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Assessing Nature-Based Interventions in Social Work with Migrants: Methodological Challenges in Temporal Impact Evaluation

Shailendra Rai ^{1,*} , Marja Honkasalo ², Kati Turtiainen ¹ and Anne Tolvanen ³ 

¹ Department of Social Sciences and Philosophy, University of Jyväskylä, Kokkola University Consortium Chydenius, P.O. Box 567, FI-67701 Kokkola, Finland; kati.m.turtiainen@jyu.fi

² Natural Resources Institute Finland (LUKE), Ounasjoentie 6, 96200 Rovaniemi, Finland; marja.uusitalo@luke.fi

³ Natural Resources Institute Finland (LUKE), Paavo Havaksen Tie 3, 90570 Oulu, Finland; anne.tolvanen@luke.fi

* Correspondence: shailendra.y.rai@jyu.fi

Abstract

This study examines the practical and methodological strengths and limitations of evaluating nature-based interventions (NBIs) with migrant participants when evaluation is integrated into routine social work and service processes. Three short-term intervention cases in Finland, involving therapeutic gardening and a guided nature walk, included 38 participants and provided real-world contexts for examining pre-post and post-only evaluation approaches. Standardized psychosocial measures were used to assess emotional wellbeing, psychological restoration, nature relatedness, and social inclusion, while four post-intervention interviews complemented the quantitative assessments. Descriptive findings showed varying patterns across measures and highlighted methodological challenges related to small and heterogeneous groups, difficulties matching some pre- and post-intervention responses, linguistic and culturally challenging item wording, and participant burden. These factors limited the assessment of temporal change and comparison across evaluation approaches. The interviews provided contextual information that supported interpretation of the quantitative findings, although their limited number precluded conclusions about sustained or intervention-attributable change. The findings highlight the importance of matching evaluation measures and their timing to the construct being assessed, intervention duration, participant characteristics, and implementation context. Concise, context-sensitive measures complemented by brief qualitative approaches may provide a feasible strategy for evaluating short-term NBIs with migrant groups. Further research with larger samples, repeated interventions, longer follow-up periods, and culturally adapted multilingual measures is needed before conclusions can be drawn about the comparative suitability of individual measures or the effectiveness of particular interventions.

Keywords: nature-based intervention; social work; migrant wellbeing; social inclusion; temporal evaluation



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1. Introduction

Nature-based interventions (NBIs) are gaining recognition for enhancing mental health and fostering social inclusion, particularly among migrant populations (Rai et al. 2023). Psychosocial challenges, such as the neglect of emotional and relational support that is often overlooked in narrowly focused integration policies, can be addressed through therapeutic

human–nature interactions. NBIs can therefore complement structural integration efforts (Heino and Jauhiainen 2020).

An ecosocial approach in social work provides a valuable framework for strengthening integration policies by addressing both structural and psychosocial dimensions of wellbeing. By linking wellbeing and empowerment with ecological sustainability, it also supports broader sustainability transitions (Närhi and Matthies 2016). NBIs align with this perspective because they address often intertwined social and ecological challenges through nature-based activities, such as therapeutic gardening, that promote both mental health and community resilience. Along with therapeutic gardening, NBIs often include guided nature walks, and forest bathing, all which have demonstrated benefits such as stress reduction, improved mood, and strengthening social cohesion (Shanahan et al. 2019).

The Biophilia Hypothesis (Kellert and Wilson 1993) supports NBIs by proposing that humans possess an innate affinity for nature. This concept helps explain how nature-based activities can foster emotional connection with the environment. This may further encourage pro-environmental attitudes and behaviors. NBIs are also supported by research suggesting that fostering an individual's nature relatedness can play a significant role in promoting migrants' social inclusion (Honkasalo et al. 2026). For migrants facing cultural dislocation or trauma, nature can promote a sense of belonging and relational inclusion (Rai et al. 2023). Belonging provides the connective tissue that links migrants lived realities to broader structures of inclusion (George et al. 2024). Projects like Kohdataan luonnossa ("Meeting in nature") in Finland illustrate how nature visits can build trust between immigrants and locals (Koponen and Simulainen 2020). Indeed, a sense of belonging is rooted in the various practices through which people and communities establish emotional and social connections to place and one another, such as therapeutic gardening (May 2013; Yuval-Davis 2006).

Modality can play a significant role in the benefits targeted by NBIs. When selecting among different types of activities for NBIs, active modalities, such as walking and gardening, have been shown to outperform passive exposures to nature, e.g., merely viewing natural scenes, in enhancing mood, reducing stress, and improving cognitive functions (Berman et al. 2008; Yeo et al. 2020). These interactive nature-based approaches may be particularly beneficial in migrant-focused programs, where social work practices aim to promote belonging and relational inclusion. For example, gardening can foster community ties and cultural identity (Rai et al. 2023) whereas guided walks can help reduce social isolation and support mental wellbeing, thereby contributing to both personal and collective resilience (Mawani and Ibrahim 2021). In this context, inclusion is understood as extending beyond basic participation to encompass relational belonging, cultural recognition, and equitable access to wellbeing. However, it remains difficult to apply and generalize the documented benefits of interactive NBI approaches for relational inclusion, as evaluation practices are still underdeveloped, particularly in relation to migrant populations and the inherently context-dependent nature of these interventions, owing to methodological challenges (Boetto 2016). These challenges highlight the need for a conceptual framework that situates NBIs within social work theory and practice.

An ecosocial lens emphasizes the interdependence of social wellbeing and ecological conditions and provides a useful framework for integrating environmental contexts into social work practice (Boetto 2016; Närhi and Matthies 2016). In this study, ecosocial principles are operationalized across the generalist social work stages of engagement, assessment, intervention, and evaluation (Berg-Weger et al. 2020). In migrant-focused NBIs, engagement involves building trust and ensuring culturally and linguistically accessible participation. Assessment considers participants social circumstances, linguistic needs, and previous experiences with nature. Intervention involves nature-based activities that support

wellbeing and social interaction. Evaluation uses methods that are rigorous while remaining understandable, culturally sensitive, and proportionate to participant burden. By situating NBIs within an ecosocial framework, this study examines the practical and methodological challenges involved in evaluating short-term NBIs with migrant participants using pre–post and post-only approaches to assist in evaluation of eco-social work practice. The primary aim is to identify the strengths and limitations of these temporal evaluation approaches when standardized psychosocial measures are applied in multilingual, culturally diverse and contextually varied intervention settings where NBIs are integrated into the routine service processes of collaborating multicultural organizations. Rather than seeking to establish the comparative validity of individual approaches or the effectiveness of particular NBI modalities, the study uses three intervention cases (i.e., intervention contexts) to examine how these different approaches capture emotional wellbeing, nature relatedness, and social inclusion with standardized psychosocial measures, and how practical factors such as language, participant burden, intervention context, and data completeness influence their administration and interpretation.

