# Nature and human health

➤ Optimizing environmental qualities and restorative components in nature-based VR-interventions

➤ NATUREACH
➤ Nordic Nature Health Hub

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What Makes a Natural Environment Health-Supportive?

- Exposure to natural environments is associated with improved health and well-being
  - Health effects vary across different natural environments
- Limited access to nature highlights the need for complementary approaches
  - Virtual nature may offer health-supportive benefits when access is limited
- VR-based research can help identify which environmental qualities and environments are most health-supportive
- Such knowledge can also inform evidence-based forest planning for social and health-related values

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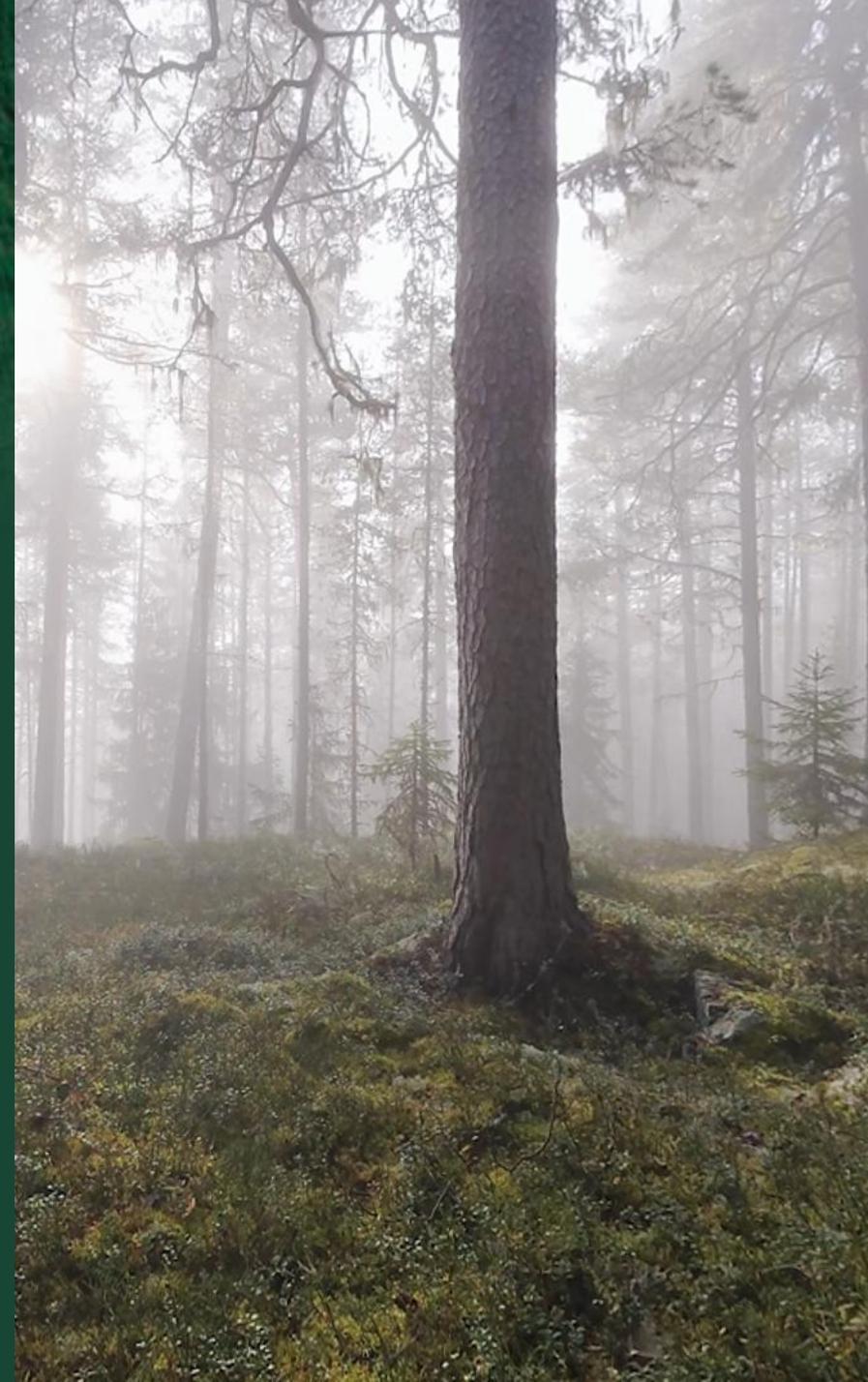
Theories

