

Young children focus more on pets than on inanimate objects: Experimental evidence for the innate nature of biophilia

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Received: 8 October 2025 | Accepted: 1 March 2026 | Published: 12 March 2026

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Keywords: biophilia; affective ecology; human-Nature relationships; children; attention.

Abstract. *The human-Nature relationship is a valuable resource through which children can mature, evolve, investigate their subjectivity, and get in touch with their own emotions and subsequently with those of other living beings, ultimately leading them to pay attention to the preservation and protection of ecosystems. With this experimental study, we aimed to investigate the biophilia hypothesis in preschool children. We proceeded with a protocol where children (0-2 years and 3-5 years) played freely for 5-10*

minutes. Then, without warning, a single novel stimulus was introduced: a pet, a remote-controlled car, a plant, or a painting. We recorded their reaction time to become aware of (to shift their attention to) the presence of the new stimulus. The objective of the experimental observations was to verify differences in the latency to fascination (bottom-up attention) when the children encountered living (pets and plants) and non-living (moving and stationary objects) entities. We hypothesize that pets will shift children's attention more quickly and more frequently than non-living objects. Furthermore, among non-living objects, moving ones will shift attention more than stationary ones. We are therefore operating within E.O. Wilson's prediction that biophilia is "our innate tendency to focus on life and life-like forms and, in some cases, to associate emotionally with them". Considering the age of the young participants, this is most likely an innate behaviour that reinforces the idea that biophilia is an evolutionary adaptation.

Note: In this paper, "Nature" is written with a capital "N" to indicate the living biosphere and the abiotic matrices (soil, air, and water) in which life is embedded, including the ecological processes they sustain. This capitalization reflects the scientific perspective of Nature not merely as a passive backdrop, but as an active ecological system that interacts and influences human health. It also avoids confusion with "nature" as the intrinsic quality of a phenomenon.

1. Introduction

Biophilia is defined as the love of life. The word 'biophilia' is a combination of two ancient Greek words, 'life' (βίος) and 'love' (φιλία). The term was originally introduced by the German psychologist Erich Fromm (1900-1980) to describe the psychological orientation of being attracted to all that is alive and vital (Fromm, 1964). Fromm adopted an ontogenetic perspective, aiming to understand the conditions under which a biophilic personality develops. Subsequently, the American biologist Edward O. Wilson (1929-2021) introduced the concept of biophilia to describe the traits of evolutionary adaptation that

allow us to develop a psychic bond with the living world (Wilson, 1984). Wilson adopted a phylogenetic perspective, aiming to understand the conditions under which biophilia is maintained as an effective adaptation over time, which led to the Biophilia Hypothesis (Kellert and Wilson, 1993).

Thereafter, Wilson refined the hypothesis, defining biophilia as “our innate tendency to focus upon life and life-like forms and, in some instances, to affiliate with them emotionally” (Wilson, 2002, p. 134). This definition of biophilia is crucial because it identifies two fundamental constructs of biophilia: the *fascination* that life exerts on human beings and the feeling of *affiliation* that human beings feel for life in certain circumstances. Fascination is an attraction capable of activating involuntary attention, a form of attention that requires no effort (Kaplan, 1995). People respond to natural environments with involuntary attention, which ensures that directed attention can rest and be regenerated from mental fatigue in adults (Berto, 2005) and in children (Barbiero et al., 2014). Affiliation is an emotional bond established with forms of life that occur under certain circumstances. From an evolutionary point of view, the feeling of affiliation resides in our ability to empathize with other creatures and to respond to their needs as if they were our own (Goodenough 1998). The ability to be empathetic can be a good predictor of the ability to affiliate with life (Di Fabio & Kenny, 2018), as empathy is an emotional state triggered by the emotional situation of another person (Hoffman, 2008). Experiencing emotional participation in life is the first step towards developing a feeling of affiliation. Normally, empathy develops between two human beings. However, the ability to experience empathy is not limited to human beings (Angantyr, Eklund & Hansen, 2011). Forms of differentiated emotional participation and asymmetrical empathy are widespread in mammals (Preston & de Waal, 2002). Nature, especially domesticated Nature, offers ample opportunities for empathetic contact (Hand et al., 2017) and can help reduce stress response (Sapolsky, 2004, pp. 234-248; Ulrich, 1984).

