CATEGORY: HORTICULTURAL FOR HEALTH OVERVIEW

Gardening Health Benefits

Gardening is an integral component of horticulture for health. This very broad subject spans many related topics. These resources focus on the health benefits of gardening with more recent research examining psychological, physiological and neurophysiological benefits using fMRI analysis (Chang & Lee, 2021; Hassan et al., 2019; Hassan et al., 2018). Other topics include gardening as a healthy lifestyle including nutrition (Eng et al., 2019; Beavers et al., 2020), motivations and attitudes about gardening, and gardening impacting a variety of populations—children, elderly, disabled and indigenous populations, community and home gardeners. Studies on urban agriculture-health connections (Soga et al., 2022), soil-gut relationship (Blum et al., 2029), staff gardening breaks (Christie et al., 2020), gardening contributing to ecospirituality (Harvey et al., 2021), wildscape gardening (Jones, 2020), and Covid-19 impacts (Wu, 2023; Fleming, 2024) are part of the body of literature.

Other categories within the horticulture for health framework may also provide information on specific aspects of health and gardening: Category: Horticulture for Health Overview: Pandemic Gardening; Category: Food, Nutrition & Food Action; Category: Landscapes for Health: Community Gardens & Urban Farms.

Key Organizations
American Community Gardening Association
American Horticultural Society
National Initiative for Consumer Horticulture *https://consumerhort.org/*
National Institutes of Health
North Carolina State University Plants for Human Health
The National Gardening Association

Books, journals & epublications on gardening health benefits
BMJ Open
Gross, H. (2018). *The psychology of gardening.* Taylor Francis.
Horticultural Science & Technology (Korea)
Journal of Environmental Horticulture
Stuart-Smith, S. (2020). *The well-gardened mind: The restorative power of nature.* Discover Books.
The American Gardener magazine: American Horticultural Society.

Research & articles on scope of gardening health benefits
Recently published selected research & articles:

Bahamonde, A. (2019). Mental health through the art of gardening. *Journal of Therapeutic Horticulture,* 29(2), 27-44.
Bailey, A., & Kingsley, J. (2020). Connections in the garden: Opportunities for wellbeing. *Local Environment*, 25(11-12), 907-920.
Beavers, A. W., Atkinson, A., & Alaimo, K. (2020). How gardening and a gardener support program in Detroit influence participants' diet, food security, and food values. *Journal of Hunger & Environmental Nutrition*, 15(2), 149-169.
Bell-Williams, R., Irvine, K., Reeves, A., & Warber, S. (2021). Digging deeper: Gardening as a way to

