

Restorative environments: Theory and research

On behavioral changes resulting from spending time in specific environments

Nature as a Restorative Agent

- Central Park, New York: Created because one believed that nature was important to people's emotional and physiological health
- As most people today live in urban settings, nature may be even more important than earlier

Motives and benefits associated with nature

- Cognitive freedom
- Escape
- Experience nature
- Growth
- Challenge
- Guidance
- Social
- Health
- Self-control
- Eco-system connectedness

Identity, Connectedness, and Nature

- Environmental identity: How deeply we identify with nature
 - When nature becomes associated with the self, we may be motivated to protect it as we would protect ourselves
 - "Loving nature to death"?

Mental fatigue as a problem in modern society: Negative consequences

- Aggressiveness
- Less tolerance
- Reduced sensitivity to social signals
- Less helpfulness
- Reduced self-control
- "Chronic Fatigue Syndrome"

Current theories on restorative environments

- Focus on conditions that make restoration necessary
- Focus on urbanites who seek nature in order to recover/ "recharge the batteries"

Early research on health effects of nature

- The quality of the view from the window as a factor in the recovery of hospitalised persons (Verderber,1986)
- The view of nature as important for recovery after surgery (Ulrich,1984)
- Clear relation between prisoners' use of health services and the view from the cell window (Moore,1981)

Theories on restorative environments

- What is being restored?
- How is the process of restoration described?
- Descriptions of restorative environments
- A resource must have been depleted, such as the ability to maintain or improve adaptation to the the environment

The process of restoration

- A number of processes leading to renewal or recovery of adaptive resources or abilities
- The processes are of a psychological nature
- The theory should define the restorative process in terms of the resources being restored and the psychological, physiological and/or social mechanisms at work
- How much time is needed for recovery?

Description of restorative environments

- A theory of restorative environments should be able to predict changes resulting from spending time in specific environments

Roger Ulrichs theory: Psychophysiological recovery from stress

- Preceding state: Stress
 - Reaction to challenge or threat to well-being/survival
 - Assumes an innate emotional response leading to "fight or flight"
 - Mobilisation of necessary resources
- Indications:
 - Negative emotions
 - Activation of the autonomous nervous system

The process of recovery

- Exposure to scenes eliciting mild to moderate interest, well-being and calm, without a need to be "on the guard"
- Negative emotions are being substituted by positive, negative thoughts are blocked and activation of the sympathetic nervous system decreases

Restorative environments

- Restorative responses are switched on through attention to preferred environmental patterns:
 - Moderate complexity
 - Focal point
 - Natural elements: Vegetation, water (both are survival signals and elicit positive emotions)

Ulrich's theory: Empirical findings

- Measurement of emotional and physiological changes of relatively short duration
- Exposure to photographic simulations of natural and urban environments
 - Emotional and physiological results under or directly after exposure depended on the type of environments being exposed
 - Nature scenes resulted in decreased sadness and anger/aggression and increased positive emotions

Attention Restoration Theory (Kaplan & Kaplan)

- Preceding state
 - Depletion of the ability to inhibit competing stimuli in order to focus on something uninteresting
 - Leads to irritability, a lack of planning ability, reduced self control etc

The process of recovery

- Through the experience of *fascination*:
 - F. is effortless and has unlimited capacity
 - Lessens demands on the central inhibitory mechanism

Kaplan & Kaplan's theory on restorative environments

- Preferred environments are also restorative because humans are assumed to be genetically prepared for processing of information that are typical of natural environments (Kaplan & Kaplan, 1989; Hartig, 1993).