According to Wilson, “biophilia is not a single instinct but a complex of learning rules that can be teased apart and analyzed individually. The feelings molded by the learning rules fall along several emotional spectra: from attraction to aversion, from awe to indifference, from peacefulness to fear-driven anxiety” (Wilson, 1993, p. 31). From this statement by Wilson, we can derive two considerations. First, biophobia, or fear and strong avoidance responses to certain natural stimuli that presumably posed risks during evolution, is an intrinsic and complementary part of biophilia (Ulrich, 1993, p. 76; Olivos-Jara et al., 2020; Soga et al., 2023).

Second, biophilia is innate but not instinctive (Lee, 2012). It is innate as a manifestation of a phenotype that passed the test of natural selection and can be studied in a phylogenetic perspective. Conversely, it is not instinctive because it does not give rise to rigid and deterministically fixed behavior. During evolution, biophilia became part of the human genotype (Kellert, 2009) through a process of coevolution of culture and genes (Wilson, 1993). This coevolution conferred a real fitness advantage to individuals capable of affiliating emotionally and creatively with the environment (Kellert, 1997, pp. 1-9). Although many clues suggest that biophilia is a hereditary trait (Barbiero & Berto, 2021; Gunnarsson & Hedblom, 2023; Fukano & Soga, 2025), the evolutionary foundations of the biophilia hypothesis remain limited. Many experimental observations that corroborate the biophilia hypothesis have been conducted with adults (Berto et al., 2018) or school-aged children (Barbiero et al., 2021; Berto, Pasini & Barbiero, 2015; Kuo et al., 2018). Only recently has the preschool age been investigated (Pirchio et al., 2025). With this study, we aim to provide further evidence to validate the biophilia hypothesis and support its constructs with experimental observations conducted with preschool children. In this pilot study, we focused on the part of the hypothesis that indicates our innate tendency to focus upon life and life-like forms, while the aspect of emotional affiliation is investigated in other projects. Our goal is to verify differences in the timing of fascination (bottom-up attention) in these young children when they are brought into contact, considered and not differentiated in different forms as gaze orientation, approach to, physical contact, verbalization, with living beings (pets and plants) versus non-living objects (remote-controlled car and a painting).

We also investigated the differences in children's reaction and attention times between the animate (animals and remote-controlled car) and inanimate (plant and painting) stimuli. Two research questions guided this study (Figure 1):

1. Do pets shift children's attention more quickly and more frequently than non-living objects?
2. Do animated objects shift attention more than non-animated ones?

2. Materials and methods

The study was conducted in two distinct places involving a nursery school in Aosta (Aosta Valley, Italy) and a preschool in Urbino (Marche, Italy). A protocol for recording observations has been agreed based on the following indicators: a.

the children were allowed to play for 10 minutes before the observations in the common room where they usually played; b. the observer was positioned to observe the whole room, but without being seen by the children; c. the novel element introduced by a teacher or figure familiar to the children without being noticed by them; d. period of measurement of response variables for up to 5 minutes.