develop non-human relationships through connection with nature. *European Journal of Ecopsychology, 7, 1-18.*
Blum, W.E.H., Zechmeister-Boltenstern, S., & Keiblinger, K.M. (2019). Does soil contribute to the human gut microbiome? *Microorganisms, 7*(9), 287.
Botts, B. (2020). Gardening and wellness. *The American Gardener, 99*(6), 30-33.
Briggs, R., Morris, P.G., & Rees, K. (2023, Aug.). The effectiveness of group-based gardening interventions for improving wellbeing and reducing symptoms of mental ill-health in adults: A systematic review and meta-analysis. *J Ment Health., 32*(4), 787-804.
Calvet-Mir, L., Riu-Bosoms, C., Gonzalez-Puente, M. et al. (2016). The transmission of home garden knowledge: Safeguarding biocultural diversity and enhancing social-ecological resilience. *Soc Nat Resourc., 29*, 556.
Chalmin-Pui, L.S., Griffiths, A., Roe, J. et al. (2021). Why garden? Attitudes and the perceived health benefits of home gardening. *Cities, 112*, 103118.
Chang, Y.S., & Tu, P.C. (2021). Healthy horticulture for senior citizens. *ISHS Acta Horticulturae 1313: International Symposium on Horticultural Therapies: Past, Present and Future.*
Chang, C.Y., & Lee, A.Y. (2021). Using functional magnetic resonance imaging (fMRI) technology to analysis the benefit of horticultural activities. *ISHS Acta Horticulturae 1330: XV International People Plant Symposium and II International Symposium on Horticultural Therapies: The Role of Horticulture in Human Well-being and Social Development.*
Chu, H.Y., Chan, H.S., & Chen, M.F. (2021). Effects of horticultural activities on attitudes toward aging, sense of hope and hand-eye coordination in older adults in residential care facilities. *International Journal Environ Res Public Health, 18*(12), 6555.
Christie, M., Hulse, L., & Miller, P.K. (2020). Time for a (gardening) break: Impacts of a "green exercise" initiative for staff health and wellbeing in a corporate environment. *Journal of Therapeutic Horticulture*, *30*(1), 1-24.
de Bell, S., White, M., Griffiths, A. et al. (2020). Spending time in the garden is positively associated with health and wellbeing: Results from a national survey in England. *Landscape and Urban Planning*, *200*, 103836.
Eng, S., Khun, T., Jower, S., & Murro, MJ. (2019). Healthy lifestyle through home gardening: The art of sharing. *Am J Lifestyle Med., 13*(4), 347-350.
Fjaestad, S.L., Mackelprang, J.L., Sugiyama, T., & Kingsley, J. (2020). Mental health outcomes associated with gardening: A scoping review. *Cultivated Therapeutic Landscapes*, 104-130.
Fjaestad, S.L., Mackelprang, J.L., Sugiyama, T. et al. (2023). Associations of time spent gardening with mental wellbeing and life satisfaction in mid-to-late adulthood. *Journal of Environmental Psychology*, *87*, 101993.
Fleming, L. (2024). COVID-19 and horticulture for health: Positive impacts on gardening, urban agriculture, food security, green spaces, plant trends and horticultural therapy. *Journal of Therapeutic Horticulture 34*(1), publication pending.
Fleming, L. (2024). University students' health & well-being supported by nature engagement & campus gardens. *Digging In, 10*(2), 6-7.
Fleming, L., & Sterling, S. (2024). School gardens: Platforms for learning, therapy & community involvement. *Cultivate 4*(2), 6-7.
Fleming, L. (2023). Garden engagement. *Digging In* 9(4), 10-11.
Fleming. L. (2023). Gardening's social side. *Cultivate,* 3(1), 1-5.
Fleming, L. (2022). Health benefits of food gardening – more expansive than improved nutrition. *Cultivate, 2*(3), 1-6.
Fleming, L. (2021). Nine ideas to make gardening easier. *Digging In, 7*(3).
Hall, C.R., & Knuth, M.J. (2019). An update of the literature supporting the well-being benefits of