Nature and public health

The evolutionary approach
> Biophilia (Fromm; Wilsson) – Biophopia
> Savannah Theory (Orians)
> Prospect-Refuge Theory (Appleton)
> *Psychoevolutionary Theory (Ulrich)*
> *Attention Restoration Theory (Kaplan & Kaplan)*

The coping, communications, and relations approach
> *Relations (Searls)*
> Scope of meaning/action (Grahn)
> *Sensory Perceived Dimensions (Grahn)*

The active approach
> Meaningful activities (Kielhofner; Relf)
> Flow (Csikszentmihalyi)
> Experiential Balance model (Persson & Johnsson)

The physiological approach
> Oxytocine (Uvnäs Moberg)

The ecological approach
> Ecotherapy (Burns; Burls)
> Ecopsychology (Jordan)

Restorative Qualities of Natural Environments

- Restorative environments are characterized by *prospect–refuge:* **open views** combined with **shelter**, often with **water** nearby—supporting perceived safety and evolutionary preferences for protected outlooks *(Appelton 1975)*:

- Natural elements such as **mature trees** and **coherent landscapes** provide visual rest through soft fascination, facilitating attentional recovery and psychological restoration *(Kaplan & Kaplan, 1989)*.

- Natural soundscapes and multisensory inputs (light, wind, scents) support calmness and moderate stimulation