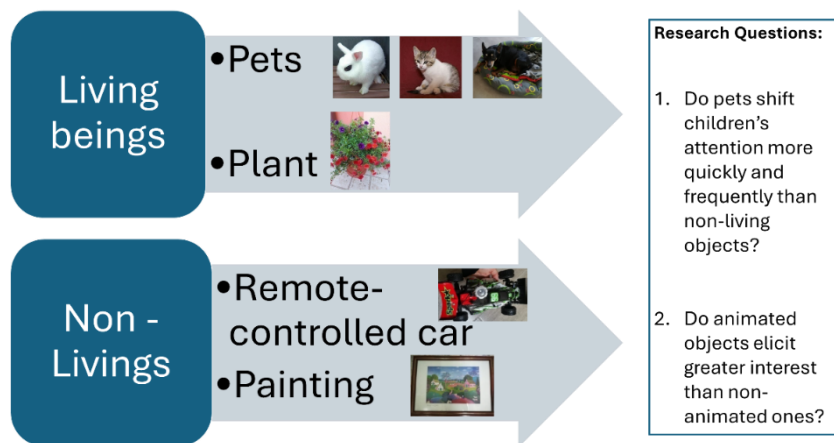


Figure 1. Study categories and research questions

Prior to the conduct of the observations, all necessary precautions were taken, so permission was sought from the head teacher to be allowed to bring a pet into the school, and permission was made for parents to sign in order to film and photograph the children to collect data related to the experiments.

We observed children's behaviour towards three baby animals (a rabbit, a cat and a dog) versus two types of non-living objects (remote-controlled car, painting) and a plant inside a pot. The objective of the experimental observations was to verify differences in the times of fascination (bottom-up attention) in contact with living and non-livings. The opportunity to conduct the study in these locations allowed us to begin investigating the preschool age spectrum.

2.1 Nursery school Aosta

The class consisted of 9 children who were observed on 15 different days. During each day of observation, at least one of the animals and all the other categories (remote-controlled car, painting and plant inside a pot) were brought to their attention. The observation session began with free play for about ten minutes, followed by the introduction of one element at a time. The new guest entered the room discreetly and without causing alarm. During these first observations it was possible to define the maximum time to detect the reaction time and attention of the children to the novelty element as 5 minutes. Each element was introduced one hour apart within the day.

2.2 Preschools Urbino

Following the preliminary results of the nursery school in Aosta, as discussed below, first a small dog and then a rabbit were considered as pets in two different preschool classes (3-5 years) from two different schools in Urbino. The same protocol was used for both classes, the first consisting of 26 children and the second of 20. In the class of 26 children, 4 replications were carried out, while in the class of 20 the observations were replicated 5 times.

3. Results

Data was analysed using IBM SPSS Advanced Statistics 29.0.1.0 software. No gender differences emerged in this study and consequently the data were analysed together.

The results for the nursery school in Aosta showed that children's attention was shifted quickly to the pets with respect to the plant, the car and the painting. The ANOVA showed significant differences in children's reaction times for animals compared with the plant and the painting (Figure 2a and 3; Table 1). While the comparison between reaction times toward animals and the car was not significant. These results were confirmed also in Urbino Preschools: children's attention was shifted quickly to the dog with respect to the other categories, while the reaction time was similar for the car and the painting. Compared to Aosta nursery school, pre-school children became aware of the plant more quickly (Figure 2b; Table 2). However, no significant differences are shown between the plant and the painting, supporting the hypothesis that children's attention is mainly directed to the animals. Another result worth highlighting is that during

the observations, all children became aware of the presence of the dog and the car, while for the plant and the painting an average of 62% and 80% respectively. Considering this, in the second preschool in Urbino we focused on the average attention span of the children on the four categories introduced. Significant differences emerged between the average attention time for the rabbit and the car compared to the plant and the painting (Figure 2c and d and Figure 3; Table 3). These results allow us to confirm the second hypothesis that animated categories are more interesting than non-animated. As shown in Figure 2, in this case the children's average reaction rate was not total and that the continuous and sustained attention towards the rabbit and the car was almost double that towards the plant and the painting (Figure 2 d).