plants: Part 2 physiological health benefits. *Journal of Environmental Horticulture, 37*(2), 63-73.
Hall, C.R., & Knuth, M.J. (2019). An update of the literature supporting the well-being benefits of plants: A review of the emotional and mental health benefits of plants. *Journal of Environmental Horticulture, 37*(1), 30-38.
Harvey, M.L., Bowman, K., & Karr, A. (2021). The gardening spirit: Evidence that frequency of gardening precisely predicts ecospirituality. *Journal of Therapeutic Horticulture, 31*(1), 1-9.
Hassan, A., & Deshun, Z. (2023). Promoting adult health: The neurophysiological benefits of watering plants and engaging in mental tasks within designed environments. *BMC Psychol., 11*(1), 310.
Hassan, A., Qibing, C., & Tao, J. (2018). Physiological and psychological effects of gardening activity in older adults. *Geriatrics & Gerontology International, 18*(8), 1147-1152.
Howarth, M., Brettle, A., Hardman, M., & Maden, M. (2020). What is the evidence for the impact of gardens and gardening on health and well-being: A scoping review and evidence-based logic model to guide healthcare strategy decision making on the use of gardening approaches as a social prescription. *BMJ Open, 10*(7), e036923.
Jones, M.S., & Niemiec, R.M. (2020). Social-psychological correlates of personal-sphere and diffusion behavior for wildscape gardening. *Journal of Environmental Management*, *276*, 111271.
Kim, S.O., Jeong, J.E., Oh, Y.A. et al. (2021). Comparing concentration levels and emotional states of children using electroencephalography during horticultural and nonhorticultural activities. *HortScience, 56*(3), 324-329.
Koay, W.I., & Dillon, D. (2020). Community gardening: Stress, well-being, and resilience potentials. *International Journal of Environmental Research and Public Health, 17*(18), 6740.
Kunpeuk, W., Spence, W., Phulkerd, S. et al. (2020). The impact of gardening on nutrition and physical health outcomes: A systematic review and meta-analysis. *Health Promot Int., 35(2), 397-408.*
Lampert, T., Costa, J., Santos, O. et al. (2021). Evidence on the contribution of community gardens to promote physical and mental health and well-being of non-institutionalized individuals: A systematic review. *PLoS One, 16*(8), e0255621.
Lentoor, AG., Motsamai, TB., Nxiweni, T. et al. (2023). Protocol for a systematic review of the effects of gardening physical activity on neuroplasticity and cognitive function. *AIMS Neurosci., 10*(2), 118-129.
Marsh, P., Brennan, S., & Vandenberg, M. (2018). 'It's not therapy, it's gardening': Community gardens as sites of comprehensive primary healthcare. *Australian Journal of Primary Health, 24*, 337-342.
McFarland, A., Waliczek, T.M. Etheredge, C., & Sommerfeld Lillard, A.J. (2018). Understanding motivations for gardening using a qualitative general inductive approach. *HortTechnology, 28*(3).
McQuillan, S. (2021). 11 ways plants enhance your mental and emotional health. *Psychologytoday.com*
Murtagh, N., & Frost, R. (2023). Motivations for urban front gardening: A quantitative analysis. *Landscape and Urban Planning*, *238*, 104835.
National Gardening Association Editors. (2021). Food is medicine. *The National Gardening Association Learning Library*.
National Institutes of Health. (2016). Plants: Partners in health?
Norwood, F. B. (2022). The garden as art, hobby, and the good life. *HortTechnology 32*(3).
Odeh, R., Diehl, E.R.M., Nixon, S.J. et al. (2022). A pilot randomized controlled trial of group-based indoor gardening and art activities demonstrates therapeutic benefits to healthy women. *PLoS ONE, 17*(7), e0269248.
Ohly, H., Gentry, S., Wigglesworth, R. et al. (2016). A systematic review of the health and well-being impacts of school gardening: Synthesis of quantitative and qualitative evidence. *BMC Public Health, 1,* 286.
Palar, K., Lemus Hufstedler, E., Hernandez, K. et al. (2019). Nutrition and health improvements after

