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Forest and Nature-Based Recreation for Older Adults: Preferences, Well-Being, and the Need for Inclusive Planning

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Abstract: This study provides user-centered insights into how inclusive forest design can support the physical, emotional, and social well-being of older adults. It operationalizes universal design principles in natural settings and confirms their relevance through empirical evidence. With global population aging accelerating, adapting forest recreation environments to meet the specific needs of older adults is increasingly urgent. This study investigates how infrastructure influences both participation and emotional well-being among older visitors in forest recreation areas. Data was collected from 446 participants aged 65 and older using a structured survey distributed through in-person and digital snowball sampling. Participants reported their infrastructure preferences and emotional responses related to forest visits. The findings show that older adults highly value site cleanliness, shaded seating, accessible restrooms, and clear signage. Expectations varied significantly by health status, age group, and visitation frequency. Emotional well-being was positively associated with both comfort and visit frequency. These results demonstrate how inclusive infrastructure plays a vital role in supporting older adults' access to and enjoyment of forest environments. The study affirms that universally designed forests not only reduce barriers, but also promote psychological health and active aging, contributing to developing more equitable and sustainable nature-based recreation areas.

Keywords: Older adults; well-being; active aging; nature-based recreation, forest recreation areas, inclusive planning, universal design, environmental accessibility.

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1. Introduction

The global trend of population aging presents both pressing challenges and new opportunities for planning public spaces. According to [1] (p. 4), the number of individuals aged 65 and older is projected to be more than double, rising from 761 million in 2021 to 1.6 billion by 2050. In several high-income European countries, such as Italy and Germany, older adults are projected to make up more than one-third of the total population within the next few decades [2]. These demographic shifts raise significant implications for how outdoor recreation spaces, and in particular forests, are designed, planned, managed, and experienced. Forests play a key role as accessible environments for leisure and physical activity, offering older populations opportunities for social interaction, cognitive restoration, and active engagement in natural settings [3-4].

An increasingly recognized form of nature-based recreation is 'forest bathing' or 'forest therapy'. it is a practice originating in Japan that involves immersing oneself in a forest environment to engage all the senses [5-6]. Unlike traditional hiking, forest bathing emphasizes mindful presence and sensory awareness, offering therapeutic benefits such as reduced stress, improved mood, and enhanced immune function. Research indicates that this practice can be very beneficial for older adults, supporting mental and physical health without the need for strenuous activity [6-8].

Older adults are not a homogeneous group; rather, they vary across multiple intersecting dimensions, including age, gender, health status, physical ability, income level, and education [9]. Researchers have proposed various frameworks and terminologies to segment this population, such as the "senior market," "mature adults," "Baby Boomers," and the "60-plus market," though such labels often obscure internal diversity [10]. Definitions based on chronological age also vary, with some studies considering individuals aged 50 and over as older adults, while others use thresholds of 60 or 65, often aligned with retirement or social policy criteria [11]. In this study, the threshold of 65 is adopted, aligning with commonly used demographic definitions and statistical practices. Adding to this, [12] (pp.15-20) propose a three-tier segmentation that reflects differences in health, lifestyle, and recreational needs: "empty nesters" (ages 55–64), who are typically still employed and financially stable; "young seniors" (65–79), who are often retired, health-conscious, and willing to invest in quality experiences; and "older seniors" (80+), who may face greater physical limitations and require more supportive infrastructure. These distinctions are critical for understanding recreational preferences and for designing forest environments that are truly inclusive.

However, the chronological age is not solely a marker. A growing body of research emphasizes the significance of subjective age, namely how old individuals feel relative to their actual age, as a determinant of behavior, health outcomes, and social engagement, including taking part in leisure and recreational activities. Many older adults perceive themselves as 7–15 years younger than their chronological age [13]. This gap between perceived and actual age has profound implications for designing age-sensitive environments, highlighting the disconnection between physical aging and personal identity. Accordingly, age-friendly planning should aim to preserve autonomy, promote engagement, and reflect the lived experience of older adults [14]. In this context, the concept of universal design has been increasingly applied in the planning of public spaces. Universal design refers to the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design [14-15]. This approach aims to create inclusive environments that include a wide range of users, including families with children and strollers, individuals with disabilities, and other minority groups, thereby promoting equality and accessibility in public spaces [16]. The activity theory of aging, originally proposed by [17] (pp. 299–320), posits that continued engagement in meaningful activities supports well-being in later life. This foundational theory has significantly influenced contemporary planning and public health efforts to promote healthy aging. Professional organizations also highlight their practical relevance. For instance, [18] emphasizes the role of meaningful engagement in supporting older adults' well-being in care settings [18]. Moreover, [19]) found that engagement in activities such as volunteering and club participation positively impacts the quality of life in older populations across various European regions. Similarly, a study by [3] demonstrated that middle-aged and older

