3.5 Seeing the forest through the trees: Contemporary and future avenues of research

Femke Beute and Agnes van den Berg

As the previous articles have illustrated, Forest Therapy research has demonstrated a wealth of merits of Forest Therapy and other nature-based health interventions on long- and short-term health and wellbeing.

In order to advance from the demonstration of these toward large-scale design and implementation of Forest Therapy embedded in national health schemes, a number of steps need to be taken. First of all, radical change in current health care systems is necessary (Frumkin et al., 2017). Formal accreditation of exposure to nature as a medical treatment requires adhering to the strict guidelines set by the medical sciences (Van den Berg, 2017). There is a need for a solid empirical evidence (Buckley & Brough, 2017). In order to accommodate these strict guidelines, we propose taking a number of methodological considerations into account that strengthen causal inferences, increase power, facilitate meta-analysis, enhance medical and societal acceptance of Forest Therapy, and enable a broader outlook on what constitutes nature. This chapter will end with a section on potential new venues of research that offer opportunities to further strengthen the evidence base of Forest Therapy.

3.5.1 Strengthening research outcomes by enabling causal inferences

Most research in Forest Therapy relies on a cross-sectional study design, which can only point to correlational rather than causal relationships between Forest Therapy and health outcomes. In order to get Forest Therapy embedded and accredited within main-stream medicine it is necessary to introduce stricter experimental designs. The gold standard within the medical field are Randomized Controlled Trials (RCTs). A structural review on the curative and preventive health benefits of Forest Therapy published in 2014 revealed only four studies that fulfilled the criteria for an RCT (Kamioka et al., 2014). Moreover, the quality of RCTs in this field of study is relatively low. For practical reasons, requirements for RCTs, such as randomization, concealment, and blinding of blinding of participants and experimenters for the experimental manipulation has proven problematic.

With the number of RCTs likely to remain small, there are a number of measures that can be undertaken to strengthen the power for causal inferences in evaluations of Forest Therapy. A first, step is adding baseline measurements. Baseline measures can strengthen the design for at least two reasons (Stevenson, Schilhab, & Bentsen, 2018). First of all, it offers a very basic comparison between different treatment groups before the treatment has taken place to rule out that groups may have been different even before starting the therapy. Not knowing at which level an individual started before the intervention makes it more difficult to conclude whether an improvement in mental health has occurred due to exposure to nature or because there might have been some systematic (or random) differences between groups in the first place. This is especially problematic with smaller sample sizes, which are often used in this type of research due to practical and pragmatic reasons (Lee et al., 2017). Many studies within the field of Forest Therapy now include baseline measures. It is, however, also important to consider the right type and timing of the baseline measures. For instance, circadian variations in physiological and endocrinology must be taken into consideration, as was done by Ochiai and colleagues (2015), by taking baseline measurements the day before the intervention, at the same time of day.

Second, having a pre-treatment measure also opens up possibilities to compare effects within, rather than only between individuals. With more advanced statistical methods, such as hierarchical linear modelling, it is possible to go one step beyond proving whether a therapeutic intervention has been beneficial or not by looking at intra-individual effects. For instance, it was establish that everyday encounters with natural elements were more beneficial for those with affective problems than for those without affective problems (Beute & de Kort, 2018).

Baseline measures alone will not lift cross-sectional research up to the level of randomized controlled trials. The addition of appropriate control conditions to compare effects in environment, treatment type, and level of physical activity constitute a second requirement for strengthening research outcomes. As custom in restoration research, nature visits are often contrasted with visits to urban or built areas. This allows for contrasting nature to its contemporary and artificial opposite, but is not always able to rule out alternative explanations of detrimental effects of the city rather than positive effect of nature.

RCTs can be broadly categorized into superiority trials, noninferiority trials, and equivalence trials (Piaggio et al., 2006). While most RCTs are designed as superiority trials, with the intention to show that one treatment is superior to another treatment, Forest Therapy researchers may also consider non-inferiority trials, e.g., to determine that the nature treatment is no worse than a regular treatment (or doing nothing), or equivalence trials,

in which the hypothesis is that the two interventions are indistinguishable from each other. Positive outcomes of the latter trials may strengthen the position of Forest Therapy within the regular range of therapies.

