

Horticulture and Health According to Three Wise Men

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Canadian Horticultural Therapy Association 2017 Annual Conference

Thought leaders from antiquity to present day have identified nature as an important factor contributing to human health and well-being. From Hippocrates' *vis medicatrix naturae* theory of the healing power of nature, to E.O. Wilson's biophilia theory of man's intrinsic need to connect with the natural world, to environmental psychologist Stephen Kaplan who has moved the horticulture-health dialogue forward with attention restoration theory (ART)—time spent in, or looking at nature can relieve stress and mental fatigue.

Examining how horticulture positively impacts human health, examined from three distinct paradigms sheds light on current and future developments. Beginning with nature's impact, followed by gardens used in healthcare settings, and concluding with nature-based therapies, the horticulture-health connection intersects several sectors, highlighting important developments in theory, research and practice.

Nature's Impact on Human Health & Well-being

Vis Medicatrix Naturae, Hippocrates' theory on the healing power of nature has been interpreted many ways. These have become foundational philosophies relating to nature's impacts on human health and include homeostasis and organisms left alone to heal.

Hiroshi, H. (1998). On *vis medicatrix naturae* and Hippocratic idea of physics in *Memoirs of School of Health Sciences*, Faculty of Medicine, Kanazawa University 22, 45-54.

Biophilia theory, as introduced by E.O. Wilson, contends that humans possess an innate tendency to seek connections with the natural world—nature and other forms of life. Stephen Kellert's newer definition of biophilia—love of life as an open-ended classification of nature—suggests man's innate desire for nature is “a birthright that must be cultivated and earned”.

Wilson, E.O. (1984). *Biophilia*. Cambridge, MA: Harvard University Press.

Wilson, E.O. (2017). *Half-Earth: Our Planet's Fight for Life*. Liveright.

Kellert, S. (2012). *Birthright: People and Nature in the Modern World*. New Haven: Yale University.

Physiological Benefits of Connecting with Nature

Psychological benefits from nature are commonly accepted; physiological benefits less understood. In the last five years research on how contact with nature can impact human physiological functioning has greatly expanded including growing, being near, and even breathing in fragrances from plants. Several prominent areas of empirical investigation in the nature-health paradigm include:

Access to nature reduces stress, pain...

Research has determined that access to nature can reduce stress, depression, myopia, pain, fatigue, aggression, impulsivity, and symptoms of Attention Deficit Hyperactivity Disorder (ADHD) and improve immune function, bone strength, wound healing, cognition, concentration, emotional resilience, empathy, vitality, relaxation, mood, and satisfaction.

Cooper Marcus, C. & Sachs, N. A. (2014). *Therapeutic Landscapes: An Evidence-based Approach Designing Healing Gardens and Restorative Outdoor Spaces*. Hoboken, NJ: John Wiley and Son.

Kuo, M. (2015). How might contact with nature promote human health? Promising mechanisms and a possible central pathway. *Frontiers in Psychology* 6, 1093.



Absorption of vitamin D...

Access to sunlight is essential for the absorption of vitamin D, which helps regulate calcium and phosphate for healthy bones and teeth.

Mitchell, L. & Burton, E. (2012). Dementia friendly neighbourhoods- a step in the right direction in Pollock & Marshall (Eds) *Designing Outdoor Spaces for People With Dementia*. Australia: University of Stirling.

Production of the mood enhancing hormone serotonin...

Exposure to natural light is important for serotonin production, and the cycle of day and night which regulates sleep. Adequate levels of natural sunlight and serotonin can help reduce sleep disorders and sundowning, the increased agitation at dusk commonly exhibited by people with dementia.

Cooper Marcus, C. (2009). Landscape design: Patient-specific healing gardens. Retrieved from <http://www.worldhealthdesign.com/Patient-specific-Healing-Gardens.aspx>

Torrington, J. & Tregenza, P. (2007). Lighting for people with dementia. *Lighting Research and Technology* 39(1), 81-97.

Seasonal Affective Disorder (SAD)...

Morning light was proven to be twice as effective as evening light in treating Seasonal Affective Disorder.

Lewy, A.J., Bauer, V.K, Cutler, N.L., Sack, R.L., Ahmed, S., Thomas, K.H. & Jackson, J.M.L. (1998).

Morning vs. evening light treatment of patients with winter depression. *Archives of General Psychiatry* 55(10), 890-896.

Neuroscience, the human brain and cognition...

Advances in neuroscience have linked exposure to, and views of nature with health improvements including lower blood pressure and stress hormone cortisol, increased activity in the nervous system, and calming in the parasympathetic system. Research by Sanchez-Rodriguez et al. suggests nature can improve and reshape brain plasticity in producing brain chemicals responsible for cognitive health.

