

BMJ Open Context, classification and study methodologies in research into nature-based therapies: protocol for a scoping review

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ABSTRACT

Introduction Nature provides an array of health benefits, and recent decades have seen a resurgence in nature-based interventions (NBI). While NBI have shown promise in addressing health needs, the wide variety of intervention approaches create difficulty in understanding the efficacy of NBI as a whole. This scoping review will (1) identify the different nomenclature used to define NBI, (2) describe the interventions used and the contexts in which they occurred and (3) describe the methodologies and measurement tools used in NBI studies.

Methods and analysis Following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols Extension for Scoping Reviews, four databases will be searched (PubMed, Web of Science, Scopus, ProQuest Dissertations and Theses Global) as well as cross-referencing for published and unpublished (masters theses and dissertations) studies on NBI in humans. Eligible studies must employ intervention or observational designs, and an English-language abstract will be required. Database searches will occur from inception up to the date of the search. Animal-based therapies and virtual-reality therapies involving simulated nature will be excluded. Independent dual screening and data abstraction will be conducted. Results will be analysed qualitatively as well as with simple descriptive statistics (frequencies and percentages).

Ethics and dissemination Since this is a scoping review of previously published summary data, ethical approval for this study is not needed. Findings will be published in a peer-reviewed journal. This protocol has been registered with Open Science Framework (<https://osf.io/mtzc8>).

INTRODUCTION

Time in nature supports physical health, mental health and overall quality of life.¹ Historically used as a therapeutic modality,² nature-based interventions (NBI) have seen a resurgence in the modern era.³ As medicine has evolved, so have NBI. For example, treating tuberculosis with fresh air in the countryside has transformed into treating an array of maladies, including, but not limited to, high blood pressure,⁴ psychosomatic disorders⁵ and post-traumatic stress disorder⁶ in a

Strengths and limitations of this study

- This scoping review will provide a comprehensive overview of reported nature-based interventions (NBI) without restriction to year and location of intervention, participant characteristics and outcomes measured.
- The study will ensure rigour with the use of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews.
- As the scoping review methodology limits our analysis to the information included in publications by the authors, we anticipate that some variables of interest will be under-reported and, thus, difficult to assess.
- The projected heterogeneity of NBI nomenclature used in the existing literature, combined with the requirement of an English-language abstract, may limit our ability to locate all eligible studies.
- The exclusion of animal-based therapies and virtual-reality therapies involving simulated nature may inhibit full discussion of NBI design, terminology and explored outcomes.

variety of settings ranging from city parks⁷ to wildland areas.^{4,8} With the emergence of NBI in the modern era, researchers are currently working to build empirical support and guidance for these interventions, including the NBI locations, outcomes and dose–response relationship.

Previous research has addressed the health benefits of nature from a non-interventional lens. For example, among other benefits, Wolf *et al* found that urban forests reduce the impacts of pollution and excess heat, improve cognition and psychological stress, boost immune systems and a community's birth outcomes and promote active living practices.⁹ In another study, Christiana *et al* found that positive health, cognitive and social outcomes are associated with nature-based physical activity in populations across the lifespan, while also identifying persisting

equity issues with respect to access.¹⁰ Furthermore, neighbourhood green space has been shown to be especially potent for health and wellness outcomes in the paediatric population.¹¹

Existing research has also lent support to the use of nature in intervention approaches that include forest bathing, park prescriptions and nature-based physical activity. With respect to outcomes, forest-based interventions have been linked to improvements in mental health, systemic inflammation, cardiovascular risk factors⁸ and regulation of the nervous system.¹² Other NBI, including gardening and nature-based physical activity, have been linked to improvements in blood pressure and mood.¹³ Beyond the generally established efficacy of nature for health outcomes, participant reception is a key driver of effective intervention design. For example, among adults living with mental illness, therapeutic outdoor recreation interventions have been broadly found to be enjoyable and inclusive methods of moving oneself towards mental and physical well-being.¹⁴ With respect to dose, Shanahan *et al*'s work on the 'nature-dose framework' found that the duration and frequency of recurrent-activity interventions should align with the outcomes to be measured; longer duration per session was associated with improvements in depression and blood pressure, while greater frequency of visits was linked to social cohesion.¹⁵ The collective evidence highlights that NBI have been successfully implemented across divergent populations and in an array of settings across the globe;^{12 13} however, concerns have been raised about methodological rigour and appropriate application of theoretical frameworks.¹⁶

As multiple evidence synthesis articles have previously been conducted in this field,^{1 7-14 17-23} we believe that it is important distinguish the scope and purpose of our current study from existing work given previous criticism regarding the production of redundant reviews.²⁴ Along those lines, Munn *et al* identified six purposes for conducting a scoping review, two of which the current study will focus on: (1) clarifying concepts and definitions, for example, nomenclature use to define NBI and (2) examining how research is conducted, for example, interventions, methodologies and measurement instruments used in NBI studies.²⁵ Concerning our first purpose, previous research has suggested that a wide array of terminology has been used to define and describe NBI by both practitioners and researchers;²¹ however, this categorisation and clarification work has not progressed beyond this observation. A 2019 Delphi study identified 27 types of NBI aimed at changing environments and behaviours, combining interventions with similar processes into groups, irrespective of terminology heterogeneity.²⁶ As the field of NBI matures into a well-established and recognised modality, a need exists to first characterise these various definitions, so that commonly acceptable terms and definitions can be established.²¹

