建築・制度デザインにおける心理学の理論と方法の適用
Psychological Theory and Method Applied to Architectural and Institutional Design

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ABSTRACT

This article begins by outlining the contributions psychologists can make to an understanding and amelioration of issues and problems of widespread public concern, including issues of health and illness, education, peace and conflict resolution, and architectural and institutional design. The paper focuses in particular on the specialty fields of environmental and architectural psychology and how design processes focusing on user interactions with their varied environments can enhance the prospect that functional and aesthetic criteria can be harmonized to best effect for the benefit of users. Practical infrastructural design challenges in the fields of education and health care are used to demonstrate how the incorporation of psychological principles in the design process can yield significant benefits for the users of educational and health care facilities.

本論文では，心理学が，健康と疾病，教育，平和と紛争解決，建築デザインを含め，広範囲に及ぶ諸問題について，理解を深め改善を図れる貢献の概要を述べる．本論では，特に，環境および建築心理学の分野に焦点をおく．多様な環境と使用者の相互作用に重きをおくデザイン過程は，使用者側に最善の効果となる機能的かつ審美的基準の見通しを，高める可能性がある．社会の基本設備の実質的なデザインは，教育および健康医療の分野で使用され，心理学的理論をデザイン過程でいかに統合させていくかが，教育および健康医療施設の使用者に意義ある恩恵をもたらす．

In the popular mind the major societal contribution of psychologists is often thought to be limited to the field of mental health. The many sub-specialty areas of psychology belie this notion. The various practical ways in which psychologists contribute to the welfare of society are revealed in part by the names of many of the fifty-six (56) divisions of the American Psychological Association (APA)(http://www.apa.org/about/division.html). These include consumer psychology, educational and school psychology, engineering psychology, exercise and sport psychology, forensic psychology, health psychology, industrial and organizational psychology, media psychology, military psychology, peace psychology, political psychology, population and environmental psychology, and rehabilitation psychology. The membership of each of these divisions consists of psychologists who have a particular concern for applying their expertise in theory and method to the issues at hand. These formal APA divisions are only the tip of the iceberg in terms of the expertise psychologists in the various sub-specialty fields can contribute to the welfare of society. There is hardly an issue or problem of widespread public concern to which psychologists cannot contribute in some meaningful way (See Rackham, 1996).

The professional obligation that psychologists have to society at large has been argued by Bevan (1991) who stated that "the professions, including the scholarly professions, were once a calling, and callings imply public responsibility. Thus, we can never simply be specialists. We must see our science, in part at least, as social or public philosophy." (p. 481). Similar sentiments were expressed years earlier by Miller (1969) who argued that psychologists ought to be prepared to give away their expertise to society. The relevance of psychological expertise to the wider public welfare was addressed by Fowler (1990), a former president of the American Psychological Association, who referred to psychology as a core discipline in the sense that many of the major issues and problems confronting the world today have as their root causes human perception and cognition expressed in the form of attitudes, values, beliefs and, ultimately, behaviour, the core phenomena which psychologists seek to understand. In addition, he argues that psychologists have developed research methodologies, including research designs and statistical analyses, that are not only integral to psychology as an academic discipline and a profession but now form part of the methodological repertoire of many of psychology's cognate disciplines.

Environmental psychology is one sub-specialty of contemporary psychology that is particularly relevant to the modern age in which environmental issues are assuming paramount importance. Wohlwill (1972) argued for the value to society of environmental psychology, pointing out that a major challenge for specialists in this nascent field was to explore "the intimate connection between some of the major questions that those concerned with environmental management and control are facing and particular problem areas from the study of motivation, cognition, attitude formation, development, etc." (p. 303). Bechtel, Marans, & Michelson (1987) subsequently described in detail the various methods in environmental and behavioural research that would make this possible.

