

Person Environment Relationships to Health and Wellbeing: An Integrated Approach

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Abstract: *It is widely acknowledged that a strong relationship exists between physical environments and human health and wellbeing. More specifically, various dimensions of person environment (PE) relationships have been studied relating to the psychological, physical and social aspects of human interactions and transactions. However, health aspects relating to human psychological and physiological relationships and such factors acting upon PE relationships are not well investigated. This paper emerges from a larger study and presents the approach undertaken to investigate the complexities of PE relationships to health and wellbeing for the purpose of reviewing research literature. The study attempts to understand how outcomes of health and wellbeing are interrelated to PE relationships when influences of the various systems of the human body are considered. Central to this study is the psychoneuroimmunology (PNI) model that proposes that the person's psychological health is internally related to the neurological and immunological systems. The PNI model was used as a basis to look at the various interrelationships of human environment interactions and transactions to health and wellbeing. This provided the study with an integrative inquiry method for exploring literature which looked at such relationships singularly or collectively.*

Keywords: *person environment relationship, health, wellbeing*

Introduction

Many properties of the built environment (BE) such as sound, smell, aesthetic qualities, social aspects, privacy, control and so on are understood to have the potential to influence the health of a person through the psychological and the physiological systems of the human body (Ulrich et al, 2004). This context has an important relevance to the interior environment as human beings interact with such settings on a frequent basis through their home, workplace, study, social places and so on. Thus, understanding outcomes of health and wellbeing in such settings is an important factor when designing and creating space. Health and wellbeing for the purpose of this study relates to psychological and physical wellness which contributes to overall human wellbeing influencing health in the process. Designers involved in the creation of human habitats have a capacity within themselves to provide conducive environments that elicit positive emotional and physical responses in people coming in contact with them.

Although methods and theories used by researchers vary from study to study, all agree that person environment (PE) interaction is an inevitable part of human existence and that the relationship between person and the environment has many facets which – though they may be interpreted in different ways – are overlapping and inter-connecting when the person and the environment are conceptualised in an integrated sense. While research in PE relationships highlight a holistic understanding of a relationship involving human health, wellbeing, and the environment, it is not always clear as to the extent or specific nature of this or to how the notions of mental and physical health and wellbeing, and environment are conceptualised.

Much of the literature on the relationship involving environment, health, and wellbeing has focused on the role of either the psychological systems or physiological systems. While the psychological, physical, social and spatial aspects are well documented, very few look at person and environment as a whole. In general, a person's psycho-physiological relationships with the BE, particularly emotional and mental relationships and their influence on the physiological systems, are less studied in physical environment research (Korpela & Ylen, 2005).

This article stems from a study investigating the health and wellbeing outcomes originating from PE interrelationships as described in the research literature. The goals of this paper are threefold. First, we investigate the nature of the PE relationship to health in research literature; if health and wellbeing resulting from the PE inter/transaction is recognised holistically. In other words, literature is examined to determine how the various systems of the human body are understood to be interrelated and how the wellbeing of a person as a whole is considered in relation to the built environment and the various elements of which it is comprised. Second, we make reference to the possibility of transdisciplinary approaches in response to increasingly complex and global health impacts demanding a broad knowledge and skills base (Frumkin, 2005). Third, we look at person and environment as a whole and in doing so recognise the importance of considering person and environment relationships as interrelationships between environmental influences and human systems which we describe in terms of a PE integrative¹ system approach.

An overview of literature

Our physiological system and psychological system are not 'separate and distinct from our experiences in life' (Ray 2004, p. 29). According to Rapoport (1990) the human body and the natural/ built environment (BE) are closely connected with each other by the simple fact that a person is always in one place or the other, be it in natural settings or human-made settings and the human body reacts to a place consciously and subconsciously all the time.

Furthermore, the fact that people are psychologically dependent on their social and physical surroundings for their individual development and wellbeing has been well-known for a long time (Ittelson, 1976).

Many studies indicate that the physical environment has properties that influence human health and wellbeing. For instance, studies on the properties of restorative environments in promoting wellbeing (see Kaplan, 1995) indicate that the environment is closely connected to the human being in terms of health and wellbeing. Roger Ulrich (1984) – one of the pioneers in promoting the concept that physical environments influence the physiological systems – in one of his early studies found that the length of stay in hospitals can be reduced by providing better physical surroundings. This suggests that mental wellbeing is necessary for the physiological wellbeing of a person and that the BE is responsible in many ways. Most recently, Ulrich and colleagues (2004) undertook an extensive literature review of ‘evidence based research’ regarding the role of the physical environment in hospital settings and found that many properties of the BE play a role in facilitating or weakening human response to illness, thus promoting or harming health and wellbeing.