Two types of attention (James, 1892)

- «Involuntary» attention
 - When attention is drawn towards something we experience as interesting
 - When something exciting or interesting happens and we focus upon it without effort
 - Restoration of mental energy
- «Voluntary» or directed attention
 - Focusing on something that does not draw our attention by itself

Kaplan & Kaplan's (1989) Attention Restoration Theory

- Mental fatigue: A consequence of "directed attention"
- "Involuntary attention":
 - Elicited by fascinating qualities found for example in natural environments
 - Restores the capacity for directed attention

Kaplan & Kaplan (1989): Four key components in restorative environments

- Being away
 - Involvement in cognitive content different from the usual
- Extent
 - Experience of totality and meaning
- Fascination
 - Fascinating stimuli elicit involuntary attention
- Person – environment compatibility
 - Matching the characteristics of the environment and the needs and behaviours of the individual

Comparing Ulrich and Kaplan & Kaplan

- Are the theories complementary?
- Preceding states that are not necessarily interrelated
 - Ulrich: Psychophysiological stress
 - Kaplan & Kaplan: Failure of focused attention
- Description of attention in natural surroundings
 - K&K: effortless
 - U: Unguarded
 - Differing implications: Attentional capacity versus physiological reactions
- Different effects of recovery
 - Attentional versus physiological and emotional
- Probably simultaneous processes

THE RESTORATIVE
BENEFITS OF NATURE:
TOWARD AN
INTEGRATIVE
FRAMEWORK
STEPHEN KAPLAN

Main points

- Directed attention and its fatigue has far-reaching consequences.
- Introduces Attention Restoration Theory, as an explanation of the processes leading to recovery from fatigue.
- Natural environments as promotive of restorative experiences
- Proposes a framework integrating directed attention and stress in the context of human-environment relationships.

Background/point of departure

- Rapidly accumulating evidence on to the psychological benefits of nature but less developed theoretical understanding
- Theory has been dominated by conflicting positions: stress reduction versus recovery of the capacity to focus attention
- The purpose of this paper:
 - To propose an integration of the apparently conflicting positions mentioned above

Background for the concept of Directed Attention

- William James (1892): 'voluntary attention'
 - Supporting a weak intention by protecting it from competing thoughts > inhibition of distractions
- Olmsted (1865): The need for urban dwellers to recover the capacity to focus
- Clinical neurology: Deficits in "Directed attention" (Mesulman, 1985) due to damage in prefrontal cortex and 'executive functioning'

Directed attention fatigue and basic processes

- The mechanism of directed attention
 - Requires effort
 - central in focusing
 - under voluntary control
 - susceptible to fatigue
 - works through inhibition
- Evolutionary mechanism
 - In nature, being alert was more important than being able to concentrate over time
 - Today the split between the important and the interesting has become extreme

Directed attention fatigue can have serious consequences

- **Selection:** Attentional capacity under voluntary control is essential for problem solving
- **Inhibition and affect:** An inhibitory capacity under voluntary control is essential for behaving appropriately
- **Fragility:** Susceptible to fatigue
- **Perception:** Impaired by lack of directed attention
- **Thought:** D.a. necessary for stepping back from the immediate situation
- **Action:** Lack of inhibition makes behaviour less adaptive and appropriate
- **Feeling:** Irritability, less willingness to help

The Restorative Experience: Involuntary attention/Fascination

- To rest directed attention, it is necessary to find other basis for maintaining focus, rendering directed attention temporarily unnecessary
- Involuntary attention (W. James) = Fascination (Kaplan & Kaplan)
 - effortless, thus resistant to fatigue
 - Allows directed attention to rest
 - Hard fascination: the city
 - Soft fascination: characteristic of natural settings

The Restorative Experience: Three additional components

- Being away: Conceptually or physically
- Extent: A whole other world
- Person-environment compatibility

Nature and the restorative environment

- Being away: Nature provides an opportunity
- Soft fascinations: clouds, sunsets, motion of leaves, water...
- Extent: Wilderness, Japanese gardens
- Compatibility: Functioning in nature require often less effort and allows many patterns

Nature and the restorative environment: Empirical findings

- Hartig et al (1991): Wilderness group showed better performance on attention demanding task
- Hartig et al (1991): Exposure to nature after fatiguing task resulted in better subsequent performance
- Cimprich (1992, 1993): Attentional deficits in cancer patients improved after nature-based activities
- Tennessen & Cimprich (1995): Restorative benefits of natural view from dormitory window: More effective functioning in daily life

