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Review

Review

Barriers and facilitators to implementing nature prescriptions for child and youth health: a scoping review

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Abstract

Spending time in and connecting with nature has been shown to have positive benefits across multiple health outcomes, including for children and youth. Growing in popularity, nature prescriptions are recommended by health providers, social providers, and educators to spend more time in nature. The health and well-being benefits from nature prescription programs hold great potential for children and youth. However, a key evidence gap remains on how nature prescriptions occur in practice in pediatric healthcare, social care, and education, including barriers and facilitators to the implementation of nature prescription programs. The purpose of this scoping review was to explore the barriers and facilitators to the implementation of nature prescription programs for child and youth health. Peer-reviewed, original studies published in English were systematically searched in six databases using search terms focusing on nature prescriptions and child and youth health. Following the recommendations of Arksey and O'Malley (2005), two reviewers independently screened 2111 titles and abstracts, 38 records were screened in full text, and 10 studies were included. Thematic analysis was conducted following Braun and Clarke's (2022) guidelines. Three themes were developed from thematic analysis: (i) safety considerations, (ii) materials, resources, and support, and (iii) program features. The results of this review can be used to guide future nature prescription program implementation strategies for child and youth health.

Keywords: nature prescription; adolescent; health; barriers; facilitators; scoping review

Contribution to Health Promotion

- Nature prescription programs are growing in practice to promote the health and well-being of children and adolescents.
- We conducted a review of the literature to explore what is known about the barriers and facilitators to nature prescription programs as a health promotion approach.
- Nature prescriptions as a nature-based intervention may be a key component of holistic care and support for child and youth health.
- Understanding the barriers and facilitators to nature prescription programs could strengthen health promotion initiatives involving nature-based interventions.

INTRODUCTION

Healthy emotional and social development during childhood and youth (0–24 years of age) lays the foundation for mental health, resilience, and other health conditions throughout life (Mental Health Commission of Canada. 2017). There has been a growing increase in the prevalence of chronic conditions (Burns et al. 2010, Perrin et al. 2014). Chronic conditions can affect future health trajectories in adulthood, long-term care needs, and account for approximately one-third of Daily Adjusted Life Years for children and adolescents (Kassebaum et al. 2017, Kyu et al. 2018, Reif et al. 2022). The World Health Organization defines noncommunicable (chronic) diseases as occurring from the result of a combination of genetic, physiological, environmental, and behavioral factors which endure for a long duration (World Health Organization. 2023). In 2002, 49% of global deaths were caused by chronic diseases, projected to increase by 64% in 2030 (Stuckler 2008). From 1990 to 2022, the prevalence of overweight and obesity among young people aged 5–19 increased by 102%, which is associated with health challenges and early mortality

from the development of conditions such as asthma, diabetes, cancer, and cardiovascular disease (Patton et al. 2016). In the 2019 Global Burden of Disease study, the estimated global mean prevalence of mental health disorders amongst young people aged 5–24 was 11.63%, and an estimated 293 million children and youth lived with a diagnosed mental health disorder (Kieling et al. 2024). More recently, multiple mental health and well-being indicators were pronounced as immediate effects from the COVID-19 pandemic across all age groups (Gruber et al. 2023), heightening a mental health crisis that was already of unprecedented trajectory (Office of the Surgeon General, 2021).

In general, youth with chronic conditions often experience other secondary challenges, such as psychiatric comorbidity, chronic pain, sleep disturbance, eating and body dysmorphia disorders, discrimination, social challenges, decreased school attendance, and impairment in academic performance (Russo 2022). Due to the intricacy of child development, the global prevalence of chronic physical and mental health conditions, and the likelihood of sequela from chronic conditions, children and youth are a vulnerable population needing support in pediatric healthcare, social care, and education.

Spending time in natural environments may have positive benefits across multiple health outcomes. There has been a positive association between nature exposure and improved cardiovascular, musculoskeletal, mental, respiratory, neurological, and digestive processes (Maas et al. 2009). Nature-based interventions, including forest bathing and structured outdoor exercise, have been found to produce beneficial effects on clinical indicators and general health status in people living with chronic physical health conditions (Struthers et al. 2024). Specifically, spending time in outdoor settings with natural elements can improve concentration and positive affect in adolescents (Greenwood and Gatersleben 2016), and improve attentional control (Schutte et al. 2015), and lower emotional symptom scores (Amoly et al. 2015) in children.

Social prescribing (SP) is a means of improving patients health and well-being by connecting them to clinical community services (WHO 2022). Growing in popularity, nature prescribing is a type of SP that involves a health provider, social provider, or educator giving individuals a recommendation to spend time in nature (James et al. 2019, Kondo et al. 2020). Nature prescriptions can be in the form of a written prescription, verbal counseling, or referral to another provider or nature-based program (Kondo et al. 2020). Nature prescribing may also include the prescription of nature-based activities that enhance physical activity and improve social connection, well-being, and mental health (Ivers and Astell-Burt 2023). For example, Parx: A Prescription for Nature, is currently Canada's first national evidence-based nature prescription program, which is an initiative driven by healthcare professionals with the aim of improving patient health by connecting them to nature (BC Parks Foundation n.d.). In the UK, Dose of Nature is a provider-recommended process for patients to participate in an 8-week program that introduces individuals to the mental health benefits of spending time in nature (Dose of Nature Prescriptions, n.d.). These programs may have significant potential to benefit child and youth health outcomes; however, little is known about how nature prescription programs occur in practice in pediatric healthcare, social care, and education. Nature prescriptions in children and youth are understudied. In a recent systematic review and meta-analysis examining whether nature prescriptions improve social, mental, and physical health, the design characteristics of nature prescriptions, and the potential channels to dispense a nature prescription, only 12% of the included studies involved participants under 18 years of age (Nguyen et al. 2023). Furthermore, while a small amount of literature reviews the health impacts of nature-based interventions, such as nature-assisted therapy (Annerstedt and Währborg 2011), gardening (Clatworthy et al. 2013), horticultural therapies (Kamioka et al. 2014), green exercise (Barton et al. 2016, Lahart et al. 2019, Mnich et al. 2019), and nature prescription programs (Kondo et al. 2020, Nguyen et al. 2023), there is a paucity of literature on the implementation of Nature Rx programs, including those focused on child and youth health.