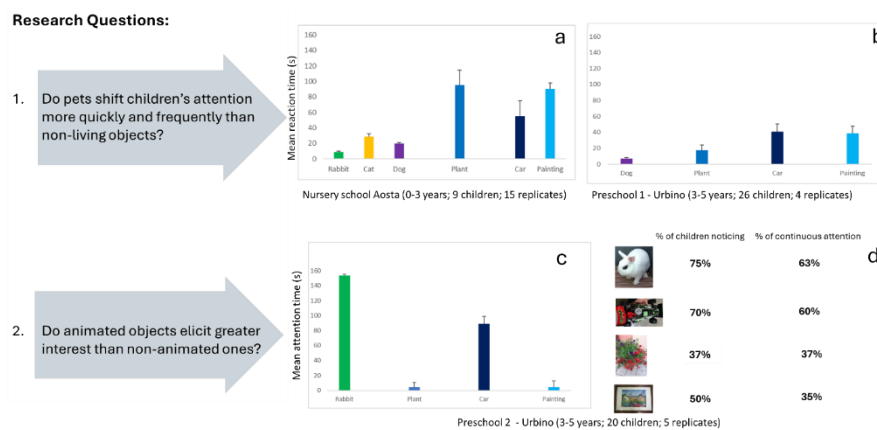


Figure 2. Research questions and results: **a)** average reaction time of children after the introduction of each category. 9 children (0-3) – 15 replicates; **b)** Average reaction time of children after the introduction of the subjects. 26 children (3-5) – 4 proofs (Preschool 1- Urbino); **c)** Average attention time that children spent on the subject during the 5 minutes observations. 20 children (3-5) – 5 proofs - Urbino 2; **d)** Percentage of children noticing the element introduced and continuous attention of the children during the observation period (Preschool 2 – Urbino).

Table 1. Pairwise test from Nursery school Aosta dataset - var: reaction time

Element	Comparison	Mean differences	Std. Error	Sig.	95% confidence interval	
					Lower limit	Upper limit
Rabbit	Cat	-20,11	9,689	0,663	-50,31	10,09
	Dog	-11,31	10,724	1	-44,74	22,11
	Plant	-66,01*	8,834	<,001	-93,55	-38,48
	Car	-26,03	8,478	0,057	-52,45	0,4
	Painting	-81,61*	11,553	<,001	-117,62	-45,6
Cat	Rabbit	20,11	9,689	0,663	-10,09	50,31
	Dog	8,8	11,257	1	-26,29	43,89
	Plant	-45,90*	9,474	<,001	-75,43	-16,37
	Car	-5,92	9,144	1	-34,42	22,58
	Painting	-61,50*	12,05	<,001	-99,06	-23,94
Dog	Rabbit	11,31	10,724	1	-22,11	44,74
	Cat	-8,8	11,257	1	-43,89	26,29
	Plant	-54,70*	10,53	<,001	-87,52	-21,88
	Car	-14,72	10,234	1	-46,61	17,18
	Painting	-70,30*	12,897	<,001	-110,5	-30,1
Plant	Rabbit	66,01*	8,834	<,001	38,48	93,55
	Cat	45,90*	9,474	<,001	16,37	75,43
	Dog	54,70*	10,53	<,001	21,88	87,52
	Car	39,98*	8,232	<,001	14,32	65,64
	Painting	-15,6	11,374	1	-51,05	19,85
Car	Rabbit	26,03	8,478	0,057	-0,4	52,45
	Cat	5,92	9,144	1	-22,58	34,42
	Dog	14,72	10,234	1	-17,18	46,61
	Plant	-39,98*	8,232	<,001	-65,64	-14,32
	Painting	-55,58*	11,1	<,001	-90,18	-20,99
Painting	Rabbit	81,61*	11,553	<,001	45,6	117,62
	Cat	61,50*	12,05	<,001	23,94	99,06
	Dog	70,30*	12,897	<,001	30,1	110,5
	Plant	15,6	11,374	1	-19,85	51,05
	Car	55,58*	11,1	<,001	20,99	90,18