- Familiarity and prior nature experiences can influence restorative responses
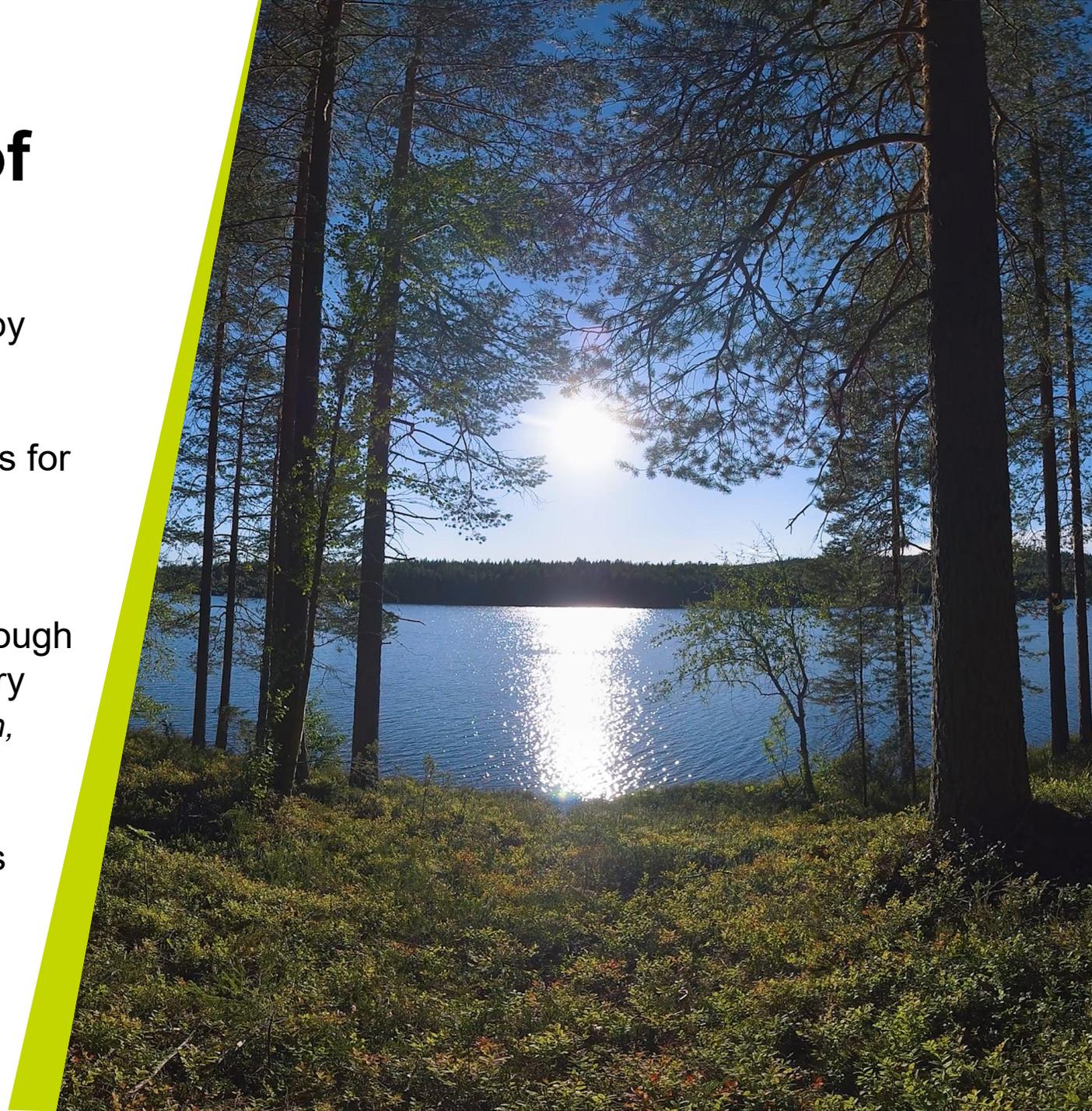
Assessing Restorative Landscape Qualities

- **Perceived Sensory Dimensions (PSD)** describe key experiential qualities related to restoration and well-being
  - Serene, Nature, Space, Prospect, and Refuge are particularly important for rest and recovery

- **Contemplative Landscape Model (CLM)** assesses visual landscape qualities linked to stress reduction and positive affect

- Both PSD and CLM can be applied to real and represented environments

Designing Optimal Virtual Natural Environments

- Spontaneous attention - Not an action movie

- Imitate a quiet moment in nature

- VR-environment based on
  - Sensory dimensions
  - Evolutionary research theories (e.g ART)

How to produce material for Nature Based VR-interventions

- Chose Nature type and elements carefully

- Chose view, camera spot and camera angle

- Chose equipment

- Mix the sound propely

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– Nature Reachable for All

- Research and development project

- VR as complement where nature access is limited

6 Client groups
- *Elderly care (Övertorneå),*
- *Palliative care (Umeå),*
- *Österåsen Lifestyle centre (Type 2 diabetes)*
- *Eating disorder unit (Vaasa hospital)*
- *Eskoo care home (Seinäjoki)*
- *Health care staff*

VR – Natural Environments produced in the NATUREACH project

With the aim to optimize the VR-interventions:
- Northern Sweden and Finland,
- A diverse range of natural landscapes, seasonal variations, times of day, weather conditions, and degrees of animal presence.
- Approx 15 minutes long. High quality 360-camera, adaption for dome, Mixed natural soundscapes

Birch pasture with cows

A pasture by a lake with cows passing by. You sit under a big birch tree with a light wind blowing in the leaves. Cinematography: Martin Gärdemalm Sound design: Andreas Estensen

Meadow in a summer night

Here, you stand in a meadow with daisies and misty trails during a summer night. Cinematography: Martin Gärdemalm Sound design: Andreas Estensen Ljuddesign: Andreas Estensen