Toward an integration of stress-oriented and attention-oriented theories

- Point of departure: "Physiological and psychological stress reactions are interrelated, and do not occur alone" (Fisher et al, 1984)
- Three factors leading to stress
 - Direct
 - Perceptual pattern
 - ...or signal

Three patterns leading to both resource deficiencies and stress responses

1. Resource deficiency as precursor to stress
2. Stress leading to resource deficiency
3. Circumstances that simultaneously lead to stress and resource deficiency

Studies supporting the integrative framework

- Bognen et al. (1990): Stress response may be due to ineffective coping with demands (i.e., resource depletion)
- Lundberg et al (1993): Stress responses interpretable as resulting from resource depletion

Conclusion

- Proposes a framework that distinguishes between the stress-related and the attentional components that lead people to seek restorative experiences
- Points to two distinct but interacting benefits of restorative experiences: stress reduction and recovery from mental fatigue
- Points to the role of directed attention in coping with challenges

Important contribution to the advancement of psychological research on restorative environments

- Instrument development: a serious, well-founded and successful attempt at constructing a valid measure of restorativeness of environments'
- A contribution to the methodological development in the field.
- Empirical findings: '
 - Test of Kaplan & Kaplan's theory of restorative environments. Confirmed theoretical assumptions that the restorative components of environments can be described in terms of fascination, extent, compatibility and being away.
 - The nature of fascination may differ in nature and city surroundings.
 - At least two outcomes of restoration: relaxation and cognitive restoration.

Selective attention and heart rate responses to natural and urban environments

Karin Laumann, Tommy Garling, Kjell Morten Stormark

Assumptions and purpose

- Assumes that natural environments have properties that attract involuntary attention, allowing recovery from mental fatigue
- Aims at empirical tests of:
 - Kaplan's (1995) theoretical integration of the ART
 - Ulrich's psycho-evolutionary theory.
- Employs Posner et al.'s attention – orienting task as a measure of selective or directed attention.
- An important question is whether the Posner task in fact is a good measure of involuntary and directed attention.

Design

- Experimental study conducted with a small group (n=28) of voluntary participants, assigned randomly to either a nature or an urban environment group

Design

- Environmental simulations (videos) developed on the basis of findings reported in Laumann et al (2001)
- Natural environment: waterfront environment with high scored on restorative components: Sounds from waves, birds, insects and boats passing by
- Urban environment: Oslo, including a walk along a main pedestrian street ending up at a bus station. Sounds from cars, people talking, construction equipment, street musicians.
- Measurements of heart rate as an indication recovery/restoration

Results

- Subjects who had been exposed to nature exhibited
 - 1) significantly longer IBI (lower HR) compared to the baseline for this group.
 - 2) significantly longer IBI (lower HR) during the video than during the baseline phase.
- Subjects who had been exposed to urban video did not exhibit any significant change in IBI compared to baseline phase.

Results

- The IBI findings suggest that exposure to nature had an arousal reducing effect, thus confirming Ulrich's predictions.
- Confirming ART: HR deceleration is an indication of a state of sensory intake and involuntary attention.
- Increased HR during mentally loading tasks also indicate that this task triggers voluntary attention and environmental rejection (i.e. an inhibitory mechanism)

Results

- Reduced arousal effect of exposure to nature: Important step further in understanding why nature is experienced as restorative and in connecting ART with psychophysiological theory.

Faber Taylor, A., Kuo, F. & Sullivan, W. C. (2001)

Coping with ADD: The Surprising Connection to Green Play Settings. *Environment & Behavior*, 33, 54-77.

Attention Deficit Hyperactivity Disorder (AD/HD)

- is characterized by severe difficulties with inattention and impulsivity

AD/HD symptoms include

- restlessness
- outbursts
- trouble listening
- difficulty following directions
- problems focusing on tasks

Why should we focus on AD/HD?

