as context-specific and subjective, and thereby problematic for the formulation of policy at the municipal or county level.

In this paper we argue that promoting healthier urban environments necessitates moving beyond a unifocal concern with equity in the spatial distribution of green spaces and the allocation of greater attention to the quality of those green spaces provided. However, retarding the effective provision of green space for health and well-being are difficulties in formulating broadly applicable concepts on what constitutes 'quality'. Accordingly, what is required is a framework for conceptualising what quality may entail in the context of green space planning when applied at different sites and against the backdrop of different user desires. This framework needs to supply a means to complement the concept of 'proximity' in enticing people to use green spaces and thereby enhance the potential health and well-being benefits of such areas. This suggests the need to move beyond traditional environmental justice

approaches focusing on the socio-spatial distribution of environmental goods to develop a more dynamic framework that integrates quality and 'use-ability' that embraces green spaces as multidimensional places with a broad array of potential uses. Consequently, this paper advances the theory of 'affordances' as a means to address this issue by demonstrating how it can be employed to develop a framework for conceptualising 'quality' in the planning and design of green spaces. Firstly, we locate this discussion within the emerging green space and well-being literature.

Green space and well-being

The link between environmental conditions and human health is well-established in the literature, with the environment viewed as one of the key determinants of health alongside inherited characteristics, lifestyle, and social and economic variables (Barton 2009)². Indeed, over the past 10-15 years, there has been a re-emergence of interest examining the impact of the environment on health in advanced economies (e.g. EEA-JRC 2013), with a considerable expansion of theoretical and empirical studies investigating the role of contextual factors in the production and maintenance of health variations (Cummins et al. 2007)³ and in measures of quality of life and well-being (Brereton, Clinch, and Ferreira 2008). While there is a longstanding recognition of the negative impacts on health and well-being of environmental 'bads' such as poor air quality and the distribution of various forms of pollution, more recently increasing attention has focused on the potential positive influence on health of environmental 'goods', such as access to 'nature'/biodiversity and the distribution of urban green space (Lake and Townshend 2006).

In the context of urban green space, studies generally examine its quality of life contribution in terms of either physical health or relating to mental health and

² In this paper we adopt a broad definition of health by going beyond a mere absence of illness and objective indicators of health to address wellbeing and quality of life (O'Neill and Simard 2006), which is in line with the seminal definition of health as set out by the World Health Organisation: 'health is not merely the absence of disease and infirmity but a state of optimal physical, mental and social well-being' (WHO 1946):.

³ Understanding the environment as a 'contextual effect' on health implies that similar individuals will have a different health status in different types of places (whereas the 'compositional effects' on health concern individual characteristics within places) (Rasugu Omariba, 2010).

well-being. In relation to physical health, there is a growing body of evidence indicating that the benefits provided by urban green space are a significant influence on health outcomes, particularly when they are easily accessible and exist in proximity to residential areas. For example, in a significant study of 6,919 people across eight European countries varying in wealth, culture and history, it was concluded that the probability of being physically active may be as much as three times greater in residential environments possessing high levels of access to green space, with the likelihood of being overweight up to 40% less (Ellaway, Macintyre, and Bonnefoy 2005b). Other studies substantiate these findings by demonstrating that access to green space increases positive assessment of their neighbourhood by residents and encourages use of local green space for physical activity (Lestan, Eržen, and Golobič 2014, Björk et al. 2008). Such research indicates that significant savings can be made to the costs of public health provision through the conscious design of places to supply greater opportunities for physical activity. Indeed, by employing UK statistics, Mourato et al, (2010) calculated that a benefit from increased accessible greenspace provision of almost £2 billion would have accrued to the UK government in 2001 through savings in the health costs incurred of treating just three physical conditions (coronary heart disease, colo-rectal cancer and stroke) and reductions in morbidity from mental health.

Urban green spaces have also been shown to deliver measurable mental health benefits and contribute to general psychological well-being (Grahn and Stigsdotter 2003, Nielsen and Hansen 2007). Such services are provided through supplying 'restorative environments' (Kaplan and Kaplan 1989), which perform a role in reducing stress from the complex demands of everyday life and helping people cope with depression, bereavement and mental fatigue (CABE 2005). These services may be particularly important within an urban context where exposure to stresses may be more acutely perceived (van den Berg et al. 2010, Beyer et al. 2014a). Epidemiological studies have identified positive effects of green spaces on the self-reported physical and mental health of residents (e.g. de Vries et al. 2003, Maas et al. 2006, van den Berg et al. 2010, Guite, Clark, and Ackrill 2006) and longevity (e.g. Takano, Nakamura,

and Watanabe 2002), with Guite et al. (2006), identifying an association between the presence of 'escape facilities' such as green space and mental well-being across a range of domains.

Given these widely espoused benefits, it is unsurprising that research has increasingly viewed urban green space provision in terms of equitable and just planning outcomes. As recorded by Walker (2012), while environmental justice campaigns and literature have traditionally focused on opposition to the distribution of environmental 'bads' (e.g. waste, pollution), green space represents one of the newer, and least explored, topics to be positioned within an environmental justice framework. The basis for including green space within environmental justice activism relates to its benefits and contribution towards quality of life, health and well-being and has become a topic for traditional socio-spatial distributional analysis (who lives near green space and who doesn't) (Agyeman, Bullard, and Evans 2003, Wolch, Byrne, and Newell 2014, Jennings, Larson, and Yun 2016). These issues are heightened within an urban environment where land is scarce and under pressure for development to maximise land values.

Thus, approaches to urban green space have generally been framed within a traditional Rawlsian perspective of justice, concerned with the distribution of environmental goods (spatial provision and proximity of green space) and procedural fairness in the distribution of environmental goods (the governance of green space and 'rules' or standards producing green space outcomes) – in other words, how and what gets distributed. However, while much research highlights the health benefits of living close to green space, results are more complex. Indeed naïve assumptions of simple cause and effect relationships are unhelpful from a planning perspective. For example, while there is recognition of the relationship between quality environments and health, there is a more limited understanding of mechanisms and of the cause and effect relationships. Where positive associations between physical activity and green space have been recorded, this has often varied by population cohort and studies have variously recommended further research regarding proximity (see for e.g. Gascon et al. 2016, Maas et al. 2006, de Vries et al. 2003) and the

perceived quality or level of attractiveness of green space (Van Dyck et al. 2011, Ord, Mitchell, and Pearce 2013). Furthermore, the existence of greenspace in a locality does not always equate with a health-promoting environment. For example, within an urban context, perceptions of vandalism, safety concerns and poor design may undermine the use of greenspace (Walker 2012). As such, it is clear that the 'quality' of greenspaces is at least as important as 'quantity' and 'proximity' in promoting physical activity.