In general, careful consideration needs to be given through to the choice of the control group as Forest Therapy often differs in many aspects from regular therapy. For instance, compared to traditional therapy, Forest Therapy also adds a component of physical activity, which in itself has proven beneficial. Roe and Aspinall (2011), for instance, found that physical activity alone already was beneficial for individuals with poor mental health, but walking in natural environments did appear to have added benefits.

A requirement for RCTs that is notably difficult to realize in Forest Therapy research concerns the experimental control over the independent variable, i.e. the therapeutic environment. While medical researchers can control in detail the ingredients of new pills or interventions, Forest Therapy researchers generally need to choose existing environments as therapeutic settings. These settings often contain elements and uncontrollable events that can compromise therapy outcomes, such as weather circumstances or loud noise and other disturbances caused by third-party activities. These issues can be overcome by doing research in more controlled laboratory settings, such as VR settings (Von Lindern, Lymeus & Hartig, 2017). However, studying Forest Therapy in laboratory settings may compromise the external validity of the findings, and is therefore only of limited use. In general, a careful selection of therapeutic settings is crucial for making causal inferences on the effects of the settings. Last, even though it is difficult to obscure the manipulation for participants, blinding the experimenter for the research conditions of the participants is achievable and a requisite for randomized controlled trials.

3.5.2 Increasing power: advantages and disadvantages of the cross-over design

Research in this area is often expensive and time-intensive. Adding to this that the research population is sometimes difficult to reach and you begin to appreciate why some studies are executed with relatively small sample sizes. Cross-over trials are often used to overcome this limitation. In a typical two by two cross-over trial, each participant receives the same treatment in both a natural and a control setting in different orders, thereby serving as his or her own control. This potentially reduces the sample size required for the same statistical power. However, there are many caveats related to this design (Jones & Kenward, 2014). The most important of these is the possibility of order effects, which means that the order in which

the treatments are administered may influence results. For example, Forest Therapy may be more effective than a control therapy during the first session, while it may be less effective during the second session (or vice versa).

A much-cited reason for an order effect is that positive effects of Forest Therapy can "carry over" to the subsequent control therapy, which mostly happens when the washout period (or time between the two treatments) is too short. There are, however, many other ways in which order effects may undermine the outcomes of cross-over trials. For example, when studying effects on attentional performance, participants may be faster in learning correct responses to a task in the natural setting, which may lead to inflated test scores during the second (non-natural) session. Another possibility, which is especially relevant when studying mood effects, is that positive experiences during a first session in a natural setting may make the second session in a non-natural setting appear less attractive then if it were experienced in isolation.

When order effects are found, a usual practice is to set aside the results of the second session and analyse the results of the first session only. It is thus of crucial importance that any cross-over trial should include preliminary tests of order effects. Unfortunately, in Forest Therapy research, just like in other areas of research, such pre-tests are often lacking, or not carried out in a proper manner (Li, Yu, Hawkins & Dickersin, 2015). A common mistake is to test for the effects of order coded as nature first or control first, or include this 'order variable' as a covariate in analyses of treatment effects (see, for example, Gladwell et al., 2016). However, since order is confounded with group, this analysis will only tap into differences between the experimental and control groups, which are already minimized by random assignment. A more appropriate statistical test of the order effect includes a test of the treatment (nature, control) by group (nature first, control first) interaction. If this test turns out significant, then the effect of the treatment differs between the first and second session, indicating an order effect. As a minimum, in research using a cross-over design, researchers should always present tables with treatment averages as a function of the order in which they were received, to allow readers to check if order played a role in the results.

3.5.3 Allowing better comparisons across different studies

With research standards set increasingly higher, the first promising steps have already been taken to include Forest Therapy within existing health care systems, but more change is necessary. A few well-executed RCTs, or some large-scale and longitudinal studies alone may not be enough to

achieve radical changes within the medical profession, they may be no more than a ripple in the water. Aggregating the results over multiple studies in a meta-analysis presents a powerful tool to yield more high-quality evidence. However, the heterogenous character of the current evidence base -partly caused by the interdisciplinary character of the research domain (Karjalainen, Sarjala & Raitio, 2010) - makes it difficult to perform meta-analyses. In addition, interventions also differ substantially in their structure and content, and range from merely viewing nature, through being near nature, to actively interacting with nature (Stigsdotter et al., 2011). Therefore, and also to improve comparability between studies, the field could benefit from more homogeneity in the research methods used, but also in the research instruments employed. To start with, research groups could start to coordinate the use of specific operationalisations of subjective wellbeing, which are included in most studies, in order to move forward in a logical and systematic manner (White, 2017).

