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Urban Older Adults' Perspectives on Nature: A Directed Content Analysis

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ABSTRACT
The theory of biophilia hypothesizes humans have an instinctual desire to interact with nature that benefits physical and cognitive development, as well as health and well-being. This study aimed to explore how the theory of biophilia was represented across urban older adults' descriptions of their experiences in and perceptions of nature. We analyzed secondary qualitative data from focus groups with community-dwelling, urban older adults. Using directed content analysis, we developed a categorization matrix and a priori codes derived from concepts and mechanisms outlined in the theory of biophilia. Two coders then independently coded the data and reached a consensus. The team then worked iteratively to identify categories and sub-categories. All participants were female (N =30), and the majority were African Americans or Black (83.3%). We identified five broad categories: 1) Cognitive Aspects of Nature, 2) Nature Influences Multiple Domains of Well-being, 3) Nature as a Platform for Shared Experiences and Social Connectedness, 4) Greater Nature Appreciation in Later Stages of Life, and 5) Barriers to Enjoying Nature. Overall, we observed that participants valued their interactions with nature and, as a result, experienced elevated feelings of well-being. Many participants explained how their appreciation for nature interactions intensified in later life, suggesting nature-based activities may be a useful approach to promoting the health and well-being of older adults.

KEYWORDS: Biophilia, non-pharmacological interventions, ecotherapy, gerontology, horticultural therapy

Regardless of age, contact with nature is associated with various biopsychosocial and spiritual benefits (Baxter & Pelletier, 2019; Hurly & Walker, 2019). A growing body of literature suggests benefits from a variety of nature-based interventions, including direct nature exposure

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(Kobayashi et al., 2015), horticulture therapy (Detweiler et al., 2012), viewing therapeutic blue and green landscapes (Finlay et al., 2015), and indirect nature exposure through videos, virtual reality experiences, and viewing digital images of nature (Browning et al., 2020; Hedblom et al., 2019; van Houwelingen-Snippe et al., 2023). Observed benefits include greater subjective well-being (Cartwright et al., 2018) and increased social connectedness (Loukaitou-Sideris et al., 2016) as well as physical and psychological health outcomes (Baxter & Pelletier, 2019; Gaekwad et al., 2022; Hurly & Walker, 2019). Previous studies investigating the health benefits of nature-based interventions have observed gains in cardiovascular relaxation and reduced stress levels (Kobayashi et al., 2015), higher levels of self-rated health and well-being (Kragh et al., 2016; Orban et al., 2017), and increased feelings of happiness (Capaldi et al., 2014).

Positive impacts of nature-based interventions have also been observed in older adults (Gagliardi & Piccinini, 2019; Loukaitou-Sideris et al., 2016). These positive impacts include reduced depression and agitation, as well as improved sleep behaviors and cognition (Gagliardi & Piccinini, 2019; Sia et al., 2020). Access to safe community parks and green spaces has been linked to increased socialization and well-being in older adults (Loukaitou-Sideris et al., 2016). Furthermore, evidence indicates older adults residing in both the community and residential facilities value interactions with nature and find these experiences meaningful (Freeman et al., 2019; Lee et al., 2022).

Despite the observed benefits of nature-based interventions, a significant gap remains: The lack of a robust theoretical framework to guide research, practice, and policy. In particular, the evidence on nature-based interventions has been described as largely atheoretical (Hurly & Walker, 2019). Moreover, most research focuses on residential facilities, limiting generalizability to community-dwelling older adults (Sia et al., 2020). Furthermore, there is a need for research that explores the diverse experiences and perceptions of outdoor environments among racially and ethnically diverse groups of older adults (Frumkin et al., 2017; Loukaitou-Sideris et al., 2016).

The Theory of Biophilia

Edward O. Wilson (1984) defined biophilia as "the innate tendency to focus on life and lifelike processes" (p. 1). This definition is often referenced in academic literature; however, biophilia proposes much more. Biophilia explains how interactions with nature across the lifespan can promote physical and psychological health, stimulate cognition, foster social engagement, and promote feelings of well-being. Rooted in biology, biophilia posits that our affinity, or 'philia,' for nature stems from both innate and learned factors (Barbiero & Berto, 2021).

Wilson (1984) believed human interactions with nature were essential for health and well-being. *Time* is an important concept in biophilia as it influences fascination with nature elements, engagement in conservation activities, and *biophobias* (i.e., fear of certain animals or aspects of nature). Furthermore, Wilson posits that cognition is strongly influenced by interactions in nature occurring across the lifespan. Although these time and lifespan elements may be particularly applicable in the context of older adults, there is limited investigation that has applied the theory of biophilia to understand how it may be observed in older adults.

Assumptions Regarding Cognition

Biophilia is often not recognized for its postulations regarding the role of nature interactions upon cognitive development and functioning; however, this is an important component of the theory (Wilson, 1984). Wilson emphasizes that nature is experienced through sensory processes (i.e., sight, sound, touch, smell, and taste), which stimulate cognition as individuals interpret and process sensory information. Moreover, perceptions of nature evoke emotions, such as awe, fascination, wonder, and fear. Thus, the cognitive processes stimulated by nature experiences are interrelated with emotional responses. Indeed, the symbiotic relationship between cognition and emotion is well-recognized and described as "cognitive-emotional interactions" (Pessoa, 2022; Pruessner et al., 2020), with some theorists arguing cognition and emotion should not be categorized as distinct processes (Okon-Singer et al., 2015).

Biophilia suggests that multisensory stimulation provided by nature experiences in early childhood coincides with important stages of cognitive development, potentially influencing cognitive processes across the lifespan. For example, biophilia asserts that people are drawn to nature during childhood due to an insatiable yearning to understand the world (Wilson, 1984). The mysterious qualities of nature observed in childhood and the emotional responses evoked by nature interactions subsequently stimulate the imagination (Wilson, 1984). The relationship between nature's multisensory stimulation, imagination, and cognitive development is well recognized, such as studies evidencing gains in children's cognitive development through unstructured nature-based play, namely due to increased imaginative play and creativity (Dankiw et al., 2020; Wojciehowski & Ernst, 2018).