Implementation science is a growing field of study that aims to identify factors that affect uptake into routine use, rather than the health impact of a clinical innovation (Bauer and Kirchner 2020). Implementing new interventions into dynamic organizations' systems requires an understanding of the implementation process, including barriers and facilitators (Finley et al. 2018, Peters-Corbett et al. 2023). According to Garcia et al. (2022), barriers are defined as 'factors that hinder, limit, or prevent people from engaging in a certain behaviour' (Garcia et al. 2022, p. 2) and facilitators are 'factors that favour, facilitate, or help people to engage in a certain behaviour' (Garcia et al. 2022, p. 2). The literature on the implementation of SP through an implementation science lens is also relevant to this review. Several reviews have reported barriers and facilitators to the implementation and evaluation of SP programs (Pescheny et al. 2018 Araki et al. 2022, Calderón-Larrañaga et al. 2022, Bos et al. 2024). Known barriers include, but are not limited to, lack of client self-perception, motivation, and confidence (Calderón-Larrañaga et al. 2022), and lack of adequate leadership, organization, knowledge, and third-sector infrastructure (Pescheny et al. 2018), while facilitators include, but are not limited to, co-production and shared decision-making (Araki et al. 2022), awareness of social determinants of health (Bos et al. 2024), trusting relationships that support cyclical referral processes (Bos et al. 2024), and organizational readiness(Pescheny et al. 2018). As a type of SP and nature-based health intervention, nature prescribing notably involves utilizing the health-promoting benefits of time spent in nature (Leavell et al. 2019), and requires particular focus on intervention implementation in practice. Therefore, this review is filling a crucial gap in the literature by drawing focus to specific barriers and facilitators to the implementation of nature prescription programs across multiple studies and can be used to inform program growth and future implementation of these programs in practice.

Therefore, the aim of this study is to explore the barriers and facilitators to the implementation of nature prescription programs for child and youth health. The three research objectives include: (i) to explore the barriers and facilitators to the delivery of nature prescription programs to children and youth; (ii) to explore the barriers and facilitators to child and youth participation in nature prescription programs; and (iii) to explore the barriers and facilitators to provider participation in nature prescription programs.

METHODS

A scoping review was conducted to collect and synthesize data from included articles to explore the existing barriers and facilitators to nature prescription programs in the context

of child and youth health. The literature search was conducted following the methodological framework presented by Arksey and O'Malley (2005) and incorporating key recommendations from Levac et al. (2010). These recommendations include creating a broad research question with a narrow scope of investigation, integration of an expert scoping study team to guide decisions about the breadth and comprehensiveness of included studies, two researchers independently screening titles and abstracts and full-text articles with a third reviewer to resolve conflicts, and iteratively extracting data using a data-charting form by two reviewers (Levac et al. 2010). Reporting of this scoping review is consistent with the PRISMA Checklist for Scoping Reviews to ensure essential reporting items are met (Tricco et al. 2018).

Criteria for including studies for review

Studies reporting on nature prescription programs for children and youth were sought for this scoping review and assessed following the inclusion criteria of: (i) participants are 0–24 years of age; (ii) nature prescriptions involve a health, social, or education provider-filled prescription to spend more time in nature; (iii) social prescription programs that involve prescribing nature; (iv) articles discuss barriers and/or facilitators to implementation and/or participation in nature prescription programs; (v) journal articles are original (primary sources) including quantitative, qualitative, or mixed methods, (vi) journal articles are peer-reviewed; (vii) English language full-text available; and (viii) access to original articles available. Although there is no universal definition of youth, the United Nations defines youth as persons between the ages of 15 and 24 years of age (United Nations, n.d.-a), and defines children as persons below the age of 18 (United Nations, n.d.-b). Therefore, our inclusion criterion of children and youth includes the age range of 0–24 years. In this review, we considered a nature prescription program to be anything involving health, social, or education provider-initiated recommendations to spend more time in nature, including referrals to participate in nature-based interventions. Articles reporting on health, social, or education provider-initiated referrals for participants to be active in nature and education-based programs that involved a pivotal component to engage in a nature-based activity were included. We excluded articles with nature prescription programs that focus on eco-education and/or diet only, articles that are not research-based (e.g. opinion pieces, editorials, or responses), and animal studies. Articles that focus on eco-education and/or diet only were excluded because they do not meet the care-based outcomes for nature prescription intervention, which focus on health and well-being (see Supplement A for inclusion and exclusion table).