Increasingly, studies are moving away from relying solely on self-reports of mental and physical health outcomes and are improving the research design by incorporating neurobiological manifestations of restorative outcomes (Hansen, Jones & Tocchini, 2017; van den Berg, 2009). More homogeneity could be accomplished by taking a more structured -and above all- more theory-driven design, and measurement, of the therapeutic interventions and benefits (Lee et al., 2017). We also need to learn more on the relationship between frequency and duration of nature therapy and its efficacy (Buckley, Brough & Westaway, 2018; Frumkin et al., 2017) and of the different contributions of different natural elements (Hartig et al., 2014).

Agreeing on the methodology as well as on the use of theory-driven and validated research instruments to incorporate in future studies would highly accommodate pushing the field forward by allowing for the aggregation of - and the comparison between- different studies.

3.5.4 Medical and societal acceptance of Forest Therapy

Incorporating Forest Therapy in health care systems does not only require a change in status quo for the health system alone, it will only work when there is wide-spread social support for the interventions. Currently, the lion's share of research in this field has been executed in Japan (Ideno et al., 2017), followed by other Asian countries as Korea (Han et al., 2016) and China (Mao et al., 2017). Only a limited number of studies have been conducted in other countries and on other continents, as for example in Denmark (Corazon, Stigsdotter, Jensen & Nilsson, 2010; Stigsdotter et al.,

2018) the UK (Barton, Griffin & Pretty, 2012), and the USA (McCaffrey, Hanson & McCaffrey, 2010).

Research in Denmark for instance established that nature-based therapy can be as effective in lowering visits to the general practitioner for individuals with stress-related illnesses than traditional cognitive behavioural therapy (Corazon et al., 2010). Less research in the other continents thus does not necessarily signal lower efficacy of the therapy in these countries. However, the attitude toward nature may be very different in Japan, with its rich history in Shinto religion, than in for instance European countries. Therefore, it is important to establish whether the same support base exists for nature interventions within different cultures and to establish which social factors are of influence, as are climate and geography (Buckley & Brough, 2017).

3.5.5 A broader outlook on nature

Milder climates – and milder summers within harsh climates – will most probably facilitate more frequent and longer nature visits (Hartig, Catalano & Ong, 2007). Benefits of nature are usually discussed in terms of access or exposure to green space, such as the proximity to parks, a therapeutic session in the forest, or visual exposure to natural versus urban stimuli. Some studies include other modalities, such as sounds (Ratcliffe, Gatersleben & Sowden, 2013) and other types of nature such as 'blue' space (Dempsey, Devine, Gillespie, Lyons & Nolan, 2018). Climate, the weather, the change of seasons, and daily transitions from day to night are, however, also inherent parts of our natural environment that are often overlooked.

A central role in all these phenomena is played by the sun. The orbit of the sun around the earth orchestrates cycles in day and night, and shifts in seasons around the world. Importantly, exposure to daylight and sunlight on its own also has profound benefits for human health (Beute & de Kort, 2014). Benefits that are very likely to also occur during Forest Therapy. Sunlight, for instance, is a quintessential 'Zeitgeber' for our biological clock and can positively influence sleep, and endocrine functioning (Roenneberg, Kantermann, Juda, Vetter & Allebrandt, 2013). Importantly, exposure to sunlight can reduce depression, and not only seasonal depression (Benedetti, Colombo, Barbini, Campori & Smeraldi, 2001; Lambert, Reid, Kaye, Jennings & Esler, 2002).

This latter line of inquiry directly connects to the second rationale for including daylight in the study of Forest Therapy. There is a wealth of studies available pointing to benefits of exposure to daylight (i.e., high intensity- and full spectrum- light) on several health outcomes. Daylight exposure thus, in itself, can have various salutogenic effects (Beute & de

Kort, 2014). This could constitute an additional rationale for 'selling' the merits of Forest Therapy to the medical profession. Outcomes within the domain of lighting benefits can often be found in the field of Chronobiology and Medicine, and often point to an advantage of exposure to light in the morning. These outcomes may serve as input for the design of Forest Therapy.