Nonetheless, this often-neglected aspect of 'quality' has gained increasing recognition through the growth in literature addressing the role of green space in psychological well-being. Studies in this vein have generally identified the positive effects of green areas on the self-reported mental health of residents (de Vries et al. 2003, Maas et al. 2006, van den Berg et al. 2010, Guite, Clark, and Ackrill 2006, Van den Berg et al. 2016). Much work in this field advances an understanding of how exposure to nature provides feelings of 'retreat' and assists in 'restoring' mental functioning. The work of Rachel and Stephen Kaplan (1989) has been particularly influential in this context. They developed the 'attention restoration theory' which suggested that people exposed to high stimulus environments which require extended periods of 'direct attention' suffer mental fatigue and reduced attention span, which can in turn lead to reduced physical and mental functioning (Herzog, Maguire, and Nebel 2003). The theory suggests that carefully designed environments can provide 'restorative settings' with specific qualities and components that are beneficial for restoring physical and mental capabilities (Kaplan 1995, Ulrich and Addoms 1981a). These services may be particularly important within an urban context where exposure to stresses may be more acutely perceived (Corkery 2015, Beyer et al. 2014b, van den Berg et al. 2010).

As urban populations expand, the design and management of green spaces presents challenges to planners, designers and public health officials in providing health-promoting environments. However, promoting healthier urban environments necessitates moving beyond an overriding concern with equity in the spatial distribution of green spaces and the allocation of greater attention to the quality of those green spaces provided. In this context, drawing on the work

of Amartya Sen (1999), increasingly environmental justice literature is moving beyond simply a focus on distribution to examine how those distributions effect well-being and how we 'function'. Instead, the emphasis is on 'capabilities' and individual agency, functioning and well-being to examine what environmental goods do for us rather than simply focusing on their distribution (Schlosberg 2009). This line of reasoning reflects insightful research demonstrating that differences in age, gender, cultural background and educational status influence perceptions of green space, and thus the potential for people to engage with such spaces (Rishbeth 2001, Jorgensen and Anthopoulou 2007, Tveit 2009, Woolley 2008). In turn, this suggests that the planning and design of green space should focus not only on provision, accessibility and distribution, but on design interventions that complement proximity by enticing people to use green spaces to enhance health and well-being through conceptualising user perceptions of green space 'quality'. Consequently, this paper advances the theory of 'affordances' as a means to address this issue by demonstrating how it can be employed to develop a framework for conceptualising quality in the planning and design of green spaces.

The Concept of Affordances

Prevalent approaches to green space planning typically conceive environmental experience as comprising a linear process of causal effects between ontologically discrete entities. Here, the environment and the person are understood as two distinguishable and separate spheres wherein attributes and happenings in the environment are envisaged as producing particular mental states in the independent perceiver (Heft 2010). In essence, the 'perceiver' is envisaged as an 'observer' rather than active participant in the configuration of themselves and the environment in which they are positioned (Anusas and Ingold 2013, Olwig 2008). This observer status pervades thinking in planning, most notably in such planning tools as landscape character assessment and visual impact assessment, but also in terms of the design of public green space (Vouligny, Domon, and Ruiz 2009). Here, environmental preference-based research implicitly assumes that providing increased exposure (Berto 2005, van den Berg, Hartig, and Staats 2007, James et al.

2015) or access to 'greener' spaces (Beyer et al. 2014a, van den Berg et al. 2010) supplies an appropriate approach to planning for health and well-being. While such work has greatly increased our understanding of what needs to be considered in planning, this line of research is frequently more attribute-descriptive than conceptually-informative, thereby limiting its ability in furnishing a workable framework applicable to a spectrum of contexts. Specifically, it focuses on the preferences people as 'observers' may have for different attributes of an environment without properly advancing a nuanced appreciation as to 'why' these preferences exist (Thwaites and Simkins 2006).

Gibson's (1979) 'ecological approach' to perception offers a potential correction to this deficit. At the heart of this approach is the idea that perception is an embodied and dynamic experience. From this position, organisms perceive a world of potentialities identified relative to the scale of their bodies, physiological capacities and temporal biophysical possibilities. Gibson used the term 'affordances' to describe such potentialities, as he needed a new word that could capture the sense of 'relativity' inherent to the concept. Affordances are thus the opportunities or constraints that exist within an environment relative to the characteristics of the organism perceiving them. Crucial to understanding this concept is that it advances a 'relational' ontology wherein 'affordances are both real and perceivable but are not properties of either the environment or the animal' (Chemero 2003, 181). As such, affordances 'emerge' within the relationship between an organism and its environment. In this sense, 'an affordance cuts across the dichotomy of subjective-objective and helps us to understand its inadequacy. It is equally a fact of the environment and a fact of behaviour' (Gibson 1979, 129). To describe this relational phenomenon, Gibson frequently employed linguistic conjunctives formed by attaching the suffix 'able' to a verb or phrase. For example, he described an apple once ripe as 'eatable' or the surface at the edge of a cliff as 'fall-off-able'. In terms of green space, Heft (2010, 19) illustrates the concept by describing a trail through a wooded area leading to a pond. Whereas the trail affords the opportunity for walking, the pond constrains this opportunity, (albeit potentially affording alternate opportunities such as swimming, fishing or sailing toy boats).

The Affordance Dimensions of Green Space

Fundamental to understanding the affordance dimensions of green space is that all aspects of the emerging experience of such spaces are produced in a relative and integrative fashion, such that no dimension exists as an a-priori attribute. Nevertheless, as this emergent experience always exists in relation to a person, to fathom the form of the experience it is necessary to appreciate the characteristics of the person who is in the relationship with that green space (Miller et al. 2014). It is thereby important to acknowledge that different people have different physical and psychological capacities, interests and needs that influence how they relate to their world (Rishbeth 2001, Jorgensen and Anthopoulou 2007, Woolley 2008). Thus, to simply plan green space without respect for difference is to risk curtailing the potential health and well-being benefits of such spaces. For example, Ward-Thompson (2007) has shown how various age groups experience parks differently, with children seeking to build dens, teenagers seeking spaces to hang-out, young parents wanting places to socialise with each other as they observe their children safely playing, and the elderly preferring traditional flower gardens with benches for rest. To this list could be added the needs of dog walkers, joggers, footballers, nature watchers and a host of other potential green space users (Chiesura 2004, Temple, Rhodes, and Wharf Higgins 2011). However, given the relational nature of the affordances concept, it is not simply the needs that must be considered but the emergent relationships between the configuration of the green space and its use. For example, whereas some adolescents have been shown to seek out green spaces that offer opportunities for active recreation in natural settings, (Van Hecke et al. 2016) other adolescents desiring independence from adult supervision seek opportunities for 'retreat' and furtive peer socialisation (Lieberg 1995) through using landform to conceal themselves from observation (Townshend and Roberts 2013). Scale is likewise an important attribute of green space configuration in the consideration of affordances. Indeed, Sugiyama et al (2010) correlated larger park size with enhanced attractiveness. With similar attention to scale, but in a different context, the detailed study of Copenhagen's 'pocket parks' by Pescharadt et al (2016) concluded that whereas

it is difficult for small green spaces to easily combine restoration with socialisation, scalar arrangement might simultaneously facilitate such affordances through the subdivision of these parks into different 'rooms' for distinctive uses. Attention to scale has also been shown to influence affordances at the regional scale whereby connecting a series of small parks into a broader green network increases the perceived opportunities for walking and cycling than would otherwise exist (Little 1990, Erickson 2006).