River bank

Here, you sit by small rapids where the water flows slowly past you. Cinematography: Martin Gärdemalm Sound design: Andreas Estensen

Sunny Forest Lake

You sit by a small forest lake and the sun glittering in the water. Cinematography: Martin Gärdemalm Sound design: Andreas Estensen

Pine forest in morning fog

Here you experience the morning mist in a forest with large pine trees. Cinematography: Martin Gärdemalm Sound design: Andreas Estensen

Forest creek

You are sitting in the forest beside a stream, listening to the gentle murmur of flowing water. Cinematography: Joel Riskumäki & Janiv Oskár Sound Design: Henri Oskár

Summer night campfire

You are sitting by a campfire in the forest on a late summer night, listening to the crackling of the fire. Cinematography: Martin Gärdemalm Sound Design: Henri Oskár

Mire

A view over a mire in late summer, with a light wind in the trees and clouds in the sky passing by. Cinematography: Martin Gärdemalm Sound design: Andreas Estensen

Winter campfire

Here you sit by a campfire during a ski trip in springtime winter. Cinematography: Martin Gärdemalm Ljuddesign: Andreas Estensen

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Seaside cliffs

You sit on a cliff looking out over the sea, with the waves hitting the shore. Cinematography: Martin Gärdemalm Sound design: Andreas Estensen

Bay

You are sitting on a beach by a calm bay with small ripples on the water where the sun is shining.   Cinematography: Esa Siltaloppi Post-production: Niko Siltaloppi

Seagull with eggs

Along the calm shoreline of a sea bay, a seagull guards its eggs. Cinematography: Esa Siltaloppi Post-production: Niko Siltaloppi

Seaside in winter sun

Here you look out over a costal bay, the sun glistening in the snow. Cinematography: Esa Siltaloppi Post-production: Niko Siltaloppi

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Measuring the effects

Evaluation of the effect of the different environments in the NATUREACH project

- <u>Choice of environment</u>, number of times and length viewed

- Eye and head movement/ <u>what elements are viewed</u> (in VR-glasses)

- Qualitative surveys/ interviews

- Quantitative surveys/ e.g. <u>mood estimations</u>

- Physiological measures/ e.g. HRV, blood pleasure etc.

