

The Science and Style of Biophilic Design enhancing education environments - naturally



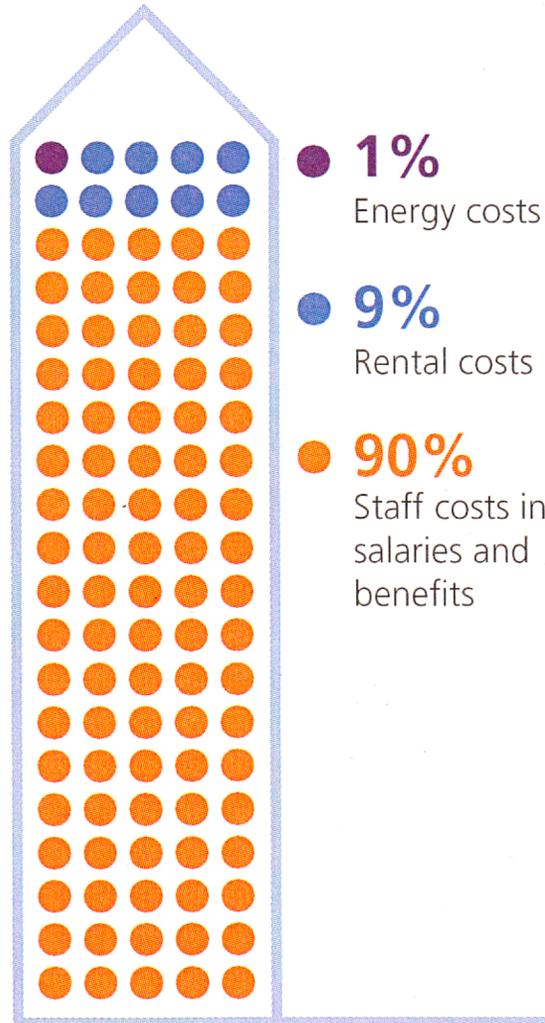
OLIVER HEATH
DESIGN

@Oliver_Heath

@human_spaces

Interface[®]

Typical business operating costs¹



10% Variation

A 10% variation applied equally to each cost has a far from equal impact

+/- 0.1%

Energy costs

+/- 0.9%

Rental costs

+/- 9.0%

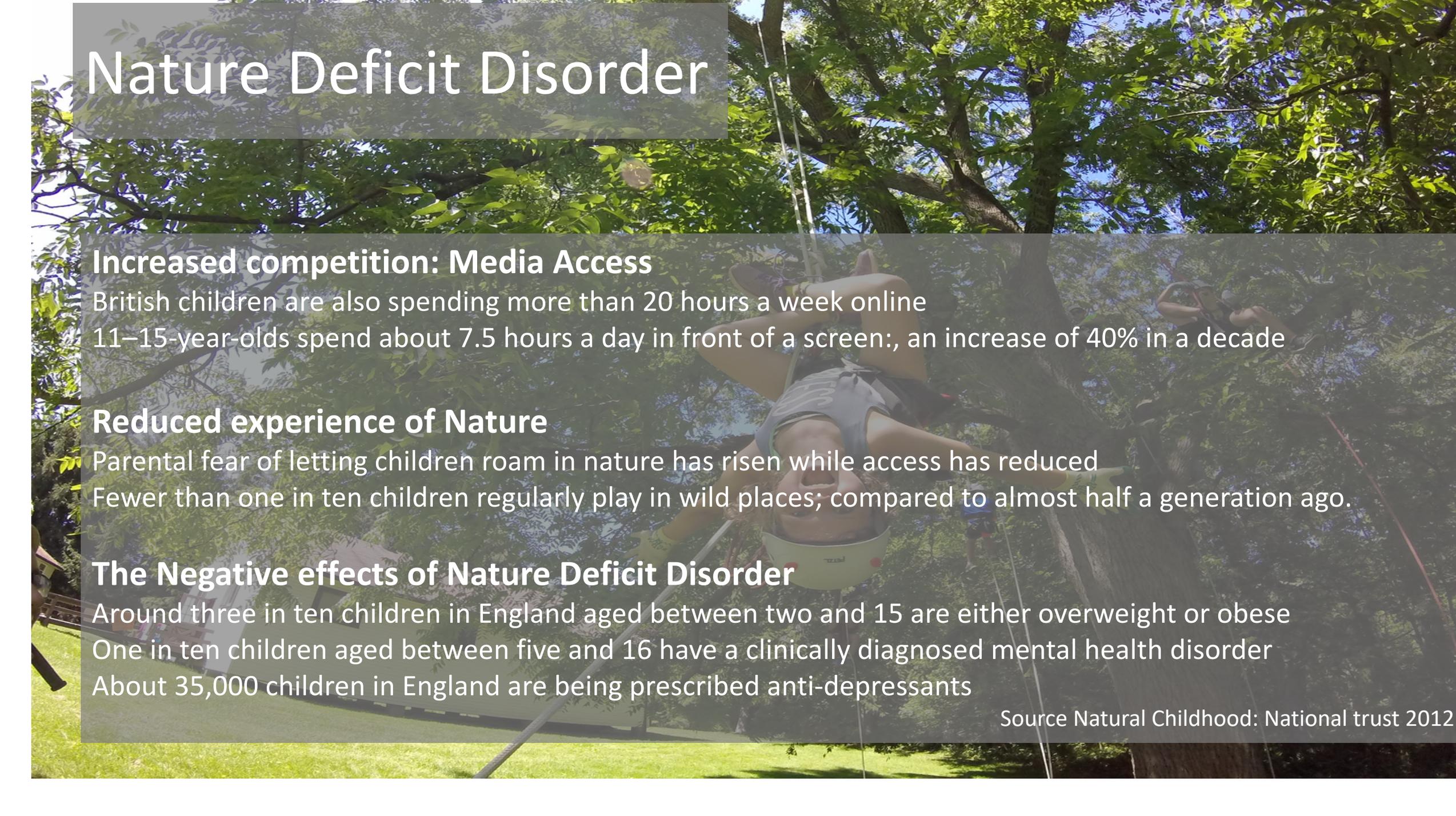
Staff costs

Introduction and Concepts

Biophilic Design: Why now?