Wilson explains that early nature interactions serve a key role in working and long-term memory and supports this assumption in reference to the node-link model described in Collins and Loftus's (1975) spreading activation theory of semantic processing. Widely accepted and applied across cognitive psychology, the node-link model proposes that the brain symbolically encodes knowledge and meaning of persons, places, or things as concepts or *nodes* (Collin & Loftus, 1975). The spreading activation theory of semantic processing explains that nodes are linked to other related concepts organized by similarity and structured to form a semantic network of long-term memories (Collin & Loftus, 1975). When an individual engages in mental processes such as conversing or responding to cues in their environment, the semantic network is activated to quickly search for memoried of related concepts (Collin & Loftus, 1975).

Biophilia proposes that nature interactions occurring in early life stages serve as foundational concepts in the semantic network and are linked to numerous nodes throughout an individual's semantic network. Since the conception of biophilia, advances in neuroscience have supported the role of sensory processes in developing concepts and recalling learned information (Fernandino et al., 2015). Furthermore, biophilia explains that the knowledge and meaning attached to concepts developed through early experiences in nature may be influenced by friends, family, and cultural background. However, biophilia's assumptions regarding the cognitive benefits of interactions with nature have been underexplored in older adult populations.

Assumptions Regarding Biophobias

According to Wilson (1986), some individuals perceive elements of nature fearfully; these fears may develop in childhood and intensify across the lifespan. This concept has since been termed *biophobia* or *ecophobia* (Estok, 2010). Although higher degrees of nature connectedness are associated with greater restorative benefits from nature interactions (Berto et al., 2018), nature interventions may cause significant distress and anxiety for individuals with biophobias

(Heinsch,2012). These are important implications when working with older adults, since biophobias may intensify through reinforcement and avoidance across the lifespan.

Assumptions Regarding Conservation

Wilson (1984) defines conservation as an ethical principle. From this perspective, an individual's engagement in conservation activities is an ethical behavior fostered by concern for future generations. Experiences throughout life can deepen one's conservation ethic through increased exposure to natural environments as well as increased awareness of environmental concerns (Wilson, 1984). In particular, individuals may experience mental well-being benefits through fulfilling their perceived conservation duties (Wilson, 1984), which is a key assertion related to the field of environmental ethics (Joye & Block, 2011). Moreover, empirical findings indicate that adults who engaged in greater levels of outdoor play as children reported greater engagement in environmental conservation during adulthood (Wells & Lekies, 2006). Other evidence emphasizes that increased exposure to nature and knowledge of environmental issues may better predict an increased likelihood of participating in conservation activities than older age alone (Otto & Kaiser, 2014).

Responses to Biophilia

Theoretical issues of biophilia include its assumptions regarding an individual's nature affiliation as an evolutionary process (Barbiero & Berto, 2021), the broad and sometimes ambiguous scope of the theory (Hurly & Walker, 2019), and the use of terminology that is open to multiple interpretations (Joye & Block, 2011). Others argue that further investigation is required to understand the causal mechanisms driving biophilia, which can inform refinements to the biophilia hypothesis (Gunnarsson & Hedblom, 2023).

Despite these issues, there is much interest in understanding the therapeutic benefits of biophilia on health and well-being (Heinsch, 2012). Although underutilized in the social sciences, architecture has embraced biophilia and applied it to develop biophilic design principles (Hu & Roberts, 2020). These evidence-based design principles enhance health and well-being across all age groups by integrating natural elements, materials, colors, shapes, textures, sounds, smells, and environmental conditions into the physical structure of spaces. This approach creates opportunities for both direct and indirect experiences of nature (Hu & Roberts, 2020; Kellert & Calabrese, 2015).

Furthermore, biophilic design has been suggested as a sustainable public health approach to promote the social and psychological well-being of our growing urban older adult populations (Frumkin et al., 2017; Grazuleviciute-Vileniske et al., 2020). For example, biophilic design principles emphasizing the inclusion of local culture and historic aspects of the neighborhood environment can address several psychosocial needs of older adults by fostering a sense of identity, belonging, and connection to their communities (Kellert & Calabrese, 2015). Additionally, community parks and gardens provide urban older adults with accessible gathering spaces, encourage physical activity, and promote overall well-being (Kellert & Calabrese, 2015; Loukaitou-Sideris et al., 2016). Community spaces designed with biophilic principles prioritize resident safety and accessibility (Kellert & Calabrese, 2015), addressing specific barriers that may limit urban older adults' interactions with nature.

While the benefits of biophilic design are well recognized, urban-dwelling older adults often have limited access to nature in their local environments (Orban et al., 2017). Furthermore, there remains a gap in research exploring how the theory of biophilia can inform other psychosocial interventions designed for urban-dwelling older adults.

The Present Study

This study aimed to explore how biophilia was reflected in racially diverse urban older adults' descriptions of their experiences in and perceptions of nature. Exploring experiences in and perceptions of nature in urban-dwelling older adults informs theoretical and practical knowledge of biophilia in various ways. Researchers can form and test hypotheses specific to this population, which can help support or refine existing theoretical knowledge. This exploration can also advance practical knowledge by providing support for current interventions, identifying strategies to adapt current standards of care, or creating new practical applications with older adults who live in urban areas. The study's insights have the potential to shape not only policy and practice in public health and gerontology but also influence urban planning strategies to accommodate the psychosocial needs of older adults.

This study was guided by the following research questions:

1. How do community-dwelling, urban older adults' descriptions of their experiences and perspectives of nature support or contradict Wilson's (1984) theory of biophilia?
2. In the context of Wilson's biophilia, how do older adults residing in urban communities describe the impact of their experiences and perceptions of nature on their feelings of well-being?

