PARACELSUS MEDIZINISCHE UNIVERSITÄT

Interreg Alpine Space

CONVEGNO BIOMIMESI

Medical evidence for nature-based therapies – examples from the Alps

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BIOMIMESI

Agenda

Larix decidua, National Park Hohe Tauern, Nov. 24

1 **Starting Points**
Urbanization <-> Health & Alpine Resources

2 **Medical Evidence**
Clinical trials with Nature-based Therapies

3 **Best Practices**
Nature-based offers

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Starting Points

Urbanization <-> Health & Alpine Resources

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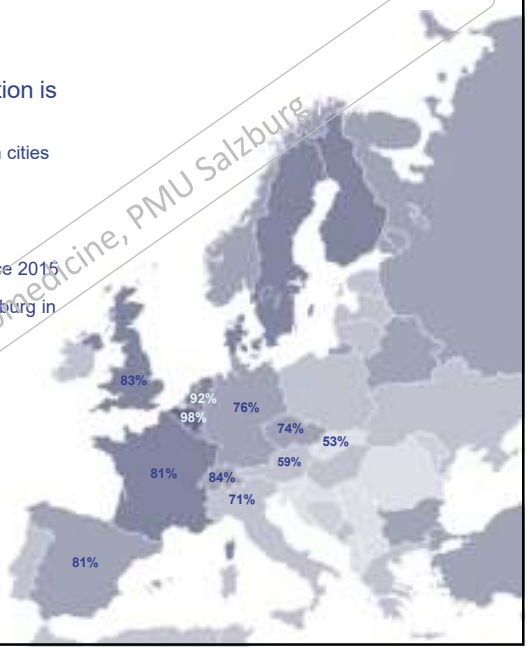
Starting Points

Urban Grey

The proportion of the urban population is growing worldwide!

- In 1940, 19% of world's population lived in cities
- By 2014, it rised to 54%
- In 2018, 74% of Europeans live in cities
- Vienna has grown by the size of Graz since 2015
- Austria grew by the size of the city of Salzburg in 2022

(CIA Worldfactbook 2014; Macionis & Parillo 2007; Statista 2021, Statistik Austria 2023)



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Push-Factors

With the cold comes the fine dust (particulate matter)

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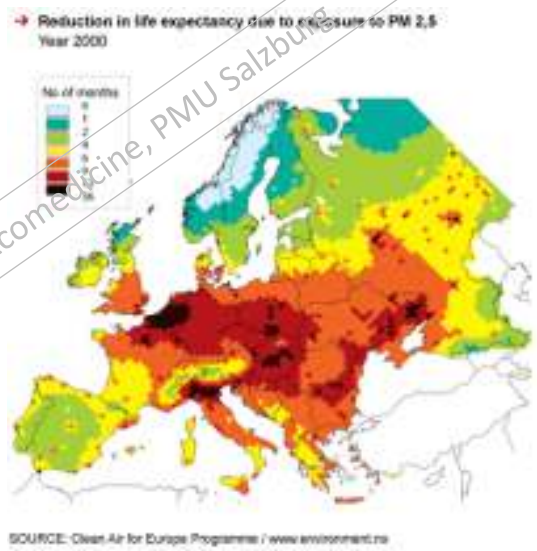
Urbanization, Urban Lifestyles & Civilization Diseases – Reduction in Life Expectancy

Particulate matter and health



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Push-Factors

Noise pollution in relevant source markets

- ↓ Cognitive performance
- ↑ Cardiovascular diseases
- ↑ Insomnia
- ↑ Stress
- ↑ Nervousness
- ↑ Blood pressure

"Synergistic effect of noise and air pollution in terms of negative health effects"

(Basner et al., 2014; Bluhm & Eriksson, 2011; Brown, 2015; Hume, Brink, & Basner, 2012; Kempen, 2011; Khan, Ketzel, Kakosimos, Sørensen, & Jensen, 2018; Lercher, Botteldooren, Widmann, Uhrner, & Kammeringer, 2011; Maschke, 2011; World Health Organization, 2011)

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Urbanization, Urban Lifestyles & Civilization Diseases

Urbanity effect in the prevalence and incidence of mental illness

The higher chronic social stress exposure in the city, together with other risk factors (social, psychological or genetic), becomes a pathogenic factor. The activity of the amygdala is greater the larger the city in which one currently lives.

Risk of disease of people in urban populations compared to the countryside

- Affective disorders → + 38 %
- Anxiety disorders → + 21 %
- Rate of depression → + 40 %
- Schizophrenic disorders → 130 % more often in women
  → 190 % more often in men
- One in three schizophrenic psychosis can be associated with urban life.