Several key PE relationship dimensions have been proposed in previous research as ways to understand and explain environmental behaviours, responses and experiences. These include spatial use, environmental privacy and control practices, other experiential behaviours, preventive health factors connected to the environment (such as ‘sick building syndrome’), importance of aesthetic qualities, and design for human physical activity (Zeisel, 2006; Bell et al, 2001). The concepts have sought to explain PE relationship as being a result of human inter/ transaction with a collection of factors. While a thorough review of each of these dimensions of PE relationship is beyond the scope of this article, some key concepts relating to psychological, social and physiological aspects of PE relationships are relevant as they support the argument that the BE and the emotional changes they generate may be associated with instigating conditions related to poor physical health and wellbeing.

As environments differ in their negative and positive health outcomes, the ‘health promotiveness [of an environment] ultimately depends on its capacity to support those health outcomes most desirable and important to its members while eliminating or ameliorating those most clearly negative and detrimental to individual and social wellbeing’ (Stokols, 2003, p.139). Another example is the sociophysical environment and its relationship to privacy. An open office plan can nurture as well as hinder a person’s opportunity for interaction with other people, however, this depends on how they perceive the space (Evans & McCoy, 1998). Some responses from such influences may generate negative responses causing anxiety.

Studies indicate that high levels of anxiety on a regular basis can affect mental wellbeing eliciting certain physiological ailments (Rosenmann, 1994).

Built environment dimensions: classification for health and wellbeing outcomes from PE relationship

The term 'human environment' has evolved to embrace not only the physical but also the psychological aspects of an environment which includes the social, interactional, transactional and organisational aspects that might affect the mental health and wellbeing (Proshansky, 1976). Canter's theory about place posits the notion that the experience of a person in the environment is the sum total of the transactions between the environment and the different levels of a person's experience. These levels are understood to involve 'personal, social and cultural constituents of person-place' (Canter, 1997, p.118). The specified dimensions in the analysis categorisation evolve from similar theories associated with PE experiences and relationships. The two primary dimensions of the PE relationship are P (person) categorised in terms of the animate dimension and E (environment) categorised in terms of the inanimate dimension. These encompass research from environmental psychology/environmental behaviour research (EBR), architecture and design (including landscape and design psychology), environmental health and healthcare settings. They include human and spatial elements.

Canter (1997) states that in order to apply the principles of environmental psychology, an understanding of what forms the experience of place where the aesthetic elements stand out in connection with creative design is particularly important. For this purpose, he points out the importance of looking at the physical environment by exploring the designer's view as well as the researcher's view. In exploring the designer's view, it is necessary to look at the different facets of place and '...the major facets of designs that the designers manipulate' (p.110). Researchers mainly are interested in the paradigms of the environment investigating what they look at. However, how they look at it is also important. As each environmental understanding reveal different aspects (Canter, 1997), the relevance of the understanding that the factors that characterise a place or building also influence the human action and experience that occurs there is important. According to these conceptions, the assumption is that designers influence the PE relationship through (1) function: the task and performance of a place; (2) form: the appearance of a place mainly comprising of the structure and composition of the space and (3) space: the whole place or space occupied. These three aspects include only the spatial perspectives which, in a broader sense, identify and incorporate the user needs (Canter, 1997).

The contextual framework

The PE integrative systems model and qualification of the animate and inanimate dimensions of the BE according to their domains provides a basis for the main approaches taken in the study; the approaches of classification and categorisation. In other words, literature is classified and categorised chiefly in terms of how it considers health and wellbeing relationships to the physical environment within an integrative systems model.

When classified from health and wellbeing perspectives, research in human environment relationships, reactions and outcomes reveal several dominant themes. They include psychological and physiological factors, the effects of the physical environmental elements, the effects of inter/transactions between humans and certain environmental stimuli such as psychological and physiological arousal, emotional factors, sensory awareness and finally the effect of these relationships on health outcomes.