Methods

We performed a secondary qualitative data analysis from seven focus groups with community-dwelling, urban older adults, which explored their perceptions and experiences regarding nature. The focus groups were conducted to inform the program delivery of Bird Tales, see Griffin and Elkins (2013) for more details about the intervention. The original study received Institutional Review Board (IRB) approval by the University of Texas at Arlington and those findings have been previously published, see Lee et al. (2022).

Participants

Through a partnership with a nonprofit for aging services located in Dallas, Texas, we recruited community-dwelling older adults (55 years and older) who served as volunteers for the agency. See Lee et al. (2022) for details regarding recruitment. Inclusion criteria for participants included adults 55 years and older, the ability to provide consent for themselves, the ability to attend focus groups without transportation assistance, and fluency in English. Participants provided written informed consent in person before beginning the focus group.

Data Collection

K.L. and a trained graduate research assistant led focus groups in a private conference room at the partner agency. The groups lasted approximately one hour and were audio recorded. Transcripts were professionally transcribed. Data are available on request.

The exploratory nature of the focus group discussion guide led to a significant portion of the qualitative data being unrelated to the original study objectives (i.e., to inform a nature-based intervention using birds). Therefore, the original analysis was restricted to data directly related to birds, and a secondary analysis was conducted using the remaining data. Initially, the secondary data analysis was conducted following an inductive thematic analysis. Through that analysis, concepts of biophilia were observed to align with the data. The research team saw an opportunity

to strengthen the analysis by re-examining the data using a deductive approach guided by the theory of biophilia, which is presented here.

Analysis

Our directed content analysis was adapted from Assarroudi et al. (2018) and Hsieh and Shannon's (2005) methodologies for directed content analysis. Methods followed by Assarroudi et al. (2018) included steps for preparing the data and development of a categorization matrix to guide the analysis. However, after determining the main categories, we followed the methods described by Hsieh and Shannon (2005) to develop pre-determined codes before completing the main data analysis. The use of pre-determined codes deviated from Assarroudi et al.'s (2018) methodology, which outlines that coding rules should be assigned to the main categories and that the development of preliminary codes should follow the main data analysis. As the main categories for our analysis were derived from broad concepts described in *Biophilia*, the development of a priori codes described by Hsieh and Shannon (2005) allowed us to identify distinctions between the main categories. In turn, this benefited our ability to interpret and categorize the coded data into sub-categories and eventually determine final categories. We describe our methods in greater detail below.

Preparation

In the preparation stage, J.C. obtained a thorough understanding of the assumptions and concepts described in *Biophilia* and then summarized each chapter in a chapter summary document. This document as well as the transcripts in their entirety, were then reviewed by J.M. Next, the two coders determined the analytic strategy: to analyze the manifest and latent content (i.e., transcribed text and unspoken meaning of the data, respectively), which is recommended for a thorough understanding of the data (Thomas & Magilvy, 2011). Then, data for this analysis were copied and pasted from the transcripts into an Excel workbook.

Organization

The organization phase involved adapting the categorization matrix processes described by Assarroudi et al. (2018) by first using the chapter summary document to develop the main categories from concepts outlined in *Biophilia* and then to create a priori codes (*see online supplement, Coding Scheme*). Due to the abstract conceptualization of biophilia, developing the main categories was completed iteratively. This included bolding and highlighting meaningful content in the chapter summary document and referencing the original text. Concepts were labeled, and their definitions were broadened and/or narrowed by comparing them with the scholarly evidence base.

Concepts of biophilia share much overlap, which prohibited our ability to assign coding rules to the main categories as outlined by Assarroudi et al. (2018). Instead, we developed a priori codes as suggested by Hsieh and Shannon (2005). General and sub-codes and their respective coding rules were developed and organized into a hierarchical coding scheme (Saldaña, 2013). The scheme was organized by general codes, and relationships shared between the general codes were defined as sub-codes.

The coding scheme was pre-tested by J.C. using data from one randomly selected focus group. The coding scheme was revised and then shared with J.M. Both researchers independently tested the codebook by randomly selecting and coding a focus group. Following this process,

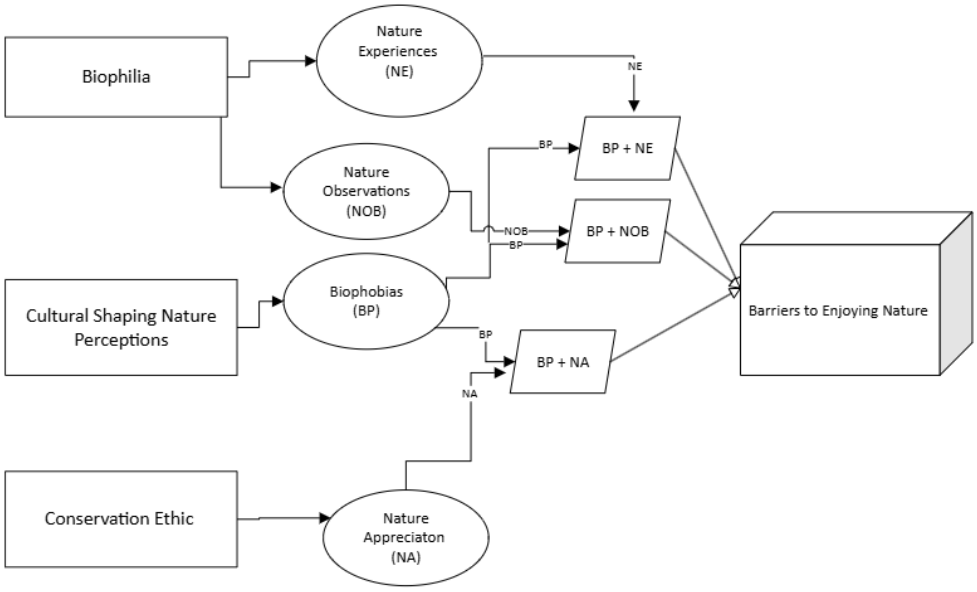
additional revisions were made to the coding scheme. The final coding scheme included 7 main categories, 12 general codes, and 22 sub-codes. Lastly, the coders completed the main data analysis by independently coding the data. The coders then came together to discuss differences and iteratively worked to reach a consensus, with K.L available as a tiebreaker when needed.