- **Stress** related illness primary cause of sickness by 2020 - WHO
- In 2015/16 stress accounted for 37% of all work related ill health cases and 45% of all working days lost due to ill health.
- **Urbanisation** 90% of UK now urbanised – up from 79% in 1950's
- We spend 90% of our time indoors
- **Technology** 93% of U.K. adults have smart technology
- 1/3 admit to checking smart phones in the middle of the night

Nature Deficit Disorder

A photograph of a child climbing a tree in a park. The child is wearing a grey tank top and a white helmet. The tree has thick branches and green leaves. The background shows a grassy area and other trees.

Increased competition: Media Access

British children are also spending more than 20 hours a week online
11–15-year-olds spend about 7.5 hours a day in front of a screen:, an increase of 40% in a decade

Reduced experience of Nature

Parental fear of letting children roam in nature has risen while access has reduced
Fewer than one in ten children regularly play in wild places; compared to almost half a generation ago.

The Negative effects of Nature Deficit Disorder

Around three in ten children in England aged between two and 15 are either overweight or obese
One in ten children aged between five and 16 have a clinically diagnosed mental health disorder
About 35,000 children in England are being prescribed anti-depressants

Source Natural Childhood: National trust 2012

Creating naturalised learning spaces for children can:

- Enhance their cognitive abilities and increase ability to focus
- Reduce symptoms of Attention Deficit Disorder (ADD)
- Increase physical activity, nutrition and creativity.
- Reduce stress and aid mental and physical recuperation



Vo Trong Nghia's FPT University Ho Chi Minh City

Reduce stress Wells, N. M. (2000). At home with nature: Effects of "greenness" on children's cognitive functioning. *Environment and behavior*, 32(6), 775-795.

Kuo, F. E., & Faber Taylor, A. (2004). A potential natural treatment for attention-deficit/hyperactivity disorder: evidence from a national study. *American journal of public health*, 94(9), 1580-1586.

Bell, A., & Dymont, J. E. (2006). Grounds for action: Promoting physical activity through school ground greening in Canada. *Evergreen*.

Wells, N. M., & Evans, G. W. (2003). Nearby nature: A buffer of life stress among rural children. *Environment and behavior*, 35(3), 311-330.

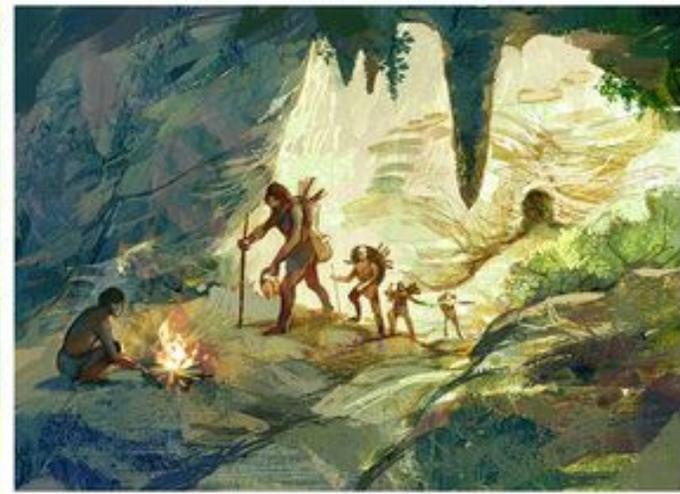
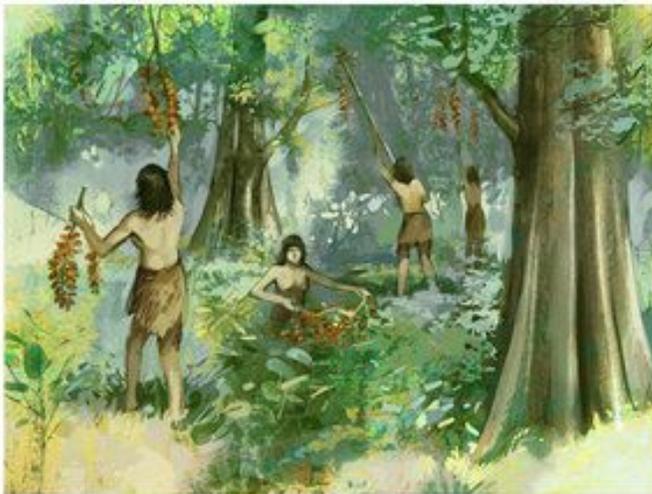
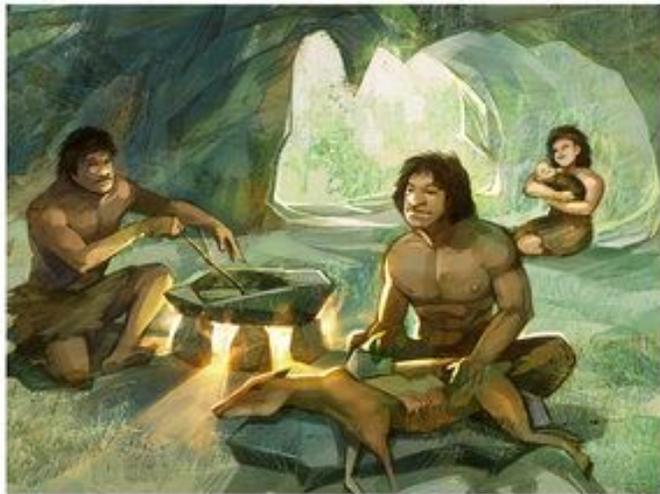
Biophilia – The innate human attraction to nature and natural processes



Image: Michelle Karpman

Our Genetic Heritage:

survival; savannah landscapes; animals; food; water;
clear views; vantage points; shelter; defence; warmth



