



# Promoting Sustainable Well-Being Through Nature-Based Interventions for Young People in Precarious Situations: Implications for Social work. A Systematic Review

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## Abstract

Precarious situations disproportionately affect the well-being of young people. Social workers are concerned with sustainable ways to improve young people's well-being, and nature-based interventions are proposed as sustainable solutions. We used a systematic review approach to identify how nature-based interventions can promote sustainable well-being. A literature search generated 1753 results, from which 49 peer-reviewed articles were selected for analysis. Young people in precarious situations (i) had underlying social, emotional, and mental health needs that put them at risk of disengaging from education or employment and (ii) were not in education or employment. The most common intervention was wilderness therapy, followed by animal-assisted interventions, outdoor adventure interventions, horticultural interventions, care farming, environmental conservation, surfing therapy, and sustainable construction. The reviewed literature indicates that nature-based interventions promote sustainable well-being by (i) ensuring that well-being was interconnected with environmental, social, and economic sustainability, (ii) fostering connectedness with nature, and (iii) producing enduring outcomes. We further used the Having-Doing-Loving-Being model of sustainable well-being to interpret well-being outcomes, concluding that nature-based interventions enhance young people's relationship with society and nature. Implications for social work include collaborating with other experts to implement nature-based interventions to address well-being problems, advocacy for the introduction of nature-based activities into schools and recognition of nature-based interventions as alternative avenues for meaningful participation.

**Keywords** Nature-based interventions · Young people · Precarious situations · Social work · Sustainable well-being

## 1 Introduction

Young people facing the transition to adulthood and a school-to-work transition are in a particularly vulnerable phase of life with many uncertainties. Moreover, these critical transitions have become more prolonged, de-standardized and precarious in nature, thereby drawing the attention of social policymakers and social workers. There is an

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increasing number of young people in precarious situations without access to the labor market, facing job insecurity, not looking for work, or not participating in education or further training. A recent report indicated that the proportion of the world's youth (15–24 years) not engaged in either education, employment or training increased from 21.8% in 2015–2019 to 23.3% in 2020 (United Nations (UN), 2022).

In this study, young people in precarious situations refer to those facing uncertainties and insecurities about their participation in education, labor market, and the wider society. These young people are a heterogeneous group with significant risk factors such as health problems and/or disabilities, learning difficulties and/or special educational needs, emotional and/or behavioral problems, offending behavior, substance misuse, school resistance, academic underachievement, being looked after or homeless, being an asylum-seeker or refugee, and having parental and/or caring responsibilities (Yates & Payne, 2006, p. 337). Precarious situations are largely occasioned by the inefficiencies or lack of structural and institutional support to address the needs of young people (Unt et al., 2021). The structural factors include the spread of neoliberalism which emphasizes the centrality of markets and causes government deregulation of the market and decline of institutional protection (Broughton et al., 2016; Kalleberg, 2011). On top of these structural challenges, crises such as global recessions, the ongoing Russia–Ukraine war and the lingering Covid-19 pandemic have exacerbated precarious situations for young people (Organization for Economic Co-operation and Development (OECD), 2022). Precarious situations consequently affect young people's health and well-being and outlook on their lives and society and these consequences sometimes extend to their immediate families (Schlee et al., 2021; Vancea & Utzet, 2017). Available data from different countries shows that young people in precarious situations are more likely to experience symptoms of anxiety and depression and become withdrawn from society (OECD, 2016; Mokona et al., 2020; Wong et al., 2019). Social workers are concerned with improving the well-being of young people in precarious situations (Munford & Sanders, 2021; Sadler et al., 2015). To do this effectively, sustainable well-being solutions are recommended because precariousness among young people is a sustainability challenge interlinked with economic, social, and environmental factors. Nature-based interventions (NBIs) have been proposed as sustainable solutions to the health and well-being challenges faced in modern industrialized societies, especially for young people who society wants to be healthy and are expected to look after nature in the future (Bragg, 2014; Rabb, 2017). NBIs are defined as programs, activities, or strategies that utilize nature to improve people's health and well-being (Shanahan et al., 2019).

Previous review studies have explored NBIs for young people (e.g., Overbey et al., 2021, Roberts et al., 2020, Steigen et al., 2016). Overbey et al. (2021) found that wilderness therapy, animal-assisted interventions, care farming, and horticultural interventions promoted positive outcomes for young people. The study only focused on the therapeutic benefits from the interventions but paid little attention to the educational and social benefits for young people. Roberts et al. (2020) reported that young people experienced improvement in self-esteem and confidence, stress reduction and restoration, resilience, and social benefits after nature activities. However, they also found negative outcomes like sadness, disgust, anxiety, and anger following contact with nature. The literature review by Steigen et al. (2016) constitutes one of the few studies that explored NBIs and precariousness. The review was based on studies of green care services in the Nordic countries which focused on people who were out of work or school or with mental and/or drug-related problems. The results showed that green care fostered improvement in health and well-being, as well

as connections with nature. Moreover, the green care services provided alternative avenues for meaningful participation in society. However, this literature review focused on both young people and adults, making it difficult to draw specific implications for young people.

The foregoing shows that social work's mandate to promote young people's well-being will be better enhanced by integrating nature in its practice (Ungar et al., 2005). Notably, social workers have been long involved in NBIs for young people (Berman & Davis-Berman, 1989; Mishna et al., 2002). Although the theoretical justification for social work's application of NBIs is still developing, scholars have linked it to various concepts such as the person-in-environment perspective, which has been central in both classic social work and the emerging ecosocial work approach (Berman & Davis-Berman, 1989; Närhi & Matthies, 2016). Ecosocial work refers to the practice of social work that emphasizes the interdependence between the natural environment and human well-being (Närhi & Matthies, 2016).

Though there is no consensus on the definition of well-being it has been broadly conceptualized into hedonia and eudaimonia, which both address what is deemed to be "a good life or a life well-lived" (Huta & Waterman, 2014, p. 28). Having a good life or living well is related to the fulfillment of human needs, therefore we approached well-being from a need-based perspective (Gough, 2017; Helne & Hirvilammi, 2015). The well-being of young people in precarious situations hinges on their underlying social, emotional, and mental health needs (Hambidge, 2017) and the benefits associated with their participation in labor market, such as access to income, opportunities to engage in beneficial activities, opportunities to develop and utilize skills, social contacts, social participation, and identity (Roosmaa et al., 2021). Apart from the social and economic dimensions of their needs, young people are also critical about environmental sustainability needs in their work values (Helne, 2022; Hirvilammi et al., 2019). This means that to fully understand and respond to the well-being challenges of young people in precarious situations, we need a holistic conception of well-being, in this case sustainable well-being. Sustainable well-being incorporates not only human/social concerns but also environmental concerns in the pursuit of what is a good life or a life well-lived. It goes beyond material prosperity and adopts a relational worldview to emphasize the quality of human relationships in society and relationships with nature as key to satisfying needs and living a meaningful life (Hirvilammi & Helne, 2014; Rabb, 2017). Sustainable well-being has been conceptualized as having, doing, loving, and being (HDLB-Model), which was originally developed by Erik Allardt though without the 'doing' dimension (Helne & Hirvilammi, 2022; Hirvilammi & Helne, 2014). "Having" acknowledges that well-being is satisfied through ecosystem services but admonishes humans to live within boundary limits. Raworth (2012) explains that a safe and just space for humanity is where humans can satisfy their needs through earth's resources without exceeding the environmental ceiling. "Doing" captures the quality of human actions and encourages meaningful activities that do not harm nature or society. "Loving" emphasizes that well-being depends on the connective relations with oneself, society, nature, and even future generations. "Being" is the holistic state of physical and mental health, spiritual existence, and a meaningful life. The HDLB Model is also related to other normative frameworks like the capability approach developed by Amartya Sen, which addresses people's real freedoms to be and to do things and the well-being they derive from them. What distinguishes the HDLB Model is that it is more relational and places the environment as the basis of well-being and existence.