Moreover, the emergent and dynamic nature of affordances means that they not only differ between people, but also differ with respect to the same person consequent on motivation, time and the effects of ageing to name but some temporal possibilities. For example, Heft (1988) has shown how affordance relationships between children, actions and objects change over time. He notes that while a young child might perceive a tree as a suitable location under which to construct a den, the same child might view that tree as an object for climbing once they grow old enough to physically reach its lower branches. Conversely, Bell et al. (2014) note how the perceived opportunities offered by green space may reduce consequent on the physical challenges of senescence. Cyclical time may also influence affordances. Indeed, most people can easily relate to how the obvious differences of night and day may completely alter perceptions of personal safety within a green space (Luymes and Tamminga 1995), while seasonal variations may influence the intensity with which a green space is used due to weather, appearance or surface conditions (Ulrich and Addoms 1981b).

Thus, a diversity of dimensions must be considered when studying the potential affordances between green space attributes and possible users. However, the challenge of accommodating such diversity presents an opportunity to coherently conceptualise what 'quality' means in the context of green space planning. Specifically, employing the idea of affordances enables the conceptualisation of 'quality' as the successful maximisation of the range of positive affordances experienced by the greatest spectrum of green space users without unduly reducing the positive affordances experienced by another. How to create 'quality' environments that stimulate the emergence of such

positive affordances thereby requires a framework that coherently organises the multiple dimensions of potential green space affordances into a workable reference tool for planners and designers. Such a framework is presented below.

An Affordances Framework for Green Space

The above review suggests that six dimensions interact in producing potential relations of opportunity and constraint. These are namely: space (e.g. landforms); scale; time; objects (e.g. presence of absence of trees, benches, cycleways); actions (e.g. climbing, jogging, bird watching); and the physical and psychological state of the person positioned in relation to these other dimensions. Importantly, none of these dimensions exist independent of the others in producing the experience of 'quality'. Rather, each dynamically interrelates to continually constitute an ever-emerging relationality as the embodied perceiver interacts with the green space. Such interactions thereby continually recreate the perception of quality by profiling the potentialities and constraints of the environment for the person interacting with it⁴. Hence, carefully considering the relationships between these dimensions offers planners and designers a conceptually informed means to negotiate context in fostering quality.

Nevertheless, locating a method to coherently and concisely convey the complexities of these relationships in a manner convenient for use is challenging. A number of options were explored by the authors, including among others: tables, radial diagrams, phase diagrams, recursive and alternating flow charts, as well as stacked and radial Venn diagrams. However, consequent on the relational ontology of the affordances concept, none of these visual methods proved satisfactory in communicating the elaborate

⁴ For example, in the case of an elderly person moving through a green space when walking, the affordances of that space may cyclically change as surface characteristics alter in different seasons: from an undulating wildflower-lined trail with birdsong in spring that affords connectivity between parks, to the same trail in winter that is muddy, slippery on slopes, lacks much border vegetation and experiences localized flooding that impedes access to other parks. This illustrates the relationality between person-actions-times-spaces-objects-scales. The particularities of this relationality may thereby influence the person's perception of the 'quality' of that environment as a location for walking.

interrelationships between perceivers and the affordance dimensions of green space. Therefore, it was concluded that a less conventional and more experimental mode of representation was required. Through this exploratory approach, a 'star' pattern began to emerge by layering the various connections and intersections between perceivers and the affordance dimensions of green space. Thus, an 'affordances star' was formulated as a visual heuristic to assist in the consideration of these relationships (Figure 1). Whereas there exists a modest number of useful 'star diagrams' in the field of design studies, these are primarily concerned with supplying aids for the description and assessment of spatial characteristics (ownership, land uses, visual permeability, management etc) (Varna and Tiesdell 2010), rather than with furnishing heuristics for exploring and deploying a relational ontological perspective on the experience of green spaces. Consequently, the affordances star answers calls to furnish designers with better ways of conceiving and responding to the dynamics of experience (Ward Thompson 2014b, Bell 2014) by offering the prospect of helping to redress a deficit of thinking tools in this field. Furthermore, the affordances star has the benefit of non-specificity to a particular site, climate or user. Instead, it presents a conceptual framework applicable across a range of contexts, thereby maximising its latent utility. Each point of the 'star' references one of the affordance dimensions of green space. Accordingly, when taken together, the six points of the star constitute the green space 'environment' as perceived by the person interacting with it. The 'quality' of that environment, understood as the sense of potential positive affordances present, is dependent on the configuration of relationality between the different points of the star relative to the perceiver.

<Figure 1 in here>

The star is constructed by inversely positioning two triangles. Thus, each point of the triangle is inherently related with the other two points on the triangle (e.g. actions-objects-persons). Also the line joining two points on one triangle intersects lines joining two points on the other triangle. This establishes a set

of multiple relations. To illustrate this, the 'quality' of the green space environment with respect to children can be partially considered: beginning with the point 'actions', there are relationships on the same triangle with the points 'persons' and 'objects' that must be considered (e.g. the compatibility between children-specific attributes (persons), play area equipment (objects) and developmental play needs (actions). As the line between the point 'actions' and 'objects' crosses the line between the points 'spaces' and 'times', the relationships between actions-spaces, actions-times, and actions-spaces-times-objects must also be considered. Thus the following relationalities may be explored in the present example: is the topography suitable for children's play – are there any steep drops nearby? [actions-spaces]; Is the play area supplied with lighting to facilitate late afternoon use in winter? [actions-times]; Is the area suitable for year-round use as a children's play space – does it flood, is it durable? [actions-spaces-times]; Do nearby trees drop leaves onto the equipment rendering them slippery and unsafe for use in autumn? [actions-spaces-times-objects]. This process of exploring the multiple relationships between the different points of the star continues until all the relationships between the points of the star have been considered.

In seeking to enhance the environmental quality of a green space, it is highly probable that different people or groups will approach the space from different perspectives. A potentially useful feature of the affordances star is that those seeking such enhancements can begin to use the star from their perspective. Thus for example, a municipal planner seeking to create a network of parks can begin at the 'scale' point; a landscape architect seeking to (re)design a park can begin at the 'spaces' or 'objects' points; while a public health official seeking to promote the active use of green space can begin at the 'actions' point. Similarly, a voluntary management committee or trust seeking to enhance the recreational or leisure potential of a green space may choose to begin at the 'spaces', 'objects' or 'actions' points depending on the specific objectives for that space. Nevertheless, the relational questioning required in the operation of the star amplifies the potential for a range of positive affordances experienced by a greater spectrum of green space users than would likely be possible should each of these perspectives operate by employing the

conventional non-relational ontological perspective on how green space is experienced. This is because in using the star, the 'scale' concerned municipal planner would have to consider the multiple relationships with 'spaces', 'objects' and 'actions, in addition to considering the multifarious interactions with 'persons' and 'times'. Therefore, the affordances star supplies a practical, yet evidence-based conceptual framework that can be deployed as a tool in seeking to enhance the health and well-being 'quality' of green spaces.