Savannah Theory – Ultimate Landscapes

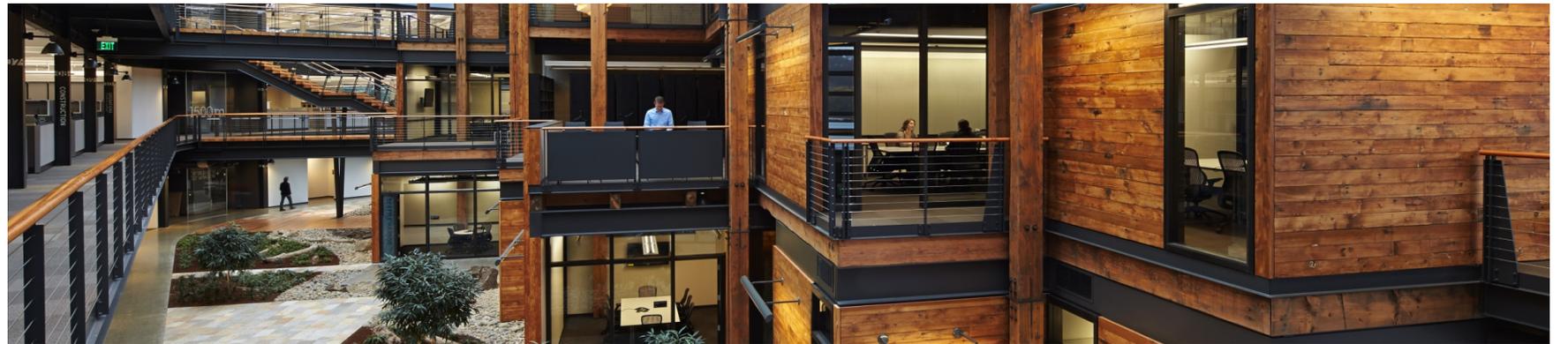


Key constructs of Biophilic design

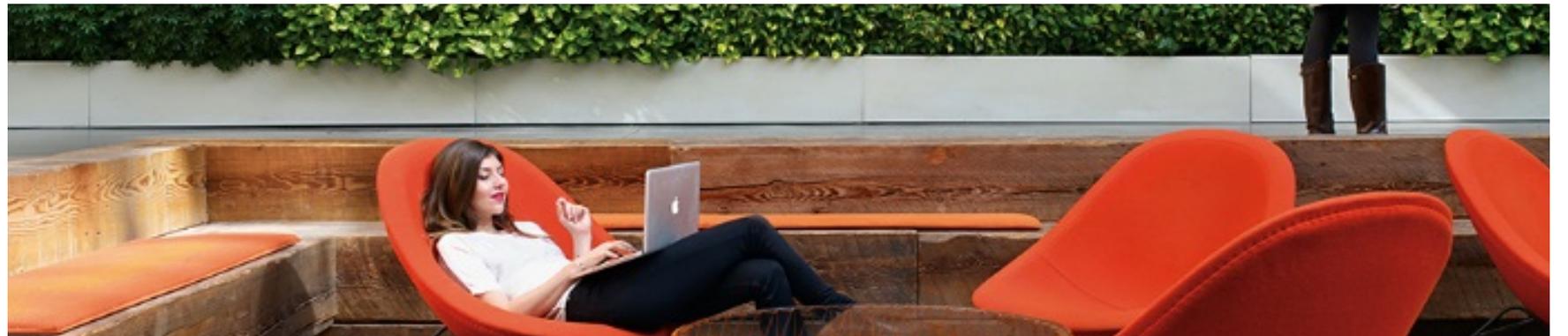
Contact with nature
Water, trees, plants, light



Natural analogues
Evoking a sense of nature



Human spatial response
Energising, relaxing, restorative



14 Patterns of Biophilic Design

Direct Connection

1. Visual Connection with Nature
2. Non-Visual Connection with Nature
3. Non-Rhythmic Sensory Stimuli
4. Thermal & Airflow Variability
5. Presence of Water
6. Dynamic & Diffuse Light
7. Connection with Natural Systems

Indirect – natural analogues

8. Biomorphic forms & patterns
9. Material connection with nature
10. Complexity and order

Human Spatial response

11. Prospect
12. Refuge
13. Mystery
14. Peril

A Direct connection to nature

Tectoniques Architects
The Paul Chevalier School, France



In a study of office workers- those with views of vegetation performed 10-25% better in mental function & memory recall tests
Californian Energy Commissions 2003: **Windows and Offices: A Study of Office Worker Performance & the Indoor Environment**

Adding greenery to interior of learning spaces



Plants in classrooms can lead to improved performance in spelling, mathematics and science by 10-14%;
Plants in the Classroom can improve student performance Daly, Burchett & Torpy, 2010

Maximise natural light

Optimising exposure to daylight alone can

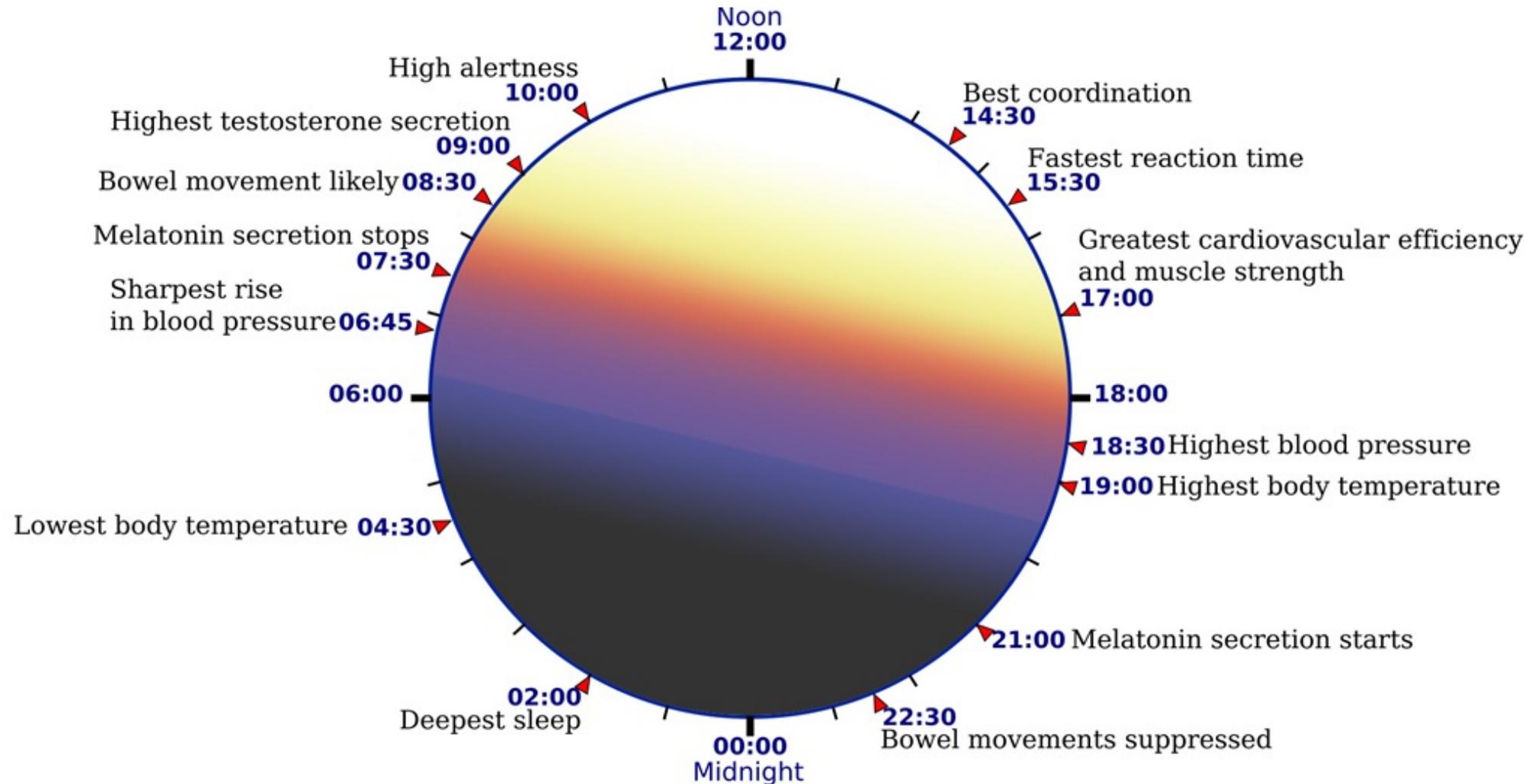
- increase the speed of learning by 20-25%.
- It can also improve attendance by an average of 3.5 days/year
- Improve test scores by 5-14%

