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## Review article

# Nature-based therapeutics: A collaborative research agenda promoting equitable access and environmental stewardship

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## ABSTRACT

**Background:** Given the duration and intensity of the COVID-19 pandemic, with strict emphasis on social distancing, many individuals and families are experiencing social isolation. The need to explore effective strategies for health promotion and wellness is clear.

**Aim:** The purpose of this report is to highlight evidence supporting the health benefits of nature-based therapeutics and to describe the exploratory and translational research agenda for a nurse-led program entitled RxPLORE™: Prescribing Life Outdoors and Real Exploration.

**Methods:** Integrative review of the current state of evidence for nature-based therapeutics and operationalisation of a nature-based health promotion framework as the foundation of a PhD-DNP collaborative program of research.

**Discussion:** Amidst the unfolding crisis of the COVID-19 pandemic, the value of nature-based therapeutics is becoming more widely recognised, as are layers of disparities in access to nature. A nurse-led team proposes a program of research outlining priorities for the translation of current evidence into practice and for the investigation of gaps in the evidence base that will inform future recommendations for nature-based health promotion. The initial population of focus is children and families.

**Conclusion:** Prescribing nature is a strategy to promote health and wellness throughout the lifespan. For all populations to experience the health-promoting benefits of nature, nurses engage community members and collaborate across sectors to advocate for equitable access to nature and environmental stewardship through conservation practices.

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## Summary of relevance

### Problem

Many individuals and families are experiencing prolonged social isolation as COVID-19 social distancing and quarantine protocols continue. Furthermore, patterns of extended screen time and increasing sedentary behaviour increase the risk for obesity and associated cardiovascular conditions long-term following the pandemic.

### What is already known

Nature-based health promotion is an evidence-based strategy to promote outdoor physical activity while enhancing health and wellness throughout the lifespan.

### What this paper adds

This paper outlines a nurse-led research agenda to improve health and wellness through translation of current evidence on nature-based therapeutics and environmental stewardship, advocacy for equitable access to nature, and investigation of gaps in the evidence base to inform future recommendations for nature-based health promotion.

## 1. Introduction and background

In recent years, young people have spent increasingly more time indoors with extended screen time and less time outdoors, becoming more disconnected from nature than previous generations (Larson et al., 2019). Reports indicate that sedentary behaviours have increased since the pandemic began, raising concerns for long-term risk of obesity and associated cardiovascular conditions (Guan et al., 2020; Parekh & Deierlein, 2020). One promising, evidence-based intervention to mitigate this risk is nature-based health promotion; a growing evidence base supports the positive impact of nature contact on health and wellbeing (Hartig et al., 2014; Kotera et al., 2020; White et al., 2019). The purpose of this report is to highlight evidence supporting the health benefits of nature-based therapeutics (NBT) and to describe the exploratory and translational research agenda for a nurse-led program entitled RxPLORE™: Prescribing Life Outdoors and Real Exploration.

## 2. Community impact of COVID-19: Access to nature

The COVID-19 pandemic has intensified the public health dilemmas of increasing rates of social isolation, sedentary behaviour, and extended screen time, all of which negatively impact health and wellbeing (Gao et al., 2020; Guan et al., 2020; Parekh & Deierlein, 2020; Rajkumar, 2020; Rundle et al., 2020). In addition, rates of post-traumatic stress disorder following pandemic quarantine parallel those of natural disasters; feelings of isolation, inconsistent information on infection control, and the financial strain of income loss represent a substantial societal burden (Brooks et al., 2020; Hawryluck et al., 2004; Sprang & Silman, 2013). Although the full community impact and response to COVID-19 social distancing continues to unfold, people across the world have turned to the outdoors with greater ardour than before amidst the unfolding pandemic, seeking release from mounting stress, tension, and isolation (Brode, 2020; Fullana et al., 2020; Nature Play WA Inc, n.d.).