Despite the growing evidence base of NBIs, they have not been well explored within the scope of promoting sustainable well-being for young people in precarious situations. Also, the literature on precarious situations among young people tend to focus more on

those who are unemployed, in precarious employment or not in education (Kivijärvi et al., 2020; Vancea & Utzet, 2017), with little attention given to younger children who might be at risk of dropping out of school or becoming unemployed (Sadler et al., 2015). Hambidge (2017) is one of the few studies that assessed the benefits of nature interventions (care farming) for young people who were at risk of disengaging from education, employment, or training. Therefore, our review focuses on two categories of young people in precarious situations: (i) those who had underlying social, emotional, and mental health needs that put them at risk of disengaging from education or employment and (ii) those who were not in education or employment. This means that young people in our review comprises children, adolescents, and youth. Our review addresses the following research questions: (i) what NBIs have been applied for young people in precarious situations? (ii) what well-being impacts do the NBIs have for young people in precarious situations? and (iii) how do the NBIs promote sustainable well-being for young people in precarious situations? We then draw implications for social work practice with young people in precarious situations. We contend that our results will contribute to building resilient and sustainable societies in which young people can meaningfully participate in society, and in which nature is valued. The review is divided into three main parts. First, we describe the systematic review process and present results on the NBIs found. Second, we analyze the well-being impacts of the NBIs for young people and explain how sustainable well-being was promoted. Third, we apply the HDLB model to discuss sustainable well-being and draw implications for social work.

## 2 Methods

This study applied a systematic quantitative approach to survey the literature and select relevant studies for inclusion in a way that is explicit and reproducible (Pickering & Byrne, 2014). The approach was selected because it enabled us to quantify and assess the different NBIs, geographic locations, study designs, and outcomes in the selected studies. Moreover, this approach is suitable for transdisciplinary research, as it enabled us to review both qualitative and quantitative literature from multiple disciplines like social work, psychology, environmental, health, and education sciences (Petticrew, 2001; Pickering & Byrne, 2014).

### 2.1 Eligibility Criteria

Predefined eligibility criteria were set for the selection of studies. First, we only considered peer-reviewed scientific studies that were published in international English-language journals. We focused on English language journals because this enabled us to access more international literature. The drawback is that many good practical, local level studies published in different languages and not peer-reviewed are omitted in this way. Also, information on ‘failures’ or non-responses may be less frequently published in scientific journals, which may lead towards a bias of success stories. Second, studies were included if they assessed the impact of NBIs on young people’s well-being. In this study, NBIs refer to programs that used nature either alone or as the main intervention along with other approaches such as therapy, labor market activation, or social rehabilitation to promote well-being. We used NBIs interchangeably with “green care,” which is an umbrella term for NBIs (Sempik & Bragg, 2016). We only considered NBIs that happened within the natural environment or outdoors. The natural environment has elements such as water, air, soil, plants, or

animals and a range of collective habitats and ecosystems found in parks, gardens, farms, and the wilderness. Third, studies in which young people were the subjects of the intervention were included. Due to the varying age range of young people and without prejudice to the different geographic contexts represented in this review, we used young people broadly to represent children, adolescents, and youth. The UN Convention on the Rights of the Child (UNCRC, 1989) defines children as persons under 18 years old and the World Health Organization (WHO) defines adolescents as persons between 10–19 years (UN, n.d.). Youth are defined differently, such as, persons between 10–24 years (WHO), 15–24 years (UN), 15–29 years (OECD, 2016), and 15–35 years (African Youth Charter) (UN, n.d.). As seen in all definitions, the age range for children, adolescents, and youth overlaps. We also included studies that applied NBIs with young people without any known risks of precariousness to compare outcomes between those in precarious situations and those who are not.

Studies that did not assess the impact on well-being were excluded. We also excluded: studies that addressed general pedagogical nature contacts like farm kindergartens, forest schooling, and nature-based education, studies that reported on gardening and eating behaviors, studies that only reported on interventions that happened indoors, and studies that only addressed the physical benefits of everyday activities in outdoor spaces as they were not directly related to the purpose of our study.

## 2.2 Data Search Strategy

Previous studies on green care and NBIs were assessed to identify the key concepts and databases used in this research area (e.g., Boddy et al., 2021; Galardi et al., 2021; Harper, 2017). Afterward, a data search strategy was devised to extensively search literature from the following online bibliographic databases: EBSCOhost (PsycINFO, MEDLINE, CINAHL GREENFILE, and ERIC); Scopus; and Web of Science. A supplementary search was conducted by checking other sources like Google Scholar and the bibliography of the selected literature. Based on previous reviews and in line with our objectives we constructed the following search terms which are combined with Boolean operator ‘OR’ and ‘AND’: (“young people” OR youth OR adolescen\* OR teen\* OR child\*) AND (wellbeing OR well-being OR “well being” OR impact) AND (“green care” OR “ecotherap\*” OR nature-based\* OR “natural environment” OR animal-assisted OR “care farm\*” OR horticultur\* OR wilderness) AND (intervention\* OR therap\* OR solution\* OR activit\*). The search terms follow the SPIDER (Sample, Phenomenon of Interest, Design, Evaluation, and Research) tool but without terms for the research type because we did not intend to limit our search to any specific research design (Methley et al., 2014). Also, we did not search for specific nature activities, such as hiking and swimming, because such a list is non-exhaustive. Rather, we used broader search terms to be able to retrieve as many and diverse nature activities.

## 2.3 Data Collection Process

The literature search generated 1,753 records, including records identified from other sources (see Fig. 1). The records were exported into the Zotero (version 5.0.89) reference manager to remove duplicates and screen for relevant studies. After removing duplicates and screening the titles and abstracts, we retrieved 174 publications for full screening which involved reading the full text publication to check for inclusion based on our eligibility criteria. We excluded studies that were not NBIs, did not assess impact