The second purpose of the current study is to examine how research on NBI is conducted.²⁵ While previous reviews have identified a broad array of intervention

designs, outcomes and methods for measuring outcomes in the existing literature,^{3 21 22} these reviews, as opposed to our review, were differentially focused with regards to purpose, inclusion criteria and methodological techniques. Thus, a need exists to provide a differentially focused comprehensive analysis of the designs, methodologies and measurements used in current NBI interventional literature. In addition, because most studies of NBI employ small sample sizes, future meta-analyses are warranted to establish empirical support for such interventions. However, without consistent methodologies and measurements, meta-analyses will be hindered. Examples of such variability include NBI with physical activity¹⁰ versus NBI without physical activity,²⁷ one-time immersive experiences⁵ versus short outings repeated over a period of time, and individual outcomes measured by a wide variety of unique metrics across different studies. Furthermore, most of the existing evidence synthesis articles have focused on specific sectors of NBI, for example, reviews of interventions among certain populations, such as adults²³ and individuals living in institutional settings;²² reviews of subcategories of NBI activity, such as Shinrin-yoku forest bathing^{19 28-32} and nature-based exercise;^{10 14 20} and reviews assessing specific outcomes such as cortisol^{21 28} and stress recovery.³³ While syntheses of NBI subcategories are valuable, a need exists to synthesise information more broadly for the purpose of identifying the types of evidence available on NBI. Without such knowledge, direction for future research on NBI, including the reporting of such, will be hindered.

Scoping reviews provide an overview of the available research evidence without producing a summary answer to a discrete research question.³⁴ Unfortunately, with the exception of reviews that focused on specific subcategories of NBI,³⁴ no robust scoping reviews under the broad umbrella of NBI, to the best of the investigative team's knowledge, have been conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR).³⁴ Adherence to such methods, including reporting, is important because they inextricably lead back to the robustness of the review as well as methodological transparency and uptake of research findings.³⁴ Given the former, the objectives of the current study are to conduct a scoping review to (1) identify the different nomenclature used to define NBI, (2) describe the NBI used and the contexts in which they occurred, and (3) describe the methodologies and measurement tools used in studies of NBI.

METHODS AND ANALYSIS

Study processes will follow the guidelines established by the PRISMA-ScR.³⁴ This protocol is registered in Open Science Framework (<https://osf.io/mtzc8>).

Study eligibility

We will include articles reporting specifically on NBI for any array of physical and/or mental health outcomes.

Table 1 Inclusion and exclusion criteria using PICOS framework

Category	Include	Exclude
Population	Any human population	Non-human populations
Intervention	Nature-based	Non-nature-based interventions
Comparison	Any nature-based comparison	Non-nature-based comparisons
Outcome	Any health or quality-of-life outcomes	Non-health or quality-of-life outcomes, for example, cost-effectiveness
Study Design/Setting	Experimental or observational studies in any natural setting, including but not limited to parks, trails, forests and beaches	Virtual reality, animal-based therapy (eg, equine) studies

PICOS, Population, Intervention, Comparison, Outcome, Study Design/Setting.

Using the Population, Intervention, Comparison, Outcome, Study Design/Setting (PICOS) framework (table 1), the inclusion of participants, NBI interventions, comparators, outcomes and nature-based settings will be broad, with the only restrictions being that we will exclude animal-based therapies and virtual-reality therapies involving simulated nature. Scoping reviews, systematic reviews and meta-analyses will be excluded, but their reference lists will be scanned for articles that may meet our inclusion criteria. Other types of articles discussing NBI but not assessing specific interventions will be excluded. As this area of inquiry is relatively novel and a scoping review approach used, publications will not be limited by (1) year of intervention, (2) country in which the intervention took place, (3) participant characteristics (age, sex, race/ethnicity, socioeconomic status, etc), (4) study design and (5) language in which the study was published, assuming an English-language abstract is available. With respect to publication type, both published, full-length, peer-reviewed manuscripts as well as full-length, unpublished studies (master's theses, dissertations) will be included. Abstracts from conference proceedings will not be included because of the dearth of information provided as well as the potential difficulty in retrieving detailed information.

Due to the breadth of the available literature, some facets of NBI will not be addressed in this study. For example, while animal-assisted therapies and virtual-reality therapies involving simulated nature provide unique opportunities with respect to NBI, these types of interventions will also not be included.²² Additionally, while some research has sought to identify which natural environments are more therapeutically beneficial than others,³⁵ we will not examine for such in our current study.