Search strategy for identification of studies

The literature search was performed on 3 February 2024. Key terms were systematically searched in the electronic databases of MEDLINE, Scopus, CINAHL, PsycINFO, Academic Search Ultimate, and GreenFILE using key search terms that focused on nature prescription programs for child and youth health (Supplement B). Considering the novelty of this topic in literature, no limits were placed on the date of publication and the search strategy was broad to maintain comprehensiveness. The search was limited to articles available in the English language and peer-reviewed journal articles. Two reviewers (S.P., N.S.) independently completed each screening stage. All conflicts during the screening and data extraction stages were resolved through reviewer discussion (S.P., N.S.). Conflicts that could not be resolved through discussion were resolved by a third reviewer (L.G.).

Collating, summarizing, and reporting of results

Covidence software was used to fulfill title, abstract, and full-text screening by two reviewers (S.P., N.S.). A standardized Microsoft Excel sheet was used to extract each articles' author(s), year of publication, title, country, research question(s), the aim of the study, study design, participants, inclusion criteria, sample size, recruitment, intervention(s), setting, details of the intervention, details of outcomes, barriers, facilitators, and relevant conclusions and/or key recommendations. Data analysis followed the framework outlined by Braun and Clarke (2022), including (i) familiarizing yourself with the dataset, (ii) coding, (iii) generating initial themes, (iv) developing and reviewing themes, (v) refining, defining, and naming themes, and (vi) writing up. The reporting of the reflexive thematic analysis process was done with consideration of Braun and Clarke's critical review of thematic analysis reporting in Health Promotion International (Braun and Clarke 2024). Reviewers one (S.P.) and two (N.S.) became independently familiarized with the dataset by re-reading the papers multiple times and making initial, high-level notes and analytic insights of any relevant findings related to the dataset. Data were systematically coded across the included studies by reviewer one and reviewer two independently coded 40% of the data. Reviewers one and two then engaged in a discussion to share interpretations of codes and co-constructed a final coded dataset. Clusters of codes were inductively compiled to be categorized together according to definition and context in the data, both as individual codes and as the full dataset. Reviewer one categorized codes independently, and reviewer two provided feedback and guidance during a collaborative discussion on the extracted data. After candidate themes were created, reviewer one collated all coded data from the full dataset relevant to the respective theme. These data were recorded in a Microsoft Excel sheet according to barriers and facilitators to best represent the research question. Reviewer two reviewed the candidate themes collated and searched for additional data from the included studies in accordance with these themes. Reviewers one and two independently reviewed the candidate themes with respect to the coded extracts and the full dataset and added any additional excerpts relevant to the candidate themes and initial codes. Reviewers one and two then had a comprehensive discussion to review the themes and engaged in a collaborative exchange about the subjective development of themes. Any aspect of theme development requiring clarification was brought to a third reviewer (L.G.) for further input.

RESULTS

Identification of studies

The initial search of the literature identified 4011 records. After duplicate removal (n = 1900), 2111 titles and abstracts were screened, and 2073 records were excluded due to ineligibility based on inclusion and exclusion criteria. Thirty-eight records satisfied inclusion criteria and underwent full-text screening, whereas 28 records were excluded due to reasons listed in Figure 1. The review included 10 records that satisfied the inclusion criteria.