Many researchers suggest that human reaction and responses to the physical environment may reflect heritage and cultural factors as well as personal beliefs and adaptability (Bell et al., 2001). They also speculate that humans respond to specific environments because of an inherent need, thus conditioning the human response towards an unconscious preference for particular settings (Kaplan & Kaplan, 1989; Ulrich, 1984). Other research suggests that human responses to their surroundings or the place they come in contact with are personal processes that vary according to many factors, such as individual experiences, and social, cultural, and emotional influences (Canter, 1997; Rapoport, 1990; Russel & Snodgrass, 1987).

In addition, there is some work that focuses on the positive effects of human wellbeing derived from direct experiences from inter/transactions with the surroundings. These researchers examine topics such as the health outcomes in healthcare settings, healing taking place in similar settings, and the outcomes of environmental experiences (Ulrich et al., 2004). An example includes how sensory awareness affects healing and therapeutic processes. These also include restorative environments. For instance, there have been several studies that show most people prefer natural landscapes over urban views, especially when urban scenes lack vegetation and water features (Kaplan et al., 1988; Ulrich, 1983; Korpela, 1991). These preferences emerge possibly from the capacity of those spaces in providing stress relief contributing in turn to the healing process.

From the review of literature, environmental preferences and restorative environment theories appear to be the most dominant. Two of these are Kaplan's (1995) 'Attention Restoration Theory' which follows a cognitive model, and Ulrich's (1983) 'Nature Restoration Theory'

which follows an 'affective' or emotional model. The 'attention restoration' concept suggests that a rapid, unconscious type of cognition may precede affect or emotion (Kaplan, 1987). Most of Kaplan's research found that preferred places contained features that influenced and encouraged the gathering of information and an understanding of the elements as a person experiences space (Kaplan & Kaplan, 1982; Kaplan, 1995). While the above mentioned model represents the perceptive and the cognitive aspects of the PE relationship, the 'affect model' emphasises human aesthetic, affective, emotional and physiological responses to the physical settings or environments (Ulrich, 1981; 1983; Ulrich, et al., 1991).

Ulrich (1983) believes that humans respond immediately, unconsciously, emotionally and physiologically. These processes play a critical role in how humans respond to the physical environments, its configurations and elements. These concepts relate to the PE interrelationship integrative health systems model, which is developed in this study from the Psychoneuroimmunological (PNI) framework. Furthermore, Pennebaker and Brittingham (1982) state that certain environmental stimuli can elicit physiological responses influenced by psychological responses. They state that, when there is 'external information' (stimuli outside the human body), the 'internal sensation' creates an awareness of it which is 'directly related to physiological change' (p.119), these perceptions evolving either consciously or without deliberation. People may not be aware of the internal physiological sensations unless it is something contradictory to everyday encounters.

Emotional responses seem to be an innate phenomenon and several researchers propose that the feelings are essentially precognitive or that the sensations occur before perception and cognition takes place (Ulrich, 1983). Ulrich (1981) suggests that the cognitive process outcomes from the initial emotional reaction are greatly influenced by cultural and personal experiences and that the affective responses may be expressed as 'neuro-physiological' activity. Exposures to everyday environments may elicit various effects on human psychological and physiological systems (Ulrich, 1981; Ulrich et al., 1991; Ulrich et al., 2006). Ulrich's (1981) findings from a study, measuring person's physiological and psychophysiological responses to environmental elements indicate that preferred environments reduce anxiety and enhance recovery process and stress responses.

These studies suggest that the environment consists of several stimulants that influence the psychological and physiological responses in humans. Although generalisation can be found within each area of research, it is still helpful to identify specific patterns existing across environmental perceptions, cognitive and emotional responses, preferences, cultural

influences and therapeutic and restorative qualities of the occupied space, to understand their influences on health outcomes. It may well indicate that the results found for one particular group may apply to other groups and that no single study by itself can be conclusive. However, as numerous studies provide similar understandings and concepts, they indicate that direct and indirect effects may exist. Emotion featured repeatedly in the review, pointing out that feelings play a role in human psychological and physiological responses to place and that the physical environment can directly affect or alter emotions.

Mind-body relationship

To understand outcomes of health and wellbeing from PE relationships, it is imperative to understand the mind-body relationship of a person. For this reason, PNI is taken as a platform to model human health and wellbeing in the holistic sense as it is one area of medical research that represents an attempt to understand psychological and physiological systems as an integrated whole (Figure 1). PNI is the study of mind-body relationships (Evans et al., 2000) considering the interrelationship of the mind to the neuroendocrine system and the immune system. Its basic tenet is that a person's immunological response is affected by their psychological wellbeing. If one's psychological/emotional health is depressed, the physical body could be more susceptible to illnesses.