Winter & Koger (2004) have described how psychological theory and expertise can be mobilized toward an understanding and amelioration of many environmental problems relating to the ecological sustainability of our planet. Enumerating many of the current environmental crises with which humanity is faced, including the implications of exponential

growth and overconsumption for the carrying capacity of the planet, they argue for an important role for psychology in addressing these problems. In their words, "As a science, psychology can illuminate the empirical dimensions of behaviors that contribute to and result from environmental threats." (p. 25). Winter & Koger acknowledge major traditions in psychology that can contribute to this process, including the Freudian (how object relations theory can help us understand the nature of our impaired relationships with the environment), social psychology (cognitive dissonance theory, attitudes versus behavior, persuasion, attribution, and the dynamics of social groups and their impact on individual behaviour as they relate to environmental issues), behavioural psychology (managing contingencies of reinforcement to discourage environmentally unfriendly behaviour while encouraging environmentally protective and sustaining behaviour), physiological and health psychology (the physiological and psychological impact of impaired environments on quality of life and longevity as mediated through the phenomenon of stress), cognitive psychology (how information related to environmental concerns achieves its cognitive representation and how various cognitive activities related to environmental perception, decision making and risk analysis may contribute toward either environmental sustainability or environmental degradation and destruction), and various holistic traditions in psychology, including Gestalt Psychology and Ecopsychology, both of which focus on the individual as part of a larger ecological field and the nature of the reciprocal relationships between human beings and their environments. Concluding that "How to sustain human existence on the planet could become psychology's core question." (p. 211), Winter and Koger then proceed to outline in practical ways how psychological theory and method associated with these various intellectual traditions in psychology can be mobilized toward practical goals related to the alleviation of the environmental crises currently facing humanity at both the individual and local level and, ultimately, at the global level of environmental sustainability and preservation.

Bonnes & Secchiaroli (1995) take a psycho-social approach to environmental issues, focusing on the complex interactions between human beings and their various environments and how these environments are known (perception and cognition) and how they influence the everyday transactions people have with their environments, whether they be natural or built, physical or social. Of particular relevance to the present paper is their account of the origins of contemporary environmental psychology, especially the emerging theoretical and empirical link between psychology and architecture and environmental design as manifest in the emergence of such specialized areas as architectural psychology and environmental psychology. While historically psychologists had not been thought to be part of the process of architectural and institutional design in any formal way, it is now clear that the phenomena of perception, cognition, performance and behaviour are integral to the success or failure of an architectural design.

The late British prime minister, Sir Winston Churchill, is reported to have observed that "First we shape our buildings and afterwards our buildings shape us." (Winston Churchill, 24th November 1951, retrieved February 7th, 2008, from http://www.churchill-society-london.org.uk/chtruste.htm). To say that buildings shape us is to say that the buildings in which we live and work shape the human mind and its products, namely, cognition, emotions and behaviour. Our buildings either liberate us to achieve the purposes for which they were designed or they impair our ability to

achieve these purposes to some degree or other. As the link between architecture and psychology began to develop as an academic specialty and profession, Canter (1972, cited by Bonnes & Secchiaroli, 1995, p. 8), one of the pioneers in this endeavour, argued that architects and designers should always take into account the psychological implications of their design decisions. For Canter, the critical contribution psychologists can make to the process of architectural design is to make explicit in a systematic and scientific way the relationships between physical form and psychological response. In other words, architectural or environmental psychologists can contribute their theoretical and methodological expertise to an understanding of how the built environment can best be tailored to support the needs of its users both in functional and aesthetic terms.

Environmental psychologists have been involved in architecture and environmental design from a number of different vantage points. Some focus on how space can be used most effectively and efficiently while maintaining the aesthetic value of that space (proxemics). Others focus explicitly on environmental aesthetics and how the internal and external aspects of buildings or building complexes, for example, can be designed in a way to induce positive feelings of well-being in the users of such structures. Still others focus on the perceptual, cognitive and behavioural aspects of ergonomic design, seeking to maximize the efficiency and comfort with which human beings can work with the machines and technology that are now endemic to most workspaces. Environmental psychologists with an ecological perspective consider the person to exist in an environmental field with both physical and psychosocial aspects, the harmonization of which can enhance the efficiency and comfort with which people can live and work in their various environments. Where specialized designs are required to support those with particular challenges such as impaired mobility, vision and audition, psychologists have the expertise to document perceptual, cognitive and behavioural difficulties which can often be overcome or ameliorated by alternate design strategies applied to the physical and social environments of concern. Finally, psychological expertise may be mobilized on behalf of community planning and design which emphasize the actual experience users are likely to have in such larger scale environments.

Of the many built environments which individuals may occupy at various stages during their lifetime, educational institutions and health care facilities are of particular strategic value for society at large. How psychologists can contribute to the design of such facilities by offering a user-centered perspective on the perceptual, cognitive and behavioral aspects of human experience in a proposed structure or facility is the focus of the following sections.