An Affordance Framework for Green Space Planning and Design

Conceiving the environment as a relational configuration of affordances means that engagement with the environment through actions such as walking, climbing and playing games, represents an attempt to 'actualise' the perceived affordances of that environment as a place appropriate for such activities. This attempt to actualise the affordances thereby generates an 'experience'. At the heart of this experience is the degree to which the initially perceived affordances constituting a relationally configured environment are perceived as facilitated or inhibited. In this way, an attempt to actualise the perceived affordances of an environment is a *learning experience*, whereby the constituents of a specific relational configuration (objects, scale, spaces, time etc) prompt greater understanding of the possibilities for future action (Michaels 2003). Accordingly, this experience may supply an opportunity for deeper engagement with green spaces as a person's confidence to engage with such spaces are enhanced. This may consequently increase both the array and depth of affordances perceived to be available in these spaces. Hence, the potential to perceive a green space more favourably may increase as a person becomes more familiar with the use of it. This may thereby both increase the frequency with which a green space is used and the array of activities performed in such a space, thus enhancing the health and well-being benefits experienced.

Therefore, increasing the prominence of green space attributes that are likely to enhance their identification as an affordance relative to an array of users may: (1) encourage the desire to actualise that affordance; (2) enhance

confidence among potential users in the use of that green space; (3) prompt greater frequency and range of uses of that green space; and (4) thereby enhance the potential of that green space to assist societal health and well-being (Withagen et al. 2012).

The 'affordances star' may assist the provision of positive 'learning experiences' by helping those designing green spaces to investigate and respond to the potential relational configuration of the dimensions of embodied perception that prompt evaluations on the 'quality' of such spaces. For example, in seeking to create a shared cycleway-walkway through a green space that will encourage greater physical activity, the green space designer can employ the affordances star to explore the relationality between objects, scale, spaces and time. Here, 'objects' such as finger posts/distance markers that regularly provide direction, and information boards displaying park maps, may be employed to supply orientation to the potential user and thereby stimulate confidence in their ability to knowledgeably navigate the green space. 'Scalar' attention may prompt designers to create a series of looped routes of different distances, some of which may connect across parks and even into regional cycling and walking networks. Referencing this array of route options on the finger posts/distance markers and information boards would offer options to the potential user and enable them to progressively explore the route network as they gain confidence and fitness (objects-scales). Allocating attention to the 'space' dimension could further enhance the learning experience. For example, investigating how best to integrate different landforms into the route to supply variety and challenge may be appropriate. These landform characteristics could then be described on the information boards and related to different route options of different length and difficulty (objects-scales-spaces). Considering how different routes would appear at different times would also be an important design concern. The affordances star would prompt consideration of how different routes would appear at night, in different seasons and in different weather, thereby focusing attention on such issues as lighting and surface materials along the different route options (objects-scales-spaces-time).

Thus, the affordances star may be employed as a heuristic device for reflection in the design process when seeking to enhance and promote the health and well-being potential of green space by fostering positive learning experiences that entice people to engage with such spaces. Given the relational ontology advanced by the approach, operationalising this heuristic requires attention to the prospective users of these spaces. Accordingly, maximising the heuristic potential of the affordances star requires the formulation of a series of 'model users' by the green space designer. To facilitate equity, this series of 'model users' should embrace a life course range that includes the spectrum of context relevant ethnicities, physical abilities, as well as the different genders (male, female and transgender). This can be achieved through the construction of a matrix that is sensitive to the socio-demographic particularities of the place within which the green space is situated. A generalised matrix is provided as Table 1 for illustrative purposes⁵.

<Table 1 in here>

In the context of seeking to enhance green space quality to attract users and thereby assist public health and well-being improvement, the capacities of the space to respond to the range of anticipated use desires by each model user may subsequently be explored by application of the affordances star. Hence, the perception of environmental quality ensuing from the interaction of various affordance dimensions (objects, scales, spaces, actions, times) may be hypothesised relative to a range of potential users. By crosschecking the various design intervention options flowing from the application of the affordance star to the model user matrix, designers can subsequently establish which intervention options are shared between the maximum number of hypothetical model users. In this way, designers can determine which interventions to prioritise when seeking to enhance the attractiveness of green

⁵ This matrix is provided as a generalised example of how such a matrix could be constructed. The specifics of the matrix would necessarily be dependent on the socio-demographic context in which the work is undertaken.

spaces for an array of potential users⁶. Consequently, this affordances framework can help move the impetus of green space planning and design from the prevailing normative concern with distributional equity to a more nuanced focus on the relationally constituted 'quality' of such environments. However, rather than denying the importance of green space proximity to public health, this refocusing seeks to complement such distributional concerns with attention to what draws people from various backgrounds to these spaces. Specifically, the emphasis on affordances advanced in this framework resets the agenda for green space planning from stressing parity of proximity to an interlacing of this concern with a distinct accent on the opportunities for rest, recreation and rejuvenation offered by such environments. It is in this sense, that the affordances framework supplies the prospect of recalibrating the motivations of green space planning and design for health and well-being from a normative concern with the distribution of green space as an objective, yet vaguely defined 'good', to a reinterpretation of this 'good' as the subjectively perceived opportunities afforded to the users of such spaces.

Conclusion

Recent years have witnessed a wave of interest in understanding the environmental influences on human health and well-being with a vast literature emerging that significantly enhances the evidence-base that has provided a renewed interest in connecting planning for the built environment with health initiatives. With this growing knowledge base, planners and designers are tasked with translating this knowledge into spatial planning frameworks and design schemes. This paper responds to an identified need to supply a conceptually-informed framework for green space planning and design for health and well-being that moves beyond the prevalence of attribute-descriptive studies evident in the literature. Both theory and practice have tended to focus on the distribution and proximity of green space, underpinned by Rawlsian concepts of distributive justice that are defined by questions of equity in the provision of environmental/social goods. In this paper, we argue for the need to

⁶ A cost-benefit analysis of these intervention options would also have to inform such prioritisation decisions to ensure maximum return on invested capital, time and effort.

consider *quality* alongside a traditional concern with proximity, and for a more nuanced and dynamic understanding of green space use and perception. To further this, the paper develops the notion of an 'affordances star' to draw attention to green spaces as multidimensional places that are experienced differently by different groups (across age, gender, ethnicity etc.). Therefore, the focus is on how we can maximise what green space does for us in terms of health benefits and not simply measuring their distribution. In this context, quality can be conceptualised in terms of the range of positive affordances experienced by the greatest spectrum of green space users without unduly reducing the positive affordances experienced by another. However, moving beyond analysis, the affordances star approach also provides a heuristic device for planners and designers working at a range of spatial scales to explore relationships and the influence of proposed design interventions.

Nevertheless, as a proposal for rethinking how we engage with the planning and design of green spaces, rather than a blueprint for context insensitive application, the heuristic presented in this paper could be refined in a number of ways. Specifically, the framework would benefit from testing in real world planning and design scenarios. This would enable those engaged with the design of green spaces to validate or refute its utility as a heuristic device, and help identify where the it could be improved. Additionally, greater research into the various affordance dimensions of green space may help better calibrate the framework to the subjective experiences of a wider range of potential users. An array of techniques exist to facilitate this, such as in-situ and ex-situ interviews, photo grouping exercises, behavioural mapping, focus groups and workshops (Hadavi, Kaplan, and Hunter 2015, Carpiano 2009, Dennis Jr et al. 2009, Moore and Cosco 2014, Lindholst, Dempsey, and Burton 2013). Through such iterative use, the affordances based framework presented in this paper offers scope to retune agendas in green space planning and design while concurrently assisting in the prioritisation of intervention options for those working in this field when seeking to enhance public health and well-being.