Many of those who are unaccustomed to outdoor recreation are looking for guidance and recommendations on how to plan activities, where to go, and how much time to spend for optimal benefit (Mandavilli, 2020; Outdoor, 2020). In response to increased numbers of visitors, some public and private nature preserves implemented temporary closure because of a lack of infrastructure to ensure protection of natural resources while limiting social gatherings that could exacerbate local and regional out-

breaks (National Park, 2020; Parks, 2020). As a result, the options for exploring nature are limited to green space in close proximity to the home; for those living in urban multi-unit residential buildings without access to private green space, park closures become a matter of health equity, intensifying the burden of financial strain and social isolation (Freeman & Eykelbosh, 2020).

The COVID-19 pandemic has drawn attention to long-standing patterns of inequitable access to high-quality parks for low-income neighbourhoods and communities of colour (Burrowes, 2020; McKenzie, Moody, Carlson, Lopez, & Elder, 2013; Walker, 2020). Relative to affluent neighbourhoods with more amenities, resource-poor neighbourhoods face significant barriers to park use: crime-related concerns for personal safety, lack of resources, and inadequate programs designed for family use (Han, Cohen, Derose, Li, & Williamson, 2018; Ngom, Gosselin, & Blais, 2016; Sefcik et al., 2019; Yoon, & Lee, 2019). Developing accessible, high-quality, nature-rich recreation areas for *all* members of society represents an urban planning strategy with the potential for a significant return on investment, given the evidence supporting the health benefits from nature contact at the individual and the population levels (Beyer et al., 2014; Kotera et al., 2020; White et al., 2019).

## 3. Health benefits of nature-based therapeutics

Nature-based therapeutics (NBT) involve intentionally guided interactions between humans and nature (landscapes and wildlife) designed to promote favourable health outcomes (University of Minnesota Landscape Arboretum, 2019). Recognition of the healing properties of nature is not new; late 19th century providers recommended contact with nature, and NBT became popular in child health programming in the early 20th century (Crnic & Kondo, 2019).

Based on theoretical models of attention restoration and stress reduction, studies confirm subjective benefits of contact with nature along the mind-body continuum, resulting in improved mood, self-esteem, cognition, attention, memory, and reduced stress (Bloomfield, 2017; Bratman, Hamilton, & Daily, 2012; Cox et al., 2017; Lackey et al., 2019; Ohly et al., 2016; Tillman, Tobin, Avison, & Gilliland, 2018). Evidence suggests that physical activity in outdoor natural environments may lead to additional health benefits, including reductions in obesity, asthma, myopia, and vitamin D deficiency (McCurdy et al., 2010).

When families explore nature together, they report increased patterns of social cohesion and support, as indicated in a landmark systematic review (Hartig, 2014). Social cohesion yields protective effects, building resilience and coping as an insulating buffer to stressors beyond the family's locus of control (Hordyk et al., 2015; Peters et al., 2010). Additional benefits of contact with nature include enhanced environmental stewardship values and behaviours over time (Asah et al., 2018; Australian Children's Education and Care Quality Authority, 2020; Barton & Pretty, 2010; Huff Sisson & Lash, 2017; Keniger et al., 2013; Rosa & Collado, 2020; Soga et al., 2016). With a broad range of health benefits and few (if any) reported side effects, NBT appears to be a low-cost, nonpharmaceutical intervention that warrants further exploration.

## 4. NBT research agenda: Development of RxPLORE™

A PhD-prepared public health nurse and a DNP-prepared family nurse practitioner have developed a collaborative research agenda, RxPLORE™: Prescribing Life Outdoors and Real Exploration. The vision of this team is *getting back to nature*. Extending this vision, the team's mission is to equip individuals, families, and communities to spend more of their daily life outdoors, engaged in exploration and stewardship of the physical and social environment

