

Research on Therapeutic Landscapes in Taiwan

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ABSTRACT

Therapeutical landscape, restorative environment, horticultural therapy, and healing garden are phrases that embody concepts recognized with increasing importance in the field of landscape architecture and design in the 21st century. Therapeutical landscape involves the use of natural landscape in therapy for people in healthcare facilities and for the general well-being of other users. Studies have shown that the interaction between nature and people leads not only to physical and mental healing, but also spiritual healing. Therapeutic, or healing, environments expand upon a holistic approach to care, addressing physical, psychological, and emotional well-being through a commitment to the overall healing experience and quality of life for the patient, resident, staff, and families. This article aims to report on and summarize various studies on the healing effect of natural landscape and horticulture activities in Taiwan. These studies and cases involve diverse populations, including hospitals, retirement communities, leisure farms, and nature-based recreational areas. In Taiwan, many studies indicate that healthcare facilities and hospitals interested in providing opportunities for horticultural therapy enable patients to work with plants. Other nature-based environments such as leisure farms and recreational areas are also looking for evidence of the beneficial natural experiences. It is believed that seeing and participating in daily contact experiences with nature – especially healthy (ecology) nature – benefit people's health; not only do plants provide visual enjoyment, but activities within nature are satisfying and therapeutic for many.

Keywords: health benefit, horticulture therapy, restorative environment

Abbreviations: ART, attention restoration theory; AWMSI, area-weighted mean shape index; BVP, blood volume pulse; EEG, electroencephalography; EMG, electromyography; HR, heart rate; MSI, mean shape index

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INTRODUCTION

Environmental psychology, horticulture, outdoor recreation, and other human-environment interaction fields of study have long been interested in the influence of nature and plants on human well-being. In the 1970s, researchers exploring the psychological role of nature applied psychometric measures to investigate the environmental perception and cognitive states of human subjects in natural environments (Kaplan 1973; Ulrich 1979). Since the 1970s, however, some researchers have begun to investigate the effects of landscapes and/or views of nature on the participants' biological as well as psychological responses to different environments (Ulrich 1981, 1983, 1986). Studies have found that exposure to environments with plants can have both physiological and psychological benefits (Ulrich 1981, 1983, 1986; Hartig *et al.* 1991; Ulrich and Parsons 1992). In addition, experiences in nature and/or wilderness environments can help with stress management and be restorative (Kaplan and Kaplan 1989). The “soft” fascination of beauty

in nature enhances mental health in terms of recovery from mental fatigue and generates opportunities for cognitive restoration (Herzog *et al.* 1997; Chang and Chen 2005).

Therapeutical landscape, restorative environment, horticultural therapy, and healing garden embody concepts recognized with increasing importance in the fields of landscape architecture and design in the 21st century. Some people living in urban environments feel more nervous, more anxiety, and more fatigue after their daily high-pressure lives. Many people are not working for material gain, but are more concerned with their spiritual happiness, peace, and relaxation. In such circumstances, natural scenery is important with regard to its therapeutic and health benefits.

What is a “therapeutical landscape”?

A therapeutic landscape involves the use of natural landscape in therapy for people in healthcare facilities and for the general well-being for others. It provides a mechanism for urban residents to release their stress caused by high

pressure working environments (Ulrich *et al.* 1991; Parsons *et al.* 1998) and reestablish mental restoration (Kaplan and Kaplan 1989; Hartig *et al.* 1991; Van den Berg *et al.* 2003).

According to Pelka (1999), access to a therapeutic landscape is a way to achieve wellness through relaxation and recovery. In addition, it cooperates with physical and psychological treatment to improve one's health. Kaplan and Kaplan (1989) proposed the Attention Restoration Theory (ART), which established a good theoretical basis for further studies on therapeutic landscapes. Meanwhile, Ulrich (1983) proposed the stress recovery-related psychophysiological environment, which supports the benefits of natural environments.