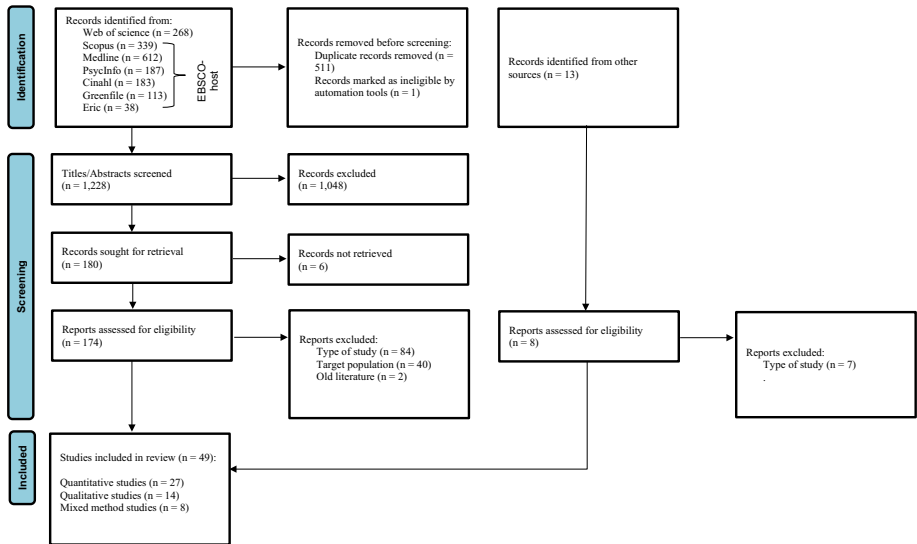


Fig. 1 PRISMA flow diagram PRISMA (<http://prisma-statement.org>)

on well-being, did not focus on our target population, or were published before year 2000. Finally, 49 publications were selected and transferred into a Microsoft Excel spreadsheet for data categorization (see Table 1). The key categories assessed from the publications included: year of publication; study participants; main results; study's geographical location; study methods; duration of intervention; and well-being outcomes. The included publications were published between 2000 and 2021.

### 3 Results

All 49 publications selected for the review were peer-reviewed empirical studies published in English-language journals. The publications assessed the impact of NBIs on the well-being of young people.

#### 3.1 Study Characteristics

##### 3.1.1 Geographic Location

Most of the studies (18) were conducted in the United States of America (USA), followed by the United Kingdom (UK), Australia, Norway, Spain, and South Africa. The rest of the countries recorded one study each: Botswana, Canada, the Czech Republic, Denmark, Hungary, Italy, the Netherlands, and South Korea (see Fig. 2). One study was conducted at 16 different sites in both the UK and South Africa (Barton et al., 2016).

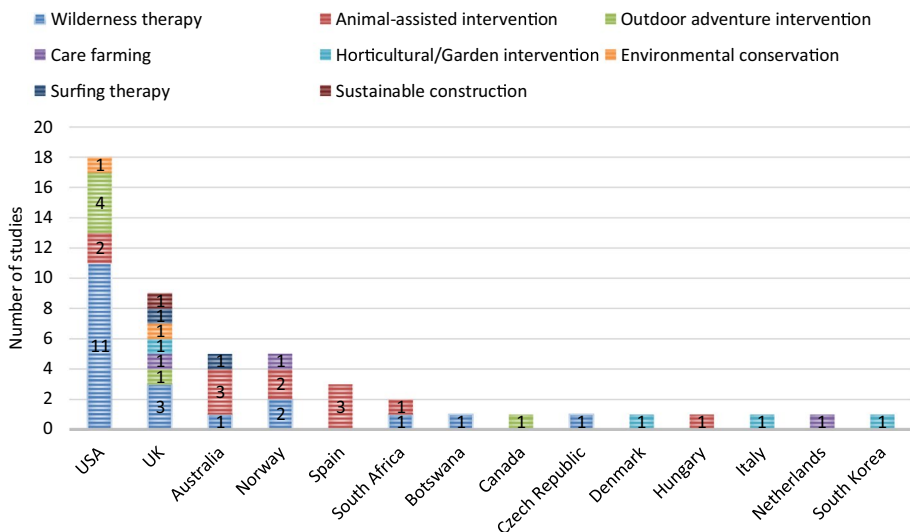


Fig. 2 Representation of NBIs in the reviewed studies

### 3.1.2 Nature-Based Interventions (NBIs)

Different NBIs were identified, but they all had a natural element. The common interventions were (i) wilderness/forest therapy with expeditions into remote forest/wilderness/woodlands, (ii) animal-assisted intervention (AAI) with observation and care for animals, (iii) outdoor adventure intervention (OAI) with challenging outdoor activities, (iv) horticultural/garden intervention with planting and caring for plants, (v) care farming with the use of agricultural landscapes and farming practices to promote well-being, (vi) environmental conservation with the preservation, management, and protection of natural places, (vii) surfing therapy with surfing in waterbodies, and (viii) sustainable construction with the use of environmentally responsible methods in construction works.

We realized that the activities within the interventions overlapped. For example, wilderness therapy and OAI utilized similar activities like adventure, camping, and hiking (e.g., Johnson et al., 2020). Care farming also involved animal-assisted and horticultural activities (Kogstad et al., 2014; Leck et al., 2015). Horticultural/garden activities overlapped with environmental conservation (Nabhan et al., 2020).

### 3.1.3 Participants

Participants refer to the young people who participated in the NBIs. Thirty-nine (39) studies involved only children and adolescents (aged 6–19 years) and 10 studies involved youth (aged 13–31 years). Two main categories of young people in precarious situations constituted the target of our analysis: (i) those who had underlying social, emotional, and mental health needs that put them at risk of disengaging from education or employment and (ii) those who were not in education or employment.

The participants at risk of disengaging from education or employment were mainly children and adolescents. Their underlying risks included family-related problems such

**Table 1** Key categories of studies

Author(s)	Participants	Age	Country	Study design	Intervention	Well-being outcomes
<i>Wilderness/forest therapy</i>						
Children and adolescents						
Bettmann et al. (2013)	n = 41 adolescents with behavioral problems	15–8 years (Mean)	USA	Time series: pre-, post-test and follow-up	8 weeks wilderness treatment	Improved mental health and behavioral symptoms
Caulkins et al. (2006)	n = 6 troubled adolescent females	15–16 years	USA	Qualitative case study	6–12 weeks wilderness backpacking (5–10 h/day)	Increased self and social competences and increased awareness
DeMille et al. (2018)	n = 120 adolescents with behavioral problems	12–17 years	USA	Quasi-experimental: pre-, post-test and follow-up with control	Continuous trekking for 80 and half days	Improved mental health symptoms
Fernee et al. (2019)	n = 14 adolescents with mental health problems	16–18 years	Norway	Critical realist exploratory study	10-week Friluftsterapi (8 single-day sessions and 2 overnight trips)	Improved mental health, abilities and supportive relationships
Gabrielsen et al. (2019)	n = 32 adolescents with mental health problems	16–18 years	Norway	Quasi-experimental and qualitative interviews. Pre-, post-test and follow-up	8–10 weeks Friluftsliv (8 single-days and 2 overnight trips)	Improved mental and emotional well-being. Reengaging in school or work, reconnecting with family
Johnson et al. (2020)	n = 816 adolescents with mental health and behavioral problems	13–17 years	USA	Experimental: pre-, post-test and follow-up	80-days (10–12 weeks) trekking and adventure activities, and psychotherapies	Improved psychophysiological functioning and family relationship
Katisi et al. (2019)	n = 650 children who have been orphaned	11–17 years	Botswana	Quasi-experimental: pre- and post-test	2-week traditional nature activities in 7 forest camps	Improved resilience, reduced grief, improved future aspirations