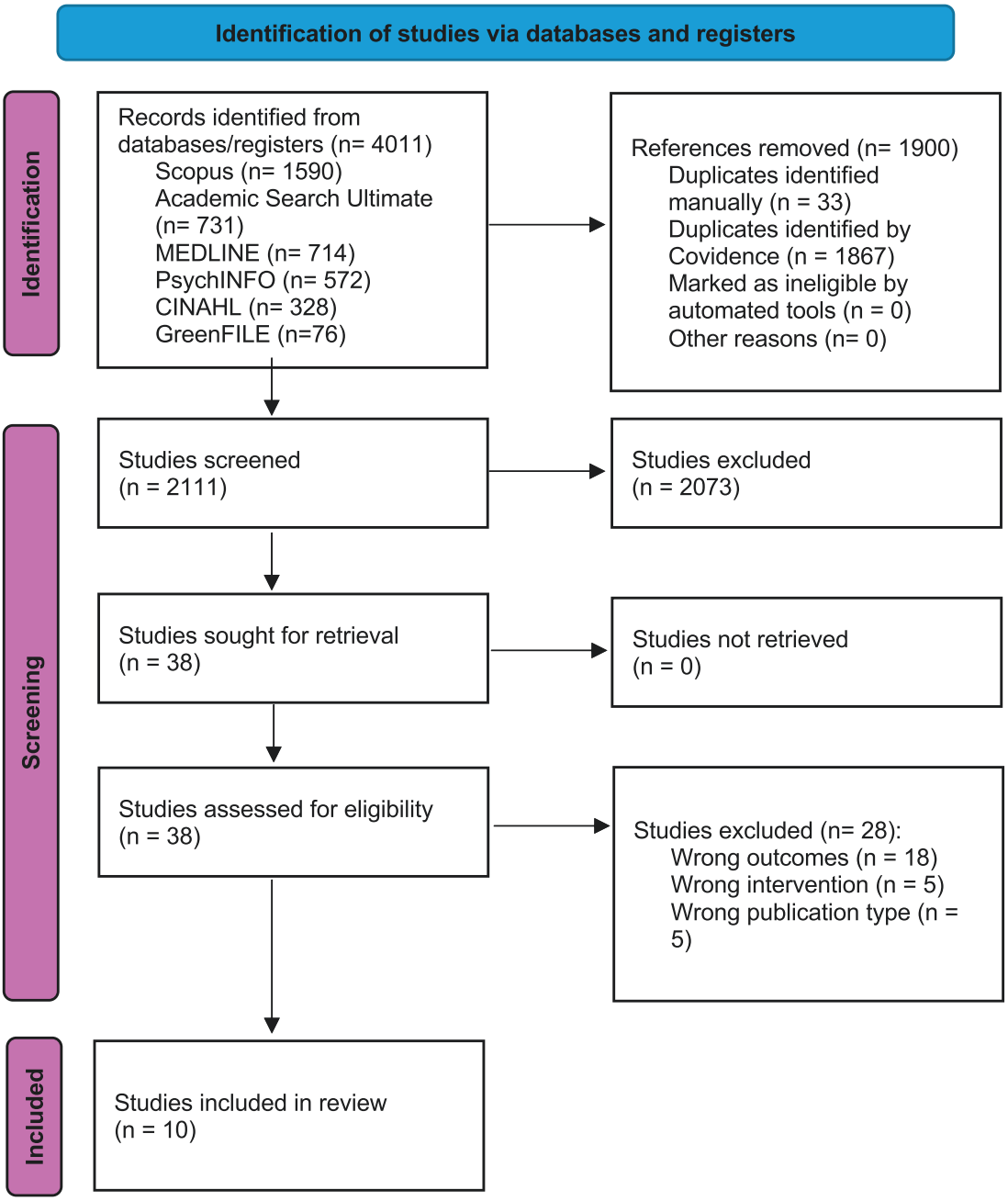

Figure 1. PRISMA flowchart.

Study characteristics and data collection

Ten studies were included in data extraction. Of the 10 studies, six studies in the review were completed in the USA (Christiana et al. 2017, James et al. 2017, Sefcik et al. 2019, Razani et al. 2020, Hollis et al. 2021, Tandon et al. 2022), one study was completed in the UK (Sands et al. 2023a, 2023b), one study was completed in Germany (Blosch et al. 2022), and one study was completed in Canada (Blais et al. 2022). Data collection methods included semi-structured interviews and focus groups ($n = 3$) (Christiana et al. 2017, Blais et al. 2022, Tandon et al. 2022), surveys and questionnaires ($n = 2$) (James et al. 2017, Blosch et al. 2022), mixed methods ($n = 3$) (Sefcik et al. 2019, Hollis et al. 2021, Sands et al. 2023a, 2023b), and one study conducted a secondary data analysis of pooled data from a clinical trial (Razani et al. 2020). See Table 1 for further study characteristics of the included studies.

Thematic analysis

Table 2 provides more detailed information on specific barriers and facilitators according to the following population categories: (i) participants, including children, youth, and caregivers, and (2) providers of nature prescriptions.

Findings

Three themes were developed across the included studies. Table 3 names and defines each theme, which is discussed further in detail below.

Table 1. Characteristics of the included studies (n = 10)

Author, year of publication, and location of study	Aim of study	Description of intervention	Description of prescription or referral process for intervention	Sample description (age of participants in intervention and/or population relevant to children and youth being studied)	Method of data collection
Blais et al. 2022, Canada	To explore perspectives of an integrated camp (local, safe summer camp consisting of outdoor camp activities) for children with heart disease and their parents.	Cardiology-approved integrated camp week at local YMCA summer day camp ("Camp Otonabee" with patients ages 4–13 years old).	Advertised through in-clinic flyers and parent groups, families, cardiologist would review each child's medical chart and provide feedback to camp staff.	Children (n = 9; 3 girls and 6 boys) and Parents (n = 10).	Perspectives of children and families were collected via semi-structured interviews.
Blosch et al. 2022, Germany	To describe and evaluate the concept of an outdoor exercise program for childhood, adolescent, and young adult cancer survivors.	Outdoor exercise program (NOAK program).	Patients were recruited by clinical exercise physiologists and pediatricians during treatment or at follow-up appointments in the outpatient hospital.	Exercise program: (n = 26; 14.6 ± 5.5 years, gender = 14 male, 12 female). Survey: (n = 21; 8–12, 13–17, and over 18 years old).	A self-developed questionnaire based on previous qualitative research to determine satisfaction with the exercise interventions and to evaluate motivations and barriers to participation in [outdoor] sports.
Christiana et al. 2017, USA	To explore Healthcare Providers' (HCPs,) perspectives on an outdoor physical activity prescription program for children and implementation barriers.	No Intervention.	Not applicable.	Health providers (n = 15).	Semi-structured qualitative interviews with children's HCPs.
Hollis et al. 2021, USA	To investigate how a therapeutic modality [intervention], focused on gardening and plant-based activities affects self-esteem, wellness, and resilience.	3-week after-school virtual horticultural therapy program (two 15-week segments).	Purposeful sampling to identify at-risk fourth graders who might benefit from the intervention	At-risk students in the fourth grade (n = 10).	Quantitative questionnaire: the Rosenberg Self-Esteem Scale (RSE); the Briefness Resilience Scale (BRS); the Scale of Positive and Negative Experiences (SPANE). Qualitative: behavioral observations, participant journals.
James et al. 2017, USA	To describe the design and implementation of Outdoors Rx and evaluate feedback from participating pediatricians regarding the utility of Outdoors Rx, barriers to success, and suggestions for improvement.	The Outdoors Rx program organizes weekly guided outdoor activities for children and their families free of charge.	Children are referred to the Outdoors Rx program with a prescription from their physician	Pediatricians (n = 23).	A self-administered survey including a combination of Likert-type scale and open-ended questions.
Razani et al. 2020, USA	To assess—at the family level—relationships between visiting parks (prior to receiving a park prescription) and socio-demographic barriers to park use, park location information attitudes that favor park use and affinity for families who visit parks following uptake of a parks prescription.	Families were randomized into two groups: a supported group was invited to three organized group outings to parks, and the other group was free to visit parks on their own.	Pediatrician provided families with a park prescription.	Patients (children ages 4–17) and one parent (total n = 87 families).	Secondary data analysis of pooled data from a clinical trial that prescribed park visits to children and their caregivers in a low-income, urban setting.