Accordingly, the study addresses the following research question: What practical and methodological strengths and limitations arise when pre–post and post-only evaluation approaches are used to assess emotional wellbeing, nature relatedness, and social inclusion among migrants participating in short-term nature-based interventions?

By addressing this question, the study advances methodological understanding that is important for strengthening the evidence base of interventions designed to promote wellbeing, belonging, and social inclusion. It provides insights into the contextual and participant-related factors that may shape evaluation outcomes when NBIs are integrated into existing services, helping to ensure that conclusions regarding intervention effects do not exceed what can be justified by the evaluation design and the available data. Furthermore, the study supports the development of more feasible, context-sensitive, and culturally responsive approaches to evaluating NBIs in social work with migrant populations.

2. Evaluation Options of NBIs

2.1. Study Design

Nature-based intervention studies often face design constraints that limit the potential for robust evaluation. In particular, process evaluations that capture what happens during the intervention are often underdeveloped. A key challenge is the lack of temporal depth, as many studies rely on single-time-point assessments and omit baseline data on participants' demographics, wellbeing, and nature relatedness, thereby reducing the ability to track change and account for participant variability (Yeo et al. 2020). Most studies focus on short-term improvements in mood and stress (Anderson et al. 2018; Berman et al. 2008), while long-term follow-up assessments remain rare, even though psychological benefits may diminish over time (Bratman et al. 2019). Moreover, in situ factors such as social interactions, environmental features, and researcher presence can significantly shape outcomes, yet are rarely assessed systematically (Carrus et al. 2015; Silva et al. 2023). Consequently, the findings become more vulnerable to biases associated with self-reported data, including social desirability bias, whereby participants may report more favourable post-intervention outcomes because they perceive improvement to be expected or socially desirable (Latkin et al. 2017).

A repeated-methods design can help address these evaluation gaps by collecting data at multiple points: before, during, and after the interventions. Such an approach enables more nuanced tracking of change, the identification of when effects emerged or faded, and individual-level analysis (Meredith et al. 2020). Moreover, when integrated into mixed-methods studies, it allows quantitative data to be triangulated with qualitative

insights, thereby enhancing credibility and depth, particularly for complex and vulnerable populations such as migrants (Mitchell et al. 2024).

2.2. Psychosocial Measures

Methodological complexities concerning the impacts of NBIs stem not only from study design but also from the selection of appropriate evaluation measures. Numerous standardized measures are available for the self-assessment of psychological constructs using multi-item scales. By combining responses to multiple items, these scales aim to capture underlying psychological constructs and their dimensions with greater reliability than single-item measures.

Self-report instruments such as the Positive and Negative Affect Schedule (PANAS, Watson et al. 1988), and the Perceived Stress Scale (PSS, Cohen et al. 1983) are widely used in experimental studies to assess emotional wellbeing. These measures can be applied to examine the psychological benefits of NBIs, although they may have limitations in capturing subtle momentary emotional changes (Lucas 2018). The PANAS may overlook transient mood fluctuations, while the PSS may fail to detect nuanced feelings of overload.

Other psychological instruments specifically designed for natural settings can also be applied in the evaluation of NBIs. The Restorative Outcome Scale (ROS, Korpela et al. 2008) offers a concise, moment-sensitive measure of psychological restoration, including mental clarity, relaxation, and relief from cognitive fatigue, making it particularly useful for the repeated evaluation of short-term NBIs. The Nature Relatedness Scale (NRS, Nisbet and Zelenski 2013) and Inclusion of Nature in Self Scales (Nisbet et al. 2009; Schultz 2001) assess individuals' connectedness to nature and are often used to help explain the extent of experienced impacts, such as restoration, stress reduction, and environmental engagement. However, because these measures assess relatively stable aspect of the human–nature relationship, they are generally less sensitive to short-term changes and are therefore used for single-time-point assessments, typically post-assessments, or for evaluating changes over longer intervention periods.

When NBIs specially aim to promote belonging and relational inclusion, measures that capture social wellbeing become essential. Yet this dimension remains undermeasured. Although Keyes's Social Wellbeing Scale provides valuable insights into social functioning by capturing how individuals perceive their relationship with society as a whole (Baumgartner and Burns 2014; Keyes 1998), it offers limited detail on whether they feel personally included in specific social contexts. In contrast, the Experience of Social Inclusion Scale (ESIS) provides a more targeted, though underutilized, approach to assessing an individual's lived experiences of social inclusion, particularly whether she or he feels accepted, involved, recognized, and able to participate in social life (Leemann et al. 2021).

All these key measures are sensitive to respondents' linguistic comprehension and interpretation, as they rely on verbal descriptions of subjective psychological states. Consequently, variations in language proficiency and cultural understandings may influence how respondents interpret and answer the scale items, potentially affecting the validity and comparability of the results. The fact that all key measures have both strengths and limitations further underscores the importance of evaluating their suitability for study designs, as well as their practical applicability to the evaluation of NBI among migrant populations.

To address these challenges in the context of migrant-focused NBIs, this study examined the strengths and weaknesses of different quantitative temporal approaches (Table 1) by employing both pre-post and post-only methods using six selected instruments to assess the psychological and social impacts of NBIs. Quantitative measurements from these instruments were complemented by post-intervention interviews, which were designed to provide qualitative insights into participants' experiences. This mixed method design

aimed to integrate statistical rigor with contextual depth, aligning with Boetto's ecosocial evaluation lens, which emphasizes holistic, inclusive, and context-sensitive assessment.

Table 1. The strengths and limitations of the key instruments used in previous studies.