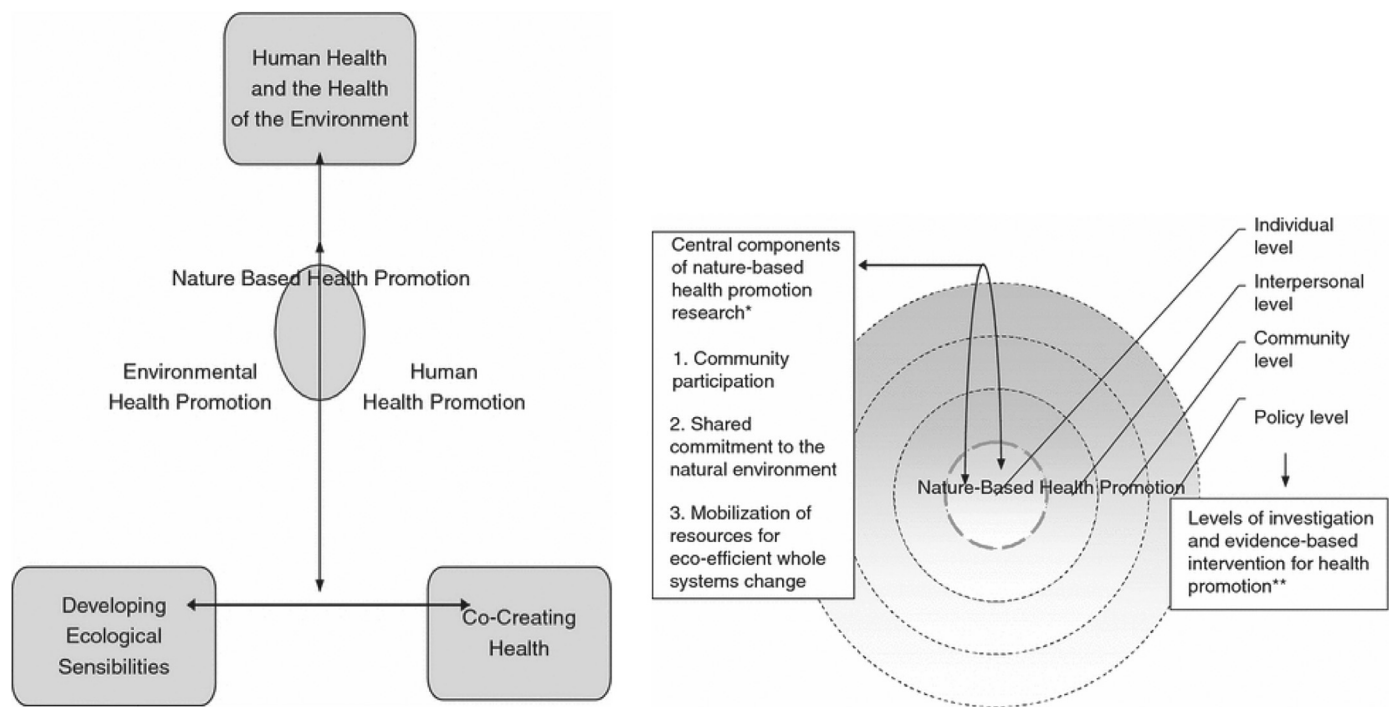


Fig. 1. Nature-based health promotion: conceptual framework (Hansen-Ketchum, Marck, & Reutter, 2009). Reprinted with permission from John Wiley and Sons.

around them. To fulfil this vision and mission, the team is focused on exploratory research to generate new evidence regarding NBT while translating current evidence into practice, in alignment with models of DNP-PhD collaboration (Courtney & Neihsel, 2016; Trautman, Idzik, Hammersla, & Rosseter, 2018).

A conceptual framework for nature-based health promotion (Fig. 1) illustrates the value of co-creating human and environmental health, “promoting ecologically sound relationships between all species” with clear implications and recommendations for nursing and interprofessional research (Hansen-Ketchum, Marck, & Reutter, 2009, p. 1531). This framework reinforces the reciprocal balance between humans and the environment: to experience the health-promoting benefits of nature, members of society must commit to restoring the environment through consistent stewardship practices. The interdependence of humans and the environment cannot be overstated; sustainable interventions reflect wholeness and result from the integration of *focal practices*, which are intentional, mindful action steps that people take each day to support their connections with each other and with nature, all aiming towards restoration (Borgmann, 1984, as cited in Hansen-Ketchum et al., 2009, p. 1531). The pathway to wholeness and sustainability, as posited by the framework authors, is through developing individual and collective *ecological sensibilities* by which we care for the human soul and the heart of the environment. Focal practices forge these ecological sensibilities, leading to *authentic engagement* and engendering a *moral commitment* to the health of people and the health of the environment (Higgs, 2005, as cited by Hansen-Ketchum et al., 2009, p. 1531).