Table 2. Pairwise test from preschool 1 - Urbino dataset - var: reaction time

Element	Comparison	Mean differences	Std. Error	Sig.	95% confidence interval	
					Lower limit	Upper limit
Dog	Plant	-10,53	11,160	1,000	-40,64	19,59
	Car	-33,85 [*]	10,160	0,008	-61,27	-6,44
	Painting	-32,10 [*]	10,848	0,024	-61,37	-2,82
Plant	Dog	10,53	11,160	1,000	-19,59	40,64
	Car	-23,33	11,072	0,228	-53,20	6,55
	Painting	-21,57	11,707	0,413	-53,16	10,02
Car	Dog	33,85 [*]	10,160	0,008	6,44	61,27
	Plant	23,33	11,072	0,228	-6,55	53,20
	Painting	1,76	10,758	1,000	-27,27	30,79
Painting	Dog	32,10 [*]	10,848	0,024	2,82	61,37
	Plant	21,57	11,707	0,413	-10,02	53,16
	Car	-1,76	10,758	1,000	-30,79	27,27

Table 3. Pairwise test from preschool 2 - Urbino dataset - var: reaction time

Element	Comparison	Mean differences	Std. Error	Sig.	95% confidence interval	
					Lower limit	Upper limit
Rabbit	Plant	149,75 [*]	35,723	0,001	54,10	245,40
	Car	64,75	30,790	0,169	-17,69	147,19
	Painting	149,75 [*]	32,670	0,000	62,27	237,23
Plant	Rabbit	-149,75 [*]	35,723	0,001	-245,40	-54,10
	Car	-85,00	34,688	0,083	-177,88	7,88
	Painting	0,00	36,367	1,000	-97,38	97,38
Car	Rabbit	-64,75	30,790	0,169	-147,19	17,69
	Plant	85,00	34,688	0,083	-7,88	177,88
	Painting	85,00 [*]	31,534	0,048	0,56	169,44
Painting	Rabbit	-149,75 [*]	32,670	0,000	-237,23	-62,27
	Plant	0,00	36,367	1,000	-97,38	97,38
	Car	-85,00 [*]	31,534	0,048	-169,44	-0,56

4. Discussion

While evidence suggests that category-specific attention for animals reflects ancestral priorities rather than expertise (New, Cosmides & Tooby, 2007), this study is the first to demonstrate that children are most fascinated by living animals that frequently capture their attention (Figure 2). Our findings are thus consistent with Wilson's prediction concerning biophilia, defined as "our innate tendency to focus on life and life-like forms and, in some cases, to associate emotionally with them" (Kellert and Wilson, 1993, p. 31). Furthermore, the young age of our participants suggests this is an innate behaviour, reinforcing the hypothesis of biophilia as an evolutionary adaptation (Barbiero and Berto, 2021; Fukano & Soga, 2024; Pirchio et al., 2025).

It is worth noting that there are differences between the two age cohorts (0-3 and 3-5 years). In particular, for children aged 3-5, the reaction time to the plant showed no significant differences compared to the dog and the moving car. This is an interesting result, as the plant is not animated, potentially suggesting that movement may play a less dominant role in attentional capture for this older cohort. Conversely, in the 0-3 group, reaction times for the car and the plant show a larger variability, which raises the question of whether this reflects differences in stimulus introduction, developmental heterogeneity, or individual attitudes toward the objects. These cohort-dependent patterns allow us to explore developmental trends across early childhood strengthen the framework proposed.

Our results align with Lobue et al. (2013), whose research suggests that humans have an affinity for animals that captures their attention, even in the presence of attractive toys. Lobue et al. (2013) propose this preference stems from animals being animated elements, while toys are not. We further explored this factor by demonstrating that, among the living organisms presented (pets and plants), children's attention is particularly drawn to movement (evidenced by the remote-control car results) and is sustained towards the animals. Crucially, in contrast to the Lobue et al. experiments, our work provides an evolutionary interpretation, suggesting that sustained, directed attention is rooted in biophilia as an evolutionary adaptation (Barbiero & Berto, 2021).

