

# The effects of sounds on restorative processes

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# How important are sounds for restorative processes?



## Stress Perspective

## Coping Perspective

## Restoration Perspective

### Theoretical assumption

Heavy demands can undermine adaptation.

Readily available resources support adaptation.

Adaptation requires periodic restoration.

### Practical assumption

Interventions can eliminate or mitigate demands.

Interventions can ensure the availability of resources.

Interventions can enhance opportunities for restoration.

# Some definitions

**Restoration:** the process of renewing or recovering physical, psychological, and social capacities that have become depleted in meeting demands.

**Restorative environment:** An environment that promotes a process of recovery from stress or some other condition that involves a commonly occurring deficit in adaptive capacities or resources (e.g., attentional fatigue).

Hartig, T. (2004). Restorative environments. In C. Spielberger (Ed.), *Encyclopedia of applied psychology* (Vol. 3; pp. 273-279). San Diego: Academic Press.

# The current situation

Cities are growing and with them the ambient noise.

Substantial research has shown negative effects of office-noise on performance, stress and fatigue.

Research has so far paid little attention to how environmental sounds might affect restorative processes.

If pleasant sounds are more pronounced and unpleasant sounds reduced, it may convey positive effects on the inhabitants and employees.

However, most recent empirical and practical work with an explicit concern for restorative environments focus on the visual environment.

# Psychophysiological stress reduction theory

- Restoration from psychophysiological stress
- Environmental contents and properties of the visual stimulus array
- More positive and less negative affect and reduced physiological arousal
- Rapid

# Stress reduction by sounds

## Sounds:

Nature sound

High noise

Low noise

Ambient noise

## Measures:

Skin conductance level (SCL)

Heart rate variability (HRV)

## Results:

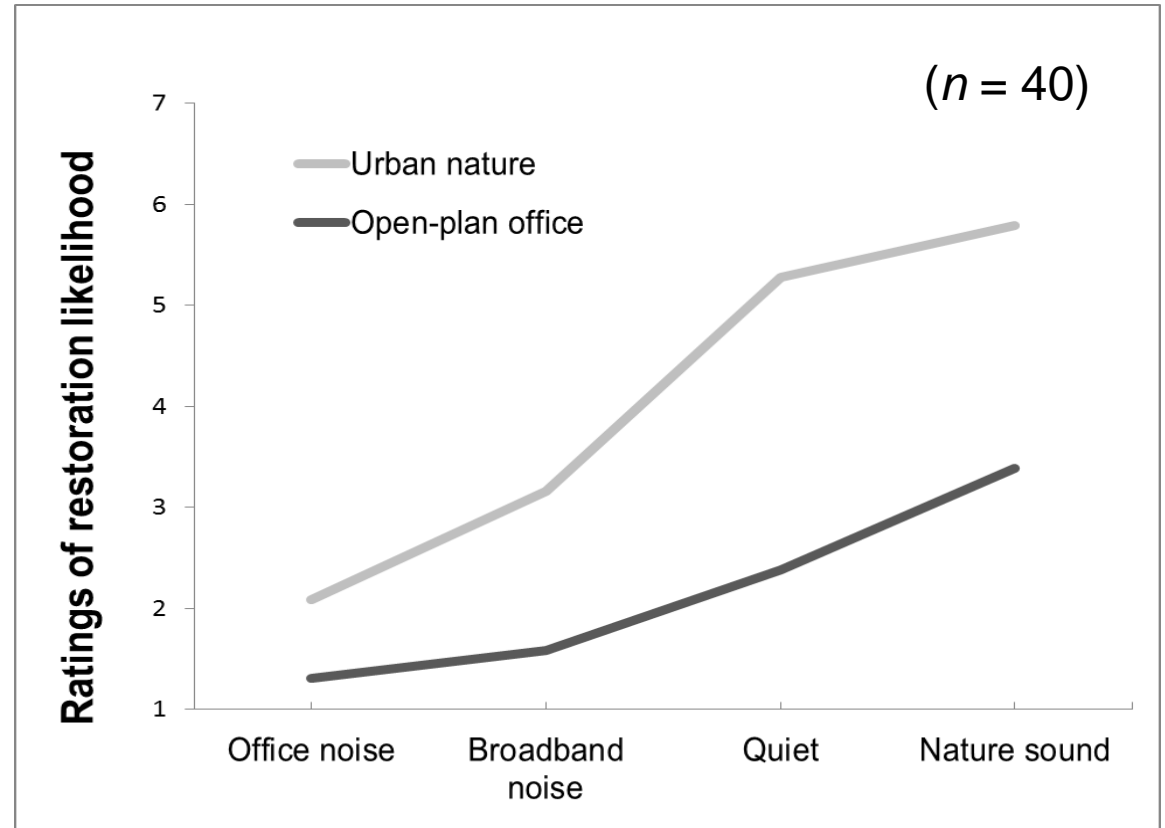
SCL recovery tended to be faster during natural sound compared to the other sound conditions