New venues for research advancements in technology and statistical tools are widening the landscape of research methodologies available to researchers. Some of these advancements are of particular interest for the field of Forest Therapy. Implementation of diary research into mobile technology has jumpstarted diary research technologies such as Ecological Momentary Assessment (Shiffman, Stone & Hufford, 2008; Stone & Shiffman, 1994). Combining momentary questions on a mobile phone with continuous ambulatory assessment of variables as, for instance, physiology, environment, activity and location facilitates the investigation of a whole new range of research questions within Forest Therapy (Beute, de Kort & IJsselsteijn, 2016). It allows the study of nature exposure in the realm of everyday life. Participants can now be monitored continuously during and for a certain period after the treatment or intervention has taken place, which can reveal important information about variables that moderate and mediate a treatment effect (Myin-Germeys et al., 2009). Do individuals, for example, respond differently to Forest Therapy and can these differences be related to personal characteristics and elements of the therapy?

Much of what was discussed in earlier sections of this chapter relates to the improvement of research designs in terms of internal validity, necessary for the accreditation of Forest Therapy within regular health care. New venues of research, such as the Ecological Momentary Assessment, allow the improvement of ecological validity by studying benefits as they occur in everyday life, by enabling monitoring participants for longer periods of time, by capturing responses in the field, by allowing the investigation of interactions of Forest Therapy with naturally-occurring encounters with nature. And this is just the tip of the iceberg. Field studies with high ecological validity may not persuade policy makers to change the health care system, but also provide an opportunity to learn more about the theory and mechanisms behind benefits of interaction with nature (Frumkin et al., 2017).

Other venues of research can also help shed light on the restorative pathways of nature, including fundamental biomedical research (Frumkin et al., 2017) investigating the role of fractal patterns and other bottom-up characteristics on immune system functioning and other health effects of natural vs. built settings (Kuo, 2015; Taylor, Spehar, Hägerhäll & Van Donkelaar, 2011; van den Berg, Joye & Koole, 2016).

Continuous advancements in statistical analyses also allow for more in-depth examination of contributing factors, such as the inclusion of mediators within randomized controlled trials to understand how environmental, personal, and social factors influence the restoration process (Hartig et al., 2014; Kardan et al., 2015), or looking at intra-individual rather than inter-individual processes using time series analysis (van Gils et al., 2014).

3.5.6 Conclusion

Modern, urban, life poses many challenges for mental and physical health. Forest therapy is knocking on the door of traditional health care systems. A strong evidence base with randomized controlled trials implementing a highly structured, homogeneous, and theory-driven set of interventions could help nature therapy being accredited within the medical sciences. The field is continuously progressing, which has not gone unnoticed. For instance, in Scotland, doctors can now officially prescribe walks in nature to improve mental and physical health (RSPB, 2018). Hopefully, not for long, practitioners, policy makers and patients alike will see the forest through the trees, and the benefits it can have on mental and physical health.

References

Barton, J., Griffin, M., & Pretty, J. (2012). Exercise-, nature-and socially interactive-based initiatives improve mood and self-esteem in the clinical population. *Perspectives in public health*, 132(2), 89-96.

Benedetti, F., Colombo, C., Barbini, B., Campori, E., & Smeraldi, E. (2001). Morning sunlight reduces length of hospitalization in bipolar depression. *Journal of affective disorders*, 62(3), 221-223.

Beute, F., & de Kort, Y. A. (2014). Salutogenic effects of the environment: Review of health protective effects of nature and daylight. *Applied Psychology: Health and Well-Being*, 6(1), 67-95.

Beute, F., & de Kort, Y. A. (2018). The natural context of wellbeing: Ecological momentary assessment of the influence of nature and daylight on affect and stress for individuals with depression levels varying from none to clinical. *Health & place*, 49, 7-18.

Beute, F., de Kort, Y., & IJsselsteijn, W. (2016). Restoration in its natural context: How ecological momentary assessment can advance restoration research. *International journal of environmental research and public health*, 13(4), 420.

Buckley, R. C., & Brough, P. (2017). Nature, eco, and adventure therapies for mental health and chronic disease. *Frontiers in public health*, 5, 220.

Buckley, R. C., Brough, P., & Westaway, D. (2018). Bringing outdoor therapies into mainstream mental health. *Frontiers in public health*, 6, 119.

Corazon, S. S., Stigsdotter, U. K., Jensen, A. G. C., & Nilsson, K. (2010). Development of the nature-based therapy concept for patients with stress-related illness at the Danish healing forest garden Nacadia. *Journal of Therapeutic Horticulture*, 20, 33-51.