Developing Final Categories

After completing the main data analysis, J.C., J.H., and A.T. developed the coded data into sub-categories and then synthesized them into final categories. This process involved observing patterns where coded data seemed to cluster together, creating visual representations of categories and related codes, and then iteratively grouping the data into sub-categories until reaching an agreement on the final categories. Data were grouped to reduce overlap and to distinguish the prominent patterns. See Figure 1 for a visual display of the application of theory to the qualitative analysis for the final category, *Barriers to Enjoying Nature.*

Figure 1.

Main Categories, General Codes, and Sub-Codes for Category, Barriers to Enjoying Nature



Trustworthiness

Our goal was to ensure maximum transparency in reporting our processes and analysis to enhance the replicability of our findings (Drisko & Maschi, 2016). As often occurs in deductive analysis, new inductively defined codes were created to capture differences between the focus group data and the theory of biophilia (Drisko & Maschi, 2016). We applied Guba and Lincoln's (1981) trustworthiness criteria: credibility, dependability, confirmability, and transferability. To enhance credibility, we used peer debriefing for coding and theme development and consulted external colleagues for diverse perspectives. Confirmability was strengthened through analyst triangulation, with multiple analysts comparing perspectives, and by involving two additional team members (J.H. and A.T.) who were not involved in the initial analysis (J.H. and A.T.) to mitigate bias. Dependability was supported by developing a priori codes and using multiple coders. Transferability was enhanced through thick data descriptions, enabling deeper context and meaning in analysis.

Results

Demographics of the Participants

In total, 30 community-dwelling, urban older adults participated in this study (Mean Age = 68.7, SD = 5.4). All participants were female, and the majority identified as African American or Black (83.3%). See Table 1.

Table 1.
Focus Group Demographics (N=30)

Demographics	Number	Percent
Age (*M*=68.7; *SD*=5.4)		
Gender		
Female	30	100%
Race/Ethnicity		
Black	25	83.3%
White	3	10.0%
Others	1	3.3%
Hispanics	1	3.3%
Mobility impairments		
No	14	46.7%
Cane	6	20.0%
Walker	2	6.7%
Wheelchair	1	3.3%
Other	7	23.3%
Average time spent outside		
Less than 10 hours weekly	11	36.7%
Less than 20 hours weekly	2	6.7%
Less than 30 hours weekly	5	16.7%
Less than 40 hours weekly	3	10.0%
40 hours and over	9	30.0%

Focus Group Findings

We identified five categories: (1) Cognitive Aspects of Nature, (2) Nature Influences Multiple Domains of Well-being, (3) Nature as a Platform for Shared Experiences and Social Connectedness, (4) Greater Nature Appreciation in Later Stages of Life, and (5) Barriers to Enjoying Nature. Participants' perceptions of and experiences in nature were often described in terms of sensory processes. Given the link between sensory processes and experiencing nature, we integrated them throughout our categories instead of creating a separate sensory processes category.

Cognitive Aspects of Nature

Cognitive aspects of nature represent participant descriptions that reflect the activation of cognitive processes and are presented in three sub-categories.

1a. Nature Stimulating Cognitive-Emotional Interactions. Across the focus groups, participants frequently described their drive to interact with nature as closely related to emotions of "awe", "fascination", and "wonder". Betty in Focus Group 6 explained, "I just love them [flowers], well, I've always loved flowers from a child until now. I'm just awed in how they look, and how they open up."

In addition, certain qualities of nature were observed as captivating to participants. Across focus groups, participants often referenced cloud formations as a quality of nature that inspired their imagination, "I like to look at the clouds. I get fascinated. How they change, how you can see all in the cloud, it looks like a shape, or [another] thing" (Carla, Focus Group 4). Another natural phenomenon frequently cited as awe-inspiring was waterfalls. For example, Mary from Focus Group 6 remarked, "I want to go to a waterfall. It's hypnotizing, you're just mesmerized." Some awe-inspiring aspects of nature were also scary: "Depends on what kind of nature you're talking about, hurricane, tornadoes, ice storms That's all nature. It's sometimes frightening, as it is beautiful" (Betty, Focus Group 6).

The awe of nature was often described as embodied experiences. Anita from Focus Group 8 stated: "But everything was so beautiful that I haven't seen and that was the first time I've seen the Grand Canyon. It was lovely. I just can't even describe it. I got big chills."

Furthermore, participants frequently described how their fascination for the mystery of nature influenced their thinking by inviting curiosity or a change in perspective: "The smells, the feels, and even the dogs they sniff and you think 'what are they doing'? You just see the world differently when it's you and nature and quiet" (Pat, Focus Group 3).

1b. Nature Experiences and Memory. Participants' descriptions of their memories of nature experiences often revealed multi-sensory perceptions and experiences of nature.

> I also noticed that when it rained the plants were green. And just the smell of cotton before the cotton bowl came on the stalk, to me it had a very calm smell to me. As well as the cornstalks. It was something beautiful, just the smell of nature, the smell of the plants. I enjoyed that growing up as a child. (Marcia, Focus Group 1)

Many participants elaborated on how nature triggered their childhood memories. Recalling memories of nature was consistently observed to spark recall of many other details. In the context of biophilia's assumption regarding nature and the node-link model, this may illustrate how nature-based memories are linked to related concepts in long-term memory.

> Back in the day, we used them [bugs] as fishing bait, but then back then, you fished with the grasshoppers, and cockroaches, and worms. My mother had one of the most beautifulest rose bushes, she had different colors, because she loved flowers, and we didn't like doing it, and she would make us get in, and dig, and plant. But it was worth it when they came up and bloom up, they was so beautiful. (Judy, Focus Group 5)

Particularly striking was the vivid detail participants provided as they recalled their childhood experiences with nature.