(Haddad et al., 2015; Lederbogen et al., 2011; Lederbogen & Meyer-Lindenberg, 2015; Peen, Schoevers, Beekman, & Dekker, 2010)

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Urbanization, Urban Lifestyles & Civilization Diseases

New Urban Penalties

Changing lifestyles & Nature Deficit

- **Altered leisure & nutrition behaviour** *Obesity, Diabetes II, metabolic syndrome*
- **Physical inactivity** *Osteoarthritis, Back Pain, Osteoporosis*
- **Stress and Crowding** *Mental disorders, Cancer*
- **Altered microbioma** *Allergy&Asthma, Autoimmune diseases,*

Lack of exercise

Crowding & other stressors

Leisure activities and eating habits

Altered microbioma

PMU (Brugha & Grigg, 2014; Cho et al., 2014; Morgenstern et al., 2008; Sanidas et al., 2017; Tzivian et al., 2017; World Health Organization, 2016) 9

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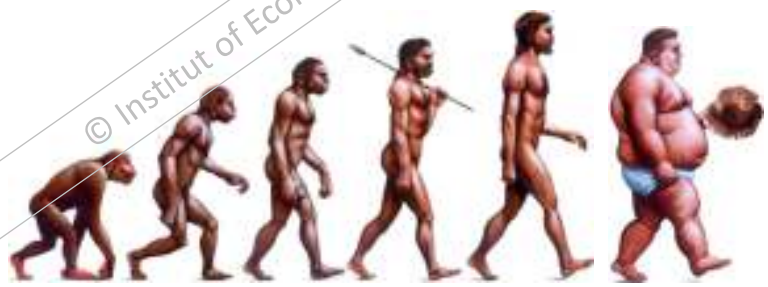
Urbanization, Urban Lifestyles & Civilization Diseases

For the first time in human history, there are more overweight people than underweight people on Earth

Obesity world population

1975	2014
Men: 3,2%	Men: 10,8 %
Women: 6,4 %	Women: 14,9 %

THE LANCET 2016



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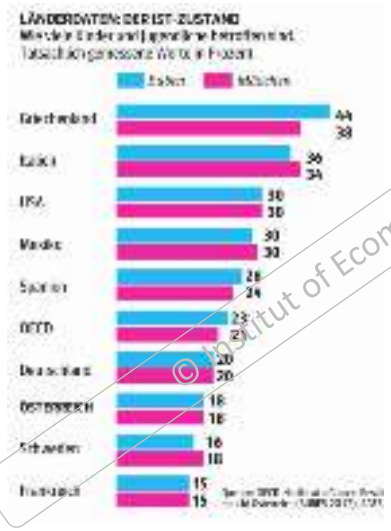
Obesity in children



Consequences of sedentary lifestyle

Sitting time and all-cause mortality risk in 222 497 Australian adults.

Those who sit longer are dead sooner...

N= 222.497, 45+

Observation period: 3 years

- **11 h** or more sitting/day ➔ **40% higher mortality** risk than those with **< 4 h** sitting/ day
- **8-11 h** sitting/day ➔ **15 % higher mortality risk** than **< 4 h** sitting/ day
- Results regardless of age, gender, body mass index, physical activity and existing cardiovascular and diabetes diseases of the participants.


