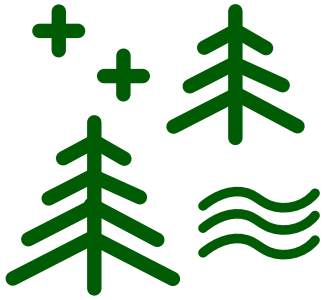

Doctor
FOREST
Communicating Positive Impacts of Forests
on Human Health, using Forest Pedagogy Methods



Doctor FOREST

Communicating Positive Impacts of Forests on Human Health, using Forest Pedagogy Methods

Forest Europe growing life

Ministerial Conference on the Protection of Forests in Europe

Authors:

Dirk Schmechel - *Bavarian State Institute of Forestry LWF with Michaela Amann and Sabine Frommknecht (LWF)*

Chapter "The restorative effects of forests" and "The importance of outdoor-education for children's health and well-being": from a literature review done at LWF by Elisabeth Gosling, 2017; Chapter "The restorative effects of education in forests and forestpedagogy on human health" 1st paragraph: summary of a presentation by Mathilda van den Bosch, University of British Columbia at IUFRO´s conference 2017

From German "Doktor Wald", published by Bavarian Ministry of Food, Agriculture and Forestry, 2018. Adapted, expanded and translated by Dirk Schmechel (LWF).

Editors:

Igor Viszlai - *FOREST EUROPE, Liaison Unit Bratislava*

Ľudmila Marušáková - *FOREST EUROPE, Liaison Unit Bratislava*

Published by

Liaison Unit Bratislava

T.G. Masaryka 22, 960 92 Zvolen, Slovak Republic

liaison.unit.bratislava@foresteurope.org

www.foresteurope.org

ISBN 978 – 80 – 8093 – 272 - 5

LWF Bavarian State Institute of Forestry

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"Forests and Human Health" a challenging topic for Forest Pedagogy

Topics such as sports, recreation or health (human health, healthy living) are those directly addressing many peoples' personal needs, wishes and expectations. The topic "Forests and Human Health" is suitable for communicating correlations between these personal demands and the multiple functions and services that sustainable forest management offers society. To communicate this complex subject, Forest Pedagogy can provide a number of effective messages and simplify or illustrate facts and knowledge concerning the positive impact of forests on human health.

Positive effects of forests on human health have also a high relevance for the dialogue between the forest sector and society: considering public opinions, interests and expectations of forests and how they should be managed, the forest sector should focus more intensively on those benefits of forests not mainly concerned with renewable resources. As well as the recreational and protection function of forests, their impact on human health is getting worldwide attention and is considered to be increasingly important. Studies show that people have strong emotional relationship with forests (Suda and Dobler, 2014). Forests and timber are perceived very positively, but for many people forestry has a negative image. Forestry is sometimes seen as a threat to forests (KleinhückelKotten, 2010; Rametsteiner et al., 2009). Therefore, those with other forest-related interests, for example, the protection of nature in non-managed forests, are raising more public awareness with their messages. Foresters are sometimes labelled as "bad guys" by public and not as "friends or forest conservers" (Dobler and Suda, 2015).

In his opening speech at the IUFRO 125th Anniversary Congress in Freiburg 2017, Göran Persson, the former Prime Minister of Sweden, underlined that "we need to find compelling narratives about how to use our forests." Narratives like "Forests are good for human health" or "Foresters guarantee these benefits with sustainable forest management" are such compelling and impressing stories. "Doctor Forest" is able to show the forester as an authentic and competent forest helper. Therefore, FP activities are an important way of conveying these messages.

With regard to demographic change, and the fact that our cities are growing rapidly "Doctor Forest" is even more urgently needed: so the World Health Organization (WHO) demands, in the "Parma Commitment for Urban Green Spaces," that "... We aim to provide each child by 2020 with an access to healthy and safe environments ... and to green spaces in which they can play and do physical activities." (WHO, 2010, 2016)

How to communicate health topics with Forest Pedagogy methods

A lot of existing Forest Pedagogy activities (games, demonstrations, field and research activities, other Forest Pedagogy practices) are suitable for illustrating the importance of forests and forest ecosystem services for human health. Nevertheless, it is necessary for forest pedagogues to be able to explain these benefits. Thus the activities should be adjusted and adapted to aspects of health impacts forests are providing.