participation in an urban home garden program. *JNEB, 51*(9), 1037-1046.
Pantiru, I., Ronaldson, A., Sima, N. et al. (2024). The impact of gardening on well-being, mental health, and quality of life: An umbrella review and meta-analysis. *Systematic Review, 14(1), 45.*
Park, S.A., Lee, A.Y., Lee, K.S., & Son, K.C. (2014). Gardening tasks performed by adults are moderate- to high-intensity physical activities. *HortTechnology, 24*(1), 58–63.
Park, S., Lee, A.Y., & Park, H. (2019). Benefits of gardening activities for cognitive function according to measurements of brain nerve growth factor levels. *International Journal of Environmental Res. Public Health, 16*(5).
Park, S.A., Son, S.Y., Lee, A.Y. et al. (2020). Metabolite profiling revealed that a gardening activity program improves cognitive ability correlated with BDNF levels and serotonin metabolism in the elderly. *International Journal of Environmental Research and Public Health, 17*(2), 541.
Park, S.A., Lee, H.S., Lee, K.S., Son, K.C. & Shoemaker, C. (2015). The metabolic costs of gardening tasks in children. *HortTechnology,* 23, 589-594.
Perez Lugones, D. (2022). Exploring home gardener needs with citizen science. *Cultivate, 2*(3), 14-15.
Pieters, H.C., Ayala, L., Schneider, A. et al. (2018). Gardening on a psychiatric inpatient unit: Cultivating recovery. *Archives of Psychiatric Nursing, 33*(1), 57-64.
Porter, C.M., Wechsler, A.M., Naschold, F. et al. (2019). Assessing health impacts of home food gardens with Wind River Indian Reservation families: Protocol for a randomized controlled trial. *BMJ Open, 9*(4), e002731.
Raymond, C.M., Diduck, A.P., Buijs, A. et al. (2019). Exploring the co-benefits (and costs) of home gardening for biodiversity conservation. *Local Environ., 24*, 258–73.
Ryan-Krause, P. (2018). Gardening: A path to development and health. *Pediatric Nursing, 44(4), 191-201.*
Saito M, Kinoshita M, Sumimoto T, et al. (2024). Association between gardening activity and frailty in patients with heart failure. *Intern Med., 16.*
Savoie-Roskos, M.R., Wengreen, H., & Durward C. (2017). Increasing fruit and vegetable intake among children and youth through gardening-based interventions: A systematic review. *Journal of Academy Nutrition and Dietetics, 117*, 240-50.
Schattenberg, P. (2022). The positive effects of gardening on mental health. *AgriLife Today.*
Scott, T.L., Masser, B.M., & Pachana, N.A. (2020). Positive aging benefits of home and community gardening activities: Older adults report enhanced self-esteem, productive endeavors, social engagement and exercise. *SAGE Open Medicine*, *8*, 2050312120901732.
Scruby, L., & Suyin Chalmin-Pui, L. (2019). Why gardening makes us feel better – and how to make the most of it. *RHS.org.uk.*
Shoemaker, C.A., Relf, P.D., Park, S., & Dorn, S. (2021). Hortophilia hypothesis. *ISHS Acta Horticulturae 1330: XV International People Plant Symposium and II International Symposium on Horticultural Therapies: The Role of Horticulture in Human Well-being and Social Development.*
Silva, T.P., & Araujo, A.M.S. (2020). Perception of improvement in people with disabilities who cultivate plants. *ISHS Acta Horticulturae 1279: XXX International Horticultural Congress IHC2018: Vll Conference on Landscape and Urban Horticulture, lV Conference on Turfgrass Management and Science for Sports Fields and ll Symposium on Mechanization, Precision Horticulture, and Robotics.*
Soga, M., Kurisu, K., Tsuchiya, K. et al. (2022). Contribution of agriculture to health promotion. *J Nutr Sci Vitaminol (Tokyo)., 68*(Supplement), S137-S139.
Sofo, A., & Sofo, A. (2020). Converting home spaces into food gardens at the time of Covid-19 quarantine: All the benefits of plants in this difficult and unprecedented period. *Human Ecology*, *48*(2), 131-139.
Sommerfield, A., McFarland, A., Waliczek, T.M., & Zajicek, J. (2021). Use of gardening programs as an intervention to children's visual-motor integration. *HortTechnology, 31*(5).

Spano, G., D'Este, M., Giannico, V. et al. (2020). Are community gardening and horticultural interventions beneficial for psychosocial well-being? A meta-analysis. *International Journal of Environmental Research and Public Health*, 17(10), 3584.
Stluka, S., McCormack, L.A., Burdette, L. et al. (2019). Gardening for health: Using garden coordinators and volunteers to implement rural school and community gardens. *Prev Chronic Dis., 16*, E156.
Tharrey, M., & Darmon, N. (2021). Urban collective garden participation and health: A systematic literature review of potential benefits for free-living adults. *Nutr Rev., 80(1), 6-21.*
Timler, K., & Sandy, D.W. (2020). Gardening in ashes: The possibilities and limitations of gardening to support indigenous health and well-being in the context of wildfires and colonialism. *International Journal of Environmental Research and Public Health*, *17*(9), 3273.
van Den Berg, A.E., & Custers, M.H. (2011). Gardening promotes neuroendocrine and affective restoration from stress. *Journal Health Psychology, 16,* 3-11.
van Lier, L.E., Utter, J., Denny, S. et al. (2017). Home gardening and the health and well-being of adolescents. *Health Promotion Practice, 18*(1), 34-43.
While, A.E. (2020). Life is for living: The contribution of the arts and gardens. *British Journal of Community Nursing*, 25(3), 140-143.
Wijekoon, W.M.S.T., Weerakoon, R., & Vitharana, S. (2021). A review of gardening as a recreation impact on people's psychological wellbeing. *IOSR Journal of Sports and Physical Education, (11), 74.*
Wu, CF., Trac, LVT., Chen, SH. et al. (2023). Enhancing human resilience beyond COVID-19-related stress: Public responses to multi-benefits of home gardening. *Sci Rep., 13*(1), 10534.
Wu, Y.C., & Chang, C.Y. (2021). The impact of landscape plant fragrance on emotion and brain responses. *ISHS Acta Horticulturae 1313: International Symposium on Horticultural Therapies: Past, Present and Future.*
Yeo, N.L., Elliott, L.R., Bethel, A. et al. (2020). Indoor nature interventions for health and wellbeing of older adults in residential settings: A systematic review. *The Gerontologist, 60*(3), e184–e199.