Sanchez-Rodriguez, M. et al. (2006). Relationship between oxidative stress and cognitive impairment in the elderly of rural vs. urban communities. *Life Sciences* 78, 1682–87.

Selhub, E. & Logan, A. (2012). *Your Brain on Nature The Science of Nature's Influence on Your Health, Happiness, and Vitality*. Mississauga, Ont.: John Wiley & Sons Canada Inc.

Ulrich, R. (1984). View through a window may influence recovery from surgery. *Science* 224, 420–21.

Olfactory pathways...

Connecting scent to the body's ability to fend off disease is related to olfactory pathways that go directly to the brain. Smelling lavender and rosemary increases free radical scavenging activity and decreases cortisol level in saliva. Diagnostic tests for dementia, where the ability to identify plant (and other) fragrances predict this health condition were developed in 2016. The isolation of smells, and use of such may be the next step in more focused treatment.

Atsumi, T. & Tonosaki, K. (2007). Smelling lavender and rosemary increases free radical scavenging activity and decreases cortisol level in saliva. *Psychiatry Res* 150, 89–96.

Devanand, D. & Lee, S. (2016). Predictive utility of entorhinal cortex thinning and odor identification test for transition to dementia and cognitive decline in an urban community population. *Presentation at the Alzheimer's Association International Conference: Toronto, Canada*.



Bacteria improves mood and cognition...

A University of Toronto/McMaster University study investigated Lactobacillus & probiotic partner genera Bifidobacterium microorganisms commonly found in soil. Their research, and others, found that this bacteria can positively influence human mood and cognition, reduce body-wide inflammation and oxidative stress, suggesting that soil/gardening can be one of several portals for human contact and health improvements.

Logan, A. & Katzman, M. (2005). Major depressive disorder: Probiotics may be an adjuvant therapy.

Med Hypotheses 64, 533–38.

Venket Rao, A., Bested, A., Beaulne, T., Katzman, M., Iorio, C., Berardi, J., Logan, A. (2009). A randomized, double-blind, placebo-controlled pilot study of a probiotic in emotional symptoms of chronic fatigue syndrome. *Gut Pathog* 19(1), 6.

Nature's colors, natural light, sounds, negative ions...

Researchers showed improvement in students' mood when bright lights, negative air ions and nature noise stimuli were present, these referred to as environmental therapeutics.

Goel, N. & Etwaroo, G. (2006). Bright light, negative air ions and auditory stimuli produce rapid mood changes in a student population: A placebo-controlled study. *Psychol Med* 36, 1253–63.

Nutrition....

Identification of superfoods, sometimes called brain foods, including plants like chestnuts, blueberries, and garlic, have influenced food choices, nutrition, gardening, edible school gardens, and ultimately health. Studies are teasing out exactly how good nutrition contributes to health including less brain fatigue, improved short-term mental outlook, less anxiety, better intake of vitamins and nutrients. Conversely, poor nutrition contributes to inflammation which can be linked to depression. Mental health disorders and cognitive decline are associated with ongoing low-grade inflammation called neuro-inflammation, and oxidative stress. These can change the structure of brain cells and availability of chemicals that bind to nerve cells facilitating nerve communication, impacting mood or behavioral change.

Jacka, F. et al. (2011). The association between habitual diet quality and the common mental disorders in community-dwelling adults: The Hordaland Health Study. *Psychosom Med* 73, 483–90.

Kavouras, S. et al. (2010). Physical activity and adherence to Mediterranean diet increase total antioxidant capacity: The ATTICA study. *Cardiol Res Pract* 24, 8626.

Maes, M. et al. (2011). Neuroinflammation and neuroprogression as new pathways and drug targets in depression: From antioxidants to kinase inhibitors. *Prog Neuropsychopharmacol Biol Psychiatry* 35, 659–63.

Selhub, E. & Logan, A. (2012). The brain on nature's nutrients: Nutri-ecopsychology in *Your Brain on Nature The Science of Nature's Influence on Your Health, Happiness, and Vitality*. Mississauga, Ont.: John Wiley & Sons Canada Inc.

Gardens in Healthcare Settings

The development of therapeutic, restorative, meditation and enabling gardens in healthcare settings in the 1990's coincided with the perspective that nature can play a *salutogenic* role in both health promotion and disease prevention. Aaron Antonovsky is credited with this term used to describe an approach focusing on factors that support human health and well-being, rather than on factors that cause disease (pathogenesis). Additionally, the rise of the green movement and increasing levels of public interest in nature's healing properties influenced the design of health services facilities—increased green spaces for use by patients, families and staff; access to outdoors; and views of nature from patient's rooms. Current trends include: utilizing evidence-based design for



healthcare facility construction and retrofitting; recognition of the dual function of indoor and outdoor green space as both physical facility and treatment delivery site; and understanding how *landscapes for health* can positively influence health.