Educational Environments

Educational systems exist for the primary purpose of transferring basic knowledge deemed necessary for success in society (e.g., language, mathematics and science skills). They are also venues for the socialization of students and serve as major purveyors of the cultural values and practices society wishes to impart to the younger generation. Formal education typically occurs in school and university settings which consist of a built infrastructure and the surrounding environment which may also be completely built or consist of elements of the more natural order such as might be seen on a university campus. The consequences of poor campus or facility design can be significant both in terms of impaired productivity and lack of aesthetic support. A

reliable assessment of how users respond to their learning environments is an important service environmental psychologists can contribute to the design process. The limitations of an existing design can also be revealed in a Post Occupancy Evaluation (POE) (Zimring, 2001) and meaningful steps can then be proposed to minimize or eliminate the impact of such limitations.

Although there are many ways to create a viable and exciting learning environment, it can be said in general that a systematic design process that interweaves the physical (the natural and built aspects of the learning environment) and the social (users of that environment including students, staff, faculty, visitors, etc.) is likely to produce the best results. By addressing the functional and aesthetic needs of prospective or current users of such an environment, the educational potential of an institution is enhanced. The Ohio State University provides a good example of these design principles at work with the aim of creating a campus that meets the intellectual, behavioural and emotional needs of its users. Presuming that attention is directed to factors known to promote the learning process in both its formal and informal aspects, designers are implicitly adopting a psychological perspective. Environmental psychologists can help to enhance the design process by making these psychological factors explicit.

In earlier editions of this journal, Rackham (2000) and Rackham & Hattori (2004) examined psychological and behavioural considerations that ought to be taken into account in the design of educational settings in the interest of maximizing the educational experience for students in both its formal and informal aspects. Rackham (2000) found that students at the International Christian University in Tokyo, Japan, value the more natural context in which the physical infrastructure of the university is set, possibly because this context helps to set the university apart as a special learning environment and also because this more natural context may have restorative properties as Mehrabian & Russell (1974), Cohen (1978), Gifford (1997), and Kaplan & Kaplan (1992) have suggested.

Rackham & Hattori (2004) focused on the match between the physical environment of International Christian University in both its built and more natural elements and the functional and aesthetic needs of student users of this environment, reaching the conclusion that various improvements are possible to better support the explicit learning goals stated by the university. Yee (2002, 2005) documents photographically many possible campus and building designs that make for learning environments that harmonize function and aesthetics. Each design seeks to incorporate the essence, mission and history of the institution in question. In other words, the architectural design of an educational facility or building is a public statement of the values held by the institution in question.

Creating and Sustaining Healthy Living and Working Environments

The creation of healthy living, working and recuperative environments is another critical area in which environmental psychologists have much to contribute. It was noted above in respect to educational environments that the learning process may be facilitated if the physical infrastructure of the educational establishment incorporates a restorative potential. Stokols (1992) argues that a major challenge of our time is to develop and sustain healthy living and working environments. Failure to do so exacts an enormous cost from the individual and society at large in terms of quality of life and longevity, not to mention the financial burden incurred by individuals and the society of which they are an integral part. Stokols points out

how individual and community health (collective well-being) comes under assault from a variety of sources, including workplace hazards, polluting by-products of high technology, uncontrolled contagious diseases, conflict, mismanagement of environmental resources leading to famine, etc. As Rackham & Hattori (2006) pointed out, a loss of a sense of security and peace can often bring with it physiological and psychological consequences that can compromise quality of life at best and can lead to serious illness or even death at worst.

Promoting a social ecology of health and well-being, Stokols (1992) argues that healthy environments and healthy inhabitants of those environments result from the dynamic interplay of various facets of the physical environment (geography, architecture, technology), personal attributes of the individual (genetic legacy, psychological and behavioural predispositions) and the social environment (culture, economics, politics). Critical attributes of the physical environment include the overall architectural design plus specific attributes of that design including lighting, coloring, temperature, noise, spatial arrangements, etc., all of which contribute in one way or another to the functional and aesthetic support a particular environment provides for the individual or group user. Both physical and social aspects of a given environment can serve as stressors for individuals using that environment or they may help to sustain a sense of well-being because they either do not possess the characteristics that are conducive to the onset of stress or they contain aspects that help to alleviate existing or ongoing stress. Common physical sources of stress in the workplace include the introduction of new technology (e.g., computers), monotony, noise, excessively bright lights or lighting that is inadequate for the job at hand, excessive heat or cold, inappropriate use of space, no opportunity for privacy, a physical design that makes cooperative endeavors more difficult than they need to be, etc.