Why might natural environments serve physiological, emotional, and attentional restoration better than urban surroundings? The research cited earlier stemmed from one or both of the two theories mentioned; although these theories share some common features (Hartig and Evans 1993), they deal with different antecedents and emphasize different restoration outcomes.

ART (Kaplan and Kaplan 1989; Kaplan 1995) complements analyses of overload in urban environments (Milgram 1970; Cohen 1978) by proposing factors that work in the renewal of a depleted capacity for directing attention. According to ART, restoration from directed attention fatigue occurs by creating psychological distance from routine mental contents (*being away*) in conjunction with effortless, interest-driven attention (*fascination*) sustained in coherently ordered environments of substantial scope (*extent*) when the person's inclinations match the demands imposed by the environment as well as the environmental supports for intended activities (*compatibility*). Kaplan and Kaplan (1989) argue that these four factors commonly rate at high levels in natural environments.

Ulrich's (1983) alternative theory about restorative environments emphasizes the physiological and emotional changes that can occur while viewing a scene after a situation involving challenge or threat. Ulrich (1983) proposes that perceiving particular qualities and contents in a scene can support psychophysiological stress recovery. Moderate depth, moderate complexity, the presence of a focal point, gross structural qualities, and natural contents such as vegetation and water can evoke positive emotions, sustain non-vigilant attention, and restrict negative thoughts, thereby aiding the return of autonomic arousal to more moderate levels (Fredrickson and Levenson 1998; Shapiro *et al.* 2001).

Contact with nature promotes health and well-being

People with access to nearby natural settings have been found to be healthier overall than those without such access. In the long-term, indirect impacts of "nearby nature" also include increased levels of satisfaction with one's home, job, and life in general (Kaplan and Kaplan 1989).

Parks first designed in the nineteenth century, resulted from city officials' strong belief in the possible health advantages that would result from open spaces (Hamilton-Smith and Mercer 1991; Rohde and Kendle 1997). It was hoped that parks would reduce disease, crime, and social unrest as well as provide "green lungs" for the city and areas for recreation (Rohde and Kendle 1997). These assumptions were used as justification for establishing parks and other natural areas in cities and preserving wilderness areas outside of cities for public use (Parsons 1991; Ulrich 1993).

Some studies have shown that interaction between nature and people leads not only to physical and mental healing, but also spiritual healing. Therapeutic, or healing, environments expand upon a holistic approach to care in health care facilities, addressing physical, psychological, and emotional well-being through a commitment to the overall healing experience and quality of life for the patient, resident, staff, and families.

Chang and Wan (2000) used the cognitive paradigm as the conceptual theory basis, applying psychophysiological measurement to depict the relationships between attention restoration and electromyography (EMG). The researchers explored psychophysiological responses in different urban-rural spectrum landscapes. Their results indicate that urban-rural landscapes have the highest attention restoration score, and urban landscapes have the lowest score (Chang and Wan 2000).

Meanwhile, Hung and Chang's (2002) cross-cultural study explored the influence of different types of landscapes on psychophysiological reactions. Indices for physiological reactions include electroencephalography (EEG), EMG, and heart rate (HR), while psychological reactions are tested with regard to ART, landscape preference, and relaxation. In addition, Hung and Chang incorporate a cultural background difference – Taiwanese versus Americans – in discussing the influences of landscapes on psychophysiological reactions.

Their results indicated that participants' right brain activity (EEG-b) reached a significant level when shown mountain and park views, which resulted in the highest EEG-b rates. ART, preference, and relaxation also reached levels of significance when viewing nature such as mountains, water, and forests, resulting in higher psychological benefits. In addition, the correlation of psychological and physiological reactions reached a level of significance.

Regarding the effect of cultural background on psychophysiological reactions when viewing different landscapes, participants from different cultures demonstrated significant changes of ART and relaxed feelings upon viewing certain landscapes. American participants had higher levels of EEG-b than Taiwanese participants when viewing pictures of mountains and forests. On the other hand, Taiwanese participants had higher EEG-b levels when viewing pictures of water and parks. Parks also induced higher ART for Taiwanese, while mountains, water, and forests did so for Americans (Hung and Chang 2002).