Table 1. Continued

Author, year of publication, and location of study	Aim of study	Description of intervention	Description of prescription or referral process for intervention	Sample description (age of participants in intervention and/or population relevant to children and youth being studied)	Method of data collection
Sands et al. 2023, UK	To provide insight into the availability of nature-based group activities and whether these may be suitable for green prescribing interventions to promote mental health and well-being in young pregnant women.	No intervention.	Not applicable.	Focus group: (n = 11, women 22–25 years); mapping exercise (n = 76) and providers.	Mapping Survey of Nature-based Activities and focus groups with women aged 16–25 years and focus groups with providers of nature-based activities.
Sands et al., a 2023, UK	Ibid	Ibid	Ibid	Ibid	Ibid
Sefcik et al. 2019, UK	To assess guardians and caregivers of children's attitudes towards nature and use of green space in low-resource urban areas. A secondary aim is to describe perceptions of physician-initiated nature prescriptions that target local pediatric populations.	No intervention.	Not applicable.	Guardians and caretakers of children (n = 42).	Focus group discussions, alongside geographic information on each participant, obtained through a brief prefocus group survey.
Tandon et al. 2022, USA	To understand barriers to children's active play in nature, before and during the COVID-19 pandemic, and how health care providers could promote Active Play in Nature.	No intervention.	Not applicable.	Pediatric health care providers and parents of children ages 3–10 (n = 28).	Focus groups with pediatric healthcare providers, individual interviews with parents.

[a]This secondary publication from a mixed-methods study by Sands et al. (2023b) reports additional findings to those reported in the initial publication (Sands et al. 2023a).

Safety considerations

Safety considerations include factors that relate to perceived feelings of security, protection, and stability, both in terms of physical safety and risk perception.

Six studies cited barriers to child and family participation due to safety concerns and related dislike of nature spaces (Christiana et al. 2017, James et al. 2017, Sefcik et al. 2019, Blais et al. 2022, Blosch et al. 2022, Sands et al. 2023a). Safety concerns included unsafe parks (Sefcik et al. 2019, Tandon et al. 2022), unsafe neighborhood spaces (Christiana et al. 2017), negative health outcomes (Christiana *et al.* 2017, Blais et al. 2022), and health-related safety challenges to participation (Blosch et al. 2022). Specific examples of health-related challenges include participant vulnerability, especially in the event of an emergency at an outdoor camp (Blais et al. 2022), participants living with conditions like asthma, obesity, and mental illness (Christiana et al. 2017), participants with poor physical ability (Blosch et al. 2022), and general unsafety of program activities for participants (Sands et al. 2023a). Moreover, Sefcik and colleagues (2019) found that poor physical conditions of outdoor nature spaces and concerns over dangerous activities and crime at local parks were barriers to participation.

On the contrary, one study cited positive features that facilitated feelings of safety. One study cited favorable features that met family safety needs, such as gates to provide child safety and autism-friendly parks were facilitators to involvement (Sefcik et al. 2019).

Materials, resources, and support

Materials, resources, and support include factors such as transportation, financial support, equitable opportunities, knowledge transfer, time, and prescribing materials. Six studies cited inadequate resources, materials, and support as barriers to participation (Christiana et al. 2017, Razani et al. 2020, Hollis et al. 2021, Tandon et al. 2022, Sands et al. 2023a), and seven studies cited facilitators related to sufficient materials and support (Christiana et al. 2017, James et al. 2017, Razani et al. 2020, Hollis et al. 2021, Blais et al. 2022, Tandon et al. 2022, Sands et al. 2023a).

Materials. For providers, the lack of adequate materials was reported as a barrier (James et al. 2017, Tandon et al. 2022), including running out of materials (James et al. 2017) and limited up-to-date, and culturally and developmentally appropriate materials (Tandon et al. 2022). For participants in a virtually delivered nature program, poor internet connection limited some participant access, which had a negative impact on child participation (Hollis et al. 2021). Materials, such as maps and smartphone applications, were indicated to support healthcare providers' ability to conduct

Table 2. Population specific barriers and facilitators, organized by author, year