This study, although innovative, has limitations that may point to directions for future research. The relatively small sample size and the simplicity of the experimental setup, based mainly on reaction time and attention span, make this

study a pilot investigation. In addition to expanding and diversifying the sample, a more detailed level could be added to the methodology, such as the integration of additional behavioural, physiological or longitudinal measures. Future studies could aim to distinguish attentional preference from interaction-driven engagement and true emotional attachment, which would allow for a more direct assessment of the “philia” component of biophilia. However, this article can be seen as a fundamental step towards this line of research. These findings contribute to the evolutionary psychology theory of hunting and gathering. Modern individuals, including children, share the fundamental genes, drives, and instincts of our *Homo sapiens* ancestors. Since these activities are deeply rooted in human biological memory, the sustained practice of associated rituals - such as searching, gathering, and dividing food - is itself part of the evolutionary process. Therefore, as Darwin (1859) posited, the actions of the seeker-gatherer and the hunter continue to be an essential component of human attitudes and behaviours today.

This research contributes to a deeper understanding of the human-Nature relationship, especially during childhood, building upon evidence that contact with natural elements is critical for children's cognitive development (Nguyen & Walters, 2024). While the impacts of social and built environments are well-documented, the role of the natural environment is less clear. Our findings, therefore, align with the review by Summers et al. (2019), which suggested that a significant, yet under-appreciated service of ecosystems is strengthening childhood development by fostering cognitive and physical growth through interaction with Nature. However, the complicated and symbiotic interactions among natural ecosystems, their services, and childhood development are poorly acknowledged in the ecological literature. For instance, an interesting aspect of our study requires further investigation: the attention children paid to a deliberately decorated plant. The level of attention paid to the decorated version, once noticed, was significantly different from the interest shown in the original, undecorated plant. This observation suggests that the children's increased attention may be linked to the opportunity for interaction or 'picking' that the decorated plant offered.

The human-Nature relationship is a crucial resource through which children can mature, evolve, and investigate their subjectivity. It allows them to connect with their own emotions and, subsequently, with those of other living beings, ultimately leading to a sustained focus on the preservation and protection of ecosystems (Barbiero and Berto, 2018). This is supported by a significant and

growing literature which suggests that engaging in active environmental care in adulthood is strongly linked to two factors: having had positive experiences in Nature during childhood and having observed childhood role models who demonstrated appreciative attention to the natural world (Chawla, 2007; Gardner, 1999; Sachs et al., 2020; Summers et al., 2019). Research confirms the importance of children spending time immersed in Nature, underscoring the need for increased contact in both outdoor and learning environments. For instance, Barbiero et al. (2021) provided experimental evidence via a longitudinal case study, demonstrating that teaching activities conducted outdoors in a natural area are the most effective method for fostering learning processes. They suggest that sustained improvements observed in pupils can be attributed to their continuous attendance in biophilia-stimulating environments.

Finally, this study aims to highlight how Affective Ecology - a framework built upon the Biophilia and Gaia Hypotheses - can complement formal ecology. By bringing people closer to Nature, Affective Ecology can strengthen the motivations that drive them to adopt pro-environmental behaviours (Barbiero, 2014). We propose that the more effectively we design and implement educational programs that stimulate the biophilic instinct, the more successful Affective Ecology will be in helping individuals understand that a close relationship with Nature is essential for the harmonious development of personality and for stimulating cognitive mechanisms (Barbiero, 2021; Summers et al., 2019). This ultimately supports the recommendation that biophilic-designed learning environments are necessary to fulfill children's innate need for natural connection.

5. Conclusions

This study adds another piece to the research carried out over more than a decade, starting with the study of children's restorative perception of Nature (Berto, Pasini, & Barbiero 2015), the emergence of emotional bonds with Nature, and the motivation for pro-environmental and sustainable behaviour. There is a growing body of literature that supports and demonstrates that early attentive and interactive tendencies towards living systems can, over time, translate into values, choices and behaviours relevant to sustainability (Marchetti et al., 2025; Piao & Managi, 2024).