The healing effects of a natural view are increasingly understood in stressful environments such as hospitals, nursing homes, remote military sites, spaceships, and space stations (Lewis 1995). In these environments in particular – as well as in windowless offices – studies show that seeing nature is important to people and is an effective means of relieving stress and improving well-being (Kaplan 1992; Lewis 1995; Leather *et al.* 1998). For example, Chang and Tseng (1998) compared two groups of patients at different hospitals with different landscape environments. Patients both views to green areas and spent time in green landscapes that led to reduced pain after general gastroduodenal ulcer and urethral surgery (Chang and Tseng 1998).

Micro-restoration experience

The natural environment appears to contain factors necessary for an attention-restoring experience (Kaplan and Kaplan 1989). Gazing at a natural view from a window in one's living environment may be an easily accessible "micro-restorative" activity.

Chang and Chen's (2005) study tested the effects of window views and indoor plants on human psychophysiological responses in workplace environments. The effects of window views and indoor plants were recorded by measuring participants' EMG, EEG, blood volume pulse (BVP), and state anxiety. Photo Impact 5.0 was used to simulate the environment in an office, where six conditions were examined: 1. window with a view of a city, 2. window with a view of a city and indoor plants, 3. window with a view of nature, 4. window with a view of nature and indoor plants, 5. office without a window view, and 6. office without a window view and indoor plants. Participants were less nervous or anxious when watching a view of nature and/or when indoor plants were present. When neither the window view nor the indoor plants were shown, participants suffered the highest degree of tension and anxiety (Chang and

Chen 2005).

Research suggests access to nature in the workplace is related to lower levels of perceived job stress and higher levels of job satisfaction (Kaplan and Kaplan 1989). Workers with a view of trees and flowers felt that their jobs were less stressful, and they were more satisfied with their jobs than others who could only see man-made environments from their window. In addition, employees with views of nature reported fewer illnesses and headaches (Kaplan and Kaplan 1989). A similar study found that a view of natural elements (trees and other vegetation) buffered the negative impact of job stress on intention to quit (Leather *et al.* 1998).

Further studies have explored university dormitory window views. Tennessen and Cimprich (1995) explored whether university dormitory residents with more natural views from their windows scored better than those with less natural views on tests of directed attention. Views from dormitory windows of 72 undergraduate students were categorized into four groups, ranging from all natural to all man-made. The capacity to direct attention was measured using a battery of objective and subjective measures. Natural views were associated with better performance on attentional measures, providing support for the proposed theoretical view (Tennessen and Cimprich 1995).

Ulrich (1981) found that slides of natural views of water and vegetation tended to hold subjects' attention and interest more effectively than urban scenes. Meanwhile, Hartig *et al.* (1991) compared three groups of experienced backpackers: one group went on a wilderness trip, one group went on an urban vacation, and the third group did not vacation. Improved proofreading scores resulted only in the wilderness vacationers. In Hartig *et al.* (1991) study, they instructed subjects complete 40 minutes of tasks designed to induce attentional fatigue, followed by one of three conditions: walking in a natural environment, walking in an urban environment, or passive relaxation. The results found that mental fatigue was most successfully relieved by a walk in a park.