Dempsey, S., Devine, M. T., Gillespie, T., Lyons, S., & Nolan, A. (2018). Coastal blue space and depression in older adults. *Health & place*, 54, 110-117.

Frumkin, H., Bratman, G. N., Breslow, S. J., Cochran, B., Kahn Jr, P. H., Lawler, J. J., . . . Wolf, K. L. (2017). Nature contact and human health: A research agenda. *Environmental Health Perspectives*, 125(7), 075001.

Gladwell, V., Kuoppa, P., Tarvainen, M., & Rogerson, M. (2016). A lunchtime walk in nature enhances restoration of autonomic control during night-time sleep: Results from a preliminary study. *International Journal of Environmental Research and Public Health*, 13(3), 280.

Han, J.-W., Choi, H., Jeon, Y.-H., Yoon, C.-H., Woo, J.-M., & Kim, W. (2016). The effects of forest therapy on coping with chronic widespread pain: Physiological and psychological differences between participants in a forest therapy program and a control group. *International Journal of Environmental Research and Public Health*, 13(3), 255.

Hansen, M. M., Jones, R., & Tocchini, K. (2017). Shinrin-yoku (forest bathing) and nature therapy: A state-of-the-art review. *International Journal of Environmental Research and Public Health*, 14(8), 851.

Hartig, T., Catalano, R., & Ong, M. (2007). Cold summer weather, constrained restoration, and the use of antidepressants in Sweden. *Journal of Environmental Psychology*, 27(2), 107-116.

Hartig, T., Mitchell, R., de Vries, S., & Frumkin, H. (2014). Nature and Health. *Annual Review of Public Health*, 35, 207-228

Ideno, Y., Hayashi, K., Abe, Y., Ueda, K., Iso, H., Noda, M., . . . Suzuki, S. (2017). Blood pressure-lowering effect of Shinrin-yoku (Forest bathing): a systematic review and meta-analysis. BMC complementary and alternative medicine, 17(1), 409.

Jones, B., & Kenward, M. G. (2014). Design and analysis of cross-over trials. Boca Raton, FL: CRC Press.

Kamioka, H., Tsutani, K., Yamada, M., Park, H., Okuizumi, H., Honda, T., . . . Abe, T. (2014). Effectiveness of horticultural therapy: a systematic review of randomized controlled trials. *Complementary Therapies in Medicine*, 22(5), 930-943.

Kardan, O., Demiralp, E., Hout, M. C., Hunter, M. R., Karimi, H., Hanayik, T., . . . Berman, M. G. (2015). Is the preference of natural versus man-made scenes driven by bottom-up processing of the visual features of nature? *Frontiers in psychology*, 6, 471. doi:10.3389/fpsyg.2015.00471

Karjalainen, E., Sarjala, T., & Raitio, H. (2010). Promoting human health through forests: overview and major challenges. *Environmental health and preventive medicine*, 15(1), 1.

Kuo, M. (2015). How might contact with nature promote human health? Exploring promising mechanisms and a possible central pathway. Frontiers in psychology, 6. doi:10.3389/fpsyg.2015.01093

Lambert, G. W., Reid, C., Kaye, D., Jennings, G., & Esler, M. (2002). Effect of sunlight and season on serotonin turnover in the brain. *The Lancet*, 360(9348), 1840-1842.

Lee, I., Choi, H., Bang, K.-S., Kim, S., Song, M., & Lee, B. (2017). Effects of forest therapy on depressive symptoms among adults: A systematic review. *International Journal of Environmental Research and Public Health*, 14(3), 321.

Li, T., Yu, T., Hawkins, B. S., & Dickersin, K. (2015). Design, analysis, and reporting of crossover trials for inclusion in a meta-analysis. PLoS ONE, 10(8), e0133023-e0133023. doi:10.1371/journal.pone.0133023

Mao, G., Cao, Y., Wang, B., Wang, S., Chen, Z., Wang, J., . . . Dong, J. (2017). The salutary influence of forest bathing on elderly patients with chronic heart failure. *International Journal of Environmental Research and Public Health*, 14(4), 368.

McCaffrey, R., Hanson, C., & McCaffrey, W. (2010). Garden walking for depression: a research report. *Holistic nursing practice*, 24(5), 252-259.

Myin-Germeys, I., Oorschot, M., Collip, D., Lataster, J., Delespaul, P., & Van Os, J. (2009). Experience sampling research in psychopathology: opening the black box of daily life. *Psychological medicine*, 39(9), 1533-1547.