Author, Year	Participants (Yes/No)	Barriers	Facilitators	Providers (Yes/No)	Barriers	Facilitators	Themes		
							Safety considerations	Materials, resources, support	Program features
Blais et al. 2022	Yes	Safety concerns related to parks and neighborhoods.	The support of the health-care team, feelings of accommodation from the staff, individualized intervention activities, encouragement for self-advocacy.	No	Not applicable.	Not applicable.	X	X	X
Blosch et al. 2022	Yes	Poor physical ability.	Improved personal physical activity, bringing a "buddy," trying something new.	No	Not applicable.	Not applicable.	X		X
Christiana et al. 2017	Yes	Barriers related to health, safety concerns related to parks and neighborhoods, patient and family time constraints, low socioeconomic status providers acting as role-models.	Providers acting as role-models.	Yes	HCP time constraints.	Providing adequate resources (maps and smartphone applications), knowledge of low-to-no cost opportunities, individualized consultation conversations based on the needs of the child and family (i.e. Pre-prescription programs), integrating patient resources and patient accessibility as part of the conversation.	X	X	
Hollis et al. 2021	Yes	Poor internet connection, sporadic attendance.	Parental buy-in and involvement.	Yes	Not applicable.	Including elements of excitement and anticipation for participants, participant check-ins.		X	X
James et al. 2017	Yes	Patient and family time constraints, lack of transportation.	Fun, free, local, potential for weight loss.	Yes	Healthcare provider time constraints, running out of materials, forgetting to prescribe, uncertainty whether families and patients fulfilled the prescription.	Suggestions to improve patient and provider outreach, at-risk populations/populations in need, streamlined prescription process.		X	X
Razani et al. 2020	Yes	Financial concerns.	Increased attitudes, perceived access, and knowledge of park locations.	No	Not applicable.	Not applicable.		X	

Table 2. Continued

Author, Year	Participants (Yes/No)	Barriers	Facilitators	Providers (Yes/No)	Barriers	Facilitators	Themes		
							Safety considerations	Materials, resources, support	Program features
Sands et al. 2023	Yes	Safety concerns, anxieties about attending and using public transportation, non-tailored and unsafe program activities.	Communication of the potential mental health benefits from being in nature, appropriate facilities, accessibility of referrals, funding, and risk assessment, opportunity for socialization, appealing activities, availability of transportation.	Yes	Lack of availability and funding of transportation when providing nature-based activities.	Suggestion to recruit women for future research and interventions through midwives, health visitors, family nurses, and social media (particularly Facebook).	X	X	X
Sands et al. 2023	Yes	Not applicable.	Setting up a WhatsApp group for participants to connect prior to sessions starting	Yes	Not applicable.	Providing high-quality information to reduce participant anxieties			X
Sefcik et al. 2019	Yes	Safety concerns related to parks and neighborhoods, poor outdoor and physical conditions of nature spaces, financial concerns, health concerns.	Local outdoor spaces that were clean, well maintained, and safe, features that would be desirable in local green spaces, education-based outdoor activities, provider resources (list of parks).	No	Not applicable.	Not applicable.	X		X
Tandon et al. 2022	Yes	Lack of patient and family resources, lack of knowledge, pandemic-related barriers.	Nonjudgmental and individualized consultations.	Yes	Lack of individualized consultation conversations, lack of developmentally and culturally relevant resources, HCP burnout, appropriate outdoor gear could be prohibitively expensive for some.	Not applicable.	X	X	X

Table 3. Themes and associated definitions

Theme	Definition
Safety Considerations	Perceived feelings of security, protection, and stability, both in terms of physical safety and risk perception.
Materials, Resources, and Support	Resources, including insufficient transportation, financial support, equitable opportunities, materials, such as prescribing materials, and support, including parental and provider buy-in, and knowledge transfer, that either hinder or facilitate engagement, participation, and implementation of nature prescriptions.
Program Features	Positive and/or negative features, including environmental (physical environment of neighborhoods, parks, nature spaces, etc.), and program (activities, participant-perceived engagement opportunities) of nature prescription programs.

prescribing conversations with families (Christiana et al. 2017).

Resources. Time: Four studies cited time constraints as general barriers to participation (Christiana et al. 2017, James et al. 2017, Blosch et al. 2022, Tandon et al. 2022). For participants and families, the burden of school, studies, and work (Blosch et al. 2022), and caregiver responsibilities (Tandon et al. 2022) were described as negatively impacting participation. In particular, daily school schedules and caregiver work schedules may make it difficult to provide opportunities for spending time outdoors (Christiana et al. 2017). If nature spaces are far from participants, allowing time for transportation and play may be dependent on the schedule of the caregiver (Tandon et al. 2022). Moreover, time demands placed on healthcare providers may prevent individualized consultation conversations (Christiana et al. 2017), prescribing may take away from other family concerns during an appointment (Tandon et al. 2022), and providers may forget to prescribe (James et al. 2017). Provider burnout was also cited as a limiting factor, and prescribing nature adequately may not be considered appropriate when appointments are significantly restricted by time (Tandon et al. 2022). Healthcare providers in one study suggested that if there was more time during consultations, they would initiate more conversations about outdoor physical activity (Christiana et al. 2017), and would facilitate nature-based consultation conversations.

Accessibility: In one study, for participants and their families, socioeconomic status was described as directly shaping children's access and ability to participate, with barriers including lack of access to natural areas, limited funds to support participation and access to equipment, and patient or family readiness as limiting factors to participation in programs (Christiana et al. 2017). Financial concerns may limit participant access to adequate nature spaces. For example, a lack of participant willingness to use financial resources, such as gas (Sefcik et al. 2019), to participate in nature-based interventions, and financial hardship could prevent travel to adequate nature spaces (Sefcik et al. 2019, Tandon et al. 2022). Lack of financial accessibility may therefore limit participant access to adequate nature spaces, and it was cited in one study that healthcare providers needed to know of the low-to-no-cost opportunities in relation to where their patients live (Christiana et al. 2017). Moreover, it was suggested that accessibility via public transport may be a enabling factor and resource to participation (Sands et al. 2023a).