(Analysis of the performance of students in day lit schools –Nicklas Bailey, 1996)



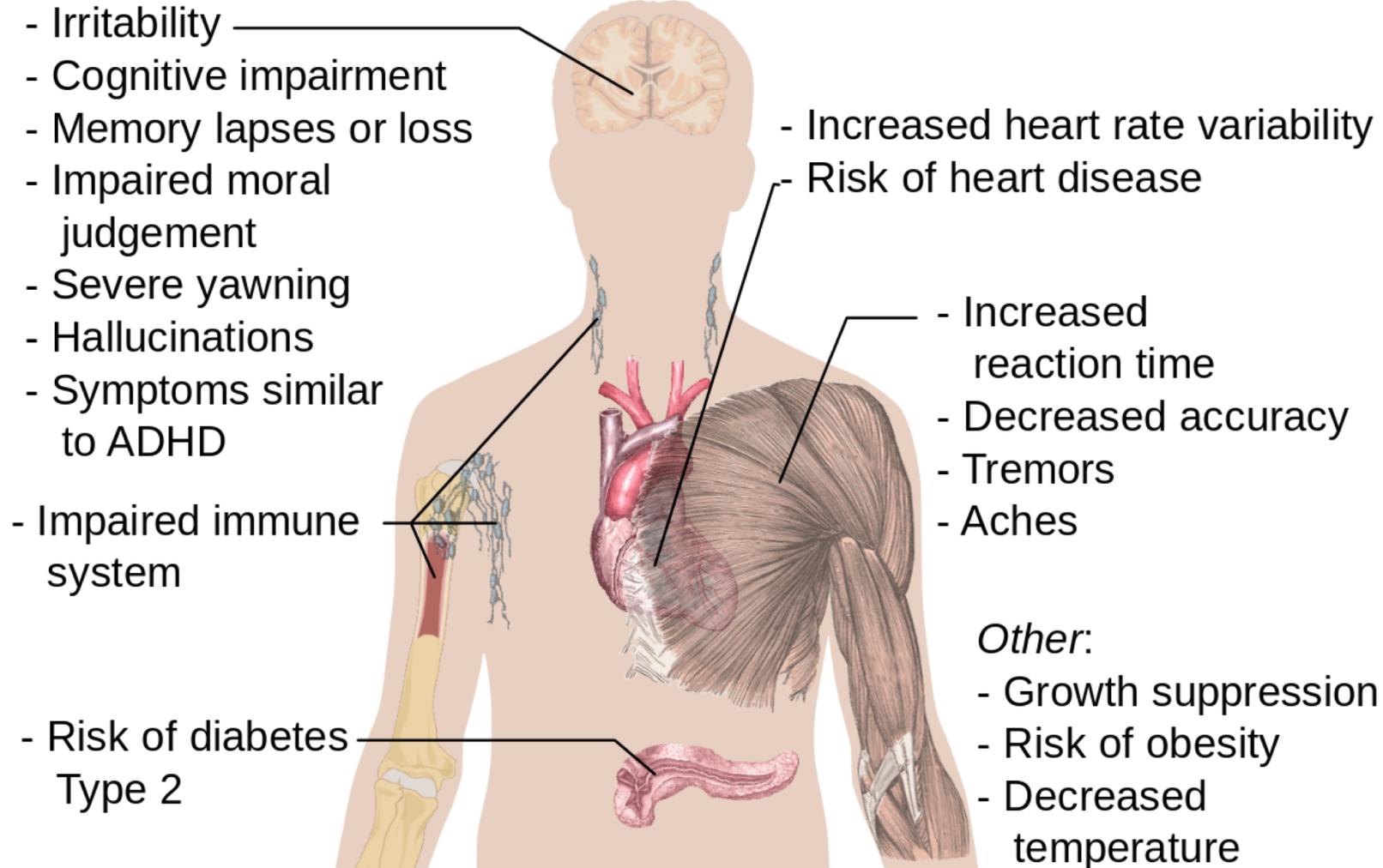
Circadian Rhythms

- The effect of natural light on the body's 24 hour clock



What happens when we don't sleep properly?

Effects of Sleep deprivation



The Importance of Sleep

Sleep deprivation is linked to a higher mortality risk, diabetes, depression.