- AD/HD is relatively common, occurring in roughly 7% of school-age children.
- AD/HD is linked to poor academic performance.
- AD/HD can have long-lasting effects on social development.

New treatment options are needed for AD/HD because

- Behavioral therapies help, but not much.
- stimulant medications are better, but have several problems

Problems with stimulant medication:

- They often have serious side effects.
- They help only 9 out of 10 children with AD/HD.
- There is no evidence they improve long-term social and academic outcomes.

According to *Attention Restoration Theory*

- Nature is engaging, so attracts our attention effortlessly.
- This allows deliberate attention to rest.
- Restored deliberate attention is then available when needed.

Since the underlying problem in AD/HD seems to be one of attention...

- **Perhaps exposure to nature can improve AD/HD symptoms?**

The participants:

96 parents or guardians of children with AD/HD aged 7-12 recruited through ads and flyers in the Midwest

ratio of boys to girls in sample same as in AD/HD populations in general (3:1)

The survey asked parents to

- nominate activities that especially affected functioning – “best activities” and “worst activities”
- rate the aftereffects of activities, grouped by setting, on symptoms
- The relationship between greenness of activity settings and symptom severity was examined.

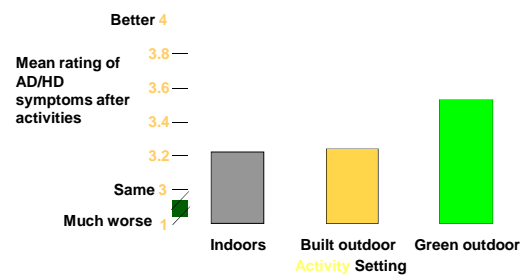
Was there a relationship between activities that most affect functioning and the greenness of their setting?

Likely settings of activities nominated as "Best" and "Worst" for AD/HD symptoms

Likely Setting	Best	Worst
Green (e.g., fishing, soccer)	85% (17)	15% (3)
Ambiguous (rollerblading, playing outside)	56% (43)	44% (34)
Not Green (video games, TV)	43% (53)	57% (69)

Was there a relationship between greenness of activity setting and ratings of post-activity symptoms?

Mean symptom ratings for activities in different greenness settings



Activities in green settings were more likely to lead to improved AD/HD symptoms.

Activities that led to worsened AD/HD symptoms were more likely to occur indoors or in barren outdoor settings.

Outdoor play in green settings should help children with AD/HD function better.

Green play settings are widely accessible, inexpensive to use, and free of side effects.

Tips for parents, teachers, and caregivers:

- Encourage children to play outside in green yards or parks and advocate recess in green schoolyards.
- Observe which activities and settings improve children's symptoms.
- Value and care for trees.

Faber Taylor, A., Kuo, F.E., Sullivan, W.C. (2002).
Views of nature and self-discipline:
Evidence from city children.
Journal of Environmental Psychology, 22, 49-63.

Main message

- Girls with a view of nature at home scored higher on tests of self-discipline

Inner-city girls are prone to risky behaviors:

- academic underachievement
- juvenile delinquency
- teenage pregnancy
- substance abuse
- To avoid these problem behaviors, girls need to have self-discipline
- Daily exposure to greenery may boost girls' self-discipline

Exposure to greenery enhances the ability to deliberately pay attention...

Greener Views → Better attention

One explanation for how greenery improves attention comes from *Attention Restoration Theory*

(Kaplan, S. 1995)

Green views → Better attention

If our deliberate attention is restored, then our capacity for self-discipline should benefit.

Better attention → Greater self-discipline

Self-discipline exists in three forms:

- concentration
- impulse inhibition
- delay of gratification

The following study explored whether exposure to greenery does lead to greater self-discipline in children.