> When I was a child growing up, I grew up in East Texas where we had this farm-field type thing, and that's when I was outside an awful lot. Climbing trees and watching the sunrise. Sitting on the porch with my grandfather drinking a little coffee. There was this particular tree when you step out our front door and look across into our field. There was a tree way back there. It was kind of in the center and it was a split tree. And that was my favorite spot to be. (Sherry, Focus Group 4).

1c. Constructing Meaning from Nature. We observed participant descriptions of nature and their nature-based memories were connected to the cognitive process of meaning-making. Several participants highlighted how the natural order of nature served as a model for their own lives.

> To me nature means order. You can get ideas from just looking at nature, how it is in order. Sometimes you can pattern your life after order of nature, like the trees, the water it flows, trees grows, birds sings and flies. (Virgina, Focus Group 1)

In addition, participants explained that their nature-based memories were memorable due to their meaningfulness. Some explained that nature-based memories were long-lasting due to sharing nature experiences with friends and families.

> But I can remember the conversations and things with my grandmother when I was a child. The things that you hold onto are a part of your heart and your life. Your grandmother, your sisters, your brothers, your uncles, and aunts that have brought all this experience to your life. And they shared, like my grandmother shared her experience with the nature. Well, those were her memory. (Mandy, Focus Group 6)

Although many participants described their nature-based memories as meaningful due to experiences shared with loved ones across the lifespan, Gina in Focus Group 6 emphasized these memories sparked the recall of sensory experiences which in turn, helped recall of additional memories:

> The memories and the relationships that you grow up with, and that feeling you get when you're around those people, and you associate that memory with the outdoors because they were outdoors when they did it. And you felt the sunrise. You heard the birds. You smelled the sweet olive tree, and all that's in your memory, and you associate it with something good. I think because in nature, you smell it, you see it, and you feel it. And you associated it with the good memory. I think it's related to other connections with a person, whereas with a car, it's new... it's a whole different memory, whereas the nature, it's an extension of a memory.

Nature Influences Multiple Domains of Well-being

Nature was observed to impact positive feelings of physical, mental, and spiritual well-being. First, participants often described how natural environments motivated them to be physically active, such as Dottie in Focus Group 1, "…out in nature, it makes you want to do something. Exercise." This motivation for greater physical activity, sparked by natural environments, was often observed to contribute to feelings of mental well-being.

> My plants make me want to go outside, and to keep them healthy. I go out and maybe cut the dead leaves off. Put a little more dirt in my flower part. Take care of it, kind of talk to it. Go out and get the water hose. All this need watering. It makes you feel better, then all this stuff in the house. (Virginia, Focus Group 1)

Other participants described how nature-based activities promoted their mental well-being, which in turn benefited their physical well-being. Similar to many participants, Suzie in Focus Group 6 described being captivated by viewing aquariums and explained how this activity helped with her relaxation and physical well-being: "Aquariums are really good because the fish and the water are just constantly moving. To me, that's so soothing. It's amazing to my blood pressure."

Other participants emphasized the role of sensory and cognitive processes as specific aspects of their nature experiences that benefited their well-being. In particular, listening to the sound of water was often connected to feelings of mental well-being. For example, "I was just going to say, if you're by the water, if you're ever depressed or something, just go sit and listen to the water. Something soothing about the water." (Carla, Focus Group 4).

Participants also explained how simply being in natural environments contributed to their feelings of mental well-being. As Kathryn in Focus Group 5 explained, "Nature means to me serenity. Because, when you get out in nature, and you just look around, you can take a deep breath and just relax."

Some experiences of well-being were related to time. Anita in Focus Group 8 was a self-proclaimed nature-enthusiast and explained she experienced feelings of well-being from observing nature during her favorite season: "Fall, the turn and watching the leaves change on the trees and just the air, the 70s and 80s degrees. Yeah, I love being out there. I be glad. And just sitting. Sometimes I just go and sit." Others experienced feelings of mental well-being from engaging with nature at particular times of day.

> And I enjoy getting up early in the morning, doing that. As a matter of fact, I look forward to it. For the sunrise, yeah, and the peace of walking the levy and the nature trail. Yeah, it's a great stress reliever too. (Gina, Focus Group 6)

Perceptions of and experiences in nature were frequently described to promote feelings of spiritual well-being:

> Nature to me is being able to go outside and enjoy yourself. Look at the weather, the way God just sets us up in ways that we could not request, wouldn't even know how to request. But mostly just waking up and enjoying the day with whatever may come across our path basically. (Kim, Focus Group 2)

Participant's spiritual well-being often centered on feelings of gratitude to God. This was often connected to the beauty of nature, as Sadie in Focus Group 2 discussed:

> When I think of nature, I think of God's creation. All the things that God has created. The beauty that's within nature. I'm not an outdoors person but a lot of times, especially in the afternoon, I love to see the sun going down and just enjoy watching the different things that go on in nature. What [God] has provided for us to really enjoy."

Nature as a Platform for Shared Experiences and Social Connectedness

Participants often described various ways in which nature fostered social and communal connections. Some explained how they had shared their love for nature with others in their community.

> Because I've lived in this building for two years, and not even seen... some of those people. But now they're coming out, and like, 'Oh, what are you doing out here now? What are you planting?' They saw me pull these weeds out, long roots, and they're like, 'How'd that root get so long?' And so, I had to do something so that I would like to be outdoor. But now other people like it too. (Kathryn, Focus Group 5)

The participants spoke of the clear impact that nature has on them and how that impacts their relationship with others:

> But I've been told I light up when I'm talking about animals and flowers and birds. My grandson once in a while is just, 'Okay Grandma.' But he gets a kick out of going out with me, because he knows that he'll be jampacked and I'll answer any question he has, and it's really special to be able to share like that." (Kay, Focus Group 7)

Participants described nature as directly facilitating social connections with others and providing a sense of connection to their communities. Virginia in Focus Group 1 described her activities in nature to beautify her local areas, fostered a strong connection to her local environments, and feelings of altruism:

> I just love doing that [cleaning flowerbeds], because it gives me a sense of belonging where I am, and to be helpful in the community. I even go as far as down the block and do it. Picking up the trash or raking up the leaves.