Human health and physical activity: Physical activity can have an enormous impact on health. Many diseases are caused by lack of physical exercise. More and more medical therapies offered by hospitals and physio clinics are carried out in forests. Forest Pedagogy activities that motivate and encourage people to exercise can contribute to physical health.

Human health and forest functions: Some of the "forest protection functions" or "public welfare functions" are directly connected with human health. Forests provide drinking water, improve air quality in urban areas and reduce traffic noise. These functions directly relate to citizens' needs and demands for recreation and tranquillity that they hope to experience in forests. A lot of Forest Pedagogy activities are focused on the functions or services of forests and so they are very suitable to communicate about "Forests for Human Health"..

Human health and food & medicine: Forests offer plenty of healthy food, such as honey, venison, mushrooms, herbs and lots more. These products are not only healthy, it is also fun to search for and gather them. Using these ingredients for cooking a "Forest dinner" will be a big adventure for the participants. Many Forest Pedagogy activities encourage participants to try to prepare "stick bread," forest mushroom soup, salted forest herb butter or self-baked bread. There are also a lot of medicinal products with healing properties that originate in forests. Forest Pedagogy activities, such as making your own arnica salve or ethereal pine needle oil are just a few examples of beneficial impact of forests on human health.

Human health and sensory experience: Forest Pedagogy is much more than just learning about forests. A lot of Forest Pedagogy activities take advantage of learning through senses and focus on hearing, smell, taste and touch. This has often to do with changing perspectives or perceptions. People can reduce their level of stress and recover faster by learning with using all their senses and taking notice of their surroundings.

Human health and meditative experience: Some Forest Pedagogy activities are silent, meditative and relaxing. They can be combined with reading or listening to poems and stories about forests, listening to fairy tale tellers or meditative texts. This may help people to relax and temporarily forget about their problems.

Human health and creatively doing: Body, soul and psyche belong together – so being creative, for example by creating "land art," drawing and designing with materials from nature and forests can intensify mental and psychological well-being of those involved, and thus have positive effects on human health.

Proposals for practical Forest Pedagogy activities

Listed you will find 10 activities of Forest Pedagogy you can choose from to carry out during a forest field trip with a group of children, teenagers or adults. The activities can be performed by all age-groups, but they have to be adapted or simplified according to the age and knowledge of participants. Some activities need preparatory work, some offer good possibilities for some alternations or amendments with follow-up activities.

As a short warm up activity it is helpful to ask the group about their experience when choosing the topic "Forests and Human Health" within their own Forest Pedagogy offers, by making a short line-up:

At the starting point of your excursion just place 4 papers in a line on the ground – with a space of 3-4 meters between the papers, on which stands in big letters the following:

- *Never before*
- *A few times*
- *Quite often*
- *Very often*

Then invite the participants to stand next to the statement which characterises their previous experience and their existing knowledge the best. Looking at your group-line-up you can now assess the commitment your participants already have with the topic Forests and Health. For the further activities you can rely on this and address your inputs more profoundly or a bit more easily.

Good luck and have fun!

My Forest – My Gym

Content:

Participants create their own forest-stick-gym and perform it with the group

Objective:

Being creative in designing a small gym exercise, showing that movement and outdoor physical activity is healthy

Preparatory work:

- Choose a place in the forest where each participant can find an approximately 1m long stick

Procedure:

- Give participants the instruction, that everybody t has to search for a 1m long stick. With this stick everybody will design/perform a short gym-exercise
- Let the whole group come together and let everyone show his/her exercise. Than the whole group (standing in a circle with sufficient space between each other) repeats each exercise together three times

Hints on health aspects:

- Explain why the air in the forests is so healthy (Clean, oxygen, terpens,..)