Green views → Better attention → Greater self-discipline

The Robert Taylor Homes (Chicago) were chosen as a research site because

- buildings are similar; only the quantity of nearby vegetation differs
- residents are randomly assigned to buildings
- residents have similar characteristics

The participants were:

- recruited by door-to-door interviewers
- 169 mother or primary care-giver and child (7-12 year old) pairs
- from 12 buildings that represented the full range of amount of nature visible from home

Data collection

- For each mother-child pair, the trained resident interviewer
 - asked the mother or care-giver to give both a "green" rating and a "built" rating of their apartment's views.
 - administered standardized tests of self-discipline to the child

Data collection

The standardized tests included tasks that measured the ability to

- concentrate
- inhibit impulses
- delay gratification

Green views

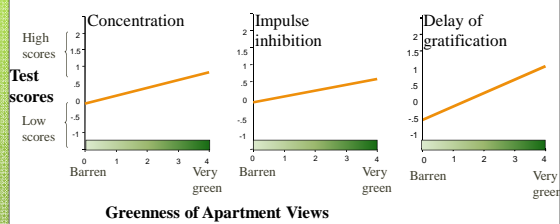
Adults asked, "How natural is your view?"



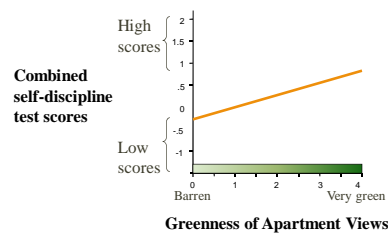
Greater self-discipline

- Children tested on
- concentration
 - impulse inhibition
 - delay of gratification

All forms of self-discipline were related to green views from home



Self-discipline increases as the greenness of the view increases



On average, the greener a girl's view from home:

- the better she concentrates
- the less she acts impulsively
- the longer she delays gratification
- ...in short, the better her self-discipline.

Two studies have shown that boys' attention is better after playing in greener places.

- Nature may affect boys just as much as girls
- But because boys spend less time at home than girls, near-home nature affects boys less
- Future studies may find that boys' self-discipline is related to the amount of nature in their play area – wherever that is.

The importance of self-discipline

• Lack of self-discipline may play a key role in:

- teenage pregnancies
- juvenile delinquencies
- substance abuse
- academic
- underachievement

A self-disciplined girl will better handle

- peer pressure
- sexual pressure
- challenging situations
- make more thoughtful choices
- do better in school

Since greenery near home increases self-discipline in girls...

- And greenery in usual play areas may eventually be shown to improve self-discipline in boys...
- We should provide access to green views for all children.

Ideas for parents, caregivers, and homeowners

- Encourage girls to study or play in rooms with a view of nature
- Encourage children to play in green spaces and advocate recess in green school yards
- Plant, value, and care for trees at your residence and in your community

A comparison of the restorative effect of a natural environment with that of a simulated natural environment

- Anette Kjellgren, Hanne Buhrkall
Human Performance Laboratory, Karlstad University, Sweden 2010

Does substitutes for nature work?

- Is exposure to a simulated natural environment (slides, photographs or videos) a satisfactory substitute for an actual natural environment?
- According to Kaplan's ART it is possible that a simulated natural environment might require more directed attention in order to focus on the simulation and exclude distracting sceneries than would an authentic natural environment; the former is less complete in natural scenery and might therefore be assumed to provide less effortless fascination

Relaxation and altered states of consciousness

- Flotation tank studies (The Human Performance Group (HPG) at Karlstad University, Sweden)
 - therapeutic effects of relaxation
 - altered states of consciousness (ASC) elicited during treatment in the flotation tank seem to contribute to an improved sense of well-being.

What is ASC

- Associated with a cognitive shift in favour of primary process oriented cognition
- logical thinking and directed attention are pushed aside by more intuitive thinking, creativity, and nondirected fantasy

Purpose

- Explore the role of ASC in restorative environments.
- Shed light on whether or not exposure to a simulated natural environment will result in similar restorative outcomes and experiences as exposure to an actual natural environment.