Health & Alpine Resources
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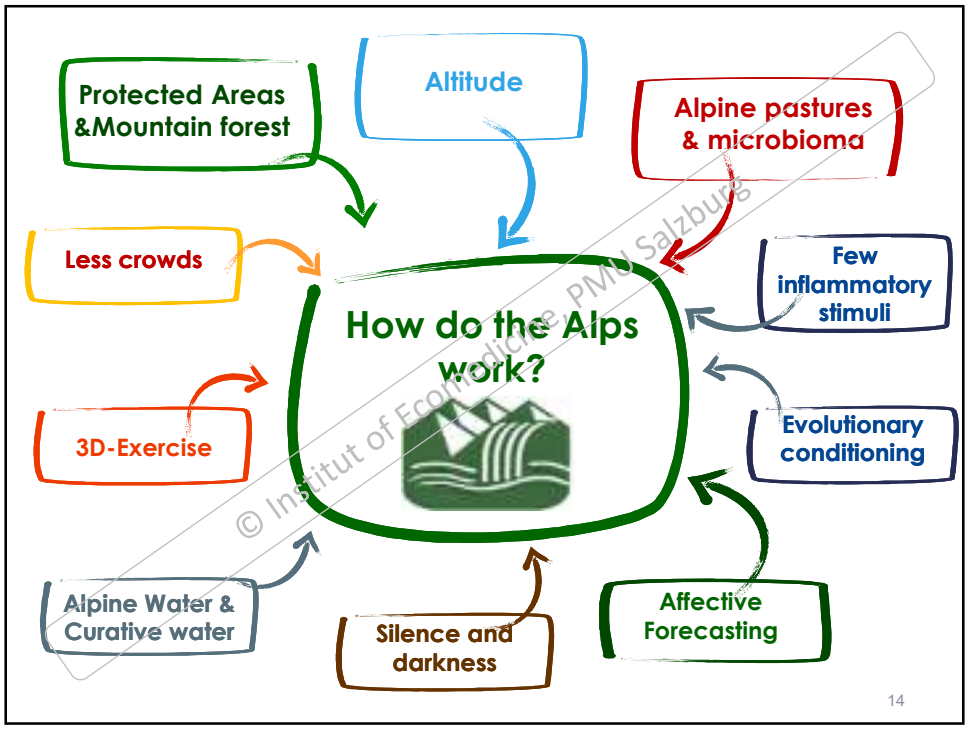
Protected Areas &Mountain forest
Altitude
Alpine pastures & microbioma
Less crowds
How do the Alps work?
Few inflammatory stimuli
3D-Exercise
Evolutionary conditioning
Alpine Water & Curative water
Silence and darkness
Affective Forecasting
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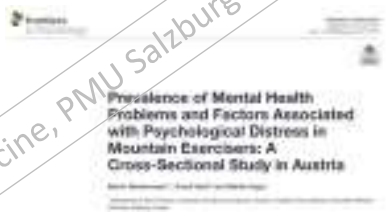
Exercise in Nature

The natural environment promotes resilience to psychological stress

Mountain exercisers have fewer mental health problems than the average of Europeans (14% : 38%)

- The more exercise, the less mental disorders.
- The more positive emotions (pos. affective valence in Green Exercise), the less mental disorders.




Älpelesattel, Allgäu

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Exercise in Nature

Alpine Green Exercise

vs.

3 h Indoor Treadmill

3 h Hiking

Green Exercise: Synergistic effect of exercise and nature

- Higher positive affective well-being during and after the hike
- Reduced negative affective mood during and after the intervention
- Higher activation after the intervention
- Reduced fatigue after the intervention
- Positive impact on Cortisol/HRV/Blood pressure


Balderschwang, © Allgäu GmbH, Erika Dürr

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Medical Evidence

Clinical trials with Nature-based Therapies

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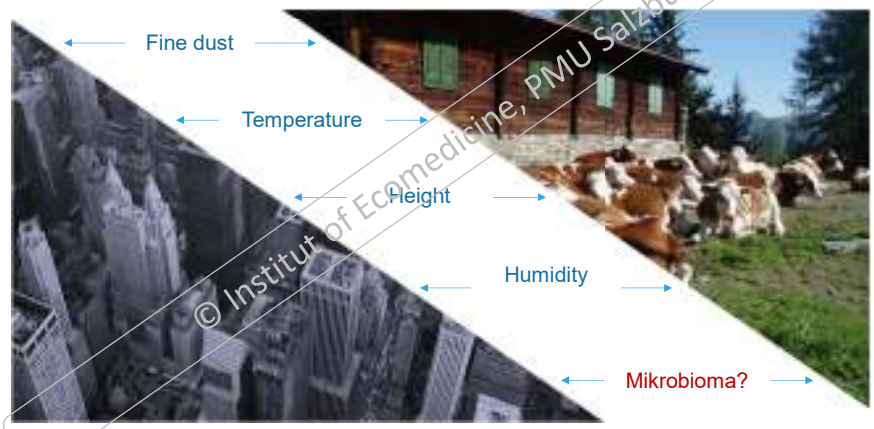
Biodiversity

Biodiversity as influencing factor – differences between urban areas and Alpine pastures



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Biodiversity

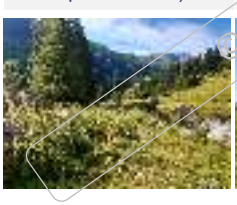
Selection of sites for microbiome analysis

Urban sites




Alpine pastures

Lägerflur (nutrient-rich alpine meadow)	Anger (grass area)	Weide (pasture)	Zuwachs (plant/bush growth)

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Biodiversity

Farm children statistically have less allergy and asthma because of the microbiome


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Biodiversity

Pilot study: Alpine Pastures & Health (WISS2025)

Research Foci:

1) Analysis of environmental parameters incl. microbiome

2) Pilot study: What is the impact of spending one week at an alpine pasture on the health of individuals without an agricultural background?