Measures	Purpose	Pros	Cons	Temporal Approach	References
PANAS	Measures emotional states	Widely validated; simple to administer; captures both positive and negative affect	Retrospective recall; susceptible to demand characteristics	Pre-post and post-only	(Watson et al. 1988; Lucas 2018)
NRS	Measures emotional and cognitive connection to nature	Captures long-term nature affinity; validated across cultures	May miss in-the-moment responses; culturally sensitive	Pre-post and post-only	(Nisbet et al. 2009; Lucas 2018)
ROS	Measures psychological restoration	Brief; sensitive to short-term change; captures mental clarity and relaxation	Limited scope; less suited for long-term tracking	Pre-post and post-only	(Korpela et al. 2008)
ESIS	Assesses belonging, engagement, agency, manageability	Tailored to inclusion; validated in Finland; multidimensional	Limited international use; emerging measure	Pre-post and post-only	(Leemann et al. 2021)
Metsähallitus Social Wellbeing Scale	Measures social wellbeing in nature contexts	Context-specific; developed for Finnish settings	Limited validation outside Finland	Post-only	(Kaikkonen et al. 2014)
Metsähallitus Social Cognitive Skills Scale	Measures social cognitive skills in nature settings	Focuses on interaction and learning in nature	Limited validation outside Finland	Post-only	(Kaikkonen et al. 2014)

3. Materials and Methods

3.1. Recruitment

The evaluation study was designed as an integral part of the NBIs process, which started with the recruitment phase. To uphold ethical integrity and participatory inclusion in line with ecosocial values, the University Ethics Committee was consulted before participant recruitment. It confirmed that the study did not require a full ethical review under the Finnish National Board on Research Integrity guidelines.

Migrant participants aged 18 years and above were recruited for the NBIs through collaborating multicultural and language-training organisations in Kemi and Oulu. For the Healing Garden interventions, invitations were distributed by Pohjantähtiopisto through its primary WhatsApp communication channels, which are widely used to disseminate information to participants attending the multicultural language-training centre. Potential participants received information about the nature-based activities and were invited to participate voluntarily through these channels. Recruitment for the Botanical Garden intervention was similarly facilitated through a collaborating multicultural centre. Because invitations were circulated through existing WhatsApp groups and other group-based communication channels rather than sent to a predefined list of individually identified potential participants, it was not possible to determine reliably how many individuals received or viewed the invitations. Consequently, a recruitment response rate could not be calculated.

Across the three interventions, 38 migrants participated: 15 in the 2022 Healing Garden intervention, seven in the 2023 Healing Garden intervention, and 16 in the 2023 Botanical Garden nature walk. Transportation to off-site intervention venues was arranged when required to support equitable participation.

Participants provided written informed consent before taking part in the impact evaluations. Consent materials were available in seven languages: Arabic, Chinese, English,

Finnish, Russian, Somali, and Turkish. The translated materials were prepared with the assistance of hired professional translators. Face-to-face communication with researchers and the multicultural-centre staff provided participants with opportunities to ask questions and seek clarification regarding the evaluation phase. Participants were informed about the study aims, among other reasons, to increase their willingness to complete the questionnaire despite its length, as well as procedures, potential risks, use of data, confidentiality arrangements, and their right to withdraw at any time without consequence.

Confidentiality was maintained through secure data storage, anonymisation procedures, and the use of anonymous participant codes. These procedures were intended to protect participants' privacy while enabling pre- and post-intervention responses to be linked where possible. The methodological implications of difficulties in matching some anonymous codes across measurement occasions are discussed later in the manuscript.

3.2. Psychosocial Measures and Temporal Evaluation Approaches

A combination of standardized psychosocial measures was used to assess emotional affect, psychological restoration, nature relatedness, social inclusion, and perceived psychosocial and nature-related outcomes. The measures were administered using pre-post or post-only temporal evaluation approaches, depending on the construct being assessed and the practical evaluation design. All measures used five-point Likert-type response formats. Because the study focused on the methodological application of these measures in short-term NBIs with migrant participants, the measures were used in either pre-post or post-only formats depending on the psychological constructs and intervention being assessed, as well as on time constraints.

3.2.1. Emotional Affect: Positive and Negative Affect Schedule

The Positive and Negative Affect Schedule (PANAS; [Watson et al. 1988](#)) was used to assess participants' emotional affect. PANAS conceptualizes positive and negative affect as relatively independent dimensions of emotional experience. Participants rated the extent to which they experienced emotions such as excitement and distress before and after the interventions. PANAS was used in a pre-post format across all three intervention cases because emotional affect can vary over relatively short periods and the scale allows comparison of participants' self-reported emotional states immediately before and after an intervention.

3.2.2. Psychological Restoration: Restorative Outcome Scale

The Restorative Outcome Scale (ROS; [Korpela et al. 2008](#)) was used to assess perceived psychological restoration associated with nature contact. The scale captures experiences such as relaxation, mental clarity, and relief from cognitive fatigue and is informed by Attention Restoration Theory ([Kaplan and Kaplan 1989](#)). Items include statements such as "I feel restored and relaxed." Its relatively concise and experience-focused structure made it relevant for examining immediate restorative experiences in short-term nature-based activities. ROS was administered in a pre-post format in the 2022 Healing Garden intervention and as a post-intervention measure in the other intervention cases.

3.2.3. Nature Relatedness: Nature Relatedness Scale

Nature connectedness was assessed using the six-item Nature Relatedness Scale (NRS-6; [Nisbet and Zelenski 2013](#)), which is informed by the Biophilia Hypothesis ([Kellert and Wilson 1993](#)). Participants responded to statements such as "My relationship to nature is an important part of who I am." NRS-6 measures the extent to which individuals perceive nature as part of their identity and worldview. In this study, pre-post NRS-6 data were available only for the 2022 Healing Garden intervention. Because nature relatedness

is generally understood as a comparatively stable disposition rather than an immediate emotional state, the instrument may, however, be less sensitive to change during a single short-term intervention. be less sensitive to change during a single short-term intervention.

3.2.4. Social Inclusion: Experiences of Social Inclusion Scale

Social inclusion was assessed using the Experiences of Social Inclusion Scale (ESIS; Leemann et al. 2021). The scale is informed by the Capability Approach (Sen 1999) and assesses participants' perceived opportunities for belonging, participation, engagement, and agency. Items include statements such as "I belong to a group or community that is important to me." ESIS was included because relational belonging and participation are central outcomes of migrant-focused social work interventions. Pre-post ESIS data were available only for the 2022 Healing Garden intervention. As with nature relatedness, meaningful changes in social inclusion may require sustained interaction over time rather than a single short-term intervention. As with nature relatedness, meaningful changes in social inclusion may require sustained interaction over time rather than a single short-term intervention.