Variations and amendments:

- A follow-up-project can be to choose the best ten exercises and to develop a “vita-parcours”

Impressions from the activity “My forest - my gym”; Photo: Vilma Issakainen, Finish 4H and Finish Forest Association

Twelve Healthy Fruits of Forests

Content:

Participants discover hidden messages in prepared walnuts

Objective:

To give an overview about the existing research results about the effects of forests on human health

Preparatory work:

- Divide 12 walnuts into two halves (with a sharp knife and a hammer; see photo below) and pull out the fruit out of one of the halves
- Print the attached page, take a pair of scissors and cut out the 12 messages as small stripes
- Roll up the stripes, put them into the empty halves of the walnuts (see photo below)
- Take a glue and stick the both halves together again

Procedure:

- Divide your group into pairs and give a walnut to each pair (if you have less than 24 participants some groups can get more than one walnut, if you there are more than 24 divide the participants into groups of three persons)
- Give 5 minutes to the pairs to open their "healthy fruit of the forest" to discuss about the hidden message and to explain the message with in their own words
- Let the whole group come together and let every pair explain their message to the others

Hints on health aspects:

- Explain when something is difficult to understand (chapter 4!). Try to let a group discussion develop. Mention, that all the 12 messages are proven results from research studies (if wanted, give the list of the references (chapter 5) to the participants)

Preparing the 12 healthy walnut-fruits of the forests; Photo: Bavarian Institute of Forestry (LWF)

Attachment – "Messages" for activity " Twelve Healthy Fruits of Forests":

Forests are good for human health - they can enforce positive emotions

Forests are good for human health – they can lower blood pressure and heart rate

Forests are good for human health – they can reduce stress hormones, and lead to higher parasympathetic and reduced sympathetic nervous system activity - which indicates reduced physiological stress

Walking in forests has also been linked to reduced blood sugar levels among diabetics

Therapy programme for those suffering from depression was more effective in reducing depression and stress when carried out in forest setting rather than hospital setting.

There are signs, that the activity of anti-cancer-cells (cancer – killing cells) increases after being in a forest.

Nature-experiences are important for healthy development of children, their growth and their later healthy way of life

Being in forests can promote physical exercise, which is beneficial for human health

Spending time in forests can facilitate social contact and help to foster a sense of community, which in turn has positive influence on health

Forests may also encourage personal growth and development, including promoting sense of purpose

Forests can lead to non-taxing concentration that has restorative effects on brain's ability to focus

Learning in forests is good for mental health and reduces behaviour - disturbances

Watching with Your Feet

Content:

Participants build their own “barefoot-trail”

Objective:

To be active together in planning, creative building and gaining sensory barefoot-experience

Preparatory work:

- Warm and dry weather is more suitable for carrying out this activity
- Have some towels and boxes of water with you, for cleaning the feet after the activity
- This activity is a good follow up after a vivid or more strenuous activity

Procedure:

- Together with participants lay a 40 cm wide ladder made of poles with a number of about 8-10 rungs each of a distance of at least 40 cm
- Order participants to fill the ladder (areas between the poles) with different forest materials or to remove forest materials in areas. For example material such as cones, moss, stones, foliage, brushwood. In a compartment for example the leaves can be removed down to the humus
- Watch out for protected species such as mosses!
- Try out the barefoot path together and let the participants share their feelings and experience

Hints on health aspects:

- Introduce the participants to the topic of walking barefoot in a forest, relate to forest animals or to our ancestors
- Mention that walking barefoot is often healthy compared to walking in shoes
- You can also mention that there is a health impact from foot-reflexology-massage and that your barefoot-walk is a little like that

Variations and amendments:

- As an alternative to the pure barefoot path a “sense path” can be built, in which all the senses (except for “tasting”) are included. In this case you don´t need the ladder
- Please ensure that not too large areas of moss are used, most native mosses are protected
- Let the participants experience the path in a specific way: blind, backwards, etc. Even a foot massage with spruce cones, for example, can be offered

Experiencing and learning with all senses, on the self-made barefoot-path; Photo: Bavarian Institute of Forestry (LWF)

The Echo of the Forest

Content:

Participants look for a place in a forest they like the most and mediate there about a poem or quotation

Objective:

Come to rest and experience relaxing in a forest, but also clear up one's mind and change one's perspective

Preparatory work:

- Collect verses from poems or quotations dealing with nature, forests, education or emotions and print them out – each verse on one sheet of paper and enough for every participant (for example from www.brainyquote.com)

Procedure:

- Introduce the group with reading a forest- or tree -poem (for example "The oak tree" from Johnny Ray Ryder Jr.)
- Give the instruction, that everyone has to look for a place in the forest nearby (not more than 50m away) s/he enjoys the most
- There are the following questions and tasks that should/can be carried out (time: 15-20 minutes):
  - Why did you choose this place?
  - What has this place to do with you, what do you feel like in here?
  - Which thoughts or emotions became important when reading your verse?
  - If you want, you can perform your feelings at this place within an own poem, a short mime-show or a poetry slam
- Let the whole group come together and ask those who are willing, to present their performance in a creative way