# Attention restoration theory

- Restoration from directed attention fatigue
- Being away, fascination, extent, and compatibility
- Performance on tasks that require directed attention
- Time to restoration not well studied nor understood



# Restoration likelihood of different sounds



Jahncke, H., Eriksson, K. & Naula, S. (2014). The effects of auditive and visual settings on perceived restoration likelihood. *Noise & Health*, 17, 1-10.

# Cognitive performance, tiredness and motivation

Main procedure for two similar studies examining the restorativeness of sounds:

|                  |  |               |       |               |                   |                              |                           |                              |               |      |              |
|------------------|--|---------------|-------|---------------|-------------------|------------------------------|---------------------------|------------------------------|---------------|------|--------------|
| <b>Section 1</b> | <b>Pretest Measures and Relaxation</b> |               |       |               |                   | <b>Noise Treatment</b>       |                           |                              |               |      |              |
|                  | Urine sample                           | Saliva sample | Relax | Saliva sample | SOFI <sup>a</sup> | Cognitive tasks <sup>b</sup> | Filler tasks <sup>c</sup> | Cognitive tasks <sup>d</sup> | Saliva sample | SOFI | Filler tasks |

|                  |                              |                          |      |                              |               |              |
|------------------|------------------------------|--------------------------|------|------------------------------|---------------|--------------|
| <b>Section 2</b> | <b>Restoration Treatment</b> | <b>Postrest Measures</b> |      |                              |               |              |
|                  | Relax                        | Saliva sample            | SOFI | Cognitive tasks <sup>d</sup> | Saliva sample | Urine sample |

1. Jahncke, H., Hygge, S., Halin, N., Green, A-M., & Dimberg, K. (2011). Open-plan office noise: Cognitive performance and restoration. *Journal of Environmental Psychology*, 31, 373-382.
2. Jahncke, H., & Halin, N. (2012). Performance, fatigue and stress in open-plan offices: the effects of noise and restoration on hearing impaired and normal hearing individuals. *Noise & Health*, 14, 260-272.

# Conclusions – normal hearing

A nature movie with sound promoted restoration of...

- performance
- feelings of alertness and energy
- motivation

... however, continued noise exposure decreased performance and gave more negative experiences in general.

# Key issues with behavioural measurement of attention restoration

- Representation of the antecedent condition
- Types of cognitive processes represented
- Duration of environmental "treatment"

Hartig, T., & Jahncke, H. [In prep.]. Restorative environments: theoretical, methodological and practical issues.

# Other factors of importance for the restorativeness of sounds?

How important are...?

- ...acoustic components
- ...familiarity
- ...habituation
- ...associations of the individual

For example, perceived restorative benefits of bird sounds vary between bird species, as well as between participants.

Ratcliffe, Gatersleben, Snowden (2013). Bird sounds and their contributions to perceived attention restoration and stress recovery. *J Environ Psychol*, 36, 221-8.

# Concluding comments

## Moving toward a greater understanding of the restorativeness of sounds:

Look at a broader range of sounds and specify the restorative components of sounds.

Consider the processes through which the resources can become restored by sounds, and examine how those processes interact.

Take a measure of the antecedent condition according to the resources of interest.

Examine the effect of "treatment duration".

# Activity Based Offices (ABW)

opportunities to restore from negative sound exposure?

# Ongoing study

## Background:

How the office is designed may be a significant moderating factor for restoration and health.

A lack of longitudinal studies comparing objective measurements of physical variation, productivity and health by different office designs.

The Swedish Transport Administration has permitted measurements on their staff before and after their employees switch from cellular and open-plan offices to ABW.

Four offices, which are rebuilt to ABW, together with a control office, are taking part in the study, consisting of 140 - 1000 employees per office.



# Aim and methods

**The aim is to investigate the effect of changing office-design on:**

- concentration
- physical activity
- leadership behavior
- well-being and sick-leave

## **Method:**

- Detailed acoustic measurements
- Questionnaire to all employees
- Detailed measurements of physical activity, concentration, patterns of work behavior and self-reported well-being (20 employees/office)

# Thank you!

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