3.2.5. Metsähallitus Wellbeing and Social Cognitive Skills Scales

Broader perceived psychosocial and nature-related outcomes were assessed using the Metsähallitus Social Wellbeing Scale and Social Cognitive Skills Scale (Kaikkonen et al. 2014). These measures were developed in the Finnish nature context and were administered only after the interventions.

The Social Wellbeing component (MET_Well) includes items addressing perceived psychosocial benefits of participation, such as "My motivation for everyday life was strengthened." The Social Cognitive Skills Scale was analytically divided into two components. MET_Nature included nature-related items such as "My appreciation for nature increased," while MET_Self included items concerning learning and personal development, such as "I learned new skills."

These measures were used as only *post*-intervention assessments because their wording asks participants to reflect on benefits or changes they perceived in connection with the nature experience. Consequently, the resulting scores are interpreted as participants' perceptions of immediate intervention-related changes.

3.2.6. Translation and Linguistic Accessibility

To support participation across different linguistic backgrounds, study information, consent materials, and questionnaire materials were made available in seven languages: Arabic, Chinese, English, Finnish, Russian, Somali, and Turkish. Translations were prepared with the assistance of hired professional translators.

During questionnaire administration, researchers and multicultural-centre staff were available to provide clarification when participants experienced difficulties understanding particular terms or statements. This support was especially important because some standardized psychosocial items contained abstract or culturally specific concepts that did not translate straightforwardly across linguistic and cultural contexts.

The translated versions were used solely to improve accessibility and were not intended to serve as newly psychometrically validated language versions of the original measures. Accordingly, the implications of linguistic interpretation and cultural adaptation for the comparability and interpretation of responses are acknowledged as potential limitations when applying these measures in NBIs context. These issues are discussed in the Section 5.

3.3. Intervention

The study included three nature-based intervention cases conducted in Finland: Healing Garden sessions in Loue in 2022 and 2023 and a guided nature walk at the Oulu Botanical Garden in 2023. Across the three cases, the interventions were intended to provide opportunities for nature engagement, emotional restoration, and social interaction while also providing real-world settings in which different evaluation approaches could be examined.

The interventions were facilitated jointly by members of the research team and staff from the collaborating multicultural organisations. Finnish was used as the primary language of facilitation because most participants were able to understand Finnish sufficiently to take part in the activities. Researchers and multicultural-centre staff were present throughout the sessions to provide instructions and practical support.

Each participant group was formed based on groups already involved in the programs of the collaborating multicultural centres, with participation being voluntary. Additionally, the intervention format assigned to each participant group was affected by practical arrangements of the collaborating multicultural centres and intervention sites rather than by allocation according to cultural background or the assumption that one intervention would provide a better cultural fit for a particular group. Participants were therefore not randomly assigned to intervention types, and the three cases should not be interpreted as experimentally comparable intervention groups. Rather, they represent naturally occurring intervention types and settings, reflecting the most accessible NBI practices to the collaborating multicultural centres, through which the feasibility and methodological challenges of NBI evaluation were examined.

All interventions followed a broadly similar format consisting of an introduction to the activity and questionnaire administration, followed by nature-based activities with shared or informal social interaction, and post-intervention evaluation. Sessions lasted approximately three to four hours, with approximately 90–120 min devoted to the principal nature-based activities. The remaining time included orientation, breaks or shared meals where applicable, questionnaire completion, and reflective discussion. Although a broadly comparable structure was used, activities were adapted to the practical conditions of each site and group, such as participants' needs for individual assistance.

3.3.1. Healing Garden Interventions

The Healing Garden interventions were conducted in Loue Village, Tervola Municipality, Lapland, using a therapeutic garden and its surrounding area. The site contained cultivation boxes, ornamental planting areas, and sheltered workspaces. Participants were recruited in collaboration with Pohjantähtiopisto, an adult education and language-training organisation supporting migrant integration in the Kemi area.

Activities included sowing grass and meadow plants, digging and planting ornamental shrubs and trees, tending cultivation areas, and undertaking mindfulness, observation, and creative activities intended to encourage sensory engagement and interaction with the natural environment. These activities drew on horticultural and nature-based approaches previously associated with psychological restoration, participation, and nature engagement (Tu et al. 2020).

In 2022, three consecutive intervention sessions were organised with rotating participant groups. In 2023, the Healing Garden activities were conducted on three non-consecutive days and included tasks such as training hop vines (*Humulus lupulus*) and painting cultivation boxes. The specific activities undertaken on each day depended partly on seasonal gardening needs and the conditions of the site, such as weather.

3.3.2. Botanical Garden Nature Walk

The third intervention was conducted at the Oulu Botanical Garden in 2023. Participants were recruited through Villa Victor, the City of Oulu's multicultural centre. The intervention consisted primarily of a guided group walk through the Botanical Garden, accompanied by opportunities for informal discussion and social interaction.

The guided nature walk was selected because it provided an accessible nature-based activity that could be organised through the collaborating multicultural centre within an urban environment. Walking-based interventions have also been associated with opportunities for stress reduction and social interaction (Mawani and Ibrahim 2021). As with the Healing Garden interventions, the choice of this activity reflected the practical resources and location-based opportunities available within the collaborating network for implementing NBIs.

3.4. Data Collection and Analysis

The evaluation data were collected during pre-intervention and/or post-intervention evaluation phases. The evaluation combined quantitative questionnaires with post-intervention qualitative interviews. The purpose of combining these approaches was not to establish the psychometric validity of individual measures, but to further examine how different evaluation approaches functioned in practice when used with migrant participants in short-term nature-based interventions.

3.4.1. Questionnaire Administration and Quantitative Analysis

Quantitative data were collected using pre-intervention and/or post-intervention questionnaires. The timing of administration differed across instruments and intervention cases according to the psychological construct being assessed and the evaluation design (Table 2). The complete questionnaire and supplementary analyses are presented in the Supplementary Materials.

Table 2. Administration of evaluation instruments across the three intervention cases.