Ochiai, H., Ikei, H., Song, C., Kobayashi, M., Takamatsu, A., Miura, T., . . . Imai, M. (2015). Physiological and psychological effects of forest therapy on middle-aged males with high-normal blood pressure. *International Journal of Environmental Research and Public Health*, 12(3), 2532-2542.

Piaggio, G., Elbourne, D. R., Altman, D. G., Pocock, S. J., Evans, S. J., & Group, C. (2006). Reporting of noninferiority and equivalence randomized trials: an extension of the CONSORT statement. *Jama*, 295(10), 1152-1160.

Ratcliffe, E., Gatersleben, B., & Sowden, P. T. (2013). Bird sounds and their contributions to perceived attention restoration and stress recovery. *Journal of Environmental Psychology*, 36, 221-228.

Roe, J., & Aspinall, P. (2011). The restorative benefits of walking in urban and rural settings in adults with good and poor mental health. *Health & place*, 17(1), 103-113.

Roenneberg, T., Kantermann, T., Juda, M., Vetter, C., & Allebrandt, K. V. (2013). Light and the human circadian clock. In: Circadian clocks (pp. 311-331): Springer.

Shiffman, S., Stone, A. A., & Hufford, M. R. (2008). Ecological momentary assessment. *Annu. Rev. Clin. Psychol.*, 4, 1-32.

Stevenson, M. P., Schilhab, T., & Bentsen, P. (2018). Attention Restoration Theory II: a systematic review to clarify attention processes affected by exposure to natural environments. *Journal of Toxicology and Environmental Health*, Part B, 21(4), 227-268.

Stigsdotter, U. K., Corazon, S. S., Sidenius, U., Nyed, P. K., Larsen, H. B., & Fjorback, L. O. (2018). Efficacy of nature-based therapy for individuals with stress-related illnesses: randomised controlled trial. *The British Journal of Psychiatry*, 213(1), 404-411.

Stigsdotter, U. K., Palsdottir, A. M., Burls, A., Chermaz, A., Ferrini, F., & Grahn, P. (2011). Nature-based therapeutic interventions. In: Forests, trees and human health (pp. 309-342): Springer.

Stone, A. A., & Shiffman, S. (1994). Ecological momentary assessment (EMA) in behavorial medicine. Annals of Behavioral Medicine.

Taylor, R., Spehar, B., Hägerhäll, C., & Van Donkelaar, P. (2011). Perceptual and physiological responses to Jackson Pollock's fractals. *Frontiers in Human Neuroscience*, 5, 60. doi:10.3389/fnhum.2011.00060

Van den Berg, A. E. (2017). From green space to green prescriptions: Challenges and opportunities for research and practice. *Frontiers in psychology*, 8, 268. doi:10.3389/fpsyg.2017.00268

Van den Berg, A. E., Joye, Y., & Koole, S. L. (2016). Why viewing nature is more fascinating and restorative than viewing buildings: A closer look at perceived complexity. *Urban Forestry & Urban Greening*, 20, 397-401. doi:http://dx.doi.org/10.1016/j.ufug.2016.10.011

Van den Berg, A.E. (2009). Restorative effects of nature: towards a neurobiological approach. Paper presented at the Human Diversity: design for life, Proceedings of the 9th International Congress of Physiological Anthropology, Delft, The Netherlands, 22-26 August 2008.

van Gils, A., Burton, C., Bos, E. H., Janssens, K. A., Schoevers, R. A., & Rosmalen, J. G. (2014). Individual variation in temporal relationships between stress and functional somatic symptoms. *Journal of psychosomatic research*, 77(1), 34-39.

Von Lindern, E., Lymeus, F., & Hartig, T. (2017). The restorative environment: A complementary concept for salutogenesis studies. In: M. B. Mittelmark, S. Sagy, M. Eriksson, G. Bauer, J. M. Pelikan, B. Lindström, & G. A. Espnes (Eds.), The handbook of salutogenesis (pp. 181-195). Cham: Springer.

White, M. P. (2017). Natural environments and human wellbeing: Definitions of wellbeing and implications for human-nature research. Paper presented at the International Conference on Landscape and Human Health: Forests, Parks and Green Care, Vienna. http://www.landscapeandhealth.at/images/Conference-LHH-May-17-19-Vienna_small.pdf