The challenge of operationalising this framework led the authors to envision the RxPLORE™ program as a starting point for leveraging intervention strategies to promote individual and collective ecological sensibilities. With the long-term goal of championing the restoration of human and environmental health, the team aims to equip nurses with NBT best practices and a socio-ecological lens to prescribe nature and advocate for *all* to reap the benefits of nature-based health promotion. With this approach, the nurse-led team aims to conduct translational research to promote

the health benefits of nature contact, to promote environmental stewardship practices, and to co-create strategies to remove barriers limiting access to high-quality green space and nature, so that all may experience those benefits firsthand.

## 5. Translational research priorities

The priorities for translational research are focused on integrating current NBT evidence into practice and advancing equitable access to nature. Recent research supports three promising formats of NBT for health promotion among children and families: hiking, gardening, and camping (Baklien, Ytterhus, & Bongaardt, 2016; Harper, 2017; Kiernan, Gormley, & MacLachlan, 2004; Mitten, Overholt, Haynes, D’Amore, & Ady, 2018; Ryan-Krause, 2018; White et al., 2018). Across the scope of practice, professional nurses focus on health teaching and motivational interviewing, whether their practice occurs in primary care, specialty care, or nonclinical settings. Every encounter with patients (individuals, families, or communities) presents an opportunity to integrate current NBT evidence for health promotion.

To facilitate the translation of evidence, the team will develop a nature discovery and restoration toolkit, infused with strategies for a range of therapeutic benefits designed to impact the health of children and families and the health of the environment through application of consistent stewardship practices. To design this toolkit, the nurse-led team will collaborate with ecologists, master naturalists, master gardeners, and community members in formative evaluation, field testing and iterative design. These collaborative partnerships will facilitate the integration of evidence-informed NBT principles with hands-on skills training, aiming to foster ecological sensibilities through focal restorative practices that are relevant and sustainable over time. Evaluation of the nature discovery and restoration toolkit will involve examining which strategies work for whom, across which settings, and why—all in keeping with the tenets of implementation science (Titler, 2018). The research team will use equitable evaluation methods, in collaboration with stakeholders and community members, throughout all

phases of study design and the ongoing iterative review of the nature discovery and restoration toolkit (Stern, Guckenburg, Persson, Petrosino, & Poirier, 2019). Using the equitable evaluation framework requires an examination of assumptions and reflective analysis throughout the research process, engaging stakeholders and ensuring the inclusion of diverse perspectives (Center for Evaluation Innovation et al., 2017). This participatory process involves selection of quantitative measures in addition to qualitative data collection. At present, the primary quantitative outcomes of interest to measure the effectiveness of the toolkit include connectedness with nature, health-related quality of life, and perceived stress. Final determinations of outcome measures will align with the priorities identified in the equitable evaluation process, which is presently in the formative stage of development.

Another translational research priority is to partner with communities and stakeholders to increase awareness of disparities in access to nature and green space and to co-create strategies to increase equitable access to nature (Casey et al., 2017; Jennings, Baptiste, Jelks, & Skeete, 2017; Jennings, Larson, & Yun, 2016; Shanahan, Lin, Gaston, Bush, & Fuller, 2014; Stevenson et al., 2020). The team found an early partner in the local parks and recreation department and nature preserve, willing to offer resources and open to collaborative planning. Additional partners include the local urban planning department and local policymakers who are vested in health promotion and matters of social and environmental justice.