Prelimenary results - Mood survey

The purpose of this type of survey is to monitor changes in the Mood of persons that have experienced a stay in a specific environment. - An example
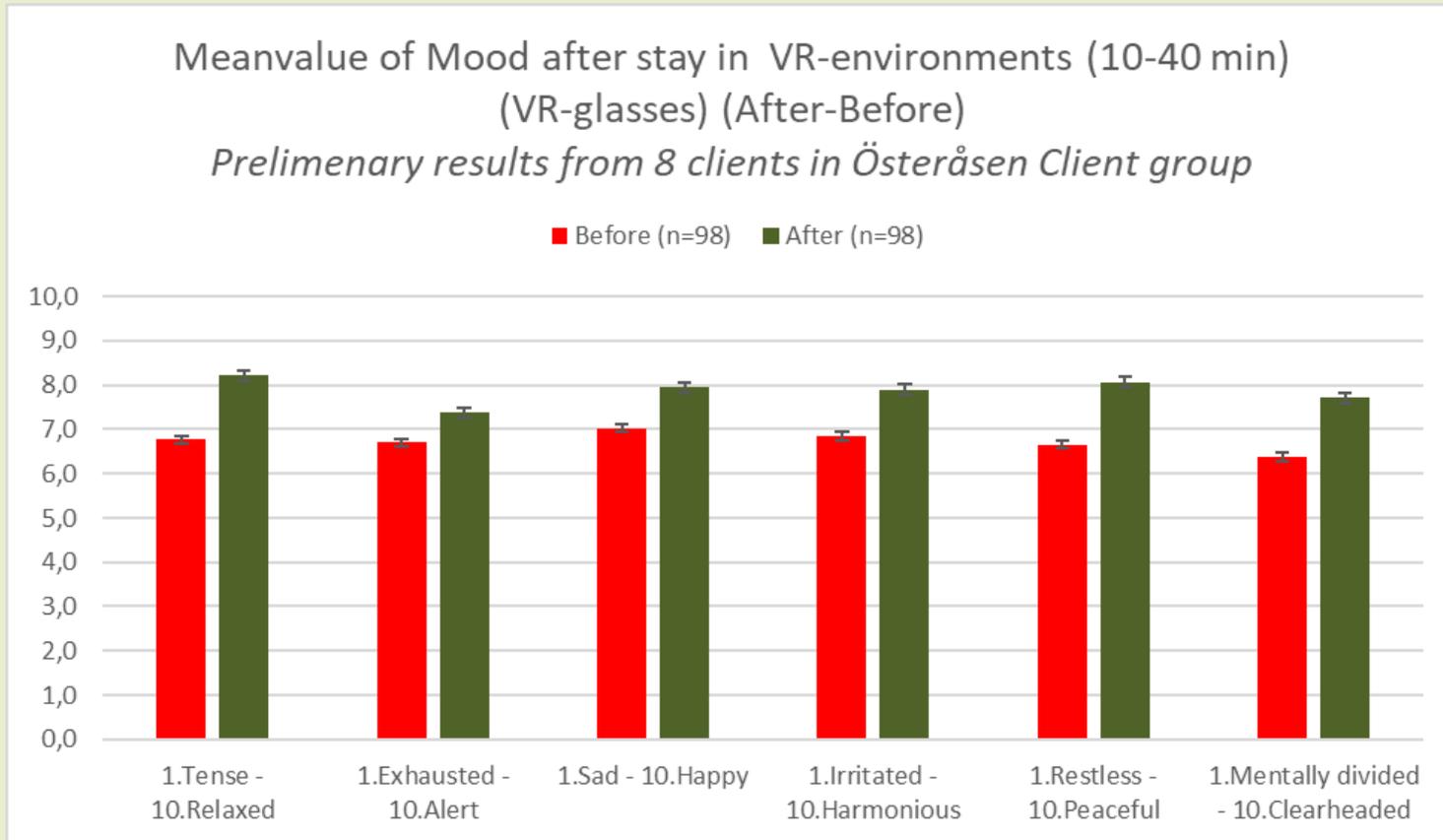
Meanvalue of Mood after stay in VR-environments (10-40 min)
(VR-glasses) (After-Before)
Prelimenary results from 8 clients in Österåsen Client group

■ Before (n=98) ■ After (n=98)

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Prelimenary results - Mood survey - change in mood - each environment