Hints on health aspects:

- Explain that a silent, meditative or just relaxing stay in forest can help people to distress themselves and forget about sorrows or troubles (see chapter 4)

Variations and amendments:

- If you have a bit more time it might be an interesting experiment to measure heart-rate and blood-pressure of some of your participants (with portable instrument, see the photo below) and to compare the data before and after the meditation time

The participants meditating;
Photo: Bavarian Institute of Forestry (LWF)

Listening to the "echo of the forest";
Photo: Laura Halvari, 4H and Finnish Forest Association

Portable instrument to measure heart-rate and blood-pressure;
Photo: Bavarian Institute of Forestry (LWF)

A Bed in a Forest

Content:

To build a forest-bed with nature-material

Objective:

Experience the refreshing and relaxing silence of a forest

Preparatory work:

- The weather should be dry and not too cold
- Search for a suitable place in advance (without dangers e.g. free from dry branches in the crowns above, without disturbing noise, etc.)
- If necessary take blankets and sleeping pads with you

Procedure:

- Start the activity with the announcement, that participants will now have relaxing time for themselves
- Therefore every participant can now find a place nearby where s/he wants to build a forest-bed from nature -material
- This can be done individually or in pairs, in small groups or as a whole group activity
- The forest-bed consists of a lying area of thin branches (for example fresh small branches from spruce) covered with leaves, brushwood or some moss. With bigger branches, the borders of the bed can be marked
- Now the participants should make themselves comfortable on their forest-bed
- Keep attention, that nobody can get cold from the ground
- With a harmonic sound (gong, xylophone) you can begin the phase of relaxing and being calm. After about 15 minutes you can finish the routine with the same sound

Hints on health aspects:

- Try to focus on the importance of relaxation for human health

Variations and amendments:

- Forest beds can be single-beds close to each other or a shared group-forest-bed
- During the resting phase you might recite a suitable, meditative text
- You may also use your forest-beds as a place to stay in the forest over night
- Please ensure that not too large areas of moss are used, most native mosses are protected

Smell - Memory

Content:

Participants experience different smells which can be found in forests

Objective:

By sensitizing the sense of smelling, participants experience relaxation, contemplation and distressing. They also can enjoy healthy and fresh air in a forest

Procedure:

- Divide your group into small groups of 2-4 persons (to design a memory - game of 8 pairs you need 8 groups)
- Instruct each group to find a special typical smell of the place in the forest they are visiting
- Give them about 10 minute time for this task. Each group must show or present their typical smell to all the others afterwards
- Let the whole group come together. Now each group presents their smell to the others
- Try to design your own "forest-smell-memory" as whole group:
  - Put the different smells two by two into identical small boxes, like film-cans (see the photo below) or other small containers
  - Mix the containers and try to find matching pairs, like in the classic memory game

Hints on health aspects:

- Explain why the air in the forests is so healthy (Clean, oxygen, ...)

Forest-smell-memory; Photo: Bavarian Institute of Forestry (LWF)

Tea from the Forest-pharmacy

Content:

Participants learn how plants or part of plants can be used as tea and they learn about forest as a living pharmacy

Objective:

Participants learn to be careful and mindful with plants and learn about their healing effects

Preparatory work:

- Prepare the materials you need; such as already dried herbs, cans and teapot, tea filter, water
- When you are no expert and do not have knowledge about plant species it is better to use herbs you already identified in advance or bought in an herb-shop or a pharmacy
- The activity might be performed the best in cooperation with a doctor, a naturopath or an herb-specialist

Procedure:

- During a forest hike participants get to know different trees and shrubs. Their healing effect is explained and which parts of plants can be used for this purpose
- Please note that the terminal sprout must not be harvested in order not to block the height-growth of the plant
- Do not harvest plants for tea growing near an intensively managed agricultural area
- With the respective plant, the knowledge deepens when tea tasting is done right on the site. To do this, hand out cups which participants can keep during the hike
- The best way to collect plants is to collect them into baskets
- Fresh parts of plants are less effective as tea because the taste and the intensity of ingredients is higher in dried plants. So for tea tasting it is advisable to use older herbs you prepared before. The fresh plants you collected prepare for drying
- Dry the plants on untreated substrates, such as clean paper, wooden boxes, baking trays or sieves from dehydrators. On these underlay, the plants are laid out loosely and stored in a dry, shady place. An attic or a low-light room are a good choice. Depending on thickness of the plant parts, drying process is completed after 4 - 7 days. If possible, turn over the parts of the plant from time to time. Plants should never be dried in the oven because too many substances would be lost.
- It is the best to store tea drugs in brown glasses or tin cans. For short periods also paper bags are sufficient

Hints on health aspects:

- Tea develops its healing effect through the ingredients of plants, but also through the heat of the water. Likewise, drinking tea itself usually promotes good health. Depending on the nature of plant substances, tea must be prepared accordingly. For thin leaves and flowers it is sufficient to pour hot water over the dried plants. How long the tea has to be drawn also depends on the condition, but the time usually ranges from 5 to 15 minutes as described in the literature.
- Thicker plant parts such as roots, bark, fruits or hard leaves, are often prepared with cold water and then brought to a boil. Again, for the time of boiling ask an expert or consult specialised literature. If you want to extract silica from *Equisetum arvense* the plants must be boiled for 20 minutes and the seeds of rose hip *(Rosa canina)* unfold their vanilla-like taste even after a longer time of boiling.
- Another form of preparation is a cold extract. Here, the plant parts are doused with cold water and allowed to stand overnight. Mucilages from *Althaea officinalis* for example dissolve only like that. Depending on the plant, this cold extract can be drunk cold or slightly warmed.

Variations and amendments:

- For your motivation, you can find some tree and shrub species with their curative effects listed on the next page. It is recommended to co-operate with a doctor, pharmacist or alternative practitioner when performing a programme on this topic.

Collected and dried herbs for making teas can be collected best in brown glass-containers
Photo: Bavarian Institute of Forestry (LWF)

Tree or shrub species	Part of the plant	Healing effect
Prunus spinosa	*Blossoms*	*Strengthening lymphatic sytem*
Betula pendula	*Young leaves*	*Stimulating kidneys*
Salix species	*Bark*	*Analgesic*
Abies alba, and other sp.	*Needles*	*Strengthening immune system*
Quercus robur/petraea	*Bark*	*Constricting effect on injuries*
Populus nigra	*Buds*	*Strengthening immune-system*
Juglans regia	*Leaves*	*Stimulating liver*
Fraxinus excelsior	*Leaves*	*Against rheumatism*
Castanea sativa	*Leaves*	*Respiratory symptoms*
Aesculus hippocastanum	*Blossoms*	*Strengthening veins*
Ulmus minor	*Bark*	*Anti-inflammatory*
Crataegus monogyna, Crataegus laevigata	*Fruits (core and capsule), Blossoms and leaves*	*Strengthening immune system*
Tilia platyphyllos, Tilia cordata	*Blossoms*	*Stimulating sweating*
Sambucus nigra	*Blossoms* *Bark*	*Stimulating sweating* *Laxative*
Frangula alnus	*Bark*	*Laxative*
Ribes nigrum	*Leaves*	*Stimulating kidneys*

In addition to tree and shrub species, there are of course still many soil plants in the forests such as strawberries, blueberries, cranberries or raspberries which are suitable as a tea drug. A visit to a drugstore or a pharmacy can open eyes. Self-study with the help of literature or visiting seminars is recommended.

The "Forest – Pharmacy" – a remarkable result of collecting herbs, Photo: Bavarian Institute of Forestry (LWF)

Food from Forests

Content:

Participants get to know herbs, how to preserve them and how to make herb-salt

Objective:

Participants get to know the healing power of plants and can take their herb-salt home

Preparatory work:

- Collecting plants and possibly drying them should be done in advance
- Find a suitable area for harvesting (away from dog lanes and pesticides)
- When you are no expert in knowledge about plant species it is better to use herbs you already identified in advance or bought in an herb-shop or a pharmacy
- The activity might be performed the best in cooperation with a doctor, a naturopath or an herb-specialist

Procedure:

- The plants can be explained the best on the spot with their growth conditions and demands
- The harvested plants are then cut with knives (preferably porcelain to preserve the ingredients) and placed into the mortar
- The mixing ratio of plant with salt is 1:1. This mixture is made into a green mash that should not be too wet (add salt again if necessary). In this form of preparation, the ingredients are preserved the best, but the mash still needs to dry, which takes another two days. For drying, simply spread the mash on a board to let it dry for two days and then rub again in a mortar and fill jars with the mixture. The mixture is very durable.
- When you take dried herbs, you can mix them with salt in the same ratio, rub them in a mortar and then the salt is ready to be tasted with vegetables or bread and butter

Variations and amendments:

- You really should know the plant species you collect! If not take an expert with you or for salt production use only herbs, that you bought in an herb-shop or pharmacy
- Do not collect in areas with a lot of dog waste or near agricultural fields (pesticides)
- After mixing the herb-salt with butter it´s a good possibility to taste the self-made “Forest-herb-salt-butter” during a break with vegetables or bread
- Herbal salt preparation works the best in spring when plants are fresh and full of power
- You can use for example these plant species: *Allium ursinum, Fragaria vesca, Oxalis acteosella, Allaria petiolata, Bellis perennis* or *Urtica dioica*. But also fresh young leaves from beech, birch or lime tree can be used

A Healing Salve from the Forest

Content:

Participants collect plants with healing effects and use them for making a salve

Objective:

To learn about plants and their healing effects in the form of a salve

Preparatory work:

- Prepare the material you need: olive oil, beeswax, small screw jars, small pot with warmer (e.g. camping-cooking-stove)
- It makes sense to collect the plant material in advance and prepare a suitable working-place for your work
- When you are no expert and do not have knowledge about plant species it is better to use herbs you already identified in advance or bought in an herb-shop or a pharmacy. The activity might be performed the best in cooperation with a doctor, a naturopath or an herb-specialist.

Procedure:

- At the very beginning you and participants prepare an oil-plant mix at some sheltered place.
- Then take a small, thin-walled pot and pour in about 150 ml olive oil and warm the oil with a small warmer
- Then add the plant parts from which you want to extract the salve into the melted oil
- For example, the leaves of *Plantago major* should be cut or teared up to small pieces. Or the root of Symphytum officinale should be peeled and cut carefully into small slices.
- The oil should cover the plants and simmer gently. Do not let it get too hot.
- After 1.5 hour you can take out the parts of the plant (or filter them). You have got the so-called warm-macerate.
- Then add beeswax little by little to this still warm oil. Clean honeycombs from the beekeeper show participants the origin of the wax. Start with little wax and be careful with the liquid.
- As with jam cooking, a sample can be taken. Put a drop of the oil-wax mixture on a small plate. If the drop gets fixed, there is enough beeswax for the salve and the liquid can be filled into small jars. If it becomes too firm, just add some olive oil again. With more and more practice you will manage to find the right consistency easier.
- To improve the odour of the salve, you can add 3-5 drops of ethereal oil per 100ml of lukewarm oil-wax mixture. But bear in mind possible allergies at this step.

What is Moving me Today

Content:

The group is planning and arranging a mobile in the forest

Objective:

Being creative in a creativity oriented group-process and experience the stimulating and soothing atmosphere of creative work in nature

Preparatory work:

- Search for a place or a tree with a suitable branch on which the mobile can be fixed
- Bring enough string to fix all the separate parts of the mobile

Procedure:

- Instruct your group to plan and construct a mobile together. This mobile can show all the experiences the participants have made during the forest-field-trip.
- Everyone looks for an object which represents his/her experience the best and attaches it into the mobile. The challenge is to get everyone´s object integrated and to bring the mobile into a good balance.

Hints on health aspects:

- This activity is well suited as the final activity of your excursion
- The mobile can remind the participants about what has influenced them mentally on this day in the forest. Make sure, that being in a balance (mentally, but also in a holistic balance of body, psyche and soul) is also very important for the physical and psychosomatic health.