Limit the use of electronic items before bed



Make use of circadian lighting systems



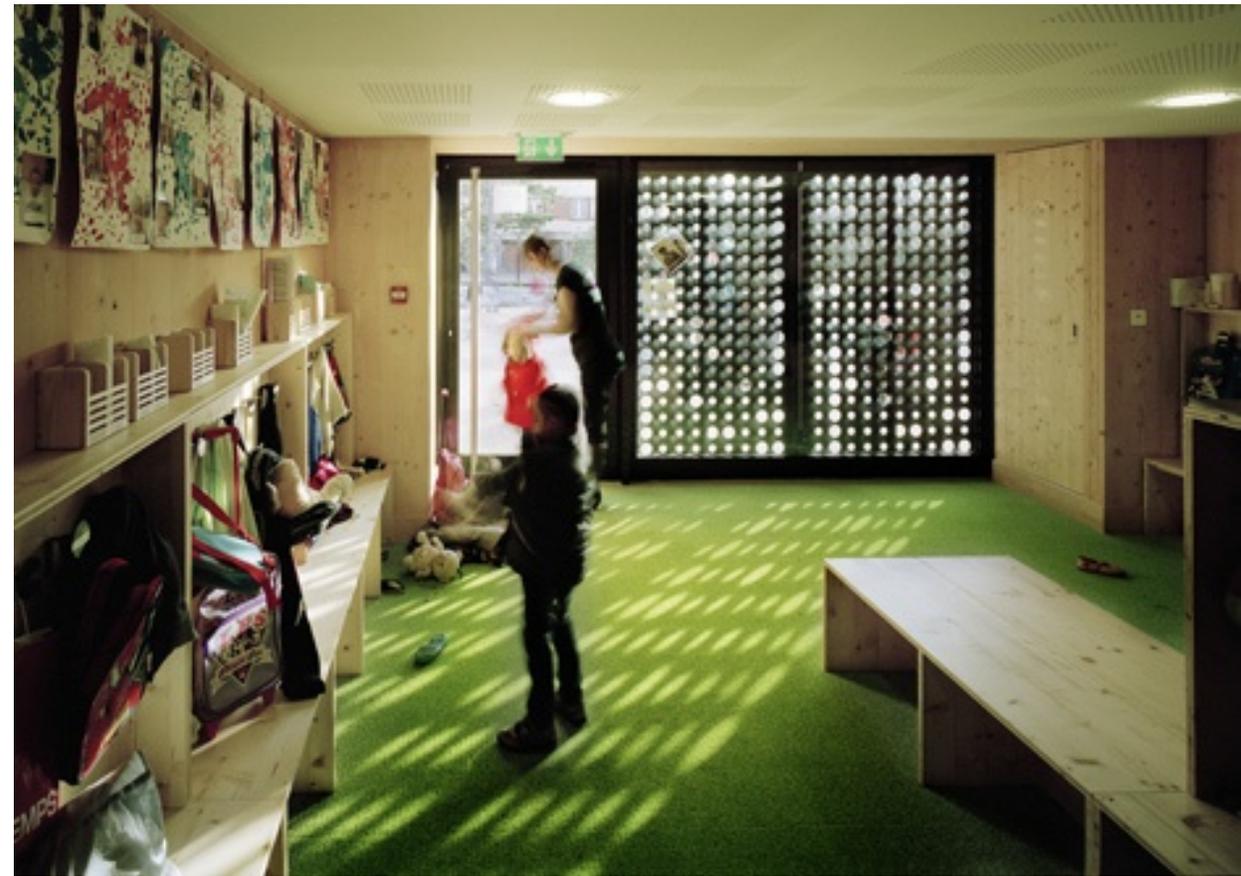
Walk or cycle to work and reap the benefits of a photon shower

Natural analogues - evoking a sense of nature

Natural materials and textures and shapes – sensory benefits through touch, vision or sound



Natural materials such as timber wall paneling reduces heart rates to improve cognitive functioning



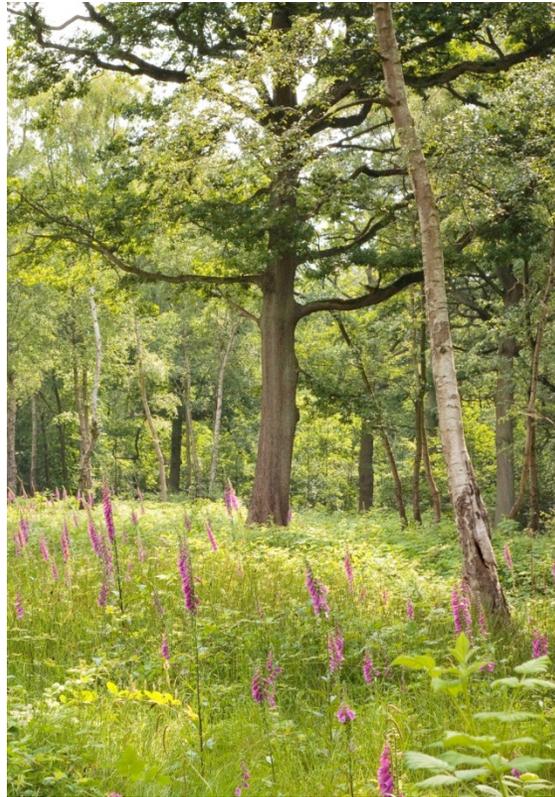
Students in the solid wood classrooms had a heart rate of average 8600 beats per day less than in the normal classroom.
School without Stress / Wood furnishings healthy for students, Joanneum Research Institute of Health Technology 2008-2009

Colour: The Ecological Valence Theory

The theory suggests (Palmer & Schloss 2010) that people are naturally more attracted to significant everyday objects that tend to provoke **positive** emotions