**Table 1** (continued)

Author(s)	Participants	Age	Country	Study design	Intervention	Well-being outcomes
Liermann and Norton (2016)	n = 9 struggling teens	14–17 years	USA	Phenomenological design: pre-, post-test and follow-up	28-day adventure activities in the wilderness	Improved family relationship and camaraderie with other teens
Norton et al. (2014)	n = 55 youth at risk	14–19 years	USA	Non-experimental and qualitative interviews	25–30 days (2–3 day solo) wilderness orientation program	Improved sense of purpose, identity complexity and developing vocational goals
Macháčková et al. (2021)	n = 68 adolescents with family-related problems	12–16 years	Czech Republic	Focus group interviews and experimental design with control	16 forest therapies (2 h each, twice per/week in 2-months)	Improved mental health and emotional symptoms, and learning prosocial behaviors
Russell (2003)	n = 523 adolescents with mental health and behavioral problems	13–19 years	USA	One-group repeated measures: pre-, post-test and follow-up	Average of 45 days in 7 outdoor behavioral health programs	Reduced client symptoms
Russell and Walsh (2011)	n = 43 young offender	14–17 years	USA	Quasi-experimental with control: pre-, post-test and follow-up	1-year wilderness adventure program	Improvement in self-efficacy and hope
Youth Paquette and Vitaro (2014)	n = 220 young offenders	16–30 years	UK	Experimental design: pre- and post-tests	10 days or 20 days wilderness expedition	Improved social skills and accomplishment motivation. Improved school attendance and employability

Table 1 (continued)

Author(s)	Participants	Age	Country	Study design	Intervention	Well-being outcomes
Pryor et al. (2006)	n = 7 young women not in school or employment	17–24 years	Australia	Exploratory case study	12-day wilderness journey that involved backpacking, camping	Improved sense of self, belongingness, and rediscovery of interest in study/training
Russell (2005)	n = 47 youth with mental health and behavioral disorders	18–20 years	USA	Qualitative case study, 24 months follow-up	Average of 45 days in 7 outdoor behavioral health programs	Improved school outcomes, acquiring jobs, and improved social relations
Control studies						
Barton et al. (2016)	n = 130 adolescents	11–18 years	South Africa and Scotland, UK	Quantitative pre- and post-test	Wilderness expeditions for 5–11 days	Improved self-esteem and increase in connectedness to nature
Frey and Parent (2019)	n = 258 young campers	16–18 years	USA	Quantitative pre- and post-test	5-day co-ed nature camping (3–4 h)	Increase in perceived leadership skills
Milligan and Bingley (2007)	n = 16 young people	16–21 years	UK	Qualitative pre- and post-test follow-up	Woodland activities and two 1-day workshop	Developed confidence, independence, inner strength, relaxation, relieving stress
Warber et al. (2015)	n = 36 campers and staff	18–31 years	USA	Mixed method: pre- and post-test and interviews	4-week nature camping	Improved holistic well-being
<i>Animal-assisted intervention</i>						
Children and adolescents						
Atherton et al. (2020)	n = 10 adolescents with substance use problems	11–17 years	USA	Quasi experimental: pre- and post-test	6-week (1.5-hour per session) equine facilitated psychotherapy	Improved behavior and reduced mental health symptoms
Balluerka et al. (2015)	n = 63 young people with mental health problems	12–17 years	Spain	Quantitative pre- and post-test with control	12-week (34 sessions) animal-assisted psychotherapy	Improve adaptive and social skills, progress in school adjustment

Table 1 (continued)

Author(s)	Participants	Age	Country	Study design	Intervention	Well-being outcomes
Boshoff et al. (2015)	n = 39 young boys living in youth care	14–18 years	South Africa	Non-randomized pre- and post-test with control	8 sessions of equine-assisted therapy	Improved life satisfaction, coping skills, and social support seeking
Dunlop and Tsantefski (2018)	n = 33 children exposed to adverse family events	7–13 years	Australia	Qualitative: semi-structured interviews	9-week (2-hour session per/week) equine-assisted therapy	Improved sense of secure attachment and happiness, and personal and social development
Harvey et al. (2020)	n = 69 young people with mental health and/or family problems	7–17 years	USA	Quantitative pre- and post-test	10-week (90 min per session/week) equine-assisted psychotherapy	Reduced mental health and improved social and study skills
Kemp et al. (2014)	n = 30 sexually abused adolescents	8–17 years	Australia	Quasi experimental: baseline, pre- and post-test	9–10 weeks (90 min per/week) equine-facilitated therapy	Improved mental health and behavioral symptoms
Muela et al. (2019)	n = 19 young people exposed to domestic violence	6–15 years	Spain	Quantitative pilot study with pre- and post-test	14-week (1 h per/session) AAI	Reduced internalizing symptoms and symptoms of post-traumatic stress disorder
Muela et al. (2017)	n = 87 young people with mental health problems	12–17 years	Spain	Quantitative pre- and post-test with control	12-week (34 sessions) animal-assisted psychotherapy	Improved mental and somatic problems, personal and social relations, and school adjustment
Tsantefski et al. (2017)	n = 41 children exposed to parental substance misuse	7–13.7 years	Australia	Quantitative pre- and post-test	12-week (2-hour session per/week) in 5 equine-assisted programs	Reduced maladaptive/difficult behavior and decreased hyperactivity

Table 1 (continued)

Author(s)	Participants	Age	Country	Study design	Intervention	Well-being outcomes
<b>Control studies</b>						
Hauge et al. (2014)	n = 75 adolescents	12–15 years	Norway	Quantitative - Randomized Control Trial	4 months equine-assisted activities (once per/week and 2 h per/session) on 13 farms	Increase in perceived social support and mastery of skills
Hauge et al. (2015)	n = 25 adolescents	13–15 years	Norway	Quantitative pre- and post-test	4-month (2-hour session per/week) equine tasks	Increased experience of social support leading to persistence during tasks and mastery
Pelyva et al. (2020)	n = 525 students	14–18 years	Hungary	Quasi 2 × 2 pre- and post-test with control	2 days per/week (9–13 h) of equine-assisted activities	Reduced emotional and behavioral problems and improved prosocial behaviors
<b>Outdoor adventure intervention</b>						
Children and adolescents						
Merenda (2020)	n = 31 young people at risk of not achieving educational goals	11–14 years	USA	Qualitative: semi-structured interviews	15 visits (4–6 h) to an adventure-based program	Improved self-confidence, teamwork, and improved school attachment
Norton et al. (2019)	n = 32 children who were victims of abuse	8–17 years	USA	Quasi-experimental with control and focus group interviews	Long-term family-enrichment adventure therapy	Improved mental health problems and family communication
Slee and Allan (2019)	n = 100 children from lower socio-economic and ethnic backgrounds	11 years (Mean)	UK	Mixed method: pre- and post-test and semi-structured interviews	3–5 days and 2–4 nights comparison of 3 adventure programs	Improved psychological well-being and increased self-determination

Table 1 (continued)