One participant viewed social connections as a type of nature experience and seemed to perceive the absence of these connections as a detriment, "We're so busy, we don't have time to pick up a piece of trash or something. Or even say good morning. To me that's nature too, because you're looking out, you're talking" (Dottie, Focus Group 1).

Participants expressed a strong value for others to experience and engage with nature as well. Anita in Focus Group 8 stated: "I think it would be so great for elderly people to be able to go out, even in they wheelchairs or whatever it may be."

Many participants emphasized a need for younger generations to have opportunities to engage with nature, as Pat explained in Focus Group 3:

> In my area, the kiddos, they want to play baseball or soccer. I wouldn't mind going to see them, maybe a waterfall or a little park where they can go out and play. The swings and... activities for them, the parents and grandparents to go out with them. But something to make them want to go out and play instead of always being inside.

In addition, participants expressed concerns that younger generations lacked involvement with nature and seemed to perceive greater access to nature may benefit younger generations: "We need more parks, we need more recreation for the children, so they won't get involved into so much bad stuff." (Luanne, Focus Group 3). Other social and communal aspects were represented by participant responses expressing concern for the environment and the welfare of future generations: "That's the other thing I think is really important, is to try not to tear down every bit of nature to build. Boy it saddens me to see that happening" (Louise, Focus Group 4).

Greater Nature Appreciation in Later Stages of Life

Several participants described that they perceived nature with greater appreciation in their later stages of life. Sherry in Focus Group 1 remarked, "Different phases of your life, you appreciate it differently." Participants offered different perspectives on "why" nature was experienced differently in later stages of life. One explanation was having less time to enjoy nature in mid-life and more time in later stages of life:

> Yes, slower. It's more relaxing and calm, and you're not so much wrapped up in the hustle and bustle. You could just go at your own pace and just be in the moment and enjoy the moment, not the hours or the minutes, but that moment. And that's what I tell people. I said just like I'm at that age now where I want to stop and smell every rose. And I'm just enjoying my life while I still can and go and just be happy. (Anita, Focus Group 8)

Others described appreciating nature at different stages of their life due to specific benefits. For example,

> Another thing is that, like you said, different phases of your life, you appreciate it differently. When I had my sons, I used to take them to the park every day. So that's another thing to take what nature offers. It helps you with different things, like being a parent. (Carol, Focus Group 7)

For others, deeper appreciation in the later stages of life was more related to changes in their perspective:

> I remember in 2015 I went to Louisiana, and I walked the streets where I grew up at. And I saw the birds, the trees blooming, different aspects of seasons. Now when I was growing up as a child, I didn't like that kind of stuff. But as I grew older and matured, I enjoyed it much better. (Liza, Focus Group 3)

Barriers to Enjoying Nature

Although some participants described themselves as "not an outdoors person", very few perceived their outdoor environments with fear. For example, Linda in Focus Group 2 stated, "Make me scared sometimes, especially if them big old crickets are sounding. Or a mouse, something like that. I'm really scared of everything." Instead of fear, participants most often described negative perceptions of "bugs" (Lori, Focus Group 2, Beth Focus Group 2) or "cockroaches" (Gina, Focus Group 6). Some highlighted aspects of nature experiences they enjoyed as well as those they disliked: "So, I will go out in rain and just love [it]...now, what I don't like is when I go out, there's mosquitoes, there's bees, there's spiders, all those little things of nature that have a tendency to bite." (Mandy, Focus Group 6)

More often than fears, they described annoyances in their local community outdoor spaces, which sometimes resulted in reduced experiences in nature: "wild dogs. People don't secure their dogs. So, I'm like, 'Okay, I hate dealing with the dogs. So, I just stay basically in the house'" (Sherry, Focus Group 4). Many participants described that they avoided their local natural environments due to negative perceptions regarding development trends in their communities:

> Those huge houses that are going into old neighborhoods and taking down those pretty little eclectic things and putting up, with no yard. They just level the whole area, and everybody seems to be more intent on the inside of the house versus the outside now or something. (Louise, Focus Group 4).

Participants often perceived new housing and business developments reduced their access to natural environments, as well as other community residents.

> I'm in an area where they're building a lot now. So, it's overwhelming, it's a little too much. I see dogs and people walking but it's a little too much, so I wish there was more green space, but all I see is construction. But I know change is what it is, but it would be nice to have more places for the kiddos to go out and play and stuff like that. (Ann, Focus Group 7)

Moreover, their local outdoor environments were often perceived as underwhelming: "There's not much [natural environments]…it's closed and it's city-ish to me. It's not open" (Barb, Focus Group 4). Some considered that age may be a factor associated with reduced access to nature interactions in outdoor settings and perceived this to have a negative impact on older adults, such as Kay in Focus Group 7: "Just to be indoor, we are indoor now because of our age, but just to be

indoor when all this stuff was going around you, it's no good. But you're limited by what you can do now."

Discussion

This study aimed to explore how the theory of biophilia was represented across urban older adults' descriptions of their experiences in and perceptions of nature. To achieve this, we investigated how their experiences and perspectives of nature supported or contradicted Wilson's (1984) theory of biophilia. In addition, this study examined how community-dwelling, urban older adults described their experiences and perceptions of nature, which influenced their feelings of well-being. Participants in this study were predominantly African American older adults, contributing to the limited research on this underrepresented population's experiences and perceptions of nature (Frumkin et al., 2017; Loukaitou-Sideris, 2016).