Examples of gardening's health benefits

Brooklyn Botanic Garden's adult education & community greening programs like Greenest Block, Street Tree Stewards, starting a vegetable garden offer ways for people to garden, enjoy environmental stewardship and be outside connecting with nature.
https://www.bbg.org/learn/adult_programs

Extension Master Gardener programs combine horticulture training with community service, delivered through land grant state universities, and active across the US and Canada, with participation by 86,000 gardener/volunteers who benefit from gardening knowledge, physical activity & social interactions.
https://mastergardener.extension.org/

Inspiration from Loveland youth gardeners [youtube] video/webinar demonstrates the power of plants on changing lives, improving health & strengthening communities.
https://www.youtube.com/watch?v=7yEQ3kDy_uk

It's official: Gardening is good for your health video from the University of Colorado Boulder identifies community gardens, nutrition, mental health, social benefits, & access to green space contributing to health.

Local farms, gardens and markets in Fort Lauderdale.

https://gyr.fortlauderdale.gov/greener-government/responsible-development-land-use/green-space-expansion/urban-farming-and-community-gardens/local-farms-gardens-markets

National Garden Clubs and affiliated local clubs promote gardening, social connections, service projects and more by involving thousands of men & women interested in gardening & providing service to their communities with a horticulture connection. Benefits include sense of belonging, meaningful purpose and intellectual/educational development.
https://gardenclub.org/

Videos, webinars & websites on gardening's health benefits
Cornell garden-based learning website offers key findings of gardening-health connections, nutrition awareness, learning achievements, social connections and life skills.
https://gardening.cals.cornell.edu/lessons/program-tools/benefits-and-research/key-findings/

Fragrant plants [youtube] video/webinar identifies plants that provide fragrance in the garden for home gardeners & therapeutic gardens at healthcare & residential facilities.
https://www.youtube.com/watch?v=6DLDqdipb9s

Infographics on benefits of plants, gardening from National Initiative for Consumer Horticulture.
https://consumerhort.org/plantsdothat-3/

Gardening provides health benefits at any age [video] from Baylor College of Medicine.
https://www.youtube.com/watch?v=t3osRE2ccrM

National Center on Safe Supportive Leaning Environments website identifies benefits of school gardening promoting student mental health.

Texas A&M Agrilife Extension website: Resources available regarding the benefits of plants, nature, and other green spaces for human health.
https://ellisonchair.tamu.edu/benefitsofplants/

The surprising health benefits of gardening – a physician comments on exercise, improvements to physical & mental health, exposure to sunlight (vitamin d), diet & body mass index [youtube] video.

Why gardening is good for our health [youtube] video by Dr. Sarah Myhill, naturopath shares ideas about mental & physical health, nutrition impacting all aspects of health & the link to gardening.

Hortophilia & great plants to nurture webinar from Dr. Diane Relf & Siang Yu Tham with information on health benefits, plants to grow and the importance of nurturing plants for humans & plant health.
https://www.youtube.com/watch?v=U2xk4k7xO_c

Interconnections of the soil-food-human microbiome talk from Conference on Connections Between Soil Health and Human Health (2018) by Dr. Carl Wepking.
https://www.youtube.com/watch?v=vpm-DKTIZu0

Your brain on plants: Why gardens are good for you in a [youtube] video from *Los Angeles Times* focuses on mental health, stress relief; experts provide comment & reference empirical evidence.

Related organizations
Plant specific gardening societies: American Hemerocallis Society, American Iris Society, American Daylily Society

Written & compiled by Lesley Fleming Nov 2021; revised in Oct 2022 by Lesley Fleming, Siang Tham; revised in 2024 by Lesley Fleming