individuals who maintain active lifestyles experience better mental well-being and social adaptation. Forest environments have been identified as uniquely supportive of successful aging, as they enable structured physical engagement and restorative psychological outcomes through outdoor-based interventions [4]. Such environments offer restorative opportunities for physical activity, cognitive stimulation, and social interaction, all of which are known to enhance quality of life [7,20-21]. Recent findings also show that activity engagement, particularly in natural or cognitively stimulating settings, can improve cognitive performance among older adults [22].

All in all, nature-based recreation and specifically forest therapy have been widely recognized for its psychological and physical health benefits [4,8]. However, the ability to benefit from these environments is not yet guaranteed for all users. Accessibility barriers such as uneven trails, lack of restrooms, poor signage, or inadequate seating, or other barriers such as social and economic ones, can significantly reduce participation among older individuals, particularly those with limited mobility or chronic health conditions [12, 23-25]. There remains a need to understand how the benefits of forest therapy and activity are mediated by site design. In this context, forest and nature-based recreation emerges as a promising domain for supporting the well-being of older adults. This segmentation further underscores the need for universal design, as previously discussed, to ensure adaptable environments across functional capacities [15, 26].

The segmentation of the older adult population introduced earlier [12] further underscores the importance of universal design in forest and recreational planning. Variations in health, lifestyle, and recreational preferences across different age groups within the older population highlight the need for environments that are adaptable to a wide range of functional abilities. Inclusive planning, grounded in universal design principles, must therefore ensure that public spaces remain accessible, equitable, and usable for all older adults, regardless of age-related changes or health limitations [26]. This perspective is supported by user preference studies in recreational forests, which reveal that infrastructure needs vary according to factors such as health status, visit frequency, and mobility patterns [9,27]. [28] (p.12) argues that aging adults represent a powerful economic and cultural force, and not only a demographic trend. As consumers, community members, and knowledge holders, they increasingly shape the demand for accessible and meaningful public spaces. From this perspective, inclusive planning is not only a matter of equality but also a strategic imperative. This approach aligns with findings that inclusive public space design directly enhances quality of life for older adults across domains such as autonomy, social interaction, and meaningful leisure [16].

Together, these findings reinforce the importance of designing forest environments that are not only aesthetically pleasing but also inclusive and supportive across a wide range of physical and cognitive abilities. Forests, long considered universally accessible, must now be re-examined to ensure they accommodate diverse aging experiences, including those with mobility or health limitations [6]. Building on the established value of green spaces for well-being [29-30], the present study offers user-centered insights into the features that enhance forest inclusiveness for older adults. It is grounded in universal design (31,15,26] and the activity theory of aging [17,19,22], translating these frameworks into actionable findings for policy and planning. This study investigates how forest recreation areas can support older adults' well-being by examining their preferences and attitudes toward infrastructure and accessibility parameters.

The objective of this study is to examine how inclusive infrastructure in forest recreation areas influences both patterns of engagement and emotional well-being among older adults. This study makes a novel contribution by focusing on forest-specific planning and empirically analyzing older adults' preferences across diverse health statuses, age segments, and visit frequencies. It operationalizes universal design principles, typically applied in built environments in natural settings, and tests their relevance through survey data from 446 respondents. By identifying differentiated infrastructure needs and emotional responses among subgroups of older adults, the study expands current understanding of how forest design can support active aging, accessibility, and psychological health.

To this end, the study is guided by two central hypotheses:

H1. *Inclusive forest infrastructure (e.g., accessible restrooms, signage, seating, and shade) contributes to a more positive and comfortable visiting experience for older adults, potentially supporting sustained engagement with nature-based recreation.*

H2. *Inclusive planning in forests contributes to positive emotional and social experiences and may support psychological and physical well-being for older adults.*

2. Materials and Methods

Qualitative survey research is a widely used method in tourism and environmental studies, particularly for capturing visitors' experiences and perceptions in natural settings. Visitor surveys are instrumental in understanding user engagement and satisfaction, providing valuable insights for the development of inclusive and accessible recreational spaces [32].

This study employed a quantitative survey methodology to explore older adults' preferences, attitudes, and emotional responses (aged 65 and above) regarding their experiences in forest recreation areas. The research aimed to assess how inclusive infrastructure supports participation in forest recreational activity and contributes to emotional well-being among the elderly.