Meanvalue of CHANGE in Mood after stay in different VR-environments (10-40 min) (VR-glasses) (After-Before)
Prelimenary results from 8 clients in Österåsen Client group
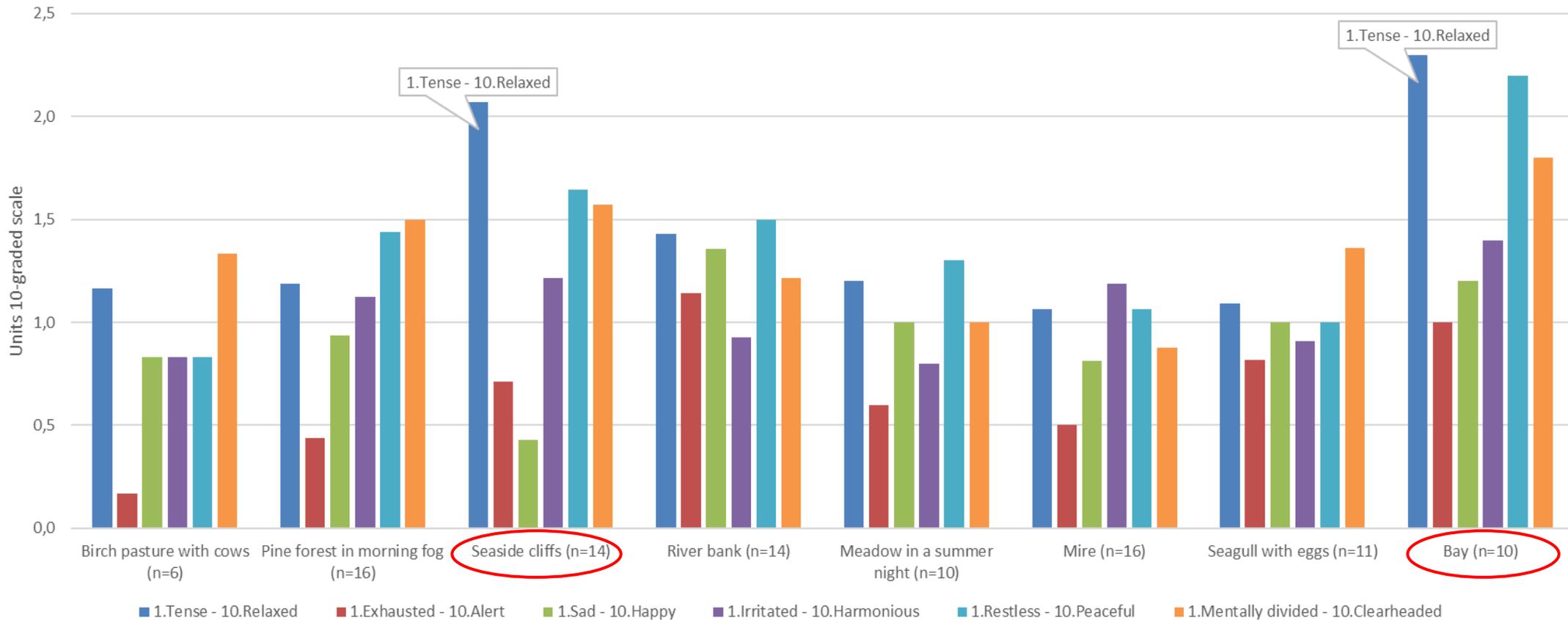
Identifying preferred nature elements

VR-glass data analysis - Heatmap:

Aggregates gaze data to show areas of high and low visual attention.

- Uses color intensity to represent fixation density and duration.

- Understanding which elements attract the most focus.