RECREATIONAL EXPERIENCES WITH NATURAL ENVIRONMENT

Contact with nature in a natural environment may be experienced via various means, including viewing natural scenes, being in natural settings, encountering plants and animals, participating in recreational activities, undertaking environmental conservation work, and participating in nature-based therapy programs, amongst others. The study upon which this paper is based included an examination of the relationships between participants' activities, psychological outcomes (recreation experience), psychological benefits (state anxiety), and physical benefits (right and left brain activity and EMG) in different nature-based tourism environments. Participants' psychological outcomes were evaluated based on outdoor recreation theories to explore the influence of various environments on participants' recreation experiences (Chou 2005). Six spots in Taroko National Park and the noted leisure farms of midst Taiwan were selected which included mountain, river, seashore, culture historical scene, rural, and leisure farm. Each spots were filmed for 20 seconds as the stimuli of environment psychophysiological test. The recreation experience scale was used to assess participants' recreation experience satisfaction. The summed score of State Anxiety Inventory was on behalf of the participants' psychological benefits. The right and left sphere Alpha brain waves (EEG-a, EEG-b) and the forehead electromyography (EMG) recorded by biofeedback instruments was on behalf of the participants' physical benefits.

With regard to the relationship between environments and recreation experiences, it is obvious that different environments could induce different recreation experiences. Participants generally thought that the river environment views provided the most recreation experience satisfaction while the seashore environment views provided the least. With re-

gards to the relationship between activity and recreation experience, the results indicated that different activities could induce different recreation experiences; participants considered active activities to induce the most recreation experience satisfaction. The relationship among environments, activities, experiences, and benefits indicated significant correlation between psychological benefits, environments, activities, and experiences.

HEALTHY LANDSCAPE AND HEALTHY PEOPLE

Natural spaces and public-owned parks not only preserve and protect the environment, but they also encourage and enable people to relate to the natural world; hence, they play a key role in a socio-ecological approach to health (Maller *et al.* 2006).

Landscape's ecological structure and satisfaction

The level of greenery is an influential factor in the level of satisfaction with living conditions. Promoting many inter-people relationships and inter-plant and wildlife relationships will improve people's preference of an environment. Luttik (2000) used the hedonic pricing method to estimate that part of a price results from a particular attribute. Nearly 3,000 house transactions in eight towns and regions in the Netherlands were studied to estimate the effect of environmental attributes on transaction prices. Luttik found the largest increases in house prices due to environmental factors (up to 28%) for houses with a garden facing water connected to a sizeable lake. The study also demonstrated that a pleasant view can lead to a considerable increase in house price, particularly if the house overlooks water (8 to 10%) or open space (6 to 12%). In addition, the analysis revealed that house prices vary according to landscape type; attractive landscape types attracted a premium of 5 to 12% more than less attractive environmental settings (Luttik 2000).

Several studies depict the relationship between greenway structures and satisfaction with living conditions. Chang (2004) explored the relationship between residents' perceptions of their living environment and the landscape ecology structures. Residents' satisfaction with their living environment has been popularly used to represent an index of the quality of the planning and design of a community. This study sought to test the theory of landscape structure of landscape ecology that relates the landscape structures to the environmental quality from an ecological perspective. The results found that the landscape ecology structures of woods and farmland have significant relationships with residents' perceptions. The Mean Shape Index (MSI) and the Area-Weighted MSI (AWMSI) of farmland patches had a significant relationship with residents' perceptions of satisfaction with natural and living conditions. In addition, a significant relationship was found between residents' natural perception and their satisfaction with living conditions. Further studies related to the urban and rural areas of the various kinds of land use patterns, especially in the suburban areas of Taiwan, are suggested.

Landscape's ecological structure and biodiversity

Using wildlife approaches, many studies point out the influences of the landscape's ecological structures on wildlife's distribution and diversity. Productivity and energy flow are also influenced (Farina 1998). The woods area of a patch is positively related with energy; the larger the patch is, the larger the number of wildlife species and diversity (Free-mark 1995).

Searching for a sustainable environment

We have tried to incorporate the field of landscape ecology into the landscape psychophysiological field. Sustainable landscapes from the perspective of healthy wildlife and healthy people have been proposed to make the connection

between these two fields. The purpose of this cooperation between the two is to figure out what kind of landscape will benefit both wildlife and humans (Weng and Chang 2003; Chiang and Chang 2005). These studies adopt bird species as indicators of the landscape's ecological factors. The authors first calculated the related indices of the landscape's ecological structures and then investigated the bird species' indicators to test the relationships between the landscape's ecological structures and wildlife. Second, they videotaped the investigation sites and showed these videos to the respondents to measure their psychophysiological responses in order to test the relationship between the landscape's ecological structures and people's physical and psychological responses. The birds' indicators and the respondents' reactions were compared to determine the landscape indicators that can or can not benefit both species. The results indicate that different landscape structures have significant relationships with species' diversity and residents' psychophysiological responses. With this exploratory study, the different beneficial effects between wildlife species and humankind were compared in regard to the landscape's ecological structures.