2.1. Survey Design

The survey instrument, developed by the research team, comprised 29 items structured to collect data across several categories. Initially, demographic and socio-demographic characteristics were gathered, including age, health status, and education level. Subsequently, questions addressed visit frequency and patterns related to forest recreation activity. Participants were then asked to rate the importance of various infrastructure and experiential elements, such as benches, signage, restrooms, and access from parking. Finally, emotional outcomes were assessed through statements like "Visiting the forest fills me with tranquility and a pleasant feeling," using a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). Internal consistency for grouped items (e.g., infrastructure importance and emotional well-being) was tested using Cronbach's alpha, with results exceeding the threshold of 0.70, indicating reliable item grouping. To ensure clarity and relevance for the older population, a pilot version of the survey was administered to 50 participants aged 65 and above. Feedback from this pilot led to minor modifications to improve item comprehension and ensure differentiation among responses.

2.2. Sampling and Data Collection

Data were collected over six months from September 2023 to February 2024, using a dual sampling strategy to maximize reach and participant diversity. First, a small number of surveys (n = 24) were administered in person at selected forest recreation sites across Israel to capture insights from active, on-site visitors. Due to logistical constraints and interruptions in fieldwork, this subset was not statistically significant and therefore was not analyzed separately. Only survey items completed by the full participant set were included in the final analysis. Second, to expand the sample and include older adults with varying visitation habits and health profiles, digital snowball sampling was employed. The survey link was distributed via social media platforms (e.g., WhatsApp, Facebook), email lists, and professional and community networks. This method yielded the majority of responses and enabled the inclusion of individuals who may not be frequent forest users but represent important segments of the older adult population. The final dataset comprised 446 Israeli residents aged 65 and older, with variation in age, health condition, education level, and forest usage frequency. While the sampling was non-probabilistic, the sample size and internal diversity provide a meaningful basis for exploratory statistical analysis.

2.3. Ethical Considerations and Analytical Approach

The study adhered to ethical guidelines for research involving human participants and received approval from the Ethics Committee of the Faculty of Social Sciences, University of Haifa. Informed consent was obtained from all participants prior to their involvement in the study.

2.4. Data Analysis

For data analysis, both descriptive and inferential statistical techniques were employed. Descriptive statistics were used to profile the sample, including demographic characteristics and general attitudes toward infrastructure elements. One-way ANOVA tests examined group differences, particularly focusing on age-related health trends and variations in infrastructure preferences. Linear regression analyses identified significant predictors of emotional outcomes, such as feelings of tranquility or social connectedness associated with forest visits. These analyses enabled the assessment of how variables like visit frequency, age, and infrastructure availability relate to the overall experience of older adults in forest environments.

This analytical strategy facilitated the examination of both broad patterns and subgroup distinctions, providing a robust foundation for evaluating the study's core hypotheses. The use of statistical testing enhanced the interpretive validity of the findings and enabled the identification of key areas where inclusive design can reduce barriers and increase well-being.

3. Results

The survey data revealed several consistent patterns in how older adults engage with and perceive forest recreation areas. These findings support both hypotheses, showing how infrastructure design influences elder user experience (H1) and how inclusive planning contributes to emotional well-being (H2). The results also underscore meaningful differences across age, health status, and visitation frequency.

3.1. Demographic Profile and Health Characteristics

Respondents ranged in age from 65 to over 90. The majority (56%) were aged 65–75, 21% were 76–80, and 23% were over 80. A substantial portion (80%) self-identified as being in good health and physically active; only 1.6% reported poor health or inactivity.

A one-way ANOVA confirmed a significant inverse relationship between age and health status [$F(1,541) = 14.210$, $p = 0.000$]. As age increases and mobility declines, the need for inclusive infrastructure such as shaded rest areas and supportive seating grows [24].

3.2. Visitation Frequency and Use Patterns

Frequent visitors (36.4%) reported visiting forest areas at least once a month and were generally healthier and more confident in navigating environments. Occasional visitors (64.6%) expressed different priorities: quiet surroundings, shaded benches, clean restrooms, and food and drink options.

They also emphasized the importance of digital pre-visit information. ANOVA testing confirmed significant differences in infrastructure and information preferences between the groups [$F(4,441) = 21.373$, $p < 0.001$].

3.3. Preferences for Forest Infrastructure

When participants were asked to rate the importance of various infrastructure elements in forest recreation areas, they expressed strong and consistent preferences across the sample. The most highly valued attribute was site cleanliness, which received the highest average score (mean = 4.92). This was followed closely by functional infrastructure (including restrooms, trash bins, and drinking fountains) and signage and navigational information, both with a mean of 4.74. Picnic tables and seating areas also ranked highly, with the mean of 4.68.