An increasing number of studies have documented the connection between mind and the body (Ader et al., 1991; Cousins, 1983; Hafen, 1996; Smith, 1998). For example, Marucha et al (1998) conducted a study on wound healing in which they compared students' healing time during vacation time versus examination time when they were under duress. It was found that healing took 40% longer in students when they were stressed during exam times (Evans et al., 2000).

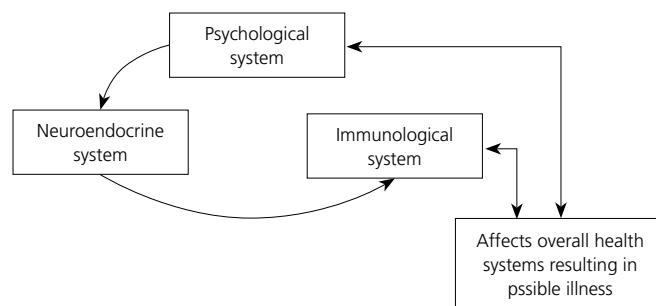


Figure 1: PNI Model.

This understanding of person as a whole is necessary when looking at environmental stressors. There are many 'sensual stresses' that stay in the background – such as urbanisation, crime, boredom, computer invasion, isolation of the aged, drugs, alcohol and tobacco abuse, noise levels – affecting the health and wellbeing of an individual adversely (Wheatly, 1994). Wheatly (1994) states that stress contributes in 'initiating, maintaining, and aggravating a number of physical and mental disorders' (p.1). Studies in the area of stress strongly support the notion that illnesses are contractible and can be aggravated by psychosocial factors responsible for stress. Though all diseases may not be based on emotions, a growing number of experts believe that some diseases result from emotional responses. For instance, a sense of loss of control over ones situation can lead to a loss of normal functioning of the physiological system (Kiecolt-Glaser et al., 2002). Stress levels from such experiences could contribute to the development of certain illnesses.

PE integrative system approach

As health and wellbeing outcomes from PE interrelationships are the responses and influences of the person as a whole inter/transacting with the environment in the integrative sense, people and environment should not be viewed in isolation. Similarly, the different aspects of the environment such as animate and inanimate elements cannot be separated as they interact and transact within themselves, eliciting different reactions from the person as s/he experiences place. In other words, they cannot be 'defined independent of the other' (Ittleston 1976, p. 56).

The investigation identifies health and wellbeing as integrated health with the consequences elicited from the transactions between the mental state and physical state resulting in either positive or negative wellbeing. It does not simply mean the absence of illness. 'Health' according to the Constitution of World Health Organization, is defined as 'A state of complete physical, social and mental wellbeing, and not merely the absence of disease or infirmity' (WHO, 2001. p. 6).

Integrative health can be said to be the embodiment of the overall systems of a person that contribute to health and wellbeing. This is mainly understood in this research using a psychoneuroimmunological (PNI) model that regards health and wellbeing as integrally related to the psychological and physiological systems of a person. By taking a transdisciplinary approach to investigate person in PE relationships it is proposed that a better understanding of the interrelationships of environment with the person's body systems and health and wellbeing is possible. As it looks at all the aspects of the human-body systems and their influence on each other, PNI is used as a framework for conceptualising the 'P' in the PE (person/environment) dialectic (Figure 2).

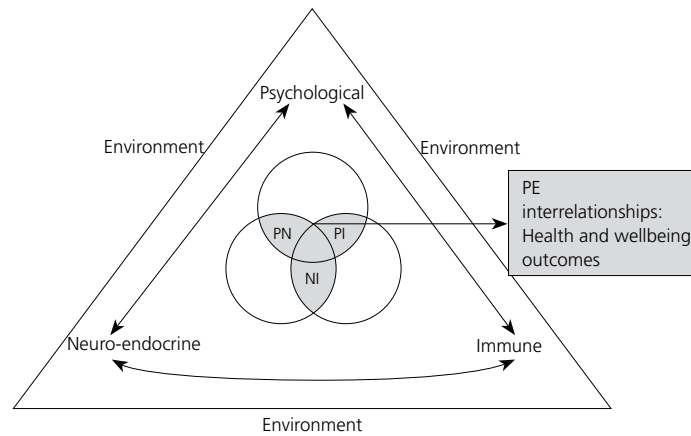


Figure 2: Model for PE relationship to integrative health and wellbeing.