Support. Support includes factors that affect social participation, such as knowledge transfer, consultation conversations, and buy-in from both parents and caregivers, and providers.

Increased knowledge of the potential health benefits from engaging with nature (Sands et al. 2023a) and increased knowledge, attitudes, and perceived access were facilitators for participants (Razani et al. 2020). Parental buy-in was cited in one study to have a direct impact on participation (Hollis et al. 2021), and the support of the healthcare team was reported as a reason for program enrollment (Blais et al. 2022).

Individualized consultations between providers, families, and participants were cited in some studies (Christiana et al. 2017, Tandon et al. 2022), where one study specifically noted parents preferred when healthcare providers were mindful of family circumstances (Tandon et al. 2022). One study reported the importance of tailoring to the families' needs and collaboratively addressing any barriers to participation, where healthcare prescribers utilized their personal experiences and presented as an active role model for families during consultations (Christiana et al. 2017). Some healthcare providers also had procedures for following up with patient progress as a method for ensuring goals were met (Christiana et al. 2017). In another study, pediatricians suggested improved outreach between the provider and nature-based intervention to combat uncertainties about participant engagement (James et al. 2017); however, this could also be resolved through integrated patient progress procedures (Christiana et al. 2017). Moreover, healthcare providers in one study suggested that if there was more time during consultations, they would initiate more conversations about outdoor physical activity (Christiana et al. 2017).

Program features

Environmental features. Some studies reported various hindrances and facilitators to program participation related to the environmental features of the program. One study specifically cited that some participants felt that their unsafe and unmaintained neighborhoods spoke to economic and racial biases in city resource allocation and were a barrier to time spent in nature (Sefcik et al. 2019). Poor physical conditions of outdoor nature spaces and concerns over dangerous activities and crime at local parks were barriers to participation, including the presence of drugs, paraphernalia, trash, the parks being unmaintained, and illegal activities as deterring factors to being in some outdoor nature spaces (Sefcik et al. 2019). On the contrary, favorable features that met family needs, such as gates to provide child safety and autism-friendly parks, were facilitators to involvement (Sefcik et al. 2019). Participants also expressed a desires for outdoor spaces that were well maintained, safe, and clean, with police patrol and video surveillance (Sefcik et al. 2019), aligning with the lack of safety that was expressed as a barrier. From a provider perspective, one study reported that providers perceived conversations about active play in nature to be more beneficial in the winter months (Tandon et al. 2022), which may facilitate willingness to prescribe.

Activity features. Studies mentioned facilitating factors that related to favorable program activities that enticed participant engagement. Favorable program activities included sending garden boxes in a virtual program by mail, which

promoted a sense of participant excitement (Hollis et al. 2021), and fun, free, and local programming (James et al. 2017), playgrounds and jungle gyms (Sefcik et al. 2019), and outdoor pools (Sefcik et al. 2019), walking, yoga, gardening, meditation, outdoor cooking, music, arts and crafts (Sands et al. 2023a) were cited as appealing and motivating factors to participation. Setting up a WhatsApp group to allow participants to connect prior to the first session was a suggestion to combat participation anxieties (Sands et al. 2023b). Moreover, engaging in an activity was also mentioned to help remove some social pressures associated with meeting new people (Sands et al. 2023a), where group-based nature activities provided an opportunity to make new friends (Sands et al. 2023b). Participant-perceived personal benefits from engaging included opportunities for socialization (Sands et al. 2023a), trying a new sport (Blosch et al. 2022), bringing a friend (Blosch et al. 2022, Sands et al. 2023a), feelings of accommodation and self-advocacy (Blais et al. 2022), and potential for weight loss (James et al. 2017). One study also cited that providers were more likely to prescribe the program to overweight or obese children (James et al. 2017).

DISCUSSION

The purpose of this scoping review was to explore and document what is currently known about the barriers and facilitators to nature prescription programs for child and youth health and address the research objectives of (i) to explore the barriers and facilitators to the delivery of nature prescription programs to children and youth, (ii) to explore the barriers and facilitators to child and youth participation in nature prescription programs, and (iii) to explore the barriers and facilitators to provider participation in nature prescription programs. This study reviews and documents the barriers and facilitators impacting participation and engagement in nature prescription programs for children and youth. Most barriers reported were related to the lack of availability of adequate resources, non-equitable opportunities to engagement, safety concerns, and inadequate prescribing materials and support. Facilitators in this review were wide-ranging, including sufficient support from caregivers and healthcare providers, safe and enjoyable nature spaces and program activities, participant knowledge, and tailoring of nature prescriptions to accommodate for socioeconomic status, location, and access.

A central finding in this scoping review was that time demands placed on healthcare providers serve as an implementation barrier to nature prescriptions for children and youth. Specifically, time constraints limited provider's ability to individualize care, provide tailored prescriptions to their patients and families, and cover all important topics of conversation in consultations. Similar to the findings of Pescheny and colleagues (2018), patient engagement was a major barrier to the implementation and delivery of SP services, including factors such as difficulty for general practitioners to explain SP in consultation with patients, money issues, and transportation issues to the prescribed services.