Blues and cyan:
calm and relaxation



Green:
calm and creativity



Yellow and orange:
energy and happiness

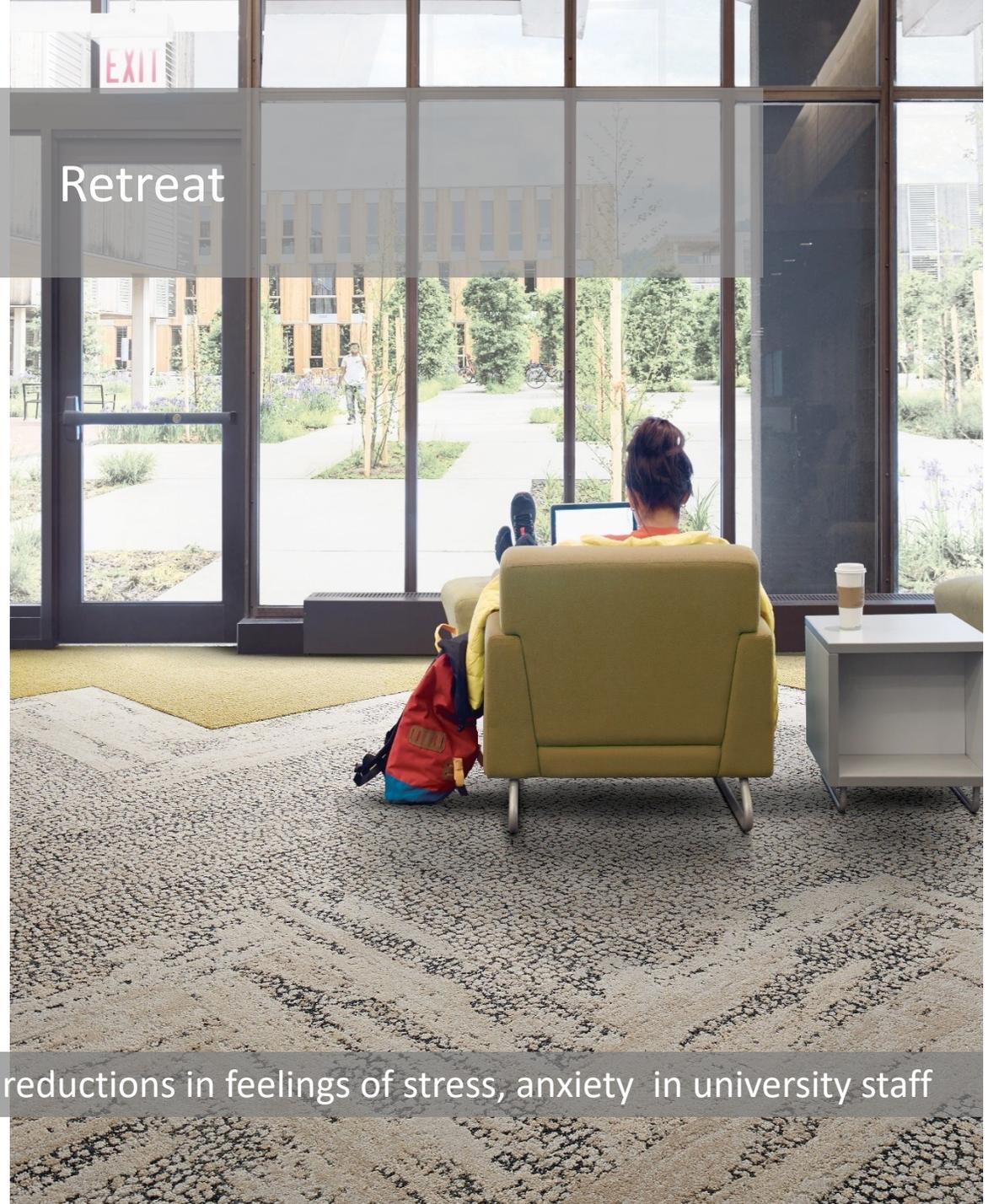


Red: excitement and
concentration

Human Spatial Response Prospect



Retreat



A UTS study showed that plants in the office resulted in 30-60% reductions in feelings of stress, anxiety in university staff

Interface[®]



0:01 / 3:25



Offices – Alleviates stress, reduces absenteeism, increases productivity and staff retention



Image: HOK London

Attention Restoration Theory

Rachel and Stephen Kaplan¹, suggest that nature can help to replenish our mental and attentional capacity. Interaction with nature can be called 'effortless attention' and helps to replenish our directed attention².