While the model recognises a dialectical relationship between person and environment, it emphasises the potential influence of the environment on the psyche or mind and the subsequent influence of this on the immune system and, correspondingly, health and wellbeing. It also indicates that when the environment affects the P or the N or the I systems, they could affect each other. The emphasis is a response to wide recognition in the literature for giving this greater attention in an integrative model of health and wellbeing. In the model depicted in Figure 2, the person is understood in terms of their psychology, particularly in relation to stress and emotions, as well as to their physiology described in terms of the neuroendocrine and the immune systems.

The physical environment has been categorised by two interrelated dimensions – the animate and the inanimate; that is, the human and physical place dimensions. They have been further subdivided into the psychological, physical and social extents within the human dimensions and elemental and spatial extents within the physical place dimension. This is depicted in Figure 3.

The animate dimension and its constituents are described as psychological, social and physiological elements related in turn to concepts such as environmental perception, environmental cognition, stress and emotion, identifying environmental stressors, person environment interdependency, environmental determinacy, environmental experiences and so on. These concepts originated chiefly from environmental psychology, however, while the field provides invaluable insights to a person's psychological responses and the environment relationship, there is less research that directly identify the specific sources of any positive and

negative impacts on health and wellbeing within the environment in the integrative sense. Having said this, there is the potential for such links to be made by taking an integrated health systems approach. This could be achieved by combining knowledge from a number of different studies. For example, environmental behavior research studies indicate a lack of control over the place a person inhabits may cause anxiety and depression and an aversion to the place, relating to individual psychological outcomes of environmental perception and cognition (Gifford, 1996). Healthcare environment studies indicate that such psychological responses could elicit additional physiological disorders (Ulrich et al., 2004).

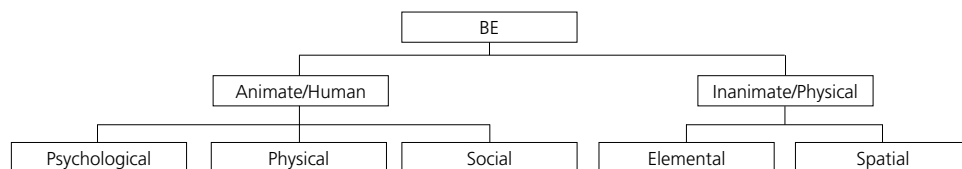


Figure 3 : Categorisation of BE and Design.

The inanimate dimension focuses on the physical elements within a space and their relationship with/to form, layout, aesthetics and so on in terms of sensual and physical impact. For example, furniture not ergonomically considered can cause certain physical ailments such as neck and back pain (Moffet et al., 2002). Open plan offices are related to headaches among employees using them depending on their type of work (Stokols, 1998). Further, the inability to change the circumstances – for instance not being able to move furniture according to need or personal choice; not having control over temperature settings – harms mental wellbeing (Stokols, 1998), and may cause other adverse health effects (Ray, 2004).

Although the animate and inanimate dimensions which are mentioned in existing studies may narrow the likely sources of the problem as direct or indirect generators of negative health and wellbeing, and/or identify person environment relationships in distinct contexts, they generally do not implicate a specific source and its consequences on health and wellbeing. The identified dimensions of the environment overlap when the person is considered in entirety.

Human health and wellbeing have been categorised in terms of the psychological and the physiological systems. In accordance with the PNI model, in this research psychological dimensions have been considered under stress, and emotional wellbeing and the physiological systems in relation to the neuroendocrine and the immune systems as represented in Figure 4.

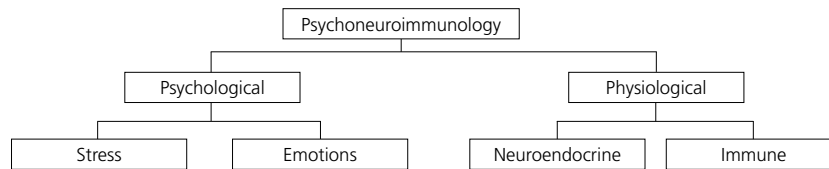


Figure 4: Categorisation of PNI.