“What moved us today?”
The group created their mobile in the forest;
Photo: Bavarian Institute of Forestry (LWF)

Background knowledge about forests and human health

Restorative effects of forests

Japan and Korea are at the forefront of health research focusing on forests. In Japan studies have investigated physical and mental health benefits of Shirin Yoku, the practice of 'forest bathing' or 'taking in/absorbing the atmosphere of forest'. These studies typically involve young adult males in a cross-over design and have consistently found that being physically present in forests (sitting or walking for 15-20 minutes) the body has more effective relaxing impact on our body than sitting or walking in a city environment. Short-term exposure to forests can enhance positive emotions, lower blood pressure and heart rate, reduce stress hormones, and lead to enhanced parasympathetic and reduced sympathetic nervous system activity (indicating reduced physiological stress) (Li et al., 2008; Morita et al., 2007; Park et al., 2007; Park et al., 2009; Park et al., 2011; Park, Tsunetsugu, Kasetani, Kagawa, & Miyazaki, 2010; Song et al., 2014). Walking in forests has also been linked to reduced blood sugar levels among diabetics and improved immunity of othrerwise healthy females (Li et al., 2008), but these studies did not include a comparison group of participants walking in non-forest environments. Meanwhile, studies from Korea provide evidence of the benefits of forests as settings for therapy programmes. For example, Kim et al. (2009) found out that a therapy programme for those suffering depression was more effective in reducing depression and stress when carried out in a forest setting rather than in a hospital setting.

The forest health effects identified in Asia may be relevant also in the European context. A pilot study in Göttingen, Germany, with a similar design to the Japanese Shirin Yoku studies found out that a walk in a forest enhanced positive mood and increased parasympathetic nervous system activity more than a city walk (Meyer, Hey, & Bürger-Arndt, 2014, 2016). Similarly, a Finnish study showed that visiting an urban forest after work increased positive emotions more than visiting a city setting, although participants' stress hormones did not differ significantly between the forest and city environments (Tyrväinen et al., 2014).

The importance of outdoor-education for children's health and well-being

There is a growing evidence that exposure to nature can promote optimal development in children. Unstructured play in a forest appeared to improve motor-fitness of pre-school children in Norway (Fjortoft, 2004), while outdoor lessons in a forest setting lead to a healthier stress response with 10 year-old students in Germany compared to students who stayed in a classroom (Dettweiler, Becker, Auestad, Simon, & Kirsch, 2017). Spending time in green spaces, for example going for a stroll in a city park or building a den in a forest, has been shown to improve concentration and positive behaviour among children with attention deficit/ hyperactivity disorder (ADHD) (Faber Taylor & Kuo, 2009; van den Berg & van den Berg, 2011). In some cases the measured improvements in behaviour

were roughly equivalent to the effect of taking ADHD medication (Faber Taylor & Kuo, 2009). Close to home nature also appears to be important for children's development and well-being. In rural areas, the level of greenness around a home can buffer the impact of stressful life events on the mental health of children (Wells & Evans, 2003).

In an urban setting, the naturalness of views from apartment windows has also been linked to greater self-discipline and impulse control among girls in low-income families (Faber Taylor, Kuo, & Sullivan, 2002). Moreover, a longitudinal study of children from low-income families participating in a housing relocation programme showed that children who moved to much greener homes were able to direct their attention post-move better (Wells, 2000).

Restorative effects of education in forests and the impact of forest pedagogy on human health

There are some research results, showing that outdoor learning, especially when there is developed a positive relationship with outdoor environment from the early childhood, can decrease the "Child Deficit Disorder" as it is described by some authors (Louv, 2006). Learning to be active and to interact with natural elements as well as learning how to obtain a good feeling from this interaction, in an outdoor-learning- surrounding, has positive impacts on education (Smith et al. 2017, McNair2012, Mittelstaedt et al. 1999). It is proven, that environment of a school yard with more green supports physical activity of pupils (Dyment & Bell, 2008, Mårtensson, 2013) and more trees in schoolyard predict increased physical activity (Arbogast et al. 2009). Similarly, natural environments at schools improve mental health and reduce behavioural disturbances (Flom et al. 2011). In specialised forest schools children behave more harmoniously (Blizard & Schuster, 2004), they have also lower levels of stress hormones (Söderström et al. 2013, Dettweiler et al. 2017). Other research projects show, that pupils from forest schools are under reduced sun-exposure (Boldemannet al. 2006, 2011), have better motor function (Boldemann et al. 2006), show better self-confidence and self-esteem (Chawla et al. 2014) and also better general well-being (Hignell et al. 2017). The "classical" school performances seem to better in forests schools too, as the research indicated improved writing and maths skills (Quibell et al. 2017), better cognitive and linguistic skills (Yildirim and Akamca, 2017, Eaton 2000), better motivation and concentration (O'Brien and Murray, 2007), better reading skills (SEER, 2000); and improved attendance (SEER, 2000).