Directed attention



Effortless attention



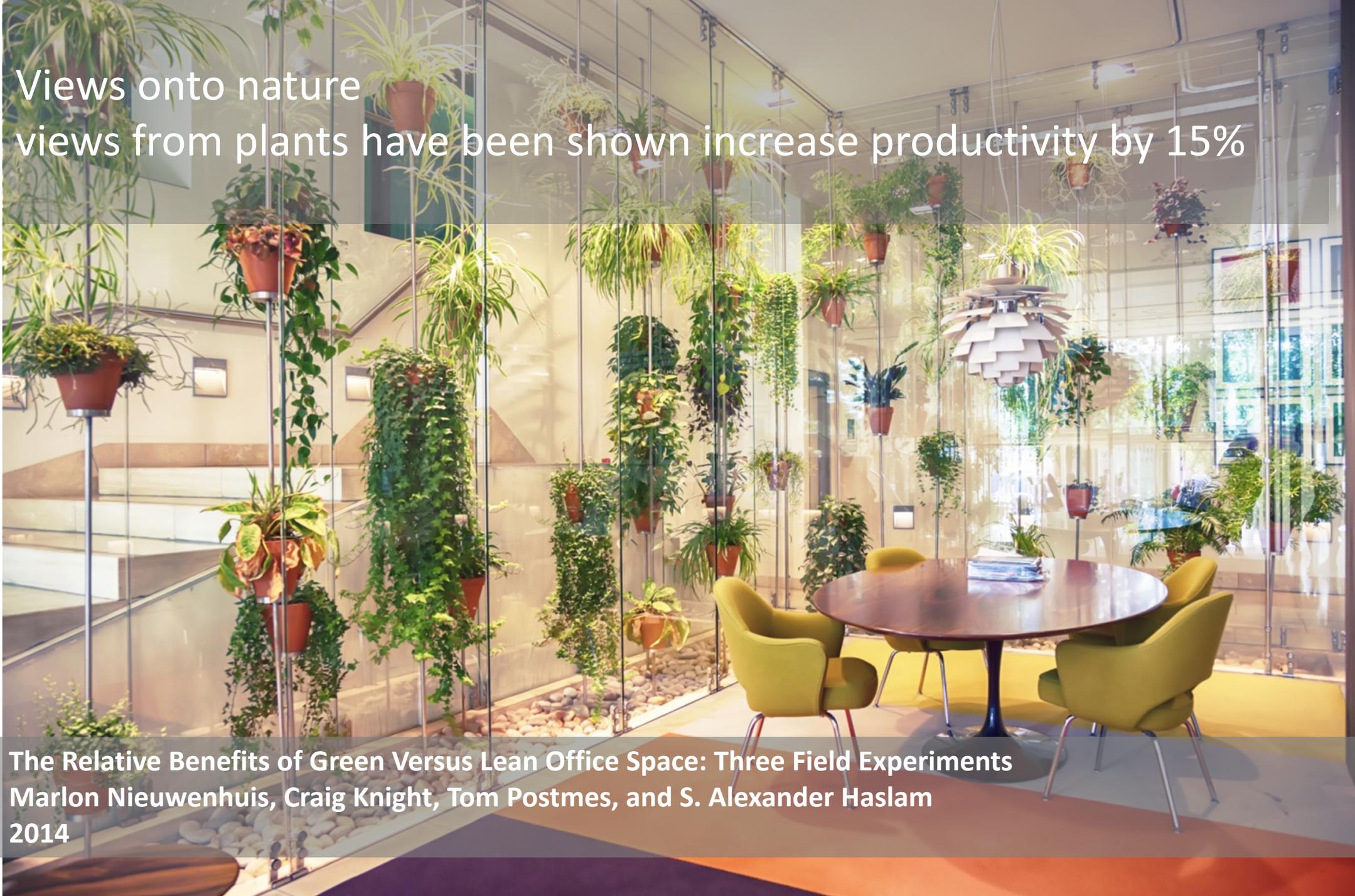
Micro recuperative workplace

¹Kaplan, R. Kaplan, S. (1989). The Experience of Nature: A Psychological Perspective. Cambridge University Press.

²Grinde, B., & Patil, G. G. (2009). Biophilia: Does visual contact with nature impact on health and wellbeing?. International Journal of Environmental Research and Public Health, 6(9), Page 2334-2335

Views onto nature
views from plants have been shown increase productivity by 15%

The Relative Benefits of Green Versus Lean Office Space: Three Field Experiments
Marlon Nieuwenhuis, Craig Knight, Tom Postmes, and S. Alexander Haslam
2014



Natural textures, colours and patterns

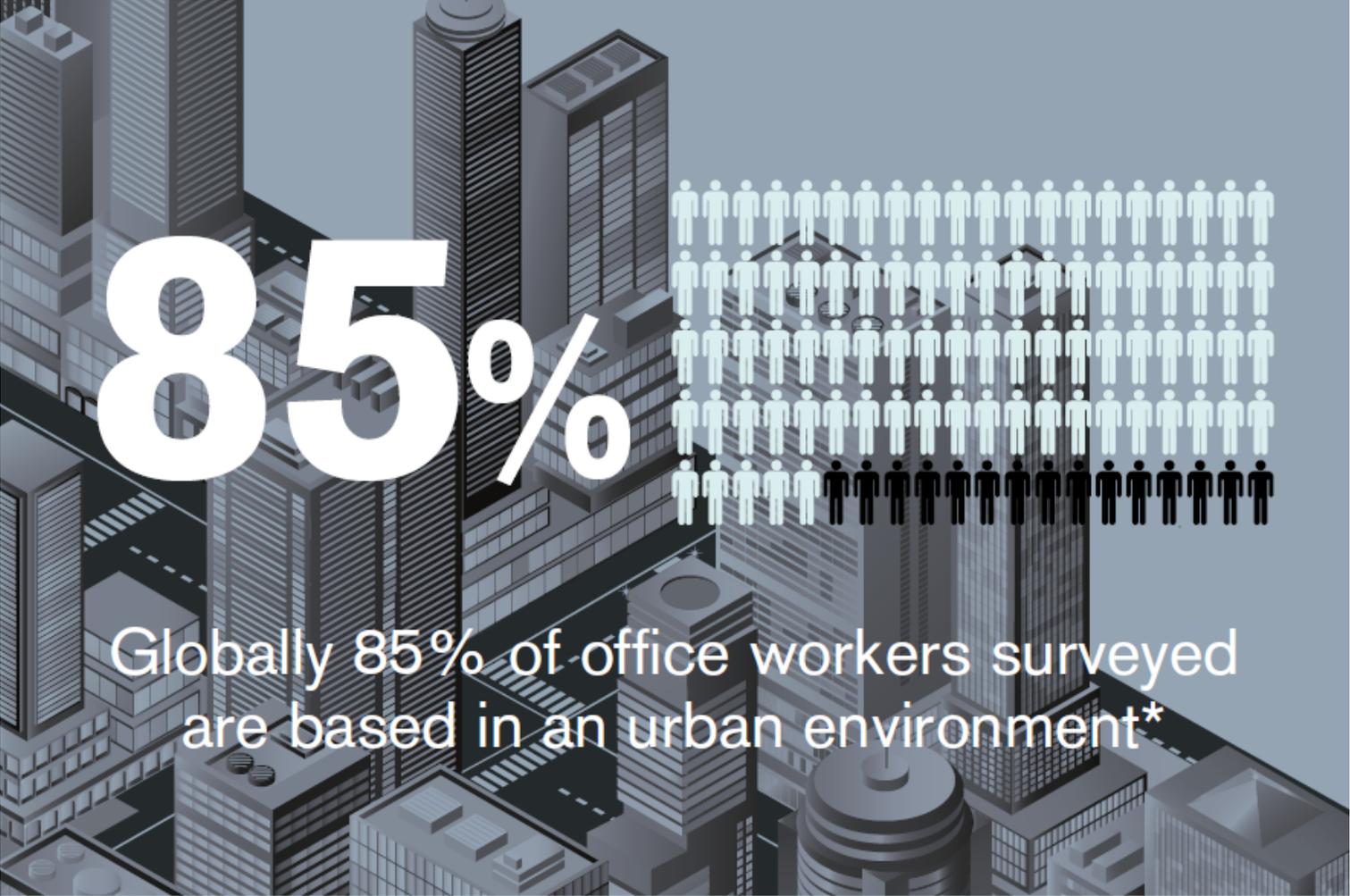
When natural features have been applied a 15% reduction in absenteeism has been reported



Romm, Joseph J. and William D. Browning (1994) "Greening the building and the bottom line." Rocky Mountain Institute, Colorado