- **Clinical study with urban-dwelling people on the health effects of Alpine pastures** (1 week intervention, focus on microbial biodiversity and immunomodulation)

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Biodiversity – Pilot study

Medical assessment at the PMU and at the intervention site

Measurement parameters:

- Nasal microbiome
- Cardiorespiratory fitness
- Quality of life & well-being
- fat metabolism
- Red blood count
- Inflammation parameters
- Smell test
- Heart rate variability

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Biodiversity – Pilot study

Impressions: Dairy processing




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Biodiversity – Pilot study

Impressions: Forestry work



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Biodiversity – Pilot study

Impressions: contact to farm animals

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Biodiversity – Pilot study

Impressions: savouring regional alpine delicacies

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Biodiversity – Pilot study

Results

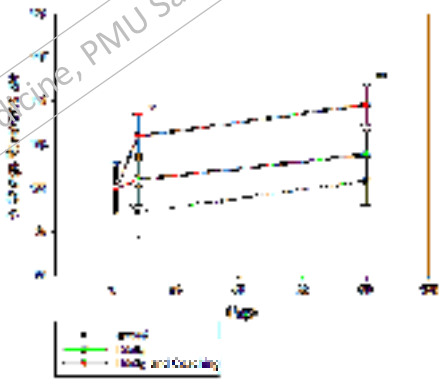
What is the impact of spending one week at an alpine pasture on the health of individuals without an agricultural background?

- Cholesterol levels (LDL and nHDL) decrease significantly
- Reticulocyte Production Index increases (Red blood cell production)
- Improvement of quality of life
- Improvement of VO2max (cardiorespiratory fitness)
- Changes of the nasal microbiome (Reduced risk of infections and inflammation)

Cardiorespiratory Fitness – Sustainability

Strengthening cardiopulmonary fitness

Mountain hiking, in combination with health psychology coaching -> improves cardiorespiratory fitness and quality of life in the long term for people with a sedentary lifestyle (RCT HICO study, n=94)

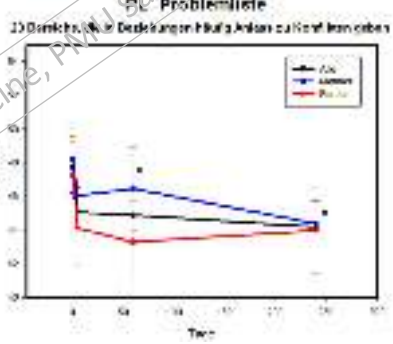


Huber et al, 2022; Steckenbauer, Tischler, Pichler & Hartl, Routledge International Handbook of Health Tourism, 2017

Healing power of the Alps

Improving relationship quality

Nine days of mountain and thermal spa holidays in the Alps improve the quality of relationships for 240 days (but only for 50 to 65-year-olds).



Pichler & Hartl: Evidenzbasierter Tourismus als Chance für den Alpenraum, 2017 in « Alpenreisen » (K. Luger/F.Rest);

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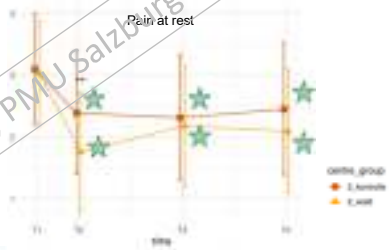
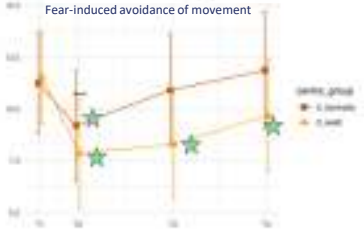
NBT & Low Backpain

Gastein

Green Exercise & Forest Therapy reduces pain in rest and fear-induced avoidance of movement

- **Benefits of green exercise and forest therapy for low back pain patients**
  - The intervention group shows more & better effects and, in some cases, longer-lasting effects for several measurement parameters.
  - subjective pain perception at rest, fear-induced avoidance of movement, balance (stability and sensitivity), and posture and mobility of the spine
  - In comparison, activating forest therapy with green exercise is superior to relaxation-oriented forest therapy without green exercise.





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Best Practices –
Nature-based offers

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Guided Outdoor Measurement of VO2Max/Cardio-Fitness
Before-After 4 Days Hiking in the National Park Hohe Tauern

Hohe Tauern Panorama Trail Fitness Test

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Waterfall-Aerosol & Allergy friendly Hotels

Hohe Tauern Health

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Forest bathing & Green Exercise

Healthy in Algund/Lagundo

Das Klima in Meran und Algund ist gesund

Long-Term Effects of Mountain Hiking vs. Forest Therapy on Physical and Mental Health of Couples: A Randomized Controlled Trial

Mountain Hiking vs. Forest Therapy: A Study Protocol of Novel Types of Nature-Based Intervention

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Thank you!
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