Funding acknowledgement

This work was undertaken as part of the ECO-Health project, funded by the Environmental Protection Agency (EPA) and the Health Service Executive under Grant Award No. 2015-HW-MS-6, and supports the implementation of the EPA Strategic Plan 2016-2020 – ‘Our Environment, Our Wellbeing’ and Healthy Ireland, the national framework for action to improve the health and wellbeing of the people of Ireland.

Pre-proof

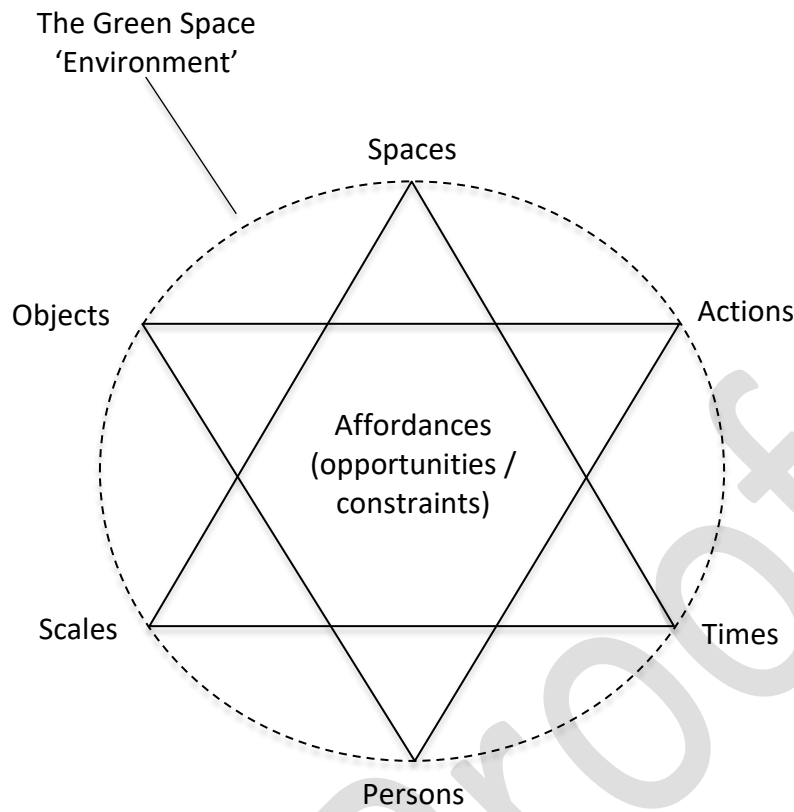


Figure 1

The 'Affordances Star': a relational framework for enhancing the quality of green space for health and wellbeing

Table 1 Generalised 'Model User' Matrix ⁺																	
Ethnic Group <input type="checkbox"/>		Ethnicity A				Ethnicity B				Ethnicity C				Ethnicity D			
Disability Status <input type="checkbox"/>		NI	MI	HI	VI	NI	MI	HI	VI	NI	MI	HI	VI	NI	MI	HI	VI
Life-Course Stage* <input type="checkbox"/>	Gender <input type="checkbox"/>																
Childhood	Male																
	Female																
	Trans.																
Adolescence	Male																
	Female																
	Trans.																
Adulthood	Male																
	Female																
	Trans.																
Later Life	Male																
	Female																
	Trans.																

NI = No Physical Impairment: MI = Mobility Impaired: HI = Hearing Impaired: VI = Visually Impaired

⁺ For illustrative purposes only. The specific composition of such a matrix should be sensitive to local socio-demographic characteristics.

* Refer to <anonymised reference> for a detailed description of a life-course approach to green space planning, design and management for health and well-being

References

- Abraham, Andrea, Kathrin Sommerhalder, and Thomas Abel. 2010. "Landscape and well-being: a scoping study on the health-promoting impact of outdoor environments." *International Journal of Public Health* 55 (1):59-69.
- Agyeman, Julian, Robert D. Bullard, and Bob Evans. 2003. *Just sustainabilities : development in an unequal world*. 1st MIT Press ed, *Urban and industrial environments*. Cambridge, Mass.: MIT Press.
- Anonymised reference.*
- Anusas, Mike, and Tim Ingold. 2013. "Designing Environmental Relations: From Opacity to Textility." *Design Issues* 29 (4):58-69. doi: 10.1162/DESI_a_00230.
- Arthurson, Kathy, Angela Lawless, and Kirsty Hammet. 2016. "Urban Planning and Health: Revitalising the Alliance." *Urban Policy and Research* 34 (1):4-16.
- Barton, Hugh. 2009. "Land use planning and health and well-being." *Land Use Policy* 26 (Supplement 1):S115-S123.
- Barton, Hugh. 2010. "Strengthening the Roots of Planning." *Planning Theory & Practice* 11 (1):95-101.
- Bell, S. 2014. "Challenges for research in landscape and health." In *Innovative approaches to researching landscape and health*, edited by C. Ward Thompson, P. Aspinall and S. Bell, 261-280. London, England, U.K.: Routledge.
- Bell, Sarah L., Cassandra Phoenix, Rebecca Lovell, and Benedict W. Wheeler. 2014. "Green space, health and wellbeing: making space for individual agency." *Health & Place* 30:287-292. doi: <http://dx.doi.org/10.1016/j.healthplace.2014.10.005>.
- Berke, Ethan M., Thomas D. Koepsell, Anne Vernez Moudon, Richard E. Hoskins, and Eric B. Larson. 2007. "Association of the Built Environment With Physical Activity and Obesity in Older Persons." *American Journal of Public Health* 97:486-492.
- Berto, R. 2005. "Exposure to restorative environments helps restore attentional capacity." *Journal of Environmental Psychology* 25:249-259. doi: 10.1016/j.jenvp.2005.07.001.
- Beyer, Kirsten, Andrea Kaltenbach, Aniko Szabo, Sandra Bogar, F. Nieto, and Kristen Malecki. 2014a. "Exposure to Neighborhood Green Space and Mental Health: Evidence from the Survey of the Health of Wisconsin." *International Journal of Environmental Research and Public Health* 11 (3):3453.
- Beyer, Kirsten MM, Andrea Kaltenbach, Aniko Szabo, Sandra Bogar, F Javier Nieto, and Kristen M Malecki. 2014b. "Exposure to neighborhood green space and mental health: Evidence from the survey of the health of Wisconsin." *International journal of environmental research and public health* 11 (3):3453-3472.
- Björk, J, M Albin, P Grahn, H Jacobsson, J Ardö, J Wadbro, P-O Östergren, and E Skärbäck. 2008. "Recreational values of the natural environment in relation to neighbourhood satisfaction, physical activity, obesity and