American Horticultural Therapy Association (1995). *Therapeutic Garden Characteristics*.

http://ahta.org/sites/default/files/attached_documents/TherapeuticGardenCharacteristic_0.pdf

Antonovsky, A. (1996). The salutogenic model as a theory to guide health promotion. *Health Promotion International* 11(11), 11-18.

Cooper Marcus, C., & Sachs, N. A. (2014). *Therapeutic Landscapes: An Evidence-based Approach Designing Healing Gardens and Restorative Outdoor Spaces*. Hoboken, NJ: John Wiley and Son.

Sachs, N. (2016). What is a healing garden in D. Kopec's *Environmental Psychology for Design*. 3rd Edition. New York: Fairchild Books.

Therapeutic Landscapes Network @ www.healinglandscapes.org

Nature-based Therapies

Therapeutic interventions today take many forms, including nature-based therapies. Research conducted in the last 10 years has strengthened empirical data validating emerging and established therapeutic modalities that incorporate nature and horticulture. Because of their flexibility in addressing challenges in all health domains--social, emotional, vocational, physical, psychological and cognitive—nature-based therapies continue to offer important strategies for health improvements.

Ecopsychology...

The relationship between human beings and the natural world using ecological and psychological principles is the foundation for this emerging discipline. Theodore Roszak originated the phrase ecopsychology, referring to nature used as therapy, and as antidotes to society's increasing reliance on technology, environmental decline with related low levels of contact with nature, and correlated increase in mental health issues and prevalence. Researchers have developed psychological tests to evaluate individual's connectedness to nature (scales) which relate to emotional well-being.

Mayer, S. & Frantz, C.M. (2004). *Connectedness to Nature Survey*. Electronic version

<http://www.hiddencorner.us/html/PDFs/CNSSurvey.pdf>

Nisbet, E. & Zelenski, J.M. (2013). The NR-6: A new brief measure of nature relatedness. *Frontiers in Psychology* 4, 813. Electronic version <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3814587/>

Rozsak, T. (1993). *The Voice of the Earth: An Exploration of Ecopsychology*. New York: Touchstone.

Ecotherapy...

Also known as nature therapy or green therapy, ecotherapy is the applied practice of the emergent field of ecopsychology. Ecotherapy encompasses several types of interventions including: nature meditation, animal assisted therapy, physical exercise in a natural environment, involvement in conservation activities, and horticultural therapy.

Buzzell, L. & Chalquist, C. (Eds) (2009).

Ecotherapy: Healing with Nature in Mind. San Francisco: Sierra Club Books.



Wilderness therapy...

Wilderness therapy provides an environment for physical exertion, mindfulness and living in the moment, with the intent of contributing to restoration of body and mind.

Shanahan, L. et al. (2009). Wilderness adventure therapy and cognitive rehabilitation: Joining forces for youth with TBI. *Brain Injury* 23, 1054-64.

Horticultural therapy...

According to the Canadian Horticultural Therapy Association, horticultural therapy is a “formal practice that uses plants, horticultural activities, and the garden landscape to promote well-being for its participants. Horticultural therapy is goal oriented with defined outcomes and assessment procedures. Horticultural therapy sessions are administered by professionally trained Horticultural Therapists”. American Alice Burlingame is credited with developing horticultural therapy as a profession in its own right in the 1950’s. One of her protégés, Mitchell Hewson, HTM, LT, RAHP, is recognized as pioneering the development of horticultural therapy in Canada.

Hewson, M. (1994). *Horticulture As Therapy: A Practical Guide to Using Horticulture as a Therapeutic Tool*.

Davis, S. (2003). Development of the profession of horticultural therapy in Simson & Straus (Eds) *Horticulture as Therapy: Principles and Practice*. Binghamton, NY: The Haworth Press.

Fleming, L. (2016). *Therapeutic Horticulture A Practitioner’s Perspective*. Smashwords.

Nature deficit disorder...

Richard Louv’s 2005 book *Last Child in the Woods* introduced the term and concept that human beings, especially children, are spending less time outdoors resulting in a wide range of behavioral problems. His 2011 book applies nature deficit disorder theory to adults.

Louv, R. (2005). Nature Deficit Disorder. *Children & Nature Network*. Retrieved from <https://www.childrenandnature.org/about/nature-deficit-disorder/>

Louv, R. (2011). *The Nature Principle: Reconnecting with Life in a Virtual Age*.

Sandry, N. (2013). Nature deficit disorder. *Educating Young Children: Learning and Teaching in the Early Childhood Years* 19(2), 32-34.