Overall, participants' descriptions of their perceptions of and experiences in nature largely supported Wilson's (1984) theory of biophilia and aligned closely with its major assumptions. In particular, multisensory attributes of nature were salient and described to promote participants' feelings of well-being in multiple ways. They frequently reported therapeutic benefits from nature exposure, particularly from viewing and listening to water, with aquariums being especially valued for their mental and physiological health benefits. Similarly, Edwards and Beck (2013) also found benefits of nature exposure from viewing aquariums. The authors observed that aquariums placed in the dining room of a nursing home significantly contributed to weight gain in residents with dementia (Edwards & Beck, 2013). Thus, aquarium-based interventions or exposure to moving water could offer a variety of therapeutic benefits for older adults, including those with dementia. Such interventions may be implemented by gerontologists or incorporated into the design of long-term care facilities and urban green spaces.

Moreover, participants often linked sensory perceptions and experiences in nature to cognitive processes that evoked emotions such as awe and fascination. Their awe for natural phenomena often included spiritual dimensions of nature. In turn, these emotions were cited as motivating factors for enjoying nature and contributed to the meaningfulness of their experiences. Environmental psychologists suggest interactions with nature may induce feelings of awe and contribute to positive effects on well-being (Lopes et al., 2020; Monroy & Keltner, 2023). For example, Monroy and Keltner (2023) propose that awe may be stimulated by nature and benefit feelings of well-being through five processes: "shifts in neurophysiology, diminished focus on the self, increased prosocial relationality, greater social integration, and heightened sense of meaning" (p. 309). Similarly, Lopes et al. (2020) found that greater experiences of awe during a 30-minute nature walk were associated with reduced negative effects, which, in turn, led to reduced levels of rumination.

Such findings have important implications for the health and well-being of urban-dwelling older adults. As healthcare professionals increasingly recognize the therapeutic benefits of nature, the use of 'green prescriptions' has gained popularity (Wen et al., 2022). For example, in New Zealand, healthcare practitioners frequently prescribe these 'green prescriptions' to encourage outdoor physical activity (Wen et al., 2022). While these prescriptions primarily focus on promoting physical activity, the findings of this study suggest that treatment plans could benefit from incorporating a broader range of nature-based interventions with a specific emphasis on sensory experiences. The benefits of nature-based sensory stimulation are further highlighted by findings from a meta-analysis conducted by Gaekwad et al. (2022), which suggested nature exposure in both natural and urban environments was linked to medium to large effects on increasing positive affect and decreasing negative affect, with the strongest effects observed from

experiences that immersed multiple senses. Considered alongside this study's findings, this highlights the importance of incorporating multi-sensory components in nature-based interventions and exploring participant perceptions through activity programming to maximize psychosocial benefits.

Furthermore, multi-sensory nature-based stimuli are associated with significant improvements in cognitive functioning, particularly in working memory performance and cognitive flexibility (Berman et al., 2021). In this study, we found clear support for biophilia's assumptions regarding nature and cognition. In particular, the assumption that early interactions with nature serve as foundational concepts within the semantic network and are linked to long-term memories was well supported. Participants frequently shared vivid details regarding their long-term nature-based memories and often recalled multiple related memories. Furthermore, participants' nature-based memories were elaborate, largely positive, and often prompted other participants to recall their own related memories.

The relationship between nature and cognition may be further understood in the context of Bandura's (1986) reciprocal determinism. This conceptualization of social learning theory focuses on the constant and dynamic interplay between personal, behavioral, and environmental factors. Personal factors such as affect, thought, preference, and disposition impact actions, such as if people choose to visit and engage with nature or natural environments. In addition, personal factors influence individuals' perceptions through their senses, their appraisals of their experiences, and subsequently, how they engage with their environments. Bandura explains that these factors intricately interact, which shapes the lens through which memories are formed, organized, and recalled. This aligns with the node-link model (Collins & Loftus, 1975) and may explain why recalling nature-related memories sparks other related memories.

Nearly all participants expressed that they enjoyed sharing their nature memories and the beauty of nature with friends and family. These findings align with gerontological evidence demonstrating that nature-based interactions are associated with increased socialization (Loukaitou-Sideris et al., 2016), feelings of social connectedness (Jiao & Luo, 2022), and prosocial behavior (Mei et al., 2024), such as enhanced empathy towards others (Jiao & Luo, 2022). The benefit of added social connections through nature experiences is especially relevant for older adults, given the strong link between social engagement and improved health and well-being in this population (Office of the Surgeon General, 2023). Furthermore, the risk of loneliness and social isolation increases in later stages of life and can contribute to an increased risk of dementia (Office of the Surgeon General, 2023). Thus, community-based programs for older adults should encourage shared nature experiences to enhance socialization and foster greater feelings of well-being.

In addition, many participants reflected on how their appreciation of nature deepened in later stages of life and explained that nature had provided them with examples for dealing with significant life experiences. Although studies have suggested older adults may strongly value interactions with nature (Freeman et al., 2019) and engage more often in conservation activities than their younger counterparts (Otto & Kaiser, 2014), there is little evidence suggesting a deeper appreciation for nature interaction in older adulthood (Hughes et al., 2019).
Furthermore, biophilia does not describe a deepening appreciation for nature. However, we believe this finding aligns with assumptions of the theory emphasizing how developmental aspects influence nature's impact on cognitive functioning, health, and well-being.

The findings of this study suggest that nature-based topics may be ideal for reminiscence interventions or an important component to include in life review and legacy activity interventions. Added cognitive and well-being benefits may be observed in nature-based reminiscence interventions by providing opportunities for multi-sensory experiences and encouraging

discussions of multi-sensory descriptions (Lee et al., 2022). Thus, a biophilic approach to psychosocial interventions in older adult groups may be useful for achieving outcomes related to cognitive functioning, social engagement, and promoting feelings of well-being.