Detailed scores for these infrastructure elements are presented in Table 1.

Table 1. Importance rating for selected infrastructure elements

Infrastructure Element	Mean Rating	Standard Deviation
Site cleanliness	4.92	0.016
Functional infrastructure (restrooms, trash bins, fountains)	4.74	0.035
Signage and navigational information	4.74	0.029
Picnic tables and seating areas	4.68	0.38

Lower-rated features included food vendors (M = 3.06) and online pre-visit information (M = 3.62). However, subgroup analysis showed these were rated higher by occasional and older participants. Regression analysis showed visit frequency significantly predicted attitudes toward food services [$F(3,442) = 9.385$, $p < 0.001$, $R^2 = 24.5$] and digital information [$F(1,541) = 14.210$, $p < 0.001$, $R^2 = 34.4$].

3.4. Emotional Benefits and Well-being Outcomes

The findings indicate that the forest is widely perceived as a space that promotes emotional restoration and well-being. Respondents strongly agreed with this statement: "Visiting the forest fills me with tranquility and a pleasant feeling" (M=4.45; SD=0.825). Similarly, the forest was seen as a preferred location for social interaction with friends and family (M=4.08; SD=1.003).

A regression analysis found a significant positive relationship between visitation frequency and emotional outcomes [$F(3,442) = 7.843$, $p < 0.001$, $R^2 = 0.15$]. This suggests that regular forest exposure contributes meaningfully to psychological well-being, offering further support for H2.

3.5. Barriers to Forest Recreation

A subset of participants, especially those in poorer health or older age, reported discomfort or difficulty during forest visits. Agreement with the statement "forest visits are complex and uncomfortable for older adults" was significantly associated with lower health status and older age [$F(3,442) = 11.08$, $p < 0.001$]. This reinforces the need for inclusive infrastructure [8,25].

4. Discussion

This study examined how inclusive infrastructure in forest recreation areas supports the participation, well-being, and emotional engagement of older adults. Drawing on a survey of 446 respondents aged 65 and older, it tested two core hypotheses: that inclusive infrastructure (e.g., signage, restrooms, benches, and accessibility features) enhances comfort and a better user participation experience in forest settings; and that such infrastructure is positively associated with emotional and social well-being. The study is situated in the context of global aging trends and responds to the emerging field of forest-specific planning in academic research [33].

The findings support the first hypothesis, confirming that fundamental features such as restrooms, shaded seating areas, clear signage, and accessible infrastructure are not only desirable but essential preconditions for a more comfortable and positive participation among older adults. These infrastructure elements also serve a broader public health role, as recent reviews show forest-based environments can deliver significant co-benefits to physical and mental health when designed with vulnerable users in mind [34]. These elements become especially critical for individuals with reduced mobility, chronic health conditions, or age-related limitations—conditions that increase in prevalence with age. These results align with prior research that underscores the ergonomic and usability demands of older populations in public spaces [15,31,35].

Moreover, these findings reinforce the argument made by [23], which argued outdoor environments should be evaluated not only in terms of aesthetics or ecological function but also their capacity to support varied physical abilities. While a growing body of research has explored the benefits of nature exposure for older adults, much of it has focused on urban parks and built environments [25,36]. In contrast, studies specifically addressing planning needs within forest recreation contexts remain relatively limited and only recently emerged [6,33]. This study helps to address that gap by foregrounding older adults' preferences in forest environments. In support of the second hypothesis, emotional and psychological benefits were clearly articulated by respondents, who reported high levels of tranquility, the reduce of stress, and social bondage during forest visits. These outcomes align with literature on forest therapy and nature-based well-being [7,21,33]. Regression analysis confirmed a modest but statistically significant relationship between visit frequency and positive emotional outcomes, suggesting that regular exposure to forest environments contributes to improved emotional health. These results reinforce findings from [29] (p.1) and [36] (pp.362–373), who emphasize the importance of access to green space for well-being in aging populations.

The segmentation of user experiences also reflects the three-tier model of older adults introduced earlier [12], which distinguishes between "empty nesters," "young seniors," and "older seniors." This model helps explain observed variations: for instance, frequent visitors, typically healthier and younger seniors, show greater adaptability and lower sensitivity to environmental shortcomings. Conversely, older or less active adults' express higher demands for supportive infrastructure and information, reflecting more limited physical and technological capacities. Importantly, the study identifies heterogeneity within the older adult population, reaffirming that they are not a monolithic group. Occasional visitors for example, prioritized quiet, seating, shade, and access to food and drink. They also placed greater value on online pre-visit information. These findings resonate with earlier work by [27], who observed that forest visitors express distinct preferences regarding site maintenance, signage, and comfort features. Their study similarly emphasized the value of tailored design based on visitor demographics and behavior.