- Comparing attention patterns between different areas.
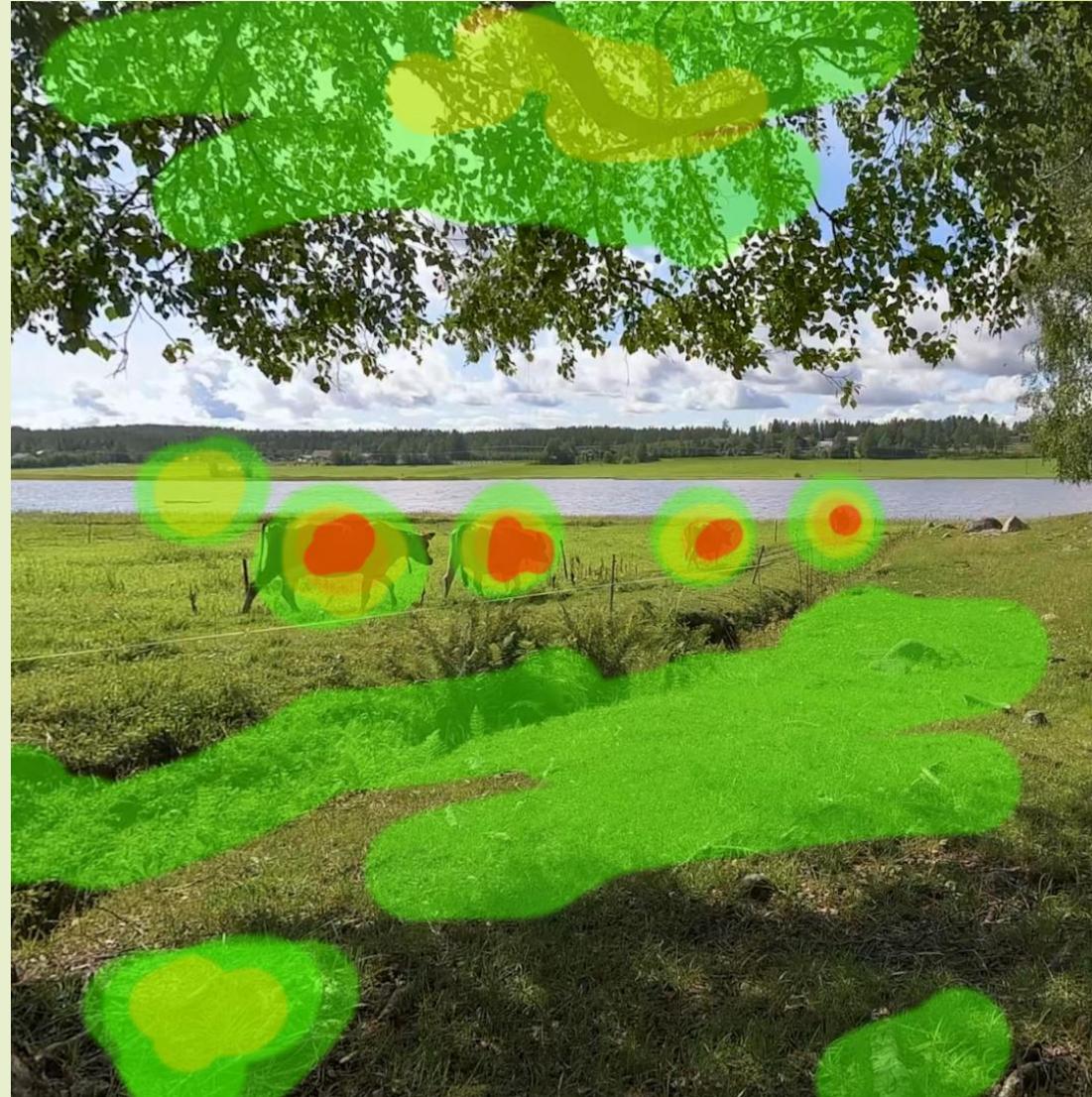
Birch pasture with cows

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Conclusions from NATUREACH

- **Carefully designed virtual natural environments can support well-being, recovery, and restorative experiences**

- Implementation outcomes depend on **environmental quality, multisensory elements, appropriate technology, and facilitation**

- User experiences varied across individuals, environments, and formats, highlighting the importance of **flexibility and person-centred design**

- Different delivery formats (VR headsets, screens, domes) offered distinct advantages depending on user needs and contexts

- Virtual nature is not a replacement for real nature, but a valuable complementary approach when access to outdoor environments is limited

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Read more….

www.slu.se/NordicNatureHealthHub

www.slu.se/Natureach

Nordic Nature Health Hub

" A meeting place for nature entrepreneurs, researchers, organizations, authorities and everyone who is interested in the effects of animals and nature on human health and well-beeing."

www.slu.se/NordicNatureHealthHub

Interreg research and development project (2018-2022)
- *Measurement of nature's health effects*
- *Mapping nature-based health values*
- *Knowledge support for nature-based entrepreneurs*
- *Building the Hub*

Concluding thought

By deepening our understanding of restorative qualities, we can design more supportive environments, enhance care practices, and better acknowledge forests as essential resources for public health.

Thanks for your attention!

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