Although some participants self-described themselves as "not an outdoors person," few participants expressed fears of outdoor environments and more often described aspects of being outdoors they disliked. This finding did not fully align with biophilia's postulations that biophobias may increase in severity across the lifespan. However, much literature emphasizes that an individual's perception of nature significantly influences the level of restorative benefits gained from their nature-based experiences (Berto et al., 2018; Capaldi et al., 2014). Hurly and Walker (2019) explained that individuals from diverse backgrounds, including those of different ages and health conditions, can benefit from nature-based interventions, provided they are agreeable to engaging with nature and do not have safety concerns or biophobias.

In this sample, we observed participants emphasized avoiding interactions with nature, not due to biophobias, but because of the quality of their community's outdoor environments. Many described their local nature spaces and outdoor areas as undesirable or unaccommodating to their physical functioning. These results are consistent with past research reporting that older adults identified local nature spaces and outdoor areas as unwelcoming or unaccommodating to their physical functioning (van Houwelingen-Snippe et al. 2023).

Although community outdoor environments, such as parks and green spaces, are described as promoting older adults' socialization and overall well-being (Loukaitou-Sideris et al., 2016), interactions with these environments are strongly influenced by their perceptions of accessibility and usability (Lien et al., 2015). Lien et al. (2015) suggested that older adults' participation in activities, behaviors, and attitudes is shaped by their perceptions of available environmental support. Referred to as *goodness of fit*, the comparison between their perceived needs and the level of accommodation available in the environment influences their engagement, interactions, and perceptions of space.

There is a significant need to carefully consider accessibility and usability when designing spaces and psychosocial interventions for older adults. Across the lifespan, reduced opportunities for nature interactions are consistently associated with negative consequences (Baxter & Pelletier, 2019). Compared with younger people, older adults have reduced opportunities for accessing natural environments in their local communities, primarily due to physical limitations and transportation barriers. Pyle (1993) emphasized that the loss of opportunities in older adulthood to engage with nature is detrimental to feelings of well-being and referred to this as the *extinction of experience*. Similarly, Levin and Nevo (2024) refer to the disproportionate reduction in access to nature experienced by older adults due to a lack of accommodations as *eco-ageism* (Levin & Nevo, 2024). We observed similar trends, such that participants described avoiding or feeling excluded from participating in their natural environments.

To ensure benefits to health and well-being outcomes among older adults through nature-based interventions, community green spaces and programming must accommodate their physical and transportation limitations. Kerishnan and Maruthaveeran's (2021) review of the evidence highlighted several community interventions to address access and use barriers and facilitate older adults' interactions with nature. Interventions included community-based transportation programs to parks in urban settings in Portland and characteristics of age-friendly parks in Philadelphia, such as rest areas, benches, and well-designed streets. Additional barriers that must be considered to increase older adults' access and use include weather-related factors such as extreme temperatures, challenges of viewing nature from indoors, and a lack of caregiving resources to take people outside both for those who live at home and those who are in residential facilities (Orr et al., 2016).

In particular, urban planners and policymakers should prioritize the accessibility and safety of green spaces to ensure older adults benefit from nature while avoiding negative effects on well-being from experiences of eco-ageism. Designing these spaces to meet the unique needs of older adults promotes equal access and opportunities to experience nature (Boffi et al., 2021). Facilitating their access to green spaces may include developing community-based transportation services tailored to older adults (Kerishnan & Maruthaveeran, 2021). In addition, accessibility and usability for this population may be further supported by incorporating rest areas, benches, and well-designed streets (Kerishnan & Maruthaveeran, 2021).

Future Directions

The findings of this study are exploratory and suggest the theory of biophilia may be useful for informing nature-based interventions and public health strategies to promote the health and well-being of older adults. Nature-based interventions and related public health strategies, as well as the development of community indoor or outdoor nature spaces, should incorporate multi-sensory components and prioritize accommodating common accessibility barriers to promote participation and engagement of older adults (Freeman et al., 2019). Indoor nature interventions may be more inclusive for older adults with biophobias and/or physical disabilities (Lee et al., 2022). Furthermore, perceptions of nature and/or biophobias should be evaluated in research or considered when developing community nature spaces to ensure positive experiences and to promote the delivery of therapeutic benefits (Capaldi et al., 2014). In addition, future studies should explore if and how awe of nature may vary in older adults when compared with younger cohorts and how fascination with nature may influence therapeutic gains associated with nature-based interactions.

Future research should examine if and how perceptions of nature change across the lifespan, which may inform the appropriateness of nature-based interventions and related public health strategies for older people (Frumkinn et al., 2017; Grazuleviciute-Vileniske et al., 2020).
Research may apply biophilia to examine the multi-sensory experience of nature and its effects on cognition and well-being. Furthermore, the scope of biophilia may offer an interesting theoretical perspective for informing non-pharmacological interventions for persons living with dementia, as the theory explores neurocognitive processes and specifically addresses the process and function of long-term memory.

Limitations

While this study had several strengths, we must acknowledge the limitations. First, the qualitative nature of this study and the small sample size limit the generalizability of the findings. Second, the focus group guide focused mainly on the benefits of nature for older adults. This may have biased our findings. We have attempted to address this limitation by accurately reporting negative perceptions of their nature experiences represented across the dataset. Third, the use of focus groups may have further contributed to biases in the data due to the recognition that participants may respond similarly to their peers. As such, we made efforts to minimize coding similar responses within the same focus group when observed to be in response to each other. Fourth, we did not include concepts and codes regarding the mechanisms of evolution described throughout the theory of biophilia. This adaptation may have influenced the accuracy of applying the theory of biophilia in this analysis.

Conclusion

Biophilia proposes that interactions with nature can support individuals' health and well-being in various ways. Overall, this group of urban-dwelling older adults' descriptions of their experiences and perceptions of nature closely aligned with the constructs outlined within biophilia. The findings of this study are exploratory and suggest biophilia may be useful for informing nature-based interventions across diverse populations of older adults, including those living with dementia.

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