Quite similar results appear in some studies concerning the "health and learning advantages" of forest kindergardens. So – just as one example - an extensive study done in Germany (Häfner, 2002) proved, that children educated in "Waldkindergarden" achieved higher competences as well as in developing fantasy and creativity as in social behavior, cooperating within teaching or motivation to interact, than pupils from typical kindergardens. A lot of more scientific proofs for the health benefits of the Waldkindergarten are summarized on the homepage of the German association of Forest kindergardens: http://bvnw.de//category/wissenschaftliche-studien/

History and background information - medicinal plants and forests

Even in a Neanderthal grave with an estimated age of 60,000 years in Iraq, researchers found *Althaea officinalis* and *Achillea millefolium*. It is also known that Neanderthals used the capsules of papaver 30,000 years ago. Pollen-diagrams from former settlements revealed that already in the older Mesolithic Era around 6,000 BC plants were cultivated for healing purposes, e.g. hop and *Artemisia species*. In the last century "Ötzi" found in an alpine glacier one of representatives of the late Neolithic (around 3,300 BC) had pieces of the anti-inflammatory mushroom *Fomitopsis betulina* within itself.

In general, there have not been present any written records of medicinal plants for a long time in our culture. The knowledge was probably handed down and taught orally, as it is said in the stories about Druids. In Asia, traditional Chinese medicine (TCM) has 5,000 years of tradition and the first textbooks are 2,000 years old. Important records for our culture came from Hippocrates (460-370 BC), Dioscorides (1st century AD). The works were translated in monasteries and their knowledge was applied there. In monastery gardens a wider variety of Mediterranean medicinal plants were cultivated in so-called "Hortuli". A well-known "Hortuli" is described on the island of Reichenau (Germany) by Walahfried Strabo (809-849 AD) and can still be visited today. Other foreign medicinal plants were added as medical plants during the period of crusades.

Later, in the 19th century, famous representatives of natural medicine were mainly priests or other churchmen, for example priest Künzle (Switzerland), priest Weidinger (Austria) or Priest Kneipp (southern Germany). Churchmen sometimes publicly advocated the use of native plants as medicine and restored the reputation of plants which were often only regarded as weeds. But they also were criticized or even accused of usingthis kind of medical therapies.

Even though most of our medicines today are manufactured industrially, more than half of the formulations are based on medicinal plants and their ingredients. Out of the 50,000 species, used as medicinal plants worldwide, an estimated amount of 15,000 species are threatened. Many of them cannot be cultivated and can only be collected as wild plants. The population of some species, e.g. *Harpagophytum procumbens* is at risk and so certificates for sustainable collection of medical-plants were established.

Forests – pharmacy of nature

Our nature, especially our forest is home for many plants. Any of them, even the poisonous, can be used for healing purposes. Important factors are dosage and preparation.

Healing effects of plants are in correlation with the food we eat. The old saying "Your food should be your medicine and your medicine should be your food" (Hippocrates) is still valid. Thus, berries can act as nutritious vitamin C donor, but taken as curative in dried form, blueberries can help against diarrhea. There is a border between food and medicine. Everything we eat can affect us – both as a strengthening as well as a weakening element.

Plants can be conserved by salt or sugar, poured as a tea, put into fat, distilled, fermented or prepared as a tincture. In addition, there are combined and extended procedures. In homeopathy, the potency of the plant is gained applying complex processes. Starting substance is usually a tincture, which is further processed and potentiated in many steps. This – for homeopaths - is an attempt to "gain the healing message of the plant".

Some medical and healing- knowledge of our ancestors has probably been forgotten due to new discoveries of conventional medicine. However, researchers and also doctors are again increasingly looking for the multiple impacts plant substances might have on human health. So a huge variety of plant species in our forests and their preservation is not only important because of biodiversity-reasons, but also to save forests as a well-equipped living pharmacy.

A bath in the forest relaxing and refreshing for body, psyche and soul!
Photo: Bavarian Institute of Forestry (LWF)

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