- wellbeing." *Journal of Epidemiology and Community Health* 62 (4):e2. doi: 10.1136/jech.2007.062414.
- Brereton, Finbarr, J Peter Clinch, and Susana Ferreira. 2008. "Happiness, geography and the environment." *Ecological Economics* 65 (2):386-396.
- CABE. 2005. *Decent Parks? Decent Behaviour?: The Link Between the Quality of Parks and User Behaviour*. London, England, UK: Cabe Space.
- Carpenter, Mick. 2013. "From 'healthful exercise' to 'nature on prescription': The politics of urban green spaces and walking for health." *Landscape and Urban Planning* 118:120-127.
- Carpiano, Richard M. 2009. "Come take a walk with me: The "Go-Along" interview as a novel method for studying the implications of place for health and well-being." *Health & Place* 15 (1):263-272. doi: <http://dx.doi.org/10.1016/j.healthplace.2008.05.003>.
- Chemero, Anthony. 2003. "An Outline of a Theory of Affordances." *Ecological Psychology* 15 (2):181-195. doi: 10.1207/S15326969ECO1502_5.
- Chiesura, Anna. 2004. "The role of urban parks for the sustainable city." *Landscape and Urban Planning* 68 (1):129-138. doi: <http://dx.doi.org/10.1016/j.landurbplan.2003.08.003>.
- Cohen, Deborah A, J Scott Ashwood, Molly M Scott, Adrian Overton, Kelly R Evenson, Lisa K Staten, Dwayne Porter, Thomas L McKenzie, and Diane Catellier. 2006. "Public parks and physical activity among adolescent girls." *Pediatrics* 118 (5):e1381-e1389.
- Cohen, Deborah A, Daniela Golinelli, Stephanie Williamson, Amber Sehgal, Terry Marsh, and Thomas L McKenzie. 2009. "Effects of park improvements on park use and physical activity: policy and programming implications." *American journal of preventive medicine* 37 (6):475-480.
- Corkery, Linda. 2015. "BEYOND THE PARK: Linking urban greenspaces, human well-being and environmental health." In *The Routledge Handbook of Planning for Health and Well-Being: Shaping a sustainable and healthy future*, edited by Hugh Barton, Susan Thompson, Sarah Burgess and Marcus Grant. London and New York: Routledge.
- Coutts, Christopher. 2016. *Green Infrastructure and Public Health*. Abingdon, England, U.K.: Routledge.
- Croucher, K, L Myers, and J Bretherton. 2007. "The links between greenspace and health: a critical literature review." *University of York, York*.
- Cummins, Steven, Sarah Curtis, Ana V. Diez-Roux, and Sally Macintyre. 2007. "Understanding and representing 'place' in health research: A relational approach." *Social Science & Medicine* 65 (9):1825-1838.
- de Vries, S., R. A. Verheij, P. P. Groenewegen, and P. Spreeuwenberg. 2003. "Natural environments -- healthy environments? An exploratory analysis of the relationship between greenspace and health." *Environment and Planning A* 35 (10):1717-1731.
- Dennis Jr, Samuel F., Suzanne Gaulocher, Richard M. Carpiano, and David Brown. 2009. "Participatory photo mapping (PPM): Exploring an integrated method for health and place research with young people." *Health & Place* 15 (2):466-473. doi: <http://dx.doi.org/10.1016/j.healthplace.2008.08.004>.
- EEA-JRC. 2013. Environment and human health. European Environment Agency.

- Ellaway, Anne, Sally Macintyre, and Xavier Bonnefoy. 2005a. "Graffiti, greenery, and obesity in adults: secondary analysis of European cross sectional survey." *Bmj* 331 (7517):611-612.
- Ellaway, Anne, Sally Macintyre, and Xavier Bonnefoy. 2005b. *Graffiti, greenery, and obesity in adults: secondary analysis of European cross sectional survey*. Vol. 331. Journal Article.
- Erickson, D. 2006. *Metrogreen: Connecting Open Space in North American Cities*. Washington, D.C, U.S.A.: Island Press.
- Frank, Lawrence D., Martin A. Andresen, and Thomas L. Schmid. 2004. "Obesity relationships with community design, physical activity, and time spent in cars." *American Journal of Preventive Medicine* 27 (2):87-96. doi: <http://dx.doi.org/10.1016/j.amepre.2004.04.011>.
- Fuller, Richard A, Katherine N Irvine, Patrick Devine-Wright, Philip H Warren, and Kevin J Gaston. 2007. "Psychological benefits of greenspace increase with biodiversity." *Biology Letters* 3 (4):390-394. doi: 10.1098/rsbl.2007.0149.
- Gascon, Mireia, Margarita Triguero-Mas, David Martínez, Payam Dadvand, David Rojas-Rueda, Antoni Plasència, and Mark J Nieuwenhuijsen. 2016. "Residential green spaces and mortality: A systematic review." *Environment international* 86:60-67.
- Gast, GC M, FJM Frenken, LATM Van Leest, GCW Wendel-Vos, and WJE Bemelmans. 2007. "Intra-national variation in trends in overweight and leisure time physical activities in The Netherlands since 1980: stratification according to sex, age and urbanisation degree." *International journal of obesity* 31 (3):515-520.
- Gibson, J. J. 1979. *The ecological approach to visual perception*. Boston: Houghton Mifflin.
- Giles-Corti, Billie, Melissa H Broomhall, Matthew Knuiiman, Catherine Collins, Kate Douglas, Kevin Ng, Andrea Lange, and Robert J Donovan. 2005. "Increasing walking: how important is distance to, attractiveness, and size of public open space?" *American journal of preventive medicine* 28 (2):169-176.
- Giles-Corti, Billie, and Robert J Donovan. 2003. "Relative influences of individual, social environmental, and physical environmental correlates of walking." *American Journal of Public Health* 93 (9):1583-1589.
- Goličnik, Barbara, and Catharine Ward Thompson. 2010. "Emerging relationships between design and use of urban park spaces." *Landscape and Urban Planning* 94 (1):38-53.
- Grahn, Patrik, and Ulrika A. Stigsdotter. 2003. "Landscape planning and stress." *Urban Forestry & Urban Greening* 2 (1):1-18. doi: <http://dx.doi.org/10.1078/1618-8667-00019>.
- Gregg, Edward W, Mark A Pereira, and Carl J Caspersen. 2000. "Physical activity, falls, and fractures among older adults: a review of the epidemiologic evidence." *Journal of the American Geriatrics Society* 48 (8):883-893.
- Guite, H. F., C. Clark, and G. Ackrill. 2006. "The impact of the physical and urban environment on mental well-being." *Public Health* 120 (12):1117-1126.
- Hadavi, Sara, Rachel Kaplan, and Mary Carol R. Hunter. 2015. "Environmental affordances: A practical approach for design of nearby outdoor settings