Instrument	Construct	Healing Garden 2022	Healing Garden 2023	Botanical Garden 2023	Evaluation Rationale
PANAS	Positive and negative affect	Pre + Post	Pre + Post	Pre + Post	Used to examine short-term differences in emotional affect
ROS	Psychological restoration	Pre + Post	Post	Post	Used to assess immediate perceived restoration following nature contact
NRS-6	Nature relatedness	Pre + Post	(Pre)	(Pre)	Nature relatedness represents a comparatively stable disposition and may be less responsive to a single short intervention
ESIS	Social inclusion	Pre + Post	(Pre)	(Pre)	Social inclusion may require sustained social interaction and therefore may be less sensitive to immediate short-term change
MET_Well	Perceived psychosocial wellbeing	Post	Post	Post	Post-only measure of perceived benefits associated with the intervention
MET_Nature	Perceived nature-related outcomes	Post	Post	Post	Post-only measure of perceived changes in appreciation, learning, and engagement with nature
MET_Self	Perceived personal development	Post	Post	Post	Post-only measure of perceived learning and personal development

The instruments were administered as part of the evaluation sessions immediately before and/or after the nature-based activities. Participants completed the questionnaires independently where possible, while researchers and multicultural-centre staff were available to clarify instructions or item wording when requested. Paper and digital questionnaire formats were provided to improve accessibility.

In the pre-intervention questionnaire, background and previous nature-engagement information was collected first, followed by PANAS, NRS-6, and ESIS. In the post-intervention questionnaire, PANAS was administered first, followed by ROS and the Metsähallitus well-being and social-cognitive-skills measures. Because several instruments were administered within the same session and the order was not randomized, responses to instruments presented later in the questionnaire may have been affected by participant fatigue. The study was not designed to quantify such order effects; therefore, differences between measures cannot be attributed solely to their properties.

Participants used anonymous respondent codes intended to allow pre- and post-intervention questionnaires to be linked without using personally identifying information. In practice, some participants forgot, changed, or inconsistently used codes between measurement occasions. Some questionnaires were also incomplete, and inconsistencies arose between paper and digital response formats. Responses that could not be reliably linked across measurement occasions were therefore not included in paired pre-post comparisons. This reduced the number of usable matched observations for some measures, resulting in missing post-intervention data for the NRS-6 and ESIS.

As the intervention groups were heterogeneous, background information was also collected on age, gender, occupation, nationality, legal status, previous nature-based experiences, frequency of nature engagement, and reasons for participating in the intervention.

Quantitative data were analyzed descriptively with basic statistical functions available in Microsoft Excel to calculate mean scale and subscale scores for each available measurement. These scores were then used to examine patterns across pre-intervention and post-intervention assessments and across the different instruments. Given the small intervention groups, heterogeneity of participants, and loss of matched pre-post observations, the descriptive findings are interpreted cautiously and are not treated as evidence of causal intervention effects or comparative instrument validity.

3.4.2. Qualitative Interviews and Analysis

Post-intervention interviews were used to provide contextual information that could assist in interpreting the quantitative measures. During the post-intervention phase, participants were invited to indicate whether they were willing to take part in a follow-up interview. Only a small number expressed willingness to participate, and four participants ultimately completed interviews.

The semi-structured interviews explored participants' experiences of the nature-based interventions, including their experiences of being part of the group, positive and negative aspects of the activities, emotional experiences, nature engagement, and perceptions of social interaction and inclusion. The interviews were conducted remotely through Microsoft Teams. Where required, professional translators supported interviews conducted in participants' native languages. Interviews were recorded, transcribed, and anonymised.

The interview material was coded by a researcher in English using thematic analysis. The analysis focused on identifying recurring patterns in participants' accounts while also examining how these experiences corresponded, extended, or contrasted with constructs represented in the quantitative scales. The resulting themes were used to contextualise the questionnaire findings rather than to validate the measurement instruments.

Three broad thematic areas were identified: psychological restoration, perceived changes in nature engagement, and social and cultural understanding. These themes and their constituent patterns are reported in the qualitative Section 4.

Because only four participants completed the interviews, the qualitative findings are interpreted as contextual and illustrative rather than representative of the wider intervention sample. The small qualitative sample also limits conclusions concerning the range of participant experiences.

4. Results

4.1. Participant Characteristics

The 2022 Healing Garden cohort comprised 15 Syrian men (aged 31–40), most of whom were refugee students. According to the background information, they reported frequent engagement with nature, either weekly or daily, including gardening and animal-assisted activities, often shared with Finnish acquaintances. While many participants identified social interaction as a key motivator for participating in group activities, the intervention was largely perceived as part of municipal welfare services rather than as a means of fostering long-term social connections.

The 2023 Healing Garden group included seven Ukrainian and Syrian participants, evenly split by gender and by age groups (aged 18–30 and 41–50). Most were refugee students, and the majority reported having no Finnish friends. Several participants engaged with nature on a weekly basis. A desire for social contact was also a key motivator for participation, along with curiosity.

The 2023 Botanical Garden walk involved 16 Ukrainian women (aged 41–50), most of whom were asylum seekers with limited proficiency in Finnish but with some existing local social ties. Although their nature visits were infrequent, all participants had prior experience with nature-based activities, usually with family members. They viewed participation in the NBIs as a means to improve mental health and build friendships.

4.2. Pre-Post Approach

Due to the exclusions of invalid data, changes in psychological indicators of all groups could only be measured using PANAS. Descriptive PANAS scores showed differences between the pre- and post-intervention assessments across the intervention groups. Because statistical significance was not assessed, these differences should not be interpreted as evidence of improvement (PANAS: Pre $M+ = 2.93$, Post $M+ = 4.03$). Negative affect declined in both Healing Garden groups but rose slightly in the Botanical Garden group (Pre $M = 2.07$, Post $M = 2.51$).

The change in other psychological indicators could be assessed only within the Healing Garden 2022. All groups showed high ROS scores, indicating restoration in the post-intervention phase, but scores declined slightly in the Healing Garden 2022 group (ROS Pre $M = 4.52$, Post $M = 4.45$). Pre- and post-assessments of NRS scores showed a slight decline in nature relatedness (NRS: Pre $M = 4.38$ Post $M = 4.21$). Social inclusion scores were generally positive in the pre-intervention phase across groups. The mean ESIS score was slightly higher at post-intervention than at pre-intervention in the 2022 Healing Garden group; however, the statistical significance of this descriptive difference was not assessed (ESIS Pre $M = 4.37$, Post $M = 4.46$).

4.3. Post Approach

Post-intervention scores on the Metsähallitus scales were consistently high, yielding values of approximately four or above. The MET_Nature subscale indicated a strong connection to nature across all groups, with the highest score observed in the Healing

Garden 2023 group ($M = 4.52$). Furthermore, within the Healing Garden 2022 group, the MET_Nature value exceeded the Post-NRS value, although both scales measure nature connectedness. The MET_Well subscale, a wellbeing indicator within the Metsähallitus scales, produced scores similar to the Post-PANAS+ and the Post-ESIS results in the Healing Garden 2022 group but lower than the Post-ROS scores. The highest MET_Well score was observed in the Botanical Garden group ($M = 4.20$). The MET_Self scores were also high ($M > 4$) across groups, reflecting positive self-perception.