Moreover, older adults with lower health levels were significantly more likely to find forest visits uncomfortable. While this group may benefit the most from the health effects of nature, they face the greatest barriers to access. This underscores a critical planning challenge: ensuring that forest environments are not only appealing aesthetically, but also genuinely inclusive. These findings call for a move beyond generic accessibility standards to more nuanced, evidence-based planning tailored to diverse user needs [8,25]. Universal design in forest settings, considering the specific needs of the elderly population and those with mobility limitations or physical ones, will ensure equitable access for all segments of all sectors of the population.

4.1. Theoretical and Practical Implications

From a theoretical standpoint, this study contributes to the theory of active aging [17,19] by linking infrastructure quality with both participatory behavior and well-being outcomes. It operationalizes universal design principles which are mainly discussed in urban contexts [15,31] within a forest setting, showing their relevance for natural, open environments. In this view, this research provides a valuable empirical model for interdisciplinary inquiry across leisure studies, environmental psychology, and tourism planning.

From a practitioners' standpoint, the study offers clear, actionable insights for recreation and tourism planners: Infrastructure such as shaded seating, accessible trails, and clean restrooms are essential for ensuring equitable access to forests. Planning should differentiate between subgroups in a way that provides quiet zones and food access for occasional visitors, and more flexible spaces for frequent users. Online pre-visit information (maps, accessibility features) should be made available in user-friendly formats to support visit planning among less technologically oriented seniors. Forest managers should consider promoting nature-based activities (e.g., guided walks or therapeutic programs) to encourage first-time or hesitant older visitors.

4.2. Methodological Challenges and Future Research

The limitations of this study should also be acknowledged. The use of non-probabilistic sampling (especially via snowball methods) may limit the generalizability of findings, despite efforts to include diverse respondents. Additionally, the study captures self-reported data, which may be influenced by memory bias or subjective interpretation. The cross-sectional design also restricts the ability to track changes in preferences or behaviors over

time. These limitations are consistent with challenges noted in prior research on older adults' outdoor preferences [25].

Future research should include longitudinal studies to observe how aging, health changes, and repeated exposure to forests shape user needs and benefits over time. In-depth qualitative methods, such as focus groups and interviews, could provide further insights into the barriers experienced by specific subgroups. Moreover, experimental interventions testing specific infrastructure improvements (e.g., benches with armrests or signage redesign) could help determine the most effective strategies for inclusive design.

By addressing an important gap in forest recreation planning for aging populations, this study contributes to a growing evidence base that supports more inclusive, age-sensitive environments. Forest design for older adults is not merely a policy obligation, it is a forward-looking strategy for public health, social inclusion, and sustainable tourism.

Bringing these insights together, this study demonstrates that inclusive forest recreation planning is not only a matter of accessibility but a strategic approach to enhancing the quality of life for older adults and creating a better recreational experience. By aligning infrastructure design with the diverse needs of aging visitors, forest environments can serve as vital settings for health promotion, social engagement, and leisure participation.

As population aging continues globally, embedding evidence-based, age-sensitive principles into forest planning becomes essential for fostering equitable and meaningful outdoor experiences across the later life course.

5. Conclusions

This study confirms that inclusive infrastructure in forest recreation areas is critical in promoting participation and emotional well-being among older adults. Features such as shaded seating, clean restrooms, and clear signage are not only functional but essential for accessibility, especially for those with declining mobility or health. The results support the need to move beyond generic accessibility standards toward context-sensitive planning that reflects the heterogeneous needs of older adults. The research also emphasizes that universal design, a concept widely applied in urban settings, is equally relevant in natural environments like forests. It can foster active aging and mental restoration. Findings show that user segments such as “young seniors” and “older seniors” have distinct preferences, reinforcing the importance of differentiated, user-centered approaches. From a planning perspective, actionable recommendations include tailoring infrastructure, offering digital pre-visit information, and promoting guided nature-based activities. As demographic aging accelerates globally, these insights underscore the strategic value of designing age-sensitive forest spaces for individual well-being and long-term public health and sustainable tourism planning.

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Abbreviations

The following abbreviations are used in this manuscript:

ANOVA	Analysis of Variance
SD	Standard Deviation
R^2	Coefficient of Determination (R-squared)
H1	Hypothesis 1
H2	Hypothesis 2
UN	United Nations

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