The categorisation helps to identify specific features that are necessary to understand health and wellbeing outcomes from PE interrelationships.

Calling for a transdisciplinary approach

Associated with the importance of PE relationships are different dimensions of the person as well as the physical characteristics of the environment. Recognition of the psychological dimensions of the PE relationship was identified in the research synthesis as an important issue in health and wellbeing, in keeping with the PNI framework. As a primary human response that influences the physiological system, the person is capable of subjective and objective interpretations and reactions. While this area is well represented in the BE domain, it seems its impact on mind-body relationships and consequently on health is not well recognised, perhaps because of the lack of a theoretical framework. Though the general area is under study in the environmental psychophysiology domain, a detailed and integrated framework regarding the outcomes of health and wellbeing originating from PE interrelationships is yet to be demonstrated in a tangible way.

Frumkin (2005) states that environmental health being dynamic in nature encourages interdisciplinary as well as transdisciplinary research, rather than trying to concentrate on one discipline to conceptualise relationships between human health and the environment. He also states that the environments have many different properties and functions allowing people to interact and respond to them in 'predictable ways' (p.xxxviii), providing different dimensions ranging from being 'alienating, disorienting, or even sickening' to being 'attractive, restorative, and even salubrious' (p.xxxviii).

Some of the most important findings linking the environment to human health and wellbeing come from studies in environmental psychology, healthcare environment research and 'sick building syndrome' research. For instance, the degree of environmental 'fit' and the ability of the environment to provide beneficial elements is highly related to the occurrences of physiological symptoms (Parsons et al., 1998); empirical evidence of positive health factors (Cox et al., 2004); control of immune regulations (Ulrich, 1986); cortisol production (Riley et

al., 1992); depression (Galea & Vlahov, 2006); work related stress (Stokols, 2000); 'attention restoration theory' (cognitive model) (Kaplan, 1995); 'nature restoration theory' ('affect' model) (Ulrich, 1983). They indicate that when the environment and person act on each other in a consistent and equivalent way, the level of positive impact on health and wellbeing increases, as opposed to situations and places where the person has little or no control.

In response to the above mentioned studies in support of the PE integrative system model, we can see the environment as having three major influential characteristics. Firstly, it contains various stimuli which are potentially a source of negative or positive health outcomes; secondly, the stimuli can act as triggers in eliciting responses depending on the person; and, finally, the environment can act on the person's individual characteristics in terms of adaptive responses and belief processes. People's perception and their beliefs are usually a turning point in their experience of place. A person perceives a place as soon as s/he encounters a setting. The outcome influences many other activities that subsequently take place within the physical environment. In general, emotionally satisfying surroundings give a positive outcome of anticipation, and reaction to, the events that are to take place inside the human body.

From the current review of the research from the identified areas, it is indicated that, even in light of the limitation to the existing research, further significance should be given to the physical environment and its impact on person's integrative systems such as PNI, to address human health outcomes of person environment inter/transactions. This can be done by:

- further research into aspects relating the PE interrelationship with health, wellbeing, and illness
- providing spaces and places that influence overall health and wellbeing positively thereby reducing the risk of illness
- managing the social outcomes and the social impact of aesthetic aspects of the physical environment through design.
- establishing situations where human and environment co-existence is supportive of one another through design
- preserving human health for longevity by providing positive environmental influence.

The complexity of the PE interrelationship with health lies in the fact that a response to mental wellbeing due to environmental influences may or may not begin within the microenvironment. There may be a variety of factors that are reasons for the trigger and generation of wellbeing or illness. These may be subjective rather than objective and

recognisable. As a result, identification of minor triggers that develop into major issues may need to be identified in the first instance. Building codes and standards are developed for design and construction – in regard to air quality, building materials, water supply, thermal requirements and so on – in order to improve the quality of the physical environment (Lawrence, 2002). However, there seems a necessity to address the psychological aspect of the human being in policy making and codes.

Conclusion

This paper has described some of the characteristics of PE relationships as portrayed in literature, conveyed an invitation to look at the P (person) as a whole, provided a framework for adopting an integrative, holistic view in relation to health and wellbeing, and by association argued for the need to undertake transdisciplinary approaches in research and design. In recognition 'that the environment is a human creation, that the environment is artefact... ' (Ittleson, 1976, p. 56), this study argues that while physical environments potentially have the power to influence the wellbeing of the person or people occupying it, the potential for the designer in influencing BE to affect the health and wellbeing of person relies on their understanding of and ability to accommodate the integrative nature of a person's psychological and physiological capacities contributing in turn to their overall health and wellbeing.