This study provides the first experimental evidence that very young children's attention toward living animals reflects innate biophilia - an evolutionary

adaptation rooted in ancestral hunting-and-gathering instincts - rather than learned expertise. This attention is powerfully driven by movement and is consistent with the emotional affinity humans hold for animated elements. By fostering biophilic orientation through biophilic-designed learning environments, educators can strengthen the essential motivations for pro-environmental behaviors, ensuring children grow into adults with the cognitive, emotional, and ethical capacity to protect ecosystems. This is a critical step in fulfilling children's fundamental need for Nature connection and safeguarding future ecological sustainability.

Biophilia thus emerges not merely as a determinant of individual contact with Nature and cognitive benefits, but as a conceptual and practical framework contributing to the development of sustainable, resilient, and regenerative socio-technical systems.

References

- Angantyr, M., Eklund, J., & Hansen, E. M. (2011). A comparison of empathy for humans and empathy for animals. *Anthrozoös*, 24(4), 369-377.
<https://doi.org/10.2752/175303711X13159027359764>
- Barbiero, G. (2014). Affective Ecology for Sustainability. *Vis. Sustain.* 1, 20-30.
<https://doi.org/10.13135/2384-8677/1419>
- Barbiero, G., & Berto, R. (2018). From biophilia to naturalist intelligence passing through perceived restorativeness and connection to Nature. *Ann. Rev. Res.* 3: 555604.
- Barbiero, G. & Berto, R. (2021). Biophilia as Evolutionary Adaptation: An Onto- and Phylogenetic Framework for Biophilic Design. *Front. Psychol.* 12, 700709
<https://doi.org/10.3389/fpsyg.2021.700709>
- Barbiero, G., Berto, R., Venturella, A., & Maculan N. (2025). Bracing Biophilia: When biophilic design promotes pupil's attentional performance, perceived restorativeness and affiliation with Nature. *Environ. Dev. Sustain.* 27, 20417–20431.
<https://doi.org/10.1007/s10668-021-01903-1>
- Berto, R. (2005). Exposure to restorative environments helps restore attentional capacity. *J. Environ. Psychol.* 25, 249-259.
<https://doi.org/10.1016/j.jenvp.2005.07.001>
- Berto, R., Pasini M., & Barbiero G. (2015). How does Psychological Restoration Work in Children? An Exploratory Study. *J. Child Adolesc. Behav.* 3: 200.
<http://dx.doi.org/10.4172/2375-4494.1000200>

- Berto, R., Barbiero, G., Barbiero, P., & Senes, G. (2018). Individual's Connection to Nature Can Affect Perceived Restorativeness of Natural Environments. Some Observations about Biophilia. *Behav. Sci.*, 8(3), 34. <https://doi.org/10.3390/bs8030034>
- Chawla, L. (2007). Childhood experiences associated with care for the natural world: a theoretical framework for empirical results. *Child. Youth Environ.* 17, 144–170. <https://www.jstor.org/stable/10.7721/chilyoutenvi.17.4.0144>
- Darwin, C., (1859). *On the Origin of Species by Means of Natural Selection, or The Perseveration of Favoured Races in the Struggle for Life*, London, John Murray.
- Di Fabio, A. & Kenny, M.E. (2021). Connectedness to nature, personality traits and empathy from a sustainability perspective. *Curr. Psychol.* 40, 1095-1106. <https://doi.org/10.1007/s12144-018-0031-4>
- Fromm, E. (1964). *The Heart of Man*. Harper and Row, New York, NY
- Fukano, Y., & Soga, M. (2024). Greenery hypothesis: An evolutionary explanation for why presence/absence of green affects humans. *People Nat.*, 6(2), 422-434. <https://doi.org/10.1002/pan3.10619>
- Fukano, Y., & Soga, M. (2025). The biophilia hypothesis revisited: back to basics, moving forward. *Trends Ecol. Evol.* 40, 527-528 <https://doi.org/10.1016/j.tree.2025.04.001>
- Gardner, H. (1999). *Intelligence Reframed*. Basic Books, New York, NY.
- Goodenough, U. (1998). *The Sacred Depths of Nature*. Oxford University Press, New York, NY.
- Gunnarsson, B., & Hedblom, M. (2023) Biophilia revisited: nature versus nurture. *Trends Ecol. Evol.* 38 (9), 792-794. <https://doi.org/10.1016/j.tree.2023.06.002>
- Hand, K. L., Freeman, C., Seddon, P. J., Recio, M. R., Stein, A., & van Heezik Y. (2017). The importance of urban gardens in supporting children's biophilia. *Proc. Natl. Acad. Sci.* 114, 274–279. <https://doi.org/10.1073/pnas.1609588114>
- Hoffman, M. L. (2008). "Empathy and prosocial behavior," in *Handbook of Emotions*. Lewis M., Haviland-Jones J. M., Feldman Barrett L. (eds.) The Guilford Press, New York, NY, 440–455.
- Kaplan, S. (1995). The restorative effects of nature: Toward an integrative framework. *J. Env. Psychol.*, 15, 169-182.
- Kellert, S.R. (1997). *Kinship to Mastery. Biophilia in Human Evolution and Development*. Island Press, Washington, DC.
- Kellert, S.R., & Wilson, E.O. (1993). *The Biophilia Hypothesis*. Island Press, Washington, DC.
- Kuo, M., Browning, M.H., & Penner, M.L. (2018). Do lessons in nature boost subsequent classroom engagement? Refueling students in flight. *Front. Psychol.* 8, 2253. <https://doi.org/10.3389/fpsyg.2017.02253>