Human Spaces Report

Global Impact of Biophilic Design in the Workplace



85%

Globally 85% of office workers surveyed
are based in an urban environment*

Global office landscape



47%

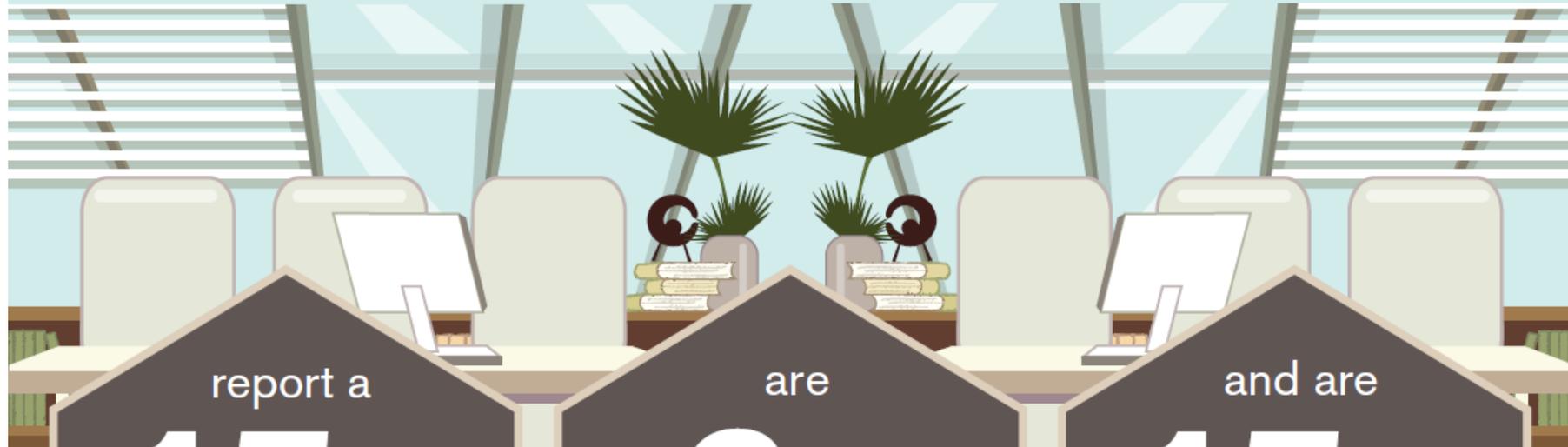
have no
natural light



58%

have no
plants

Workers in office environments with natural elements, such as greenery and sunlight



report a

15%

higher level
of well-being

are

6%

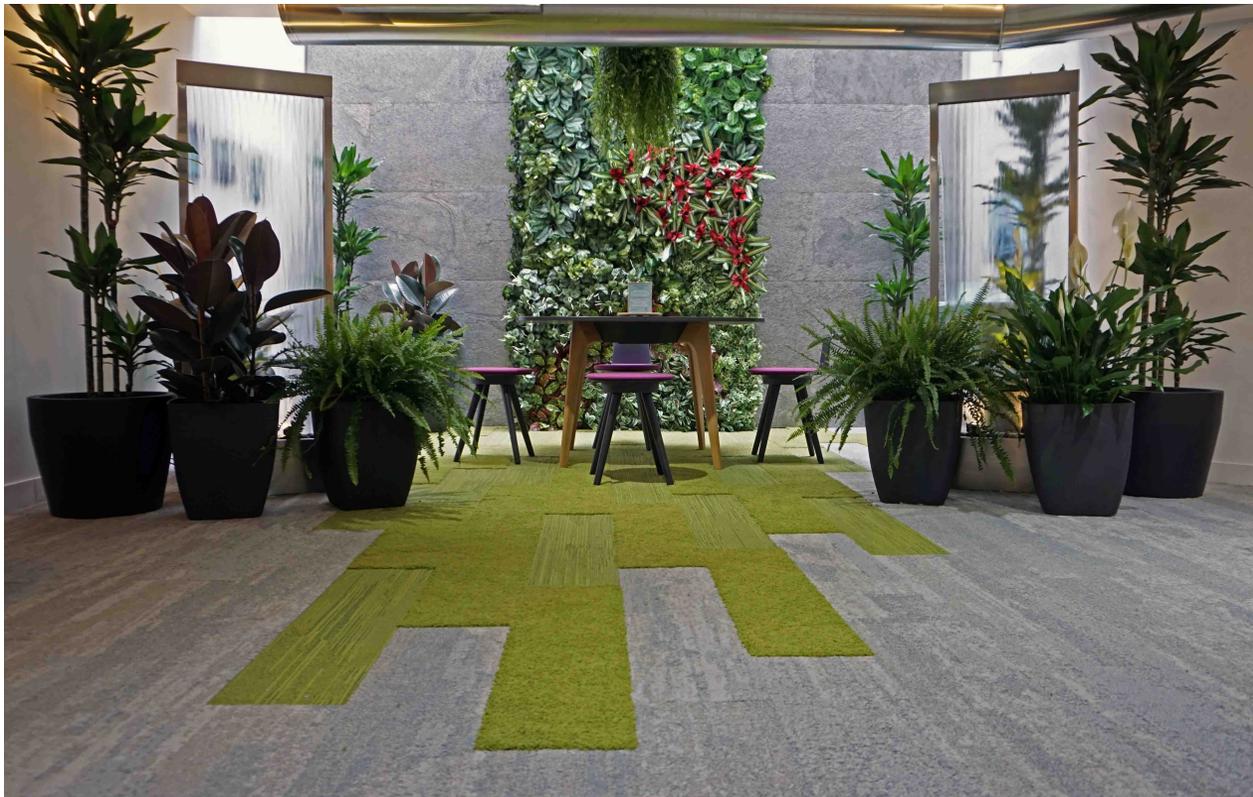
more
productive

and are

15%

more
creative

Strategies for Biophilic design – low to high



Biophilic Design Strategies At Low, Medium and High scales

- **Low cost -**

for the money in your pocket – staff or business activity

- **Medium cost**

Low to medium cost refurbishment – budgets and contractors involved

- **High cost**

high budget refurbishments to new build design projects



Biophilic Design - enhancing education environments

- Reduces stress, heart rates and blood pressure
- Increases rates of cognitive recuperation between studies
- Enhances focus and concentration
- Increases rates of learning
- Improves test results
- Improves attendance
- Improves desirability of education settings



The Science and Style of Biophilic Design enhancing education environments - naturally



OLIVER HEATH
DESIGN

Twitter: @Oliver_Heath

Interface[®]