Author(s)	Participants	Age	Country	Study design	Intervention	Well-being outcomes
Vankanagan et al. (2019)	n = 42 youth with mental health problems	11–18 years	USA	Quantitative exploratory design: pre- and post-test	12 sessions of adventure therapy with 60–180 min	Improvement in social relationships and improved critical items
Control studies						
Barfield et al. (2021)	n = 26 students from a rural school district	14 years (Mean)	USA	Qualitative descriptive design	10 weeks of 2 outdoor activities and health education (twice weekly in 90–180 min per/session)	Students relieved stress, improved physical well-being and self-esteem
Usuba et al. (2019)	n = 26 aboriginal youth	12.1–18.1 years	Canada	Quantitative pre- and post-test	9 or 10-day intensive wilderness canoe excursion to compare well-being measures	Improved spiritual, emotional, physical, mental health, and social well-being
<i>Horticultural/garden intervention</i>						
Children and adolescents						
Gray and Seddon (2005)	n = 10 young people with difficulties at school	13–15 years	UK	Qualitative inquiry	2 academic years (3-full days per/week) of horticultural activities	Improved self-esteem, teamwork and community connectedness, healthy eating
Malberg Dyg and Wistoft (2018)	n = 30 students	Kindergarten to 8th grade	Denmark	Exploratory case studies with different groups	7-month (once per/week) garden therapy involving 5 school gardens	Positive emotions, interpersonal well-being, self-esteem, and improved behavior
Oh et al. (2020)	n = 582 students	11–13 years	South Korea	Quantitative observational study with pre- and post-test	7 weeks horticultural activities (60 min per/session)	Improved emotional intelligence, self-esteem, resilience, and improvements in school environment

Table 1 (continued)

Author(s)	Participants	Age	Country	Study design	Intervention	Well-being outcomes
Scartazza et al. (2020)	n = 8 young males with autism	15–23 years	Italy	Open pilot pre- and post-test	2-year (once per/week 4 h per/session) horticultural activities	Improved task performance and interactions and improved local biodiversity
<i>Care farming</i>						
Children and adolescents van den Berg and van den Berg (2011)	n = 12 children with mental health problems	9–17 years	Netherlands	Quantitative: structured observation and group interview	3-day experience in 2 care farms. Comparison of experience in wooded area and built setting	Improved concentration in the woods, restoration, social relations
Youth Kogstad et al. (2014)	n = 9 young people who were not in school or work	17–27 years	Norway	Qualitative interviews taken 2–4 times	1-year in 3 care farm enterprises (6 h per day for 5 days per/week)	Improved personal and social skills, relations with animals and plants, meaningful activities
Leck et al. (2015)	n = 93 young people having mental health and behavioral problems and struggling in mainstream education	Under 16–30 years	UK	Mixed method: pre- and post-test and qualitative interviews	3–12 months activities in 13 care farms (1–5 days per/week)	Improved personal development, environmental engagement, social interaction, and improved physical and mental health
<i>Environmental conservation</i>						
Children and adolescents Nabhan et al. (2020)	n = 130 youth from low-income households	13–19 years	USA	Evaluative study with baseline health records, pre- and post-test	6-week (32 h per/week) ecological restoration activities	Improved emotional and physical well-being, capacity for environmental restoration, and sense of community

Table 1 (continued)

Author(s)	Participants	Age	Country	Study design	Intervention	Well-being outcomes
<p>Youth</p> <p>O'Brien (2018)</p>	n = 29 youth at risk of exclusion (school and work)	13–28 years	UK	Qualitative observation and interviews	4–8 days visit and multi-visits (5 h per/week or fortnight) to Westonbirt Arboretum	Improved mental and social well-being, strong sense of achievement, and nature conservation
<p><i>Surf therapy</i></p> <p>Children and adolescents</p> <p>Drake et al. (2021)</p>	n = 9 young people with mental health problems	8–18 years	Australia	Focus group interview and follow-up	6-week surf program	Improved mental well-being, sense of belonging and community, improved sense of mastery and accomplishment
Hignett et al. (2018)	n = 40 young people excluded or at risk of exclusion from mainstream schooling	13–16 years	UK	Mixed method pre- and post-test and interviews	12-week surf program in a marine natural environment	Improved physical fitness, relationship with peers, greater connectedness at school and improved environmental knowledge
<p><i>Sustainable construction</i></p> <p>Youth</p> <p>Davies et al. (2020)</p>	n = 33 young people not in education, employment or training	19 years (Mean)	UK	Quantitative pre- and post-test	8-week (8 sessions, one full day per/week) sustainable building project	Improved mental health problems and social connection

as coming from low socio-economic and ethnic minority backgrounds, abuse and neglect, being orphaned, and being in out-of-home care placement, mental health problems such as anxiety and depression, behavioral problems such as substance use, truancy, having challenges with the law and offending behavior (see Table 1). These challenges put them at risk of achieving educational goals (Balluerka et al., 2015; Merenda, 2020; Norton et al., 2014) and having difficulties coping with education (Dunlop & Tsantefski, 2018; Gray & Seddon, 2005; Hignett et al., 2018; Liermann & Norton, 2016; Macháčková et al., 2021; Russell, 2003, 2005), and not ready for work (Leck et al., 2015). The participants who were not in education or employment were made up of youth. They had low self-image, low accomplishment motivation, and lack of purpose (Kogstad et al., 2014; O'Brien, 2018; Paquette et al., 2014; Pryor et al., 2006).

### 3.2 Methodological Issues Related to the Reviewed Studies

Most of the studies were quantitative (27), followed by qualitative (14) and mixed methods (8) (see Table 1). While the sample sizes were larger for the quantitative studies, they were smaller for the qualitative studies making the findings less generalizable. Also, due to studies combining different age groups of young people all together it was difficult to assess specific outcomes for specific age groups in the sample (O'Brien, 2018). The quantitative studies used standardized outcome measures but only one qualitative study customized a standardized measure (Merenda, 2020). Also, different studies used different outcome measures to assess well-being outcomes. This limited the validity of the well-being outcomes and made comparability harder.

Furthermore, most studies did not record baseline data while only nine studies administered follow-up measurements. This limited the ability to assess impact on well-being over time. Also, 11 studies used comparison/control groups to make causal inferences of the observed changes in well-being outcomes, but some treatment groups had more acute problems than the control group (e.g., Norton et al., 2019). Of the two studies that randomly selected participants for intervention (Hauge et al., 2014; Paquette & Vitaro, 2014) only Hauge et al. (2014) used a Randomized Controlled Trial (RCT) to evaluate effectiveness. The lack of RCTs weakened the measurement of impact and increased the level of potential bias.

Some NBIs were implemented complementarily alongside other treatment modalities (e.g., Johnson et al., 2020) such as taking medication and receiving counselling and therapy, but the studies did not control for these confounding factors (Kemp et al., 2014; Scartazza et al., 2020; van den Berg & van den Berg, 2011). Finally, most of the studies did not assess the previous nature exposure of young people as a factor that could affect their present contact with nature and well-being outcomes. For example, one participant mentioned that the intervention had no meaning to him because he grew up surrounded by nature (Ferneer et al., 2019). Therefore, the impacts identified in the studies could have been influenced by these confounding factors.

### 3.3 Well-Being Outcomes

The well-being outcomes are analyzed in themes representing the common patterns of well-being identified from the studies (Braun & Clarke, 2006). All the studies reported positive well-being outcomes for young people, including improved physical, mental, social, and spiritual well-being, as well as improved skills and functioning. Some



studies also reported negative nature experiences, no improvement, and/or deterioration in certain well-being outcomes. In what follows, we present the well-being outcomes in themes and highlight how NBIs promoted sustainable well-being.