- Lee, P. C. (2012). The human child's nature orientation. *Child Dev. Perspect.* 6, 193–198. <https://doi.org/10.1111/j.1750-8606.2012.00232.x>
- LoBue, V., Bloom Pickard, M., Sherman, K., Axford, C., & DeLoache, J. S. (2013). Young children's interest in live animals. *Br. J. Dev. Psychol.*, 31(1), 57-69. <https://doi.org/10.1111/j.2044-835X.2012.02078.x>
- Marchetti, V., Scopelliti, M., Angelini, G., Boezeman, E.J., van Doesum, N.J., Staats, H. & Fiorilli, C. (2025), Understanding Proenvironmental Behavior: A Model Based on Moral Identity and Connection to Nature. *J. Appl. Soc. Psychol.* 55, 644-656. <https://doi.org/10.1111/jasp.70004>
- New, Y., Cosmides, L., & Tooby, J. (2007) Category-specific attention for animals reflects ancestral priorities, not expertise, *Proc. Natl. Acad. Sci.* 104 (42), 16598-16603 www.pnas.org/cgi/doi/10.1073/pnas.0703913104
- Nguyen, L. & Walters, J. (2024). Benefits of nature exposure on cognitive functioning in children and adolescents: A systematic review and meta-analysis. *J. Env. Psychol.*, 96, 102336, <https://doi.org/10.1016/j.jenvp.2024.102336>
- Olivos-Jara, P., Segura-Fernández, R., Rubio-Pérez, C. & Felipe-García, B. (2020). Biophilia and Biophobia as Emotional Attribution to Nature in Children of 5 Years Old. *Front Psychol.* 11, 511. <https://doi.org/10.3389/fpsyg.2020.00511>
- Piao, X., & Managi, S. (2024) Determinants of pro-environmental behaviour: effects of socioeconomic, subjective, and psychological well-being factors from 37 countries. *Humanit Soc Sci Commun* 11, 1293. <https://doi.org/10.1057/s41599-024-03790-z>
- Preston, S.D. & de Waal, F.B.M. (2002). “The communication of emotions and the possibility of empathy in animals,” in *Altruism and Altruistic Love: Science, Philosophy, and Religion in Dialogue*. Post S. G., Underwood L. G., Schloss J. P., Hurlbut W. B. (eds.) Oxford University Press, Oxford, 284–308.
- Pirchio, S., Costa, S. & Ferri, R. (2025). Biophilia in Italian preschool children: preliminary findings. *Front. Psychol.* 16, 1567848. <https://doi.org/10.3389/fpsyg.2025.1567848>
- Sapolsky, R.M. (2004). *Why Zebras