Data sources

Adhering to the recent PRISMA-S guidelines for literature searches in systematic reviews,³⁶ the following databases will be searched: (1) PubMed, (2) Web of Science, (3) Scopus and (4) ProQuest Dissertations and Theses Global. We will not search Embase because it is not freely available to the investigative team and Scopus has been reported to provide 100% coverage of Embase.³⁷

Draft search strings are shown in online supplemental appendix A. Search strings will include words and phrases encompassing four categories: (1) types of nature, (2) types of interventions, (3) types of outcomes and (4) human study population. The final search strategy will be developed by the authors in collaboration with a health sciences librarian at West Virginia University. Databases will be searched from the date of inception until the date of the search.

Given that this is a scoping review, our searches will be intentionally broad to reduce the chances of missing potentially eligible studies. All searches will be conducted by a health sciences research librarian. In addition to electronic database searches, cross-referencing from retrieved studies will also be conducted to identify any potentially eligible studies. The citations from each database will then be imported into EndNote V.20 by the first author³⁸ and saved as separate files. The search files from each database will then be merged and saved into one overall file. The first author will then remove duplicates electronically and manually, save the results as another separate file and then export to Rayyan for study screening.³⁹

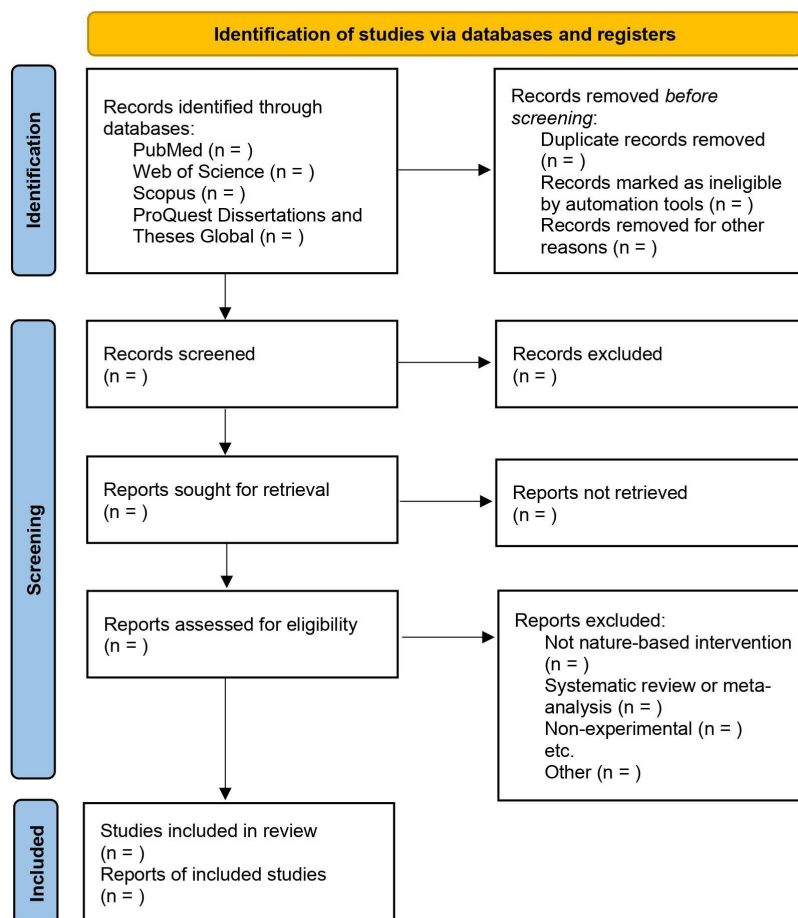
Study selection

A flow diagram of the study screening process is shown in figure 1. Studies exported from EndNote into the most recent version of Rayyan³⁹ will be independently screened by two authors. The titles and abstracts will first be screened for potentially eligible studies. If a decision regarding eligibility cannot be made based on the title and abstract screening, the full text of each article will be retrieved and reviewed for eligibility. Any discrepancies in eligibility will be settled collaboratively by the two study screeners. If agreement cannot be reached, the third author will provide a recommendation. On completion of study screening, a reference list of all excluded studies, including the reasons for exclusion, will be included as a supplementary file.

Data abstraction

A codebook for data abstraction will be developed in Microsoft Excel for Mac, V.16.53.⁴⁰ To avoid data abstraction bias, two authors will use separate workbooks to independently code (dual coding) each item from every study

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only



From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71. doi: 10.1136/bmj.n71

Figure 1 Flow diagram.^{42 43} PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analysis.

to ensure accuracy and consistency. The authors will then meet to review their selections. Any disagreement in the items coded will be discussed until mutual agreement is reached. If agreement cannot be reached, the third author will provide a recommendation. A tentative list of items to code for is shown in online supplemental appendix B. Of note, type of environment will be coded according to the categories identified by Bratman *et al.*⁴¹

Research synthesis

As is customary for scoping reviews, data will not be synthesised quantitatively. Rather, analysis will primarily be conducted qualitatively along with simple descriptive statistics such as frequencies and percentages.

Patient and public involvement

None.

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and manuscript edits. CGA helped refine the research question. All authors have contributed to study design and revising the protocol. All authors have approved the final manuscript.

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