### 3.3.1 Improvement in Mental Health and Behavioral Problems

The studies reported that anxiety and depression were among the common mental health symptoms of young people, while interventions improved their physical and mental health and learned prosocial behavior (e.g., Atherton et al., 2020; Bettmann et al., 2013). Several young people expressed happiness, relaxation, and freedom during the nature activities (Dunlop & Tsantefski, 2018; Fernee et al., 2019; Leck et al., 2015). Also, some studies reported different mental well-being and behavioral outcomes between young and older participants. In some cases, only older adolescents improved below clinical cutoff (DeMille et al., 2018; Russell, 2003) while in other cases, more improvements were observed for younger children (Harvey et al., 2020), including recording the biggest reduction in mental and behavioral problems (Russell, 2003). For the young people who were at risk of disengaging from education, the improvements in mental health and behavioral problem corresponded with improved engagement at school like school adjustment and relationship with teachers and colleagues (Balluerka et al., 2015; Hignett et al., 2018; Muela et al., 2017), reduced truant and other destructive behaviors at school (Macháčková et al., 2021; Van-kanegan et al., 2019) and improved attendance and academic performance at school (Harvey et al., 2020; Slee & Allan, 2019). Also, some youth who were unemployed reported reduced anxiety, especially those who had elevated levels of symptoms (Davies et al., 2020; Pryor et al., 2006).

### 3.3.2 Self-esteem and Sense of Purpose

Several studies reported that young people's self-esteem and confidence improved after participating in the interventions (Balluerka et al., 2015; Caulkins et al., 2006; Gabrielsen et al., 2019; Liermann & Norton, 2016; Merenda, 2020; Russell & Walsh, 2011; Scartazza et al., 2020; Slee & Allan, 2019). These improvements were protective factors against precarious situations for children and adolescents at risk of not completing school. The interventions enabled them to reflect on the long-term effects of their actions, believe in themselves, synthesize ideas about their future and improve their aspirations (Katsi et al., 2019; Norton et al., 2014). The youth who were not in education or employment became motivated and rediscovered an interest in studying or training for a career (Pryor et al., 2006). One youth expressed an interest in becoming a social worker following the intervention (Kogstad et al., 2014).

### 3.3.3 Resilience and Coping Skills

The interventions enabled the young people to improve individual and contextual resilience, especially for children who were most at risk (Katsi et al., 2019). This was due to the challenging outdoor activities, like backpacking, which required perseverance from participants (Caulkins et al., 2006; Fernee et al., 2019; Pryor et al., 2006). Also, problem-solving and social support seeking were identified as important coping skills for some adolescent boys who had behavioral and school problems (Boshoff et al., 2015). Support

seeking seems an important coping skill for children and adolescents with difficulties at school, as one teacher mentioned that pupils could ask for help much more, leading to improved academic performance and school attendance (Slee & Allan, 2019). Increased levels of resilience were also identified among some young women who were long-term unemployed and had low educational attainment (Pryor et al., 2006).

### 3.3.4 Sense of Belonging and Community

Developing a sense of belonging improved young people's well-being (Pryor et al., 2006). Some young people with social relations difficulties bonded with others and felt a sense of community during the interventions. Especially, surfing activities provided a group identity, shared experiences, and a sense of community for adolescents at risk of exclusion from mainstream education (Drake et al., 2021; Hignett et al., 2018). Some children who had few friends at school were able to improve interpersonal behaviors and make new friends (Dunlop & Tsantefski, 2018). Also, among some unemployed youth, there was a sense of belonging to the labor market which they expressed by virtue of their participation in the intervention. They considered their participation as "going to work" and protested when others considered it as a mere activity (Kogstad et al., 2014, p. 61). Further, the NBIs promoted a sense of community by bringing young people together with their families, teachers, and community elders to address well-being problems, promote community traditions and address community environmental problems (Gray & Seddon, 2005; Nabhan et al., 2020; Oh et al., 2020; Scartazza et al., 2020). Community traditions in NBIs, such as offering tobacco and seed piercing, represented the spiritual dimensions of well-being which are culturally relevant and contributed to belonging to community and nature (Katsi et al., 2019; Usuba et al., 2019; Warber et al., 2015).

### 3.3.5 Meaningful Occupation and Contribution to Society

The NBIs offered opportunities for young people to engage in meaningful and regular activities to utilize their skills and develop new ones. Young people became motivated to give back and/or economically participate in society (Leck et al., 2015; Norton et al., 2014; Pryor et al., 2006). Also, the NBIs facilitated the acquisition of mastery and employable skills like horticultural skills for adolescents with difficulties at school (Gray & Seddon, 2005), nature conservation skills for youth at risk of dropping out of school or becoming unemployed (O'Brien, 2018), and sustainable construction skills to some unemployed youth (Davies et al., 2020). Moreover, some adolescents received income and certificates for their participation in the interventions (Weaver, cited in Nabhan et al., 2020).

### 3.3.6 Reengagement in Education, Employment or Training, and Community

The studies also revealed that some young people who had dropped out of school returned to school, gained a certificate, and had high hopes of continuing to university; those who were unemployed secured jobs or started a vocation, and others reintegrated into their families and communities (Gabrielsen et al., 2019; Kogstad et al., 2014; Norton et al., 2014; Russell, 2003, 2005). Also, children who were at risk of disengaging from education became attached to school after the interventions (Merenda, 2020).

### 3.3.7 Negative Outcomes

Following the contact with nature, some young people expressed negative experiences like fear, anxiety, tiredness, and injury (Milligan & Bingley, 2007; O'Brien, 2018; Russell, 2005; van den Berg & van den Berg, 2011). Adverse weather conditions like cold, rain, and windstorms influenced some negative experiences (Drake et al., 2021; Fernee et al., 2019; Hignett et al., 2018). The negative experiences mean not all participants benefited from the interventions (Dunlop & Tsantefski, 2018). However, some of the negative experiences happened in the first few days during the intervention, but participants became resilient as the interventions continued (e.g., Pryor et al., 2006). Some adolescents expressed a total dislike for the intervention (Caulkins et al., 2006), others did not experience changes in some well-being outcomes (Balluerka et al., 2015; Boshoff et al., 2015; Frey & Parent, 2019; Kemp et al., 2014; Liermann & Norton, 2016; Muela et al., 2017, 2019; Russell & Walsh, 2011; Tsantefski et al., 2017), and a few others deteriorated in some well-being outcomes (Davies et al., 2020; Gabrielsen et al., 2019). Also, some youth still used illicit substances, had legal problems, and few did poorly at school (Liermann & Norton, 2016; Russell, 2005).

### 3.4 'Control' studies

We included studies (11) that reported on NBIs for young people who did not fall under the two categories of precariousness (see Table 1). The 'control' studies were included to check the effectiveness of NBIs and the differences in outcomes between young people in precarious situations and those in the general population. This enabled us to know whether the NBIs are particularly beneficial to young people with additional needs (Roberts et al., 2020). We found that the 'control' studies also reported both positive and negative outcomes. Young people experienced improvements in health, self-esteem and sense of purpose, sense of belonging and community, social relationships, and connectedness with nature. Some also reported anxiety in nature and no improvement in certain outcomes. The findings from the 'control studies' signify that NBIs do not only promote the well-being of young people in precarious situations but also young people in the general population. The results, therefore, show that the impact reported for young people in precarious situations are not necessarily conditioned by their additional needs. The practical significance of NBIs for the young people in the 'control studies,' is that their improvement in well-being served as protective factors against future risk, especially for those in school and uninvolved in extracurricular activities and those from rural areas (Barfield et al., 2021; Milligan & Bingley, 2007; Pelyva et al., 2020).