- in urban residential areas." *Landscape and Urban Planning* 134:19-32. doi: <http://dx.doi.org/10.1016/j.landurbplan.2014.10.001>.
- Heft, H. 1988. "Affordances of children's environments: a functional approach to environmental description." *Children's Environments Quarterly* 5 (3):29-37.
- Heft, H. 2010. "Affordances and the perception of landscape: an inquiry into environmental perception and aesthetics." In *Innovative approaches to researching landscape and health: open space: people space 2*, edited by C. Ward Thompson, Peter Aspinall and Simon Bell, 9-34. London, England, U.K.: Routledge.
- Herzog, Thomas R, P Maguire, and Mary B Nebel. 2003. "Assessing the restorative components of environments." *Journal of Environmental Psychology* 23 (2):159-170.
- Howard, E. 1965 (1902). *Garden Cities of Tomorrow*. Cambridge, Massachusetts, U.S.A.: M.I.T. Press.
- James, Peter, Rachel F. Banay, Jaime E. Hart, and Francine Laden. 2015. "A Review of the Health Benefits of Greenness." *Current Epidemiology Reports* 2 (2):131-142. doi: 10.1007/s40471-015-0043-7.
- Jennings, Viniece, Lincoln Larson, and Jessica Yun. 2016. "Advancing sustainability through urban green space: cultural ecosystem services, equity, and social determinants of health." *International journal of environmental research and public health* 13 (2):196.
- Jorgensen, Anna, and Alexandra Anthopoulos. 2007. "Enjoyment and fear in urban woodlands – Does age make a difference?" *Urban Forestry & Urban Greening* 6 (4):267-278. doi: <http://dx.doi.org/10.1016/j.ufug.2007.05.004>.
- Kaczynski, Andrew T, and Karla A Henderson. 2007. "Environmental correlates of physical activity: a review of evidence about parks and recreation." *Leisure Sciences* 29 (4):315-354.
- Kaplan, Rachel, and Stephen Kaplan. 1989. *The experience of nature: A psychological perspective*: CUP Archive.
- Kaplan, Stephen. 1995. "The restorative benefits of nature: Toward an integrative framework." *Journal of Environmental Psychology* 15 (3):169-182.
- Lake, Amelia, and Tim Townshend. 2006. "Obesogenic environments: exploring the built and food environments." *The Journal of the Royal society for the Promotion of Health* 126 (6):262-267.
- Latkin, Carl A., and D. Curry Aaron. 2003. "Stressful Neighborhoods and Depression: A Prospective Study of the Impact of Neighborhood Disorder." *Journal of Health and Social Behavior* 44 (1):34-44.
- Lestan, Katarina, Ivan Eržen, and Mojca Golobič. 2014. "The Role of Open Space in Urban Neighbourhoods for Health-Related Lifestyle." *International Journal of Environmental Research and Public Health* 11 (6):6547.
- Lieberg, M. 1995. "Teenagers and public space." *Communication Research* 22 (6):720-744.
- Lindholst, Andrej Christian, Nicola Dempsey, and Mel Burton. 2013. "Introducing a method for mapping recreational experience." *Proceedings of the Institution of Civil Engineers - Urban Design and Planning* 166 (5):296-308. doi: 10.1680/udap.11.00012.

- Little, C.E. 1990. *Greenways for America: creating the North American landscape*. Baltimore, Maryland, U.S.A.: The Johns Hopkins University Press.
- Luymes, Don T., and Ken Tamminga. 1995. "Greenways Integrating public safety and use into planning urban greenways." *Landscape and Urban Planning* 33 (1):391-400. doi: [http://dx.doi.org/10.1016/0169-2046\(94\)02030-J](http://dx.doi.org/10.1016/0169-2046(94)02030-J).
- Maas, Jolanda, Robert A Verheij, Peter P Groenewegen, Sierp de Vries, and Peter Spreeuwenberg. 2006. "Green space, urbanity, and health: how strong is the relation?" *Journal of Epidemiology and Community Health* 60 (7):587-592. doi: 10.1136/jech.2005.043125.
- Mensah, Collins Adjei, Lauren Andres, Upuli Perera, and Ayanda Roji. 2016. "Enhancing quality of life through the lens of green spaces: A systematic review approach." *International Journal of Wellbeing* 6 (1).
- Michaels, Claire F. 2003. "Affordances: Four Points of Debate." *Ecological Psychology* 15 (2):135-148. doi: 10.1207/S15326969ECO1502_3.
- Miller, David, J Morrice, Peter Aspinall, Mark J Brewer, K Brown, R Cummins, R Dille, Donaldson-Selby, A Gilbert, A Hester, P Harthill, Richard Mitchell, Sue Morris, Imogen Pearce, L Robertson, Jenny Roe, Catharine Ward Thompson, and Chen Wang. 2014. *Greenhealth: Contribution of Green and Open Space to Public Health and Wellbeing*. Scotland: Scottish Government: Rural and Environmental Science and Analytical Services Division, James Hutton Institute, OPENSpace Edinburgh University, University of Glasgow, Heriot-Watt University, Biomathematics and Statistics Scotland.
- Moore, A. D., and N. G. Cosco. 2014. "Using behavioural mapping to investigate healthy outdoor environments for children and families: conceptual framework, procedures and applications." In *Innovative approaches to researching landscape and health*, edited by C. Ward Thompson, P. Aspinall and S. Bell, 35-75. London, England, U.K.: Routledge.
- Mourato, Susana, Giles Atkinson, Murray Collins, Steve Gibbons, George MacKerron, and Guilherme Resende. 2010. "Economic assessment of ecosystem related UK cultural services." *The Economics Team of the UK National Ecosystem Assessment, London School of Economics, London*.
- National Trails Office. 2012. *A Guide to Planning and Developing Recreational Trails in Ireland*. The Irish Sports Council.
- Natural England. 2009. *Green Infrastructure Guidance*. Sheffield, England, U.K.: Natural England.
- Natural England. 2010. "Nature nearby: accessible natural greenspace guidance." *Natural England: Peterborough*.
- Nielsen, Thomas Sick, and Karsten Bruun Hansen. 2007. "Do green areas affect health? Results from a Danish survey on the use of green areas and health indicators." *Health & place* 13 (4):839-850.
- Norman, Gregory J, Sandra K Nutter, Sherry Ryan, James F Sallis, Karen J Calfas, and Kevin Patrick. 2006. "Community design and access to recreational facilities as correlates of adolescent physical activity and body-mass index." *Journal of Physical Activity & Health* 3:S118.