Water and farm landscapes were found to have similar effects both on birds and humans; both preferred the presence of water and farmland. Bodies of water provide food sources and enable respondents to feel relaxed. Meanwhile, farmland also provides foods, and large farmlands encourage relaxation similar to the visual effects of a savanna, thereby fitting Appleton's prospect and refuge theory (Chiang and Chang 2005).

Defining sustainable environment is a complex endeavor; the use of this term in this study attempts to create a connection between landscape ecology, well-developed knowledge of landscape structure and wildlife, and landscape psychophysiology – the relationship between landscape and people's physical and psychological responses – to demonstrate how landscape can benefit both wildlife and humans, a sustainable environment for living generations.

REFERENCES

- Chang C-Y (2004) The relationships between landscape ecology structures and residents' living satisfaction. *Acta Horticulturae* **639**, 261-267
- Chang C-Y, Chen P-K (2005) Human response to window views and indoor plants in the workplace. *HortScience* **40**, 1354-1359
- Chang C-Y, Tseng T-H (1998) Research of influences of hospital environment on patients' physical and psychological reactions. *Journal of the Chinese Society for Horticulture Science* **46**, 231-246
- Chang C-Y, Wan L-L (2000) Landscape benefits on the EMG and attention recovery effects. *Journal of Landscape* **7**, 1-22
- Chiang Y-C, Chang C-Y (2005) *Searching a Sustainable Environment for Wildlife and Humankind*. IUCN World Commission on Protected Areas, 5th Conference on Protected Areas of East Asia, Hong Kong, China
- Chou M-T (2005) Participants' recreational experiences and psychophysiological benefits in nature-based tourism environments. Unpublished master thesis, National Chung Hsin University, Taiwan, 71 pp
- Cohen S (1978) Environmental load and the allocation of attention. In Baum A, Singer JE, Valins S (Eds) *Advances in Environmental Psychology* (Vol 1) Lawrence Erlbaum, Hillsdale, NJ, pp 1-29
- Farina A (1998) *Principles and Methods in Landscape Ecology*, Chapman and Hall Press, New York, 235pp
- Freemark K (1995) Assessing effects of agriculture on terrestrial wildlife: developing a hierarchical approach for the US EPA. *Landscape and Urban Planning* **31**, 99-115
- Fredrickson BL, Levenson RW (1998) Positive emotions speed recovery from the cardiovascular sequelae of negative emotions. *Cognition and Emotion* **12**, 191-220
- Hamilton-Smith E, Mercer D (1991) *Urban Parks and Their Visitors*, The Parks Division and Metropolitan Board of Works, Melbourne, 79 pp
- Hartig T, Evans GW (1993) Psychological foundations of nature experience. In: Gärling T Golledge RG (Eds) *Behavior and Environment: Psychological and Geographical Approaches*, North-Holland, Amsterdam, pp 427-457
- Hartig T, Mang M, Evans GW (1991) Restorative effects of natural environment experiences. *Environment and Behavior* **23**, 3-26
- Herzog TR, Black AM, Fountaine KA, Knotts DJ (1997) Reflection and attention recovery as distinctive benefits of restorative environment. *Journal of Environmental Psychology* **17**, 165-170
- Hung C-C, Chang Y-C (2002) Psychophysiological benefits of landscapes studies of mountain, water, forest, park, and city. *Horticulture NCHU* **27**, 79-86
- Kaplan R (1973) Some psychological benefits of gardening. *Environment and Behavior* **5**, 145-161