These quantitative findings were complemented by post-intervention interviews with four refugee or asylum-seeking participants, which revealed three core themes: psychological restoration, nature-related behavioral change, and cultural understanding. These themes are introduced in the following section, where interview responses are compared with scale items (presented in parenthesis), while interview quotes appear in italics.

4.3.1. Psychological Restoration

The interview outcomes supported the psychological restoration indicated by the ROS and MET_Well subscale, while also highlighting the broader benefits of nature for human wellbeing. Items from the ROS, such as “I feel calm”, were echoed in participant narratives: “Nature provides rest and stress relief and very good emotional impact” (Interviewee Y, Botanical Garden group) and “If you want to be on your own then the best thing is to be in nature” (Interviewee X, Botanical Garden group). These reflections reinforce the emotional wellbeing captured by the ROS and the MET_Well items. However, the latter narrative also suggests a desire for temporary social withdrawal.

Similarly, the MET_Self item “I got new creative thoughts” and the ROS item “Being in nature helps me to clear my mind” were supported by participants’ reflections. For example, one participant noted, “It [nature] helps to concentrate and not to get tired” (Interviewee Z, Botanical Garden group), and another stated, “It results in more motivated and focused movement towards your goals” (Interviewee X, Botanical Garden group), highlighting the cognitive benefits of nature engagement.

4.3.2. Behavioral Change

When comparing interview outcomes with the scale scores, similarities were found but also nuances that the items could not fully capture. The MET_Nature includes items such as “My interest in nature increased” and “I have learned new things about nature,” which were reflected in participants’ experiences. One participant shared: “I love flowers and nature. In Ukraine, I had gardens and visited a botanical garden. In Finland, I enjoy the greenery, and planting flowers here was a wonderful experience” (Interviewee Z, Healing Garden group). Furthermore, an increased understanding of and concern for nature, aligned with these items, emerged in another participant’s reflection: “In Finland, nature is treated with care” (Interviewee X, Botanical Garden group). This quote may also indicate growing cultural understanding (a topic introduced further in Section 4.3.3).

Behavioral changes associated with the MET_Nature item “I spend more time in nature than before” were evident in reports of increased outdoor activity and reduced fear, as shown by the following statements: “I go out even when the weather is bad” (Interviewee Z, Botanical Garden group) and “Before, I was afraid of going outside, afraid of snakes. Now I go more out in nature” (Interviewee W, Healing Garden group). However, one participant cautioned that “One activity doesn’t make a big difference in nature visitation” (Interviewee X, Botanical Garden group), suggesting that a single NBI session may not be sufficient to foster lasting behavioral change.

4.3.3. Cultural Understanding

The interviews that supported the findings using the Metsähallitus scales also provided additional insights. One participant noted: “You learn how people interact here, even if they prefer solitude.” (Interviewee X, Botanical Garden group). This reflection aligns with the MET_Well item “I feel I have a good understanding of how society works.”, supporting the idea that nature-based activities can promote cultural awareness and an understanding of local social norms.

The MET_Well also includes items such as “In nature, it was easier to discuss personal issues.” This construct was reflected in a participant’s experience: “We had the opportunity to share our feelings with people from my country who had the same plight, and it was very precious.” (Interviewee Y, Botanical Garden group). Similar experiences were shared by another participant, who also noted limitations: “We socialize, but it doesn’t lead to long-term friendships” (Interviewee X, Botanical Garden group). This observation again points to the need for sustained engagement and aligns with questionnaire responses (the background information) from the 2022 Healing Garden group, which suggested that the intervention was perceived primarily as municipal support rather than a source of lasting social ties.

5. Discussion

This study examined the practical and methodological strengths and limitations of using temporal evaluation approaches to evaluate short-term nature-based interventions with migrant participants. Rather than conducting an independent research study aimed at establishing the comparative validity of individual psychological measures or the effectiveness of particular NBI modalities, this study integrated NBI processes and their evaluation into existing service practices, following Boetto’s (2016) ecosocial approach to social work. Consequently, the findings illustrate how different measures perform under real-world conditions, where evaluation processes are influenced by factors such as language, participant burden, intervention context, and data completeness.

5.1. Methodological Implications of Temporal Evaluation Approaches

The descriptive pre–post findings showed differing patterns across the measures. PANAS captured changes in positive and negative affect across the intervention groups, while NRS-6, ESIS, and ROS showed relatively small differences between measurement occasions in the 2022 Healing Garden group. These patterns indicate that some changes may occur in participants’ mental states during the NBI process. However, the ability of the psychological measures to detect such changes, as well as the effectiveness of specific intervention modalities in producing them, should be interpreted cautiously, as the study was not designed or sufficiently powered to establish statistically significant intervention effects. They are therefore best understood as descriptive indications of how the different measures responded within the available dataset, rather than as evidence that participants improved as a direct result of the interventions.

The differences observed between measures, however, highlight the importance of matching a measure to the temporal characteristics of the construct being evaluated. The revealed performance of the measures implies that immediate emotional affect and psychological restoration may be more responsive to short-term intervention settings than nature relatedness or social inclusion, which may reflect comparatively stable dispositions or processes that develop through repeated interaction over time. Consequently, limited short-term change on NRS-6 or ESIS should not necessarily be interpreted as evidence that these instruments perform poorly. Instead, the timing of measurement may have been insufficient to capture meaningful change in the underlying constructs.

Post-only approaches reduced the need to repeat lengthy questionnaires and therefore offered practical advantages in settings where participant burden was a concern. However, caution is warranted, as social desirability bias in self-reported data may have contributed to more favorable outcomes (Latkin et al. 2017). Post-only measures used independently can seldom demonstrate change over time. High post-intervention scores should therefore be interpreted as participants' perceptions of immediate outcomes rather than as evidence that the intervention caused improvement.

5.2. Language, Cultural Interpretation, and Participant Burden

The experiences on linguistic accessibility of evaluation suggest that standardized wording may not always transfer straightforwardly across linguistic and cultural contexts. Indeed, a central methodological finding concerned the practical difficulty of applying standardized psychosocial measures in multilingual and culturally diverse intervention settings. Although questionnaires were professionally translated, some individual words and abstract statements remained difficult for participants to interpret consistently. The absence of formal back-translation and cross-cultural validation also limited the extent to which equivalence between the translated and original versions can be assumed.