- O'Neill, M., and P. Simard. 2006. "Choosing indicators to evaluate Healthy Cities projects: A political task?" *Health Promotion International* 21 (2):145-152.
- Olwig, K. 2008. "Performing on the Landscape versus Doing Landscape: Perambulatory Practice, Sight and the Sense of Belonging." In *Ways of Walking: Ethnography and Practice on Foot*, edited by T. Ingold and J.L. Vergunst, 81-92. Aldershot, England, U.K.: Ashgate.
- Ord, Katherine, Richard Mitchell, and Jamie Pearce. 2013. "Is level of neighbourhood green space associated with physical activity in green space?" *International Journal of Behavioral Nutrition and Physical Activity* 10 (1):1.
- Owens, Patsy Eubanks. 2002. "No teens allowed: The exclusion of adolescents from public spaces." *Landscape journal* 21 (1):156-163.
- Peschardt, Karin K., Ulrika K. Stigsdotter, and Jasper Schipperrijn. 2016. "Identifying Features of Pocket Parks that May Be Related to Health Promoting Use." *Landscape Research* 41 (1):79-94. doi: 10.1080/01426397.2014.894006.
- Renalds, A., T. H. Smith, and P. J. Hale. 2010. "A systematic review of built environment and health." *Family and Community Health* 33 (1):68-78.
- Rishbeth, Clare. 2001. "Ethnic Minority Groups and the Design of Public Open Space: An inclusive landscape?" *Landscape Research* 26 (4):351-366. doi: 10.1080/01426390120090148.
- Rydin, Yvonne. 2012. "Healthy cities and planning." *Town Planning Review* 83 (4):xiii-xviii.
- Sallis, James F., Adrian Bauman, and Michael Pratt. 1998. "Environmental and policy interventions to promote physical activity." *American journal of preventive medicine* 15 (4):379-397.
- Schlosberg, David. 2009. *Defining environmental justice: Theories, movements, and nature*: Oxford University Press.
- Sen, Amartya. 1999. "Commodities and capabilities." *OUP Catalogue*.
- Sugiyama, T., J. Francis, N. J. Middleton, N. Owen, and B. Giles-Corti. 2010. "Associations between recreational walking and attractiveness, size, and proximity of neighborhood open spaces." *American Journal of Public Health* 100 (9):1752-1757. doi: 10.2105/ajph.2009.182006.
- Takano, T, K Nakamura, and M Watanabe. 2002. "Urban residential environments and senior citizens' longevity in megacity areas: the importance of walkable green spaces." *Journal of Epidemiology and Community Health* 56 (12):913-918. doi: 10.1136/jech.56.12.913.
- Temple, Vivienne, Ryan Rhodes, and Joan Wharf Higgins. 2011. "Unleashing physical activity: an observational study of park use, dog walking, and physical activity." *Journal of Physical Activity and Health* 8 (6):766.
- Thwaites, K., and I. Simkins. 2006. *Experiential Landscape: An Approach to People, Place and Space*. Abingdon, England, U.K.: Routledge.
- Townshend, Tim G., and Marion Roberts. 2013. "Affordances, Young People, Parks and Alcohol Consumption." *Journal of Urban Design* 18 (4):494-516. doi: 10.1080/13574809.2013.835696.
- Tveit, Mari Sundli. 2009. "Indicators of visual scale as predictors of landscape preference; a comparison between groups." *Journal of Environmental Management* 90 (9):2882-2888. doi: <http://dx.doi.org/10.1016/j.jenvman.2007.12.021>.

- Tzoulas, Konstantinos, Kalevi Korpela, Stephen Venn, Vesa Yli-Pelkonen, Aleksandra Kaźmierczak, Jari Niemela, and Philip James. 2007. "Promoting ecosystem and human health in urban areas using Green Infrastructure: A literature review." *Landscape and Urban Planning* 81 (3):167-178.
- Ulrich, R.S., and D.L. Addoms. 1981a. "Psychological and recreational benefits of a residential park." *Journal of Leisure Research* 13:43-65.
- Ulrich, Roger S, and David L Addoms. 1981b. "Psychological and recreational benefits of a residential park." *Journal of Leisure Research* 13 (1):43-65.
- van den Berg, Agnes E., Terry Hartig, and Henk Staats. 2007. "Preference for Nature in Urbanized Societies: Stress, Restoration, and the Pursuit of Sustainability." *Journal of Social Issues* 63 (1):79-96. doi: 10.1111/j.1540-4560.2007.00497.x.
- van den Berg, Agnes E., Jolanda Maas, Robert A. Verheij, and Peter P. Groenewegen. 2010. "Green space as a buffer between stressful life events and health." *Social Science & Medicine* 70 (8):1203-1210.
- Van den Berg, Magdalena, Mireille van Poppel, Irene van Kamp, Sandra Andrusaityte, Birute Balseviciene, Marta Cirach, Asta Danileviciute, Naomi Ellis, Gemma Hurst, and Daniel Masterson. 2016. "Visiting green space is associated with mental health and vitality: A cross-sectional study in four european cities." *Health & place* 38:8-15.
- Van Dyck, D., G. Cardon, B. Deforche, and I. De Bourdeaudhuij. 2011. "Do adults like living in high-walkable neighborhoods? Associations of walkability parameters with neighborhood satisfaction and possible mediators." *Health and Place* 17 (4):971-977.
- Van Hecke, L., B. Deforche, D. Van Dyck, I. De Bourdeaudhuij, J. Veitch, and J. Van Cauwenberg. 2016. "Social and Physical Environmental Factors Influencing Adolescents' Physical Activity in Urban Public Open Spaces: A Qualitative Study Using Walk-Along Interviews " *PLoS ONE* 11 (5):1-24.
- Varna, George, and Steve Tiesdell. 2010. "Assessing the Publicness of Public Space:The Star Model of Publicness." *Journal of Urban Design* 15 (4):575-598. doi: 10.1080/13574809.2010.502350.
- Veitch, Jenny, Kylie Ball, David Crawford, Gavin R Abbott, and Jo Salmon. 2012. "Park improvements and park activity: a natural experiment." *American journal of preventive medicine* 42 (6):616-619.
- Vouligny, Évelyne, Gérald Domon, and Julie Ruiz. 2009. "An assessment of ordinary landscapes by an expert and by its residents: Landscape values in areas of intensive agricultural use." *Land Use Policy* 26 (4):890-900.
- Walker, Gordon. 2012. *Environmental justice: concepts, evidence and politics*: Routledge.
- Ward Thompson, C. 2007. "Playful nature: what makes the difference between some people going outside and others not?" In *Open Space: People Space*, edited by C. Ward Thompson and P. Travlou, 23-38. London: Taylor & Francis.
- Ward Thompson, C. 2014a. *Innovative approaches to researching landscape and health*, edited by C. Ward Thompson, P. Aspinall and S. Bell, 232-257. London, England, U.K.: Routledge.

- Ward Thompson, C. 2014b. "Landscape quality and quality of life." In *Innovative approaches to researching landscape and health*, edited by C. Ward Thompson, P. Aspinall and S. Bell, 232-257. London, England, U.K.: Routledge.
- Ward Thompson, Catharine 2011. "Linking landscape and health: The recurring theme." *Landscape and Urban Planning* 99 (3):187-195.
- Ward Thompson, Catharine, and Peter A. Aspinall. 2011. "Natural Environments and their Impact on Activity, Health, and Quality of Life." *Applied Psychology: Health & Well-Being* 3 (3):230-260. doi: 10.1111/j.1758-0854.2011.01053.x.
- WHO. 1946. Constitution of the World Health Organisation. New York: WHO.
- Withagen, Rob, Harjo J. de Poel, Duarte Araújo, and Gert-Jan Pepping. 2012. "Affordances can invite behavior: Reconsidering the relationship between affordances and agency." *New Ideas in Psychology* 30 (2):250-258. doi: <http://dx.doi.org/10.1016/j.newideapsych.2011.12.003>.
- Wolch, Jennifer R., Jason Byrne, and Joshua P. Newell. 2014. "Urban green space, public health, and environmental justice: The challenge of making cities 'just green enough'." *Landscape and Urban Planning* 125:234-244. doi: <http://dx.doi.org/10.1016/j.landurbplan.2014.01.017>.
- Woolley, Helen. 2008. "Watch This Space! Designing for Children's Play in Public Open Spaces." *Geography Compass* 2 (2):495-512. doi: 10.1111/j.1749-8198.2008.00077.x.