Veteran to farmer programming...

Integrating vocational, therapeutic, educational, social enterprise and rural community re-structuring elements into innovative programs for those transitioning from military to civilian life, this hybrid model of social, vocational and health programming has as its core value, connecting humans to nature.

Fleming, L. (2015). Veteran to farmer programs: An Emerging nature-based programming trend. *Journal of Therapeutic Horticulture* 25(1), 27-48.

Westlund, S. (2014). *Field Exercises: How Veterans Are Healing Themselves through Farming and Outdoor Activities*. New Society Publisher.

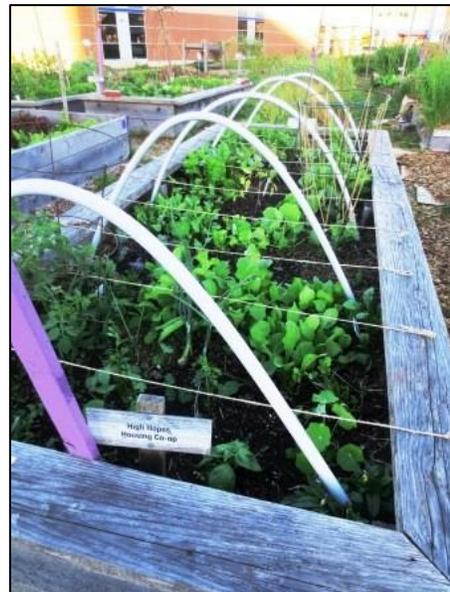
Attention restoration theory (ART)...

Stephen Kaplan’s attention restoration theory (ART) suggests that stress, mental fatigue and concentration can be improved by time spent in, or looking at nature. The capacity of the brain to focus on a specific stimulus or task is limited, and results in 'directed attention fatigue'.

Berman, M., Jonides, J., Kaplan, S. (2008). The cognitive benefits of interacting with nature. *Psychological Science* 19(12).

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

Kaplan, S. (1995). The restorative benefit of nature: Toward an integrative framework. *Journal of Environmental Psychology* 15(3), 169-182.



Farm to table...

Field to fork, farm to school, farm to cafeteria, food pharmacies, and other community supported agriculture trends reflect societal values of: food traceability, food security, food safety, food freshness and seasonality, small farm economics, heirloom fruits and vegetables. All of these promote

horticulture used for positive health outcomes, touching on nutrition, social engagement, and (youth) education.

Boyer, R., McFarland, A.L., Zajicek, J.M. & Waliczek, T.M. (2011). Growing minds: The effects of school gardening on parent involvement in elementary schools. *Journal of Therapeutic Horticulture* 21(2).

Morgan, P. et al. (2010). The impact of nutrition education with and without a school garden on knowledge, vegetable intake and preferences and quality of school life among primary-school students. *Public Health Nutrition* 13(11), 1931-1940.

Investigating how gardening modifies brain activation using fMRI technology...

Student Christy Penman, MS, undertook groundbreaking research in 2015 with participation by 7 interdisciplinary clinicians at the University of Florida using state of the art fMRI medical technology to explore how gardening modifies the patterns of brain activation and enhances the mental health profile of healthy women.

Penman, C. (2015). *Gardening Modifies the Patterns of Brain Activation and Enhances the Mental Health Profile of Healthy Women*. University of Florida: Master's Thesis.

Interdisciplinary professional development with horticultural therapists and recreation therapists...

Gardening for Both Recreation and Treatment was the theme for conferences hosted by the Nova Scotia Recreation Professionals in Health (2013 & 2017) and the Michigan Horticultural Therapy Association (2017). CEU accreditation was granted by the American Therapeutic Recreation Association. This type of interdisciplinary professional development appears to be on the rise, embraced by practitioners from several therapeutic disciplines interested in exchange of ideas, practices and principles related to gardening, nature and health.

Fleming, L., Carroll, K., Douglas, J. & Flinton, C., (2017). Interdisciplinary professional development, CEUs and horticultural therapy: The Michigan model. Pending publication in *Journal of Therapeutic Horticulture* 26(1).

Fleming, L. (2016). Workshop outline: Gardening as recreation and treatment modality. *Therapeutic Horticulture A Practitioner's Perspective*. Smashwords.

Summary

An ever-expanding body of research strengthens the validity of a horticulture-health connection—an abbreviated term referring to access to nature, landscapes for health, and nature-based therapies. Incorporating this extensive array of knowledge into health services is the challenge for therapeutic and medical professionals. The continued support and advocacy for therapeutic gardens, horticultural and other nature-based therapies, and, perhaps most importantly, access to nature, is critical to the human condition and all of its health domains.