References

- Ader, R., Felten, D. L., & Cohen, N. (1991). *Psychoneuroimmunology* 2nd Ed. San Diego: Academic Press.
- Bell, P.A., Greene, T.C., Fisher, J. D., & Baum, A. (Eds). (2001). *Theories of Environment-Behaviour Relationships* (5th Ed.). Harcourt College Publishers, pp. 98–135.
- Canter, D. (1997). The facets of place. In Moore, G.T. & Marans, R. W. (Eds). *Advances in Environment, Behavior, and Design. Towards the Integration of Theory, Methods, Research, and Utilization*. Volume 4. New York: Kluwer Academic/ Plenum Publishers.
- Cousins, N. (1983). *The Healing Heart*. New York: Avon Books.
- Cox, H., Burns, I., & Savage, S. (2004). Multisensory environments for leisure: Promoting wellbeing in nursery home residents with dementia. *Journal of Gerontological Nursing*, 30(2), 37–45.
- Evans, G. W., & McCoy, J. M. (1998). When buildings don't work: The role of architecture in human health. *Journal of Environmental Psychology*, 18, 85–94.
- Evans, P., Hucklebridge, F., & Chow, A. (2000). *Mind Immunity and Health: The science of Psychoneuroimmunology*. London/New York: Free Association Books.
- Frumkin, H, (Eds). (2005). *Environmental Health: From Global to Local*. New York: John Wiley & Sons, Inc.

- Galea, S., & Vlahov, D. (2006). Urbanization. In Frumkin, H. (Ed.). *Environmental Health: From Global to Local*. New York: John Wiley & Sons.
- Gifford, R. (1996). Environmental perception and cognition. In Gifford, R. (Ed.). *Environmental Psychology: Principles and Practices*. (2nd Edition). Boston: Allyn & Bacon.
- Hafen, B. Q., Karren, K. J., Frandsen, K. J., & Lee, S. N. (1996). *Mind-Body Health. The effect of Attitudes, Emotions and Relationships*. Massachusetts: Allyn and Bacon.
- Ittleson, W. H. (1976). Environmental perception and contemporary perceptual theory. In Proshansky, H. M., Ittleson, W. H. & Rivlin, L.G. (Eds). *Environmental Psychology: People and their Settings*. The Experience of Nature: A Psychological Perspective. 2nd Edition. New York: Cambridge University Press.
- Kaplan, S., Talbot, J., & Kaplan, R. (1988). Coping with daily hassles: The impact of nearby nature on the work environment. Project Report *U.S.Forest Service , North Central Forest Experiment Station, Urban Forestry Unit Cooperative Agreement, 23*, 85–08. Washington DC: US .Govt. Printing Office.
- Kaplan, S. (1995). The restorative benefits of nature. Towards an integrative framework. *Journal of Environmental Psychology*, 15, 169–185.
- Kaplan, S. (1987) Aesthetics, affect and cognition: Environmental preference from an evolutionary perspective. *Environment and Behavior*, 19, 3–32.
- Kiecolt-Glaser, J. K., McGuire, L., Robles, T. F., & Glaser, R. (2002). Psychoneuroimmunology and Psychosomatic Medicine: Back to the future. *Psychosomatic Medicine*, 64, 15–28.
- Korpela, K. M., & Ylen, M. (2005). Perceived health is associated with visiting natural favourite places in the vicinity. *Health & Place*. 1–14 (in press).
- Korpela, K. (1991). Are favorite places restorative environments? In Urbina-Soria, J.; Ortega-Andeane, P. & Bechtel, R. (Eds). *Healthy Environments*. Proceedings of the Twenty-Second Annual Conference of the Environmental Design Research Association, Oaxtepec, Morelos, Mexico, March, pp. 12–15.
- Lawrence, R. J. (2002). Healthy residential environments. In Bechtel, R. & Churchman, A. (Eds). *Hand Book of Environmental Psychology*. New York: Wiley.
- Moffet, H., Hagberg, M., Hansson- Risberg, E. & Karlqvist, L. (2002). Influence of laptop computer design and working position on physical exposure variables. *Journal of Clinical Biomechanics*, 17, 368–375.
- Parsons, R., Tassinari, L. G., Ulrich, R. S., Hebel, M.R., & Grossman-Alexander, M. (1998). The view from the road: Implications for stress recovery and immunization. *Journal of Environmental Psychology*, 18, 113–139.
- Parsons, R., & Tassinari, L.G. (2002). Environmental Psychophysiology. In Betchel, R. & Churchman, A. (Eds). *Handbook of Environmental Psychology*. New York: John Wiley & Sons.
- Proshansky, H. M. (1976). Research methods in Environmental Psychology. Environmental perception and contemporary perceptual theory. In Proshansky, H.; Ittelson, W. & Rivlin, L. (Eds). *Environmental Psychology: People and their settings* (2nd Ed).
- Pennebaker, J. W., & Brittingham, G. L. (1982). Environmental and sensory cues affecting the perception of physical symptoms. In Baum, A. & Singer, L. (Eds). *Advances in Environmental Psychology*, Volume 4. Hillside, NJ: L. Erlbaum Associates.