### 3.5 Toward Sustainable Well-Being

We identified three ways in which NBIs promoted sustainable well-being: an interconnection between well-being and environmental, social, and economic sustainability; young people's connections with nature; and the long-term sustenance of the improved well-being outcomes.

The well-being outcomes reported above are interconnected with sustainability dimensions. Environmental sustainability was expressed in how the natural environment and nature activities were utilized in non-damaging ways to promote the well-being outcomes

presented above. The animals and plants were properly cared for (e.g., Hauge et al., 2014; 2015). The horticultural and environmental conservation interventions helped to preserve the natural environment. Nabhan et al. (2020) reported that activities like restoring microbial soil crusts and aromatic plant guilds reciprocally benefitted the natural environment and reduced health risks. Also, cultivating local lettuce promoted local biodiversity (Scartazza et al., 2020). Social sustainability was promoted through building social relationships, a sense of belonging and community between the young people and their communities. For example, some youth living with autism were able to socially interact and share action with community elders through a horticultural program (Scartazza et al., 2020), some children and adolescents were able to practice their cherished local community traditions through NBIs which promoted community cohesion (Usuba et al., 2019; Katisi et al., 2019), and environmental restoration activities by some adolescents improved the community's resilience against diseases like valley fever, asthma, and other climate-change-induced diseases (Nabhan et al., 2020). Economic sustainability was reflected in how NBIs promoted the meaningful occupation and contribution to society and reengagement in employment for the young people. They further acquired employable skills, received certificates, and in some cases earned income for their participation in NBIs (Weaver, cited in Nabhan et al., 2020). According to Scartazza et al. (2020), the cultivated local lettuce was of better quality than two commercial varieties already in the market, making the local lettuce more suitable for market and commercialization. This is important for local production and consumption.

Moreover, several interventions enhanced young people's connectedness with nature, which is positively correlated with improved well-being. This was enabled through the reciprocal caring relationships young people had with nature, especially through caring for animals, plants, and the natural environment (Kogstad et al., 2014; Malberg Dyg & Wistoft, 2018). Caring for animals promoted positive behavior, caring for plants promoted a sense of accomplishment, and caring for the environment promoted a sense of responsibility. Young people consequently became aware of the human impact on nature, appreciated nature more, and developed a new affective relationship with nature (Barton et al., 2016; Hignett et al., 2018; Leck et al., 2015; van den Berg & van den Berg, 2011).

The studies underlined the significance of the length and intensity of the intervention on sustaining the improved well-being outcomes (Balluerka et al., 2015; Merenda, 2020). We found evidence that both shorter and longer interventions can promote long-term sustenance of improved well-being outcomes though in most cases the longer interventions resulted in the long-term sustenance of improved well-being outcomes. Some interventions were noticeably short (1–5 days) involving activities, such as, one-day woodland experience, three-day experience in farms and adventure activities (Milligan & Bingley, 2007; Slee & Allan, 2019; van den Berg & van den Berg, 2011). Gabrielsen et al. (2019) found that a shorter intervention did not produce immediate positive impacts but produced positive impacts in the long-term. Also, when the impact of shorter and longer interventions was compared in the same intervention it came out that the shorter interventions produced larger impacts (Paquette & Vitaro, 2014; Russell, 2003). This was because of the high intensity of the shorter interventions (Paquette & Vitaro, 2014). On the other hand, longer interventions (1–2.5 years) led to the sustenance of improved well-being outcomes for many of the young people, although a few of them said the effects did not last (Gray & Seddon, 2005; Russell, 2005; Scartazza et al., 2020). Kogstad et al. (2014) reported that some youth who spent longer time (1.5–2 years or more) doing farming activities secured permanent jobs or returned to school with academic success. Some of the longer interventions

incorporated follow-up support to help young people reintegrate into their communities, and this was crucial for enduring outcomes.

## 4 Discussion

Our review shows that NBIs that utilize the natural environment, nature activities, and social context with therapeutic support can promote sustainable well-being of young people in precarious situations. The majority of the studies we reviewed originated from the USA, and they involved wilderness therapy. This confirms Harper's (2017) findings that in the child and youth care literature most publications focus on wilderness therapy and primarily come from the USA. We used 'young people' broadly to represent children, adolescents, and youth due to the different international age range. Mental health and behavioral problems were common among young people in precarious situations, constituting the underlying risks to precariousness and consequences of precariousness (OECD, 2016).

Despite reporting some negative or unexpected outcomes, most of the studies showed the positive impacts of NBIs. The negative outcomes were related to negative experiences in nature and no improvement and/or deterioration in certain well-being outcomes. This corroborates Roberts et al. (2020), who also identified negative effects in young people's nature contact.

For the children and adolescents, family-related problems and problems of mental health and behavior affected their participation in education or employment. Sadler et al. (2015) asserted that mental or physical health problems, adverse childhood experiences or families with a lack of commitment to education may underpin the reasons for poor educational attainment in young people. Children and adolescents, especially older adolescents, had larger improvements in their mental well-being and behavioral functioning which influenced educational engagements like school attendance, performance and relationship with teachers and peers. They felt belonged and attached to school. Leck et al. (2013) noted that one social benefit of NBIs is that they bring people with similar situations together making them feel belonged and accepted. Moreover, those who lacked confidence in themselves could develop self-esteem and confidence after accomplishing different nature activities. Berger (2008) reported similar findings that some children who were not doing well in the classroom had an opportunity to excel in nature activities thereby increasing their self-worth. Adolescents also developed coping techniques like hope and social support seeking skills which enhanced their collaboration with teachers.

Some youth who were not in education or employment also had underlying social, emotional, and mental health needs, but many experienced mental health challenges like anxiety and depression as consequences of being in precarious situations. The NBIs improved their mental health symptoms, self-esteem and sense of purpose, and resilience. Also, they experienced well-being outcomes that related more to latent benefits of employment, such as, opportunities to engage in meaningful occupation through which they developed employable and social skills and contributed to society, social identity, and opportunities for social contact. It has been reported in another study that green care projects provide access to latent benefits of employment for people who are not in employment (Sempik & Bragg, 2016). Eventually, some young people reengaged in education, employment, and wider society.

To emphasize how NBIs promote sustainable well-being, our results are interpreted in the light of the HDLB Model (Hirvilammi & Helne, 2014). "Having" reflects in how

the well-being of young people in precarious situations is embedded within the natural environment. The natural environment provided the landscape, fauna, and flora which enabled the interventions. The variety and affordance in nature encouraged adventure and hands-on activities which led to improvement in well-being (Brussoni et al., 2017). Moreover, the restorative benefits of nature contact improved young people's mental well-being, such as making them feel happy, relaxed, and free. The restorative benefits of nature are well documented (e.g., Korpela, 2008). Another key aspect of the 'having' dimension refers to satisfying needs within boundary limits, that is, the use of nature must be ecologically sustainable. This, however, was not within the scope of the studies we reviewed except for highlighting how young people reciprocally cared for and managed plants, animals, and the natural environment. Meanwhile, a recent literature review study found that nature activities like camping, hiking, skiing, and equine activities could negatively affect the natural environment and biodiversity in numerous ways (Tolvanen & Kangas, 2016). The authors reported that recreational trampling could degrade the soil and vegetation, equine activities could lead to the spread of alien plant species in disturbed campsites, and wildlife could be affected by disturbances caused by humans on foot.