These difficulties are particularly important for constructs such as emotional affect (PANAS), nature relatedness (NRS-6), and social inclusion (ESIS) where meaning may depend strongly on language, cultural background, and personal experience. Statements that appear straightforward within the context in which a scale was originally developed may carry different meanings for participants from different linguistic and cultural backgrounds. Researcher or facilitator clarification may improve accessibility but can also introduce variation in how standardized items are explained.

Participant burden further influenced the feasibility of the evaluation process. Completing several scales before and after relatively long intervention sessions required sustained attention. Repetition of conceptually similar items may have contributed to frustration or fatigue. Because questionnaire order was fixed rather than randomized, possible order effects cannot be ruled out. Instruments presented later in the evaluation may therefore have been more susceptible to reduced concentration, although this study did not directly measure fatigue.

PANAS and NRS-6 were primarily developed and validated in predominantly Western, educated adult populations, including university students and community samples (Watson et al. 1988; Nisbet and Zelenski 2013), whereas ESIS was specifically developed and validated in Finland among adults experiencing or being at risk of social exclusion (Leemann et al. 2021), while ROS and the Metsähallitus scales were developed and applied in Finnish wellbeing and nature-related research contexts (Korpela et al. 2008; Kaikkonen et al. 2014). The findings of this study suggest that the practical suitability of an evaluation measures for ecosocial work with migrant populations cannot be determined solely on the basis of psychometric properties validated in Western populations. Considerations related to linguistic accessibility, participant burden, administration procedures, and contextual fit are also critical.

5.3. Role of Qualitative Data in Interpreting Evaluation Outcomes

The small number of post-intervention interviews ($n = 4$) provided mainly contextual and illustrative information that helped interpret the quantitative findings. Participants described experiences related to psychological restoration, nature engagement, and social and cultural interaction, thereby illustrating how they interpreted and experienced intervention outcomes that were not fully captured by the quantitative measures based on pre-defined items.

The qualitative findings were particularly useful when questionnaire outcomes and participant narratives did not align straightforwardly. For example, relatively stable or declining scores on measures of nature relatedness could be considered alongside participants' accounts of increased appreciation of nature or willingness to spend time outdoors. Such seemingly conflicting results do not necessarily establish that one form of evidence is more valid than another; rather, they demonstrate that standardized measures and participant narratives may capture different dimensions of experience, a phenomenon that has been widely recognized in mixed-methods research as methodological complementarity (e.g., [Greene et al. 1989](#)).

The interviews were not specifically designed to evaluate participants' perceptions of the questionnaires themselves. Consequently, the present study cannot determine systematically how participants experienced individual measurement tools, which instruments they found easiest or most difficult to complete, or how questionnaire burden influenced their responses. Including explicit questions on measures' comprehensibility, cultural relevance, and respondent burden would strengthen future methodological evaluations.

5.4. Methodological and Implementation Limitations

Several methodological and implementation limitations affect the interpretation of the findings. First, the intervention groups were small and heterogeneous, and participants were not randomly allocated to intervention modalities. The interventions were embedded within the routine service processes of collaborating multicultural organisations and were shaped by existing organisational partnerships, participant availability, and practical opportunities rather than by an experimental design. Recruitment through existing group-based communication channels supported accessibility and voluntary participation but also resulted in variable attendance and group composition. These conditions also created practical challenges related to scheduling, transportation, facilitation, and linguistic support. Consequently, differences between the gardening and walking interventions cannot be interpreted as evidence of comparative intervention effectiveness. The small intervention groups and loss of reliably matched pre-post observations also limited the feasibility of inferential statistical analysis. Consequently, the study cannot determine whether the observed descriptive differences represent statistically significant change.

Second, anonymous respondent codes were used to protect participant confidentiality while enabling pre- and post-intervention responses to be linked. However, some participants forgot, changed, or inconsistently recorded their codes, and some questionnaires were incomplete. This reduced the amount of usable paired data and limited the extent to which temporal differences could be examined consistently across measures. Future studies should retain appropriate privacy protection while using more robust procedures for longitudinal linkage, such as participant-generated identifiers accompanied by clear instructions and reminders or researcher-managed pseudonymous codes.

Third, although questionnaire materials were prepared with the assistance of professional translators, the translated measures were not subjected to formal back-translation or separate cross-cultural psychometric validation. During administration, some participants also required clarification of individual words or abstract psychosocial statements. The interpretation of translated items may therefore have differed across languages and cultural backgrounds, while assistance from researchers and facilitators may also have introduced variation in how individual items were explained.

Fourth, the study relied primarily on self-reported outcomes. Post-only responses in particular may have been influenced by social desirability, courtesy, expectancy, or demand effects. Participants knew that they had taken part in interventions intended to support wellbeing and social interaction and may therefore have felt an expectation

to report positive experiences. High post-intervention ratings should consequently be interpreted as participants' perceived immediate outcomes rather than as objective evidence of intervention effectiveness.

Fifth, participant burden may have affected response quality. Several measures were administered within relatively long intervention sessions, and some questions addressed conceptually similar issues. Questionnaire order was fixed rather than randomised, and fatigue was not measured directly. It is therefore not possible to determine the extent to which fatigue, reduced concentration, or order effects influenced later responses.

Finally, only four participants completed the post-intervention qualitative interviews. The interviews provided useful contextual information for interpreting the quantitative findings but cannot represent the range of experiences across all intervention participants. They also focused primarily on participants' experiences of the NBIs rather than on their experiences of completing the evaluation measures. The present study therefore cannot systematically determine which measures participants considered easiest, most burdensome, or most culturally appropriate to complete.

5.5. Implications for NBI Evaluation in Social Work

The findings provide several practical considerations for the evaluation of short-term NBIs in migrant-focused social work. The choice of evaluation measure should reflect both the construct being assessed and the time frame within which meaningful change can reasonably be expected. Measures addressing immediate affective or restorative experiences may be more compatible with short-term interventions, whereas constructs such as nature relatedness and social inclusion may require repeated participation or longer follow-up periods before meaningful temporal change becomes detectable.