Kelloway & Day (2005) argue for a holistic approach to producing healthy workplaces. The physical, psychological, behavioural and social dimensions are all important. They argue, therefore, for multiple indices of both individual and organizational health in workplace environments and describe how these indices can be mobilized toward establishing work environments that support worker morale, satisfaction and productivity.

Carlopio (1996) argued specifically for the need to give proper consideration to the physical environment as it relates to worker satisfaction and developed a questionnaire that can be used to assess satisfaction with the physical attributes of any work environment. They argue for the advantages of providing the best possible physical working conditions that emphasize safety, comfort, a pleasant atmosphere (aesthetics), support for the job at hand, all in the interests of promoting physical and mental health. They argue that these are the prerequisites to improving worker productivity, motivation and overall job satisfaction.

Psychologically Enhanced Design of Health Care Facilities

If psychologically informed design decisions are important for creating healthy work environments, they are especially important for facilities designed particularly for the care of the sick and injured, those whose health problems are acute and those whose health problems are chronic and debilitating, thereby requiring long term care in an institutional setting of some sort such as a hospital, nursing home or hospice. Several years ago, a Reuters article appeared in the popular media entitled "Bad Hospital Design in UK

Said to Interfere with Patient Care." A leading neurosurgeon at the Atkinson Morley Hospital in London was cited as observing that form and colour and light have actual physical effects on patients and that modern block-like hospitals are working against the welfare of patients. He pointed to the importance of open, airy ward designs and views of more natural environments such as gardens as being conducive to patient welfare and recovery, something he claimed Florence Nightingale had known many years earlier. He also lamented the fact that poor hospital design worked against the welfare of the medical and support staff, producing additional stress that could interfere with delivery of the "hospitality" that a health care facility should be offering to its clients.

A variety of studies have been conducted over the years regarding housing quality and mental health (e.g., Halpern, 1995; Evans, Wells, Chan, & Salzmann, 2000). In these studies, the built environment is construed as a source of stress and stress is often a precursor to more serious health conditions of both a physiological and psychological nature. The link between health and the built environment is usually not direct and a variety of intervening factors may come into play to produce the observed outcome. Nevertheless, the evidence is sufficiently compelling to warrant further investigation into the link between the nature of the built environment and a person's mental health status.

Hospitalization for an acute or chronic illness or injury can be a traumatic experience. The impact of hospitalization will vary with the individual but often it is a stressful experience as the patient not only has to cope with an illness or injury but a new environment that, if poorly designed, may contribute to the distress the patient is already experiencing. The negative psychological effects of chronic stress can include anxiety, depression and anger. These, in turn, may contribute to a deterioration in physiological parameters such as blood pressure, increased cortisol levels, and elevated triglyceride and cholesterol levels. These psychological and physical factors may then manifest themselves behaviorally in terms of such health compromising behaviors as sleeplessness, aggression, failure to comply with treatment regimens, etc.

Proper design of health care facilities may play a significant role in ameliorating such problems or preventing them in the first place. Conversely, bad hospital, hospice or nursing home design can aggravate the stress experienced by patients and caregivers alike. Stress can accrue from such poorly managed physical features of the environment as poor air quality (including unpleasant odours), inadequate lighting or excessive lighting, excessive noise, incoherent or illegible layout of hospital wards, rooms, nursing stations, corridors, and ancillary facilities such as meeting or recreational rooms. For those suffering some chronic or terminal condition, an increasingly likely prospect in ageing societies, developing institutions with life affirming physical and social infrastructures is very important.

The Center for Health Design based in Concord, California takes as its mission the transformation of healthcare settings into healing environments that improve outcomes through design decisions based on empirical data (The Center for Health Design at http://www.healthdesign.org/research). The Center reports, for example, that adjustments to the physical design of the Cardiac Critical Care Unit at Methodist Hospital in Indianapolis, Indiana produced a variety of benefits including a 75% decline in patient falls and more efficient nursing care through relocation of nursing stations and nursing staff. At the Barbara Ann Karmanos Cancer Institute in Detroit, Michigan, a 30% decrease in medical errors was reported as a result of allocating more space for medical treatment

rooms. Ulrich and Zimring (The Center for Health Design at http://www.healthdesign.org/research) claim that "evidence-based design" can improve hospital environments by enhancing patient safety, eliminating environmental stressors, and providing more pleasant, comfortable and supportive spaces for patients, medical staff and visitors. Their specific recommendations include well-designed air ventilation and filtering systems, sound-absorbing ceiling tiles and carpeting, better lighting including access to natural light, small changes to room layouts, colour schemes, furniture choice and arrangement, floor coverings, curtains, and views of more natural settings such as gardens.