"Doing" was reflected in how young people performed meaningful and responsible activities within nature. The meaningful activities involved nature conservation activities, caring for animals, cultivating local crops to improve the local biodiversity and economy, restoring springs and wetlands, etc. Meaningful activities on the one hand promoted the well-being of young people and on the other hand sustained the natural environment. The activities provided young people with structure and opportunities to utilize their skills thereby improving their self-esteem and sense of purpose. These are seen as satisfying the latent benefits of employment through NBIs. Also, by doing meaningful activities, young people acquired social and employable skills and gave back to society and nature. Steigen et al. (2016) similarly found that green care provided meaningfulness and real work experience. At the structural level, meaningful occupation offered alternative avenues to participate in society sustainably.

"Loving" was seen in young people's mutually beneficial and caring relationships with society and nature. Moriggi et al. (2020) highlighted that NBIs enable caring relationships between humans and nature. The connective relationship with other humans and animals enabled the young people to overcome isolation and improve prosocial behavior. Moreover, the interventions improved local biodiversity and promoted community cohesion through connecting young people with community elders and creating opportunities to practice traditional norms. 'Loving' also reflected in young people's connectedness with nature which made them aware of the human impact on nature and appreciated it more. Studies show that strong connections with nature are associated with improved well-being and pro-environmental behavior (Bragg, 2014; Nisbet & Zelenski, 2013).

"Being" in a state of holistic well-being and meaningful life summed up young people's experiences in NBIs. It reflected in the sense of oneness with other humans, community, and nature as expressed by young people. This is supported by Granerud and Eriksson (2014) who identified that NBIs improve well-being and promote meaningful life.

Finally, sustainable well-being concerns the long-term sustenance of the improved well-being outcomes. Longer and intense NBIs that incorporate follow-up/aftercare services produced sustainable outcomes, as has been reported in other studies (e.g., Norton, 2010). However, follow-up services must consider young people who live in remote areas who could be at a disadvantage in terms of the frequency of services they receive (Paquette & Vitaro, 2014).

## 4.1 Limitations and Future Research

As common with studies investigating NBIs, we found a shortage of robust scientific methods, like RCT designs, to assess effectiveness (Bragg, 2014). This is because young people in precarious situations are a heterogeneous group with complex and varied needs which makes it difficult to assemble them into equivalent groups and assess their well-being. Therefore, our review is limited because we grouped young people who had different ages and varied needs into precarious situations. The implication is that we are likely to miss the peculiar needs of specific young people, especially the most vulnerable ones. Also, our review is limited because we only included papers published in English language journals which implies that we are likely to miss other relevant local examples of NBIs not published internationally. Furthermore, some methodological choices in the reviewed studies limited the results and conclusion drawn. They included the lack of standardized outcome measures making it difficult to validly assess well-being outcomes, lack of baseline data and follow-up measures to assess changes in outcomes over time, and the use of different outcome measures making it hard for comparability. Also, some NBIs were implemented complementarily alongside other treatment modalities without controlling for these confounding factors. These limitations also limit the results and conclusions drawn in our review.

As we have done in this review, future reviews must also consider having control studies to compare difference in outcomes with the main studies. Since recreational activities in nature can negatively impact the natural environment, future studies should assess not only how NBIs impact young people's well-being but also how these activities impact the natural environment, like, climate change or biodiversity loss. Also, future studies must assess young people's previous exposure to nature as a variable that can influence their outcomes in NBIs.

### 4.1.1 Implications for Social work

Many of the studies included in our analysis were published in social work-related journals, and the interventions were related to social work in several ways. Social workers were involved in the implementation of NBIs through referring young people to the interventions and directly participating in the interventions as clinical or field experts, or founder of the NBI. Also, some practitioners in the NBIs had a background in social work education or pedagogy, and the interventions collaborated with social work institutions like the child protection agencies. This makes it important to draw implications for social work practice with young people in precarious situations.

First, this review study contributes to deepening ecosocial approach in social work by emphasizing the interlinkages between human well-being and the natural environment. At the conceptual level, social work must embrace "sustainable well-being" because it incorporates not only human concerns but also environmental concerns. Also, the critical social work dimension of the ecosocial approach is realized in the implementation of NBIs because they enable social workers to share power with young people who are already in disadvantaged and less powerful situations (Ungar et al., 2005). Therefore, social workers must be more directly engaged in NBIs by being in the natural environment and outdoors with young people where young people feel more relaxed and power imbalances can be neutralized.

Second, one key dimension of NBIs is transdisciplinarity, that is, they cross multiple disciplines like social work, psychology, environmental and health science and enable collaborations with non-academic partners, like farmers, child protection institution, community elders, and families. This implies that social workers do not need to become experts to be able to implement NBIs, rather they must collaborate with the experts and key stakeholders for the implementation of NBIs.

Third, social workers working with children and adolescents in the school setting must integrate or advocate for nature activities and green spaces into education because this improves students' well-being and the school environment (Oh et al., 2020; Vankanegan et al., 2019). This would also help to prevent and address the early onset of mental health and behavioral problems in children and adolescents (Carcillo et al., 2015; Sadler et al., 2015). Moreover, NBIs in schools would offer struggling students the opportunity to excel outside the classroom.

Fourth, our results show that NBIs provide latent benefits of employment, such as meaningful occupation and opportunities to utilize skills and connect with others. Moreover, NBIs offer sustainable alternatives to labor market participation characterized by a safe working environment, recognition, respect, and non-strict supervision. Powers and Peeters (2019) stated that when considering alternative and sustainable economy, we must recognize valuable activities that result in products or services and still take care of nature. As such, social work must advocate for the recognition of NBIs, like sustainable construction, care farming, and garden/horticulture programs as alternative employment because these activities entail the production of goods and services that could be patronized by community members and eventually enhance local economies.

Fifth, precarious situations do not only affect the well-being of young people. For children, it can affect their family relationships (Liermann & Norton, 2016) and for youth it can affect the health and well-being of their partners (Baranowska-Rataj & Strandh, 2021). Therefore, social workers' role in NBIs must include identifying and involving immediate families, schools, and communities to ensure comprehensive intervention (Carcillo et al., 2015).

## 5 Conclusion

This study is one of the first comprehensive reviews of NBIs for young people in precarious situations to assess not only the effectiveness of interventions but also their relevance for sustainable well-being. Although the review covered the international literature, we limited our selection to papers published in English-language journals. This affects the scope of the topic because the effects of NBIs have not always been published internationally. Based on our results, we can conclude that NBIs can promote sustainable well-being by helping to address the well-being challenges facing young people in precarious situations, providing them with opportunities to meaningfully participate in society and connect with other humans and nature.

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## Declarations

**Conflict of interest** The authors declare that there are no known financial or personal interests that could have influenced this work.

**Ethical Approval** Not applicable.

**Informed Consent** Not applicable.

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