In the present study, the relatively concise and experience-focused wording of the Restorative Outcome Scale appeared practically suitable for assessing immediate restoration following nature-based activities. Its brevity may also help reduce respondent burden when repeated assessments are required. However, the present study does not establish that ROS is psychometrically superior to PANAS or other wellbeing measures, and its suitability for migrant populations requires further investigation. Similarly, the Metsähallitus measures used experience-specific statements related to perceived outcomes such as appreciation of nature, learning, motivation, and social interaction. Such wording may offer practical advantages in short-term post-intervention evaluation compared with measures that assess relatively stable dispositions. Nevertheless, post-only measures cannot establish whether participants' perceptions changed from baseline and should therefore be interpreted as assessments of perceived immediate outcomes rather than evidence of intervention-induced change.

When post-only approaches are used, particular attention should be paid to possible social desirability bias. Respondents should be clearly informed that both positive and negative experiences are equally valuable and that there are no preferred or expected answers. Such communication may help support more accurate self-reporting. Combining post-only quantitative measures with brief qualitative interviews may also provide useful contextual information for interpreting participants' responses.

Furthermore, respondents should be clearly informed that both positive and negative evaluations are equally valuable, particularly when measures are administered only post-intervention, as self-reported responses may be especially susceptible to social desirability bias (Latkin et al. 2017).

The findings also highlighted challenges in assessing changes in social inclusion. Such changes may be difficult to assess because social inclusion is a multidimensional and relational construct. Participants may also find it difficult to evaluate changes in their sense of belonging, agency, and social connectedness, particularly over a short period.

Moreover, belonging is sometimes treated too narrowly as a subjective feeling, even though it also depends on whether individuals have genuine opportunities and capacities to form meaningful connections. For example, a participant may enjoy social interaction during a guided walk while still lacking enduring social relationships, institutional recognition, or equitable opportunities to participate in society. Social inclusion lacks a universally accepted definition and, together with belonging and the development of social relationships, represents a dynamic process that may unfold over longer periods through repeated interactions (Allen et al. 2021; Ben Brik and Brown 2025). Consequently, the choice and timing of a measure may determine which dimensions or stages of this broader and more complex inclusion process are captured. The use of social inclusion measures therefore requires careful conceptual and temporal consideration. In short-term NBIs, measures such as ESIS may not capture changes that require repeated interaction or longer periods to emerge. Further research is needed to determine which evaluation protocols, forms of language support, and measurement intervals are most appropriate for assessing social inclusion in migrant-focused NBIs integrated into routine service processes.

Qualitative approaches are particularly valuable in this context because they can help explain why standardized scores remain stable, change unexpectedly, or appear inconsistent across instruments. They may also help identify discrepancies or response patterns that suggest the possible influence of social desirability bias. In this study, the interviews added contextual information about psychological restoration, nature engagement, and social and cultural experiences that could not be captured fully by the questionnaire scores alone. Rather than serving as evidence that one instrument was more valid than another, the qualitative material demonstrated the value of combining standardized measures with participants' own accounts when interpreting complex psychosocial outcomes.

From a practice perspective, evaluation should be integrated into the planning of NBIs rather than added only after an intervention has been designed. During the planning process, researchers, social workers, multicultural organizations, and participants should jointly consider which outcomes are realistic to assess, how much evaluation burden is reasonable, what linguistic support is required, and when measurements should take place. Such collaboration may improve both the feasibility of the evaluation and the quality of the resulting data.

6. Conclusions

Evaluating nature-based interventions with migrant participants requires attention not only to the outcomes being measured but also to the practical, linguistic, cultural, and temporal conditions under which evaluation takes place. This study used three short-term NBI cases in Finland to examine the methodological strengths and limitations of temporal evaluation approaches to assessing emotional wellbeing, psychological restoration, nature relatedness, and social inclusion.

The findings indicate that the feasibility of integrating evaluation into routine service processes depends on the construct being assessed, the intervention duration, the wording and length of the measures, and the characteristics of the participant group. Pre-post designs provide a baseline for examining within-participant differences over time, but their implementation may be complicated by variable attendance, changing intervention conditions, difficulties linking responses across measurement occasions, and the additional burden created by repeated questionnaire. Post-only measures may reduce this burden and provide useful information about participants' perceived immediate experiences. However, without baseline data, they cannot independently demonstrate temporal change or establish intervention effectiveness. Without baseline data, they cannot independently demonstrate temporal change or distinguish perceived intervention outcomes from pre-existing response tendencies or socially desirable responding. Although such biases may also affect pre-post

assessments, baseline measurements provide an important reference point for interpreting post-intervention responses.

Linguistic and cultural accessibility emerged as central methodological considerations. Although questionnaire materials were professionally translated, participants experienced difficulties interpreting abstract or emotionally specific items, partly because the translated measures had not undergone formal back-translation or cross-cultural validation. Translation and cultural adaptation should therefore be incorporated into the evaluation design from the outset. Pilot testing and participant feedback can help assess item comprehensibility and cultural relevance before measures are implemented more widely.

Post-only evaluation also requires careful attention to possible social desirability and expectancy effects. Participants should be informed that both positive and negative experiences are equally valuable and that there are no preferred responses. Neutral and clearly understandable item wording, together with opportunities for qualitative feedback, may help support more accurate interpretation of participants' self-reported experiences. These safeguards do not remove the limitations of post-only designs but can strengthen their practical use when baseline assessment is not feasible.

Combining concise quantitative measures with qualitative approaches may provide a feasible strategy for evaluating short-term NBIs in social work practice. Brief interviews can contextualize questionnaire responses and reveal aspects of participants' experiences that predefined items may not fully capture. This may be particularly valuable when assessing nature relatedness and social inclusion, as these multidimensional and culturally adaptive constructs may develop gradually through repeated experiences and relationships. They may also involve abstract concepts whose meanings and expression vary across cultural and linguistic contexts, making them difficult for migrant participants to articulate. Further research should examine which measure, assessment intervals, and forms of linguistic support are most appropriate using larger samples, repeated interventions, longer follow-up periods, and formally adapted multilingual measures.

Evaluation planning should be integrated into NBI design and undertaken collaboratively by social workers, researchers, multicultural organizations, and migrant participants. Recruitment procedures, participant identification, data-linkage methods, questionnaire timing, linguistic support, intervention duration, and participant burden should be considered together. Greater collaboration between can contribute to evaluation approaches that are both methodologically robust and responsive to the realities of culturally and linguistically diverse intervention settings. Evaluation protocols that are accessible, culturally responsive, and proportionate to participants' circumstances are essential for generating meaningful evidence while maintaining inclusive social work practice.

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