Purpose

- Compare the restorative effects of relaxation in a natural environment with those of relaxation in a simulated natural environment
 - Psychological and physiological measures,
 - Qualitative descriptions of experiences gained while relaxing in each environment.
- Evaluate the ability of natural and simulated natural environments to induce ASC.

Method

- Participants
 - Diagnosed as suffering from stress and/or burnout syndrome.
 - 18 agreed to participate in the experiment
 - 14 female (78%) and 4 male (22%) mean age 36.83 years.

Design

- A repeated-measure design was implemented. The natural condition included inspecting the natural environment, and the simulated condition included viewing a slideshow of pictures of the same natural environment during a half hour

Measures

- HAD – hospital anxiety depression scale
 - measures the individual's degree of anxiety and depression
- Stress-VAS
 - measuring the individuals self-estimated level of current stress.
- Syllogism I-II
 - The syllogism test requires logical and deductive thinking during a limited amount of time, and was utilized as a manipulative step towards inducing more stress and mental fatigue amongst the participants prior to exposure to each environment.
- Emotional state test
 - Participants were asked to describe their emotional state in an open-ended question by writing up to ten sentences. The Emotional State Test contained written instructions about this.
- SE – stress and energy
 - a self estimation instrument concerning individuals' stress and energy experiences.
- EDN – experienced deviation from normal state
 - Utilizing a modified version s of standardized instruments for use with flotation tank therapy for obtaining judgments regarding altered states of consciousness. The instruments acquired judgments regarding altered states of consciousness (ASC).
- Physiological measures
 - The pulse and the systolic and diastolic blood pressure were measured immediately before and after the half hour of relaxation on each occasion

Environments

- Natural environment
 - the woods in Karlstad Nature Park (Mariebergsskogen) with 400 year-old pines and deciduous trees, as well as lakes, and rivers.
- Simulated natural environment
 - a quiet, dimly lit room without windows was utilized, located in the Human Performance Laboratory.
 - A slideshow, consisting of 97 photographs, displayed at 10-second intervals
 - The photographs (used in the simulated natural environment) were taken in Karlstad Nature Park

Procedure

- Data was gathered for each participant on 2 separate occasions in a simulated natural environment at the Psychology Department of Karlstad University (Karlstad, Sweden), and in a natural environment in the woods of Karlstad Nature Park (Mariebergsskogen).
- No more than two participants attended simultaneously. For each participant, a period of six to eight days elapsed between exposures to the two conditions.

Findings

- The actual natural environment resulted in a higher degree of ASC (Altered states of consciousness) and increased energy than did the simulated natural environment. Furthermore, it seemed as if both environments were equally efficient in reducing stress

Findings

- The phenomenological analysis of the verbal descriptions obtained in the natural environment resulted in six categories describing positive experiences:
 - Intensified sensory perception
 - A feeling of harmony and union with nature
 - Well-being and quality of life
 - Renewed energy and awakening
 - "Here-and-now" thinking
 - A sense of tranquillity.

Findings

- The experiences of relaxation in the simulated natural environment were characterized by mainly by more negative descriptions
 - Restlessness and anxiety; Lack of concentration; A sense of being cut off from nature's sensory input; Longing to be in 'real' nature; and Positive emotions.
- It is clear that the natural environment induced more ASC than the simulated natural environment.

Findings

- All participants experienced many positive effects subsequent to a hard, stress inducing task that required directed attention, during the relatively short period of relaxation (30 min) in the natural environment

Conclusions

- The findings suggest that both environments facilitate stress reduction in line with the positive effects of restorative environments, as described by Ulrich (1983) and that stress reduction alone might not be sufficient to completely explain beneficial effects and well-being.
- The natural environment seemed to promote restoration and increased energy by offering 'fascination', in line with Kaplan and Kaplan (1989), and by inducing altered states of consciousness to a greater extent than those induced by the simulated natural environment.
- In this study, the simulated natural environment did not seem to be experienced as a completely satisfactory substitute for the natural environment