Although Pescheny and colleagues (2018) provided similar findings for SP to those in this review, nature prescription programs are still unique from SP and require tailored implementation strategies. For example, co-production was another overarching theme between SP (Aranki *et al.* 2022) and nature prescribing, where initiatives should involve collaboration between prescribers and end-users in the design of the 'solution', whether being SP or nature prescription. Specifically noted in this review, tailoring nature prescriptions to the families' needs and collaboratively addressing any barriers to participation is essential to nature prescribing (Christiana *et al.* 2017). These specific barriers vary from SP, such as safety concerns related to nature spaces, challenges related to equitable accessibility to nature spaces, and knowledge translation of the health benefits from engaging with nature.

Central to the nature of prescription barriers and facilitators in this review is the issue of equity. Without adequate financial means or transportation, accessing safe green spaces to participate in nature prescription programs may be difficult, exacerbating issues of health inequity. This review highlights several barriers, including safety concerns, poor quality of nature spaces, and insufficient access were factors that hindered participation, which may be reflective of broader social inequities. Socioeconomic status further illuminates these issues and may hinder participation due to limited financial resources when acquiring transportation, equipment, and appropriate attire, particularly in the winter months. These findings corroborate those of Pescheny and colleagues (2018), where financial issues and transportation were barriers to patient engagement. Similarly, a review conducted to investigate tourism as a tool to contribute to nature-based mental health care, found that money for access and transportation were barriers to accessing urban green space for some populations (Buckley and Cooper 2022). These financial and accessibility issues can be mitigated by providers' integration and knowledge of equitable opportunities. A facilitator cited in this review indicated that healthcare, social care, or education providers of nature prescriptions should have knowledge of low-to-no-cost opportunities in their local community, which may combat challenges related to transportation and financial concerns. Moreover, concerns for safety, crime, and dangerous activities in nature spaces may prevent family access and willingness to engage in a nature prescription. Other intersecting forms of marginalization, including ability, health status, gender, racism, and related safety and security bear further consideration. Nature prescription programs should therefore integrate considerations of equity, including offering equitable opportunities in local community and utilize appropriate approaches that consider environmental and socio-ecological factors.

The findings presented in this review outline key barriers and facilitators influencing the implementation of nature prescription programs for children and youth and can be used to guide the implementation of future programs. Providers and programmers can utilize these findings to help guide the development of implementation strategies to support participants, caregivers, and families with accessibility to and easy participation in nature prescription programs. Considering this scoping review is exploratory in nature, it produced a synthesis of the evolving body of literature of nature prescribing and may be useful in identifying areas for future research (Peters *et al.* 2020). Future reviews, such as systematic reviews, should consider the quality of the included studies using critical appraisal tools to further validate these findings.

LIMITATIONS

The findings presented in this scoping review must be considered within the context of study limitations. We did not

conduct a methodological quality assessment of the included studies using a critical appraisal tool due to the methodology chosen for this review. Considering this is a drawback in this review, future reviews, if feasible and appropriate to the research question, should assess the quality of evidence presented in this paper.

Across all included studies, the authors did not provide a definition of their intervention in relation to nature prescription programs. Similarly, Kondo and colleagues (2020) also identified that there is no established definition of natural prescription programs exists. Although this allowed for flexibility and inclusivity of findings in this review, nature prescription programs are still left to interpretation, which may lead to issues of inconsistency across studies. The barriers and facilitators reported in the included studies were not investigated with a specific equity lens (e.g. socioeconomic, gender, race, and ability-based frameworks), which may make it difficult to appropriately interpret various inequities across populations. Moreover, the majority of studies (~ 66%) included in this review were based in the USA. Therefore, this review may lack country-specific findings of nature prescription programs. Future research should investigate the nature of prescription programs on a global and equity scale, and explore experiences, perspectives, and implementation strategies in multiple countries and contexts to inform tailored intervention design and implementation.

CONCLUSION

Nature prescription programs have the potential to positively impact health outcomes for children and youth. However, in order to reach potential beneficiaries, it is important to take into consideration reported barriers and facilitators to implementation. This review reports barriers and facilitators that influence the implementation of nature prescription programs in practice, including availability and allocation of resources and support, safety concerns, and considerations of equity and socioeconomic status. Factors influencing implementation outcomes are multifaceted, and it is necessary to analyze findings from participant, parent, and caregiver, and provider perspectives to improve the current nature of prescription programs and to guide future implementation. To fully support the implementation of nature prescription programs, future research should further explore facilitators and barriers to support equitable participation of children and youth inclusive of varying socioeconomic and geographic realities. As nature prescription programs grow in practice, defined parameters of what the programs typically entail, and clearer descriptions of program deliverables should also be explored to ensure consistency of future research. The results of this review can be used to guide future program implementation strategies to support child and youth health.

Supplementary data

Supplementary data is available at *Health Promotion International* online.

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Author contributions

Conceptualization (S.P., N.S., A.G., and L.G.); methodology (S.P., N.S., A.G., and L.G.); data curation (S.P. and N.S.); formal analysis (S.P., N.S., and L.G.); writing- original draft (S.P.), writing- review and editing (S.P., N.S., A.G., and L.G.). All authors have contributed in relation to the ICJME Guidelines.

Conflict of interest

None declared.

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Data availability

The data underlying this article will be shared on reasonable request to the corresponding author.

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