- Kaplan R (1992) The psychological benefits of nearby nature. In: Relf D (Eds) *The Role of Horticulture in Human Well-being and Social Development*, Timber Press, Portland, OR, pp 125-133
- Kaplan R, Kaplan S (1989) *The Experience of Nature: A Psychological Perspective*. Cambridge, Cambridge University Press, NY, 360 pp
- Kaplan S (1995) The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology* **15**, 169-182
- Leather P, Pyrgas M, Beale D, Lawrence C (1998) Windows in the workplace. *Environment and Behavior* **30**, 739-763
- Lewis CA (1995) Human health and well-being: The psychological, physiological, and sociological effects of plants on people. *Acta Horticulturae* **391**, 31-39
- Luttik, J (2000) The value of trees, water and open space as reflected by house prices in the Netherlands. *Landscape and Urban Planning* **48**, 161-167
- Maller C, Townsend M, Pryor A, Brown P, St. Leger L (2006) Healthy nature healthy people: "Contact with nature" as an upstream health promotion intervention for populations. *Health Promotion International* **21**, 45-54
- Milgram S (1970) The experience of living in cities. *Science* **167**, 1461-1468
- Palka E (1999) Accessible wilderness as a therapeutic landscape: Experiencing the nature of Denali National Park, Alaska. In: Williams A (Ed) *Therapeutic Landscape: The Dynamic Between Place and Wellness*, University Press of America, Inc., Maryland, pp 29-51
- Parsons R (1991) The potential influences of environmental perception on human health. *Journal of Environmental Psychology* **11**, 1-23
- Parsons R, Tassinari LG, Ulrich RS, Hebl MR, Grossman-Alexander M (1998) The view from the road: implications for stress recovery and immunization. *Journal of Environmental Psychology* **18**, 113-140
- Rohde CLE, Kendle AD (1997) Nature for people. In: Kendle AD, Forbes S (Eds) *Urban Nature Conservation – Landscape Management in the Urban Countryside*, E. and F. N. Spon, London, pp 319-335
- Shapiro D, Jamner LD, Goldstein IB, Delfino R (2001) Striking a chord: Moods, blood pressure, and heart rate in everyday life. *Psychophysiology* **38**, 197-204
- Tennessen CM, Cimprich B (1995) Views to nature: Effects on attention. *Journal of Environmental Psychology* **15**, 77-85
- Ulrich RS (1979) Visual landscapes and psychological well-being. *Landscape Research* **4**, 17-23
- Ulrich RS (1981) Natural versus urban scenes: some psychophysiological effects. *Environment and Behavior* **13**, 523-556
- Ulrich RS (1983) Aesthetic and affective response to natural environment. In: Altman I, Wohlwill JF (Eds) *Behavior and the Natural Environment*, Plenum Press, New York, pp 85-125
- Ulrich RS (1986) Human responses to vegetation and landscapes. *Landscape and Urban Planning* **13**, 29-44
- Ulrich RS (1993) Biophilia, biophobia, and natural landscapes. In: Kellert SR, Wilson EO (Eds) *The Biophilia Hypothesis*, Shearwater Books/Island Press, Washington, DC, pp 73-137
- Ulrich RS, Parsons R (1992) Influences of Passive Experiences with Plants on Individual Well-being and Health. In: Relf D (Eds) *The Role of Horticulture in Human Well-being and Social Development*, Timber Press, Portland, OR, pp 90-105
- Ulrich RS, Simons RF, Losito BD, Fiorito E, Miles MA, Zelson M (1991) Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology* **11**, 201-230
- Van den Berg AE, Koole SL, Van der Wulp NY (2003) Environmental preference and restoration: (How) are they related? *Journal of Environmental Psychology* **23**, 135-146
- Weng P-Y, Chang Y-C (2003) The influence of respondents' natural perception and psychophysical responses. *Horticulture NCHU* **28**, 101-109