- Rapoport, A. (1990). *The Meaning of the Built Environment: A Nonverbal Communication Approach*. Arizona: The University of Arizona Press.
- Ray, O. (2004). How the mind hurts and heals the body. *American Psychologist*, (59)1, 29–40.
- Riley, V., Fitzmaurice, M. A., & Spackman, D. H. (1981). Psychoneuroimmunologic factors in Neoplasia: Studies in animals. In Ader, R. (Ed.). *Psychoneuroimmunology*. New York: Academic Press.
- Russell, J. A., & Snodgrass, J. (1987). Emotion and the environment. In Stokols, D. & Altman, I. (Eds). *Handbook of Environmental Psychology*. New York: Wiley.
- Rosenman, R. H. (1994). *Human Stress and the Environment. Environmental Topics*. Volume 5. Rose, J. (Ed.). Philadelphia: Gordon and Breach Science Publishers
- Smith, A. P. (1998). *The Power of Thought to Heal: An Ontology of Personal Faith*. Claremont Graduate University.
- Stokols, D. (1998). Environmental design. Psychosocial and organizational Factors. In Stellman, J. (Ed.). *Encyclopedia of Occupational Health and Safety*. 4th Edition. International Labour Office Geneva.
- Stokols, D. (2000). Creating health promotive environments: Implications for theory and research. In Stokols, D. & Jamner, M. (Eds). *Promoting Human Wellness: New Frontiers for Research, Practice, and Policy*. Berkeley, California, London : University of California Press.
- Stokols, D. (2003). The ecology of human strengths. In Aspinwall, L. & Staudinger, U. (Eds). *A Psychology of Human Strengths: Fundamental Questions and Future Directions for a Positive Psychology*. Washington, DC, London: American Psychological Association.
- Ulrich, R. S. (1981). Natural versus urban scenes: Some psychophysiological effects. *Environment and Behaviour*, 13, 523–556.
- Ulrich, R. S. (1983). Aesthetic and affective response to natural environment. In Altman, I. & Wohlwill, J. (Eds). *Behavior and the Natural Environment*. New York: Plenum Press
- Ulrich, R. S. (1984). View through a window may influence recovery from surgery. *Science*, 224, 420–421.
- Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology*, 11, 201–230.
- Ulrich, R. S., Zimring, C., Quan, X., Joseph, A.; & Choudhary, R. (2004). *The Role of the Physical Environment in the Hospital of the 21st Century*. The Center for Health Design. URL: http://www.healthdesign.org/research/reports/pdfs/role_physical_env.pdf (accessed 12 December, 2005).
- Wheatly, D. (1994). Medical implications of stress. Human stress and the environment. In Rose, J. (Ed.). *Environmental Topics*. Volume 5. Philadelphia: Gordon and Breach Science Publishers.
- World Health Organization. (2001). *Health impact assessment as part of strategic environmental assessment*. Breeze, C. & Lock, K. (Eds). URL. <http://www.euro.who.int/document/e74634.pdf> (accessed 23 February, 2005).
- Zeisel, J. (2006). *Inquiry by Design: Environment/Behavior/Neuroscience in Architecture, Interiors, Landscape and Planning*. New York: W.W.Norton & Company.

Endnotes

- ¹ Integrated basically means a way for looking at person and environment and their relationships as a whole, rather than as separate entities. This also means understanding person as a whole and environment as a whole. In the integrated sense then PE relationships become PE interrelationships.