Early community member partners include families from schools in the local school district, with whom the authors have a long-standing service-learning relationship. These schools are in low-income neighbourhoods, and some have outdoor learning gardens and centres at varying stages of sustainability and community ownership. The team is also aiming to partner with faith-based and nonprofit organisations to reach other families who have limited access to high-quality nature and green spaces. The intent is to co-create the advocacy and policy agenda for changes that are meaningful for the community. Resources to support this work include Urban Institute guidelines focused on the use of park funding to close gaps in equity (Eldridge, Burrowes, & Spauster, 2019).

## 6. Exploratory research priorities

The priorities of exploratory research are to investigate current gaps in the NBT evidence base and to examine promising biomarkers for evaluation of NBT efficacy to influence health indicators, particularly in children and families. Much of the evidence on the health benefits of NBT is limited to cross-sectional and observational study designs with an inconsistent protocol, lack of time points to establish causality, and limited objective measurement (Hartig et al., 2014). The need for further research is a frequent finding in the scientific literature describing the benefits of contact with nature. Priorities for exploratory research are the identification of distinct features of effective NBT, objective measurement of the health response, and clarification of the dose-response effect.

Recent systematic and state-of-the-art reviews on the benefits of NBT emphasise the need for a longitudinal study design; a more diverse population in terms of race, ethnicity, identity, and socioeconomic status; and objective outcome measures (Hansen et al., 2017; Lackey et al., 2019; Tillman et al., 2018). For this reason, initial exploratory research will focus on the efficacy of NBT to influence vital signs (blood pressure, heart rate, respiratory rate) and other health indicators (cortisol and immune function) of children and families in a low-income, racially/ethnically diverse school community. The nurse-led team will collaborate with community partners to co-create the intervention design to optimise the acceptability and relevance.

To build the evidence base for the impact of nature contact on objective health indicators, it is important to design replicable intervention studies that include promising biomarkers in the NBT literature: blood pressure, heart rate, and cortisol. Furthermore, recent pioneering research has led a cadre of multidisciplinary researchers to call for investigation of the role of the microbiome in conferring NBT-related physical health benefits, particularly regarding immune function (Frumkin et al., 2017). Collective evidence in animal models indicates that exposure to biodiverse environments enhances the composition of the microbiome favourably; the changes result in improved health through reduced anxiety and greater innate immunity in mice (Liddicoat et al., 2020; Zhou et al., 2016).

The skin microbiome has significance, both as a protective barrier and an active interface with the environment; the depth and balance of microbial diversity on the skin is thus a direct reflection of the biodiversity in the physical environment (Prescott et al., 2017). Skin and gut microbiota strengthen innate immunity and thereby live in symbiosis with the host; as such, it is proposed that manipulating the microbiome of the skin and gut through biodiverse environmental exposure may be a promising treatment option for a range of immune-mediated diseases that emerge in conditions of dysbiosis (Coates et al., 2019; Forbes et al., 2016). Resolving these conditions yields improvement in symptoms. For these reasons, the exploratory research agenda includes an investigation of the efficacy and dose-response patterns of NBT, particularly in early childhood, to influence the skin microbiome.

## 7. Conclusion

Nature-based therapeutics represent an integrative modality with growing evidence to support health and wellness at a time when society faces a multitude of existential public health threats. A nurse-led team has collaborated to develop a program outlining translational research priorities (practice integration of current NBT evidence to advance the health of families, the health of the environment, and equitable access to nature for all people) and exploratory research priorities (investigation of gaps in the evidence base to inform future recommendations for nature-based health promotion). The implementation of this program of research will promote access to nature, support health promotion, and instill principles of conservation and environmental stewardship among children and families.

### Authorship contribution statement

**Gina Alexander:** Conceptualisation, Methodology, Writing – Original draft preparation and revisions. **Vicki Brooks:** Conceptualisation, Methodology, Writing – Reviewing and editing.

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### Ethical statement

This manuscript consists of an integrative review of the literature and description of a nurse-led research agenda. An ethical statement is not applicable for this manuscript.

### Conflicts of interest

The authors have no conflicts of interest to report for this manuscript.

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