Ulrich (1984, 1991, 1992, 1997, 2000) and Ulrich et al. (1991) have argued for the importance of evidence-based hospital design in general and for specific design imperatives such as exposure to natural light and natural views as ways of making hospital environments more palatable to those who have to use them or for those for whom the hospital is their work environment. Many of Ulrich's observations and conclusions were summarized in an article published on the Internet entitled "Evidence Based Environmental Design for Improving Medical Outcomes" (Retrieved February 6th, 2008 from http://muhc-healing.mcgill.ca/english/Speakers/ulrich_p.html). Ulrich observes that healthcare facility design traditionally has emphasized such concerns as functional efficiency, costs, and providing effective platforms for medical treatments and technology. Sometimes this means that the needs of the users (patients and staff members) are given secondary or even tertiary consideration. In Ulrich's estimation, a negative consequence of this orientation has been that the psychological and social needs of patients have been largely disregarded in the design of healthcare facilities and often marginalized in creating visitor and staff spaces. He argues that in spite of traumatizing hospital experiences and major stress from illness, little priority has been given to creating surroundings that calm patients, or help to strengthen coping resources and healthful processes. Rather, this emphasis on function has often produced environments now considered starkly institutional, stressful, and detrimental to care quality (Ulrich, 1992; Horsburgh, 1995).

Ulrich argues that there is now compelling evidence to indicate that environmental factors affect patient outcome in significant ways. For example, control or elimination of noise is important for it can be a significant source of stress which can work against an individual's recovery. The use of pleasant music, especially when controllable by the listener, can lead to a reduction in restlessness and anxiety. Evidence suggests that access to windows and natural views and direct access to sunlight are preferred by patients and may contribute to their sense of well-being. As for flooring, evidence suggests that carpet is preferred to vinyl by most patients although nursing staff tend to prefer vinyl floors for the practical reason that they are much easier to clean. Finally, furniture arrangements can facilitate or inhibit social interaction among longer term hospital residents. Movable furniture can confer a flexibility that can enable smaller or larger group activities in the same physical space. A healthy social environment can contribute to a psychological sense of well-being which contributes, in turn, to a better health outcome overall.

Ulrich argues that evidence indicates that the incorporation of psychosocially supportive criteria in the hospital design process can bring the following benefits to patients and staff alike: (1) reduced stress, (2) improved sleep, (3) reduced pain, (4) lower rates of infection, (5) improved patient satisfaction, (6) significant benefits to the staff (reduced stress, greater job satisfaction, higher

quality staff), and (7) cost savings.

Socrates observed long ago that just as the eyes cannot be cured without reference to the head, or the head without the body, neither can the body be cured without reference to the soul. Sir William Osler, the renown 19th century Canadian physician, noted wisely that it is often just as important to know what sort of patient has the disease as what sort of disease the patient has. Health and illness are complex holistic phenomena involving a seamless interaction between the physical, the physiological, the psychological, and the social dimensions of human experience. The design of health care facilities that maximize in their physical and social dimensions the kind of support that users of these facilities need is a very important area in which environmental and architectural psychologists can contribute to the greater welfare of society at large.

Summary and Conclusions

This paper began with the assertion that psychologists, with their theoretical and methodological expertise regarding human cognition and behaviour, have much to contribute to the welfare of society at large in many different domains of concern. Environmental and architectural design are areas of particular relevance to environmental psychologists who can share their insights into the nature of the reciprocal relationships between human beings and their various environments. Education and health care are areas of widespread public concern in all societies. Incorporating psychological expertise in the design and evaluation of educational and health care facilities can bring important benefits to the users of such facilities. Professionals in all disciplines have an ethical responsibility to render what expertise they can muster to the service of the wider society of which they are a part. Through the application of systematic methods of inquiry underpinned by solid theoretical perspectives, environmental psychologists can help to make explicit what works and what does not work in institutional and facility design from the user's perspective. As almost all members of most societies are users of formal educational facilities and many members of society become users at some point in their lives of health care facilities, careful attention to the psychological dimensions of experience in these environments is very important if users are to obtain maximum functional and aesthetic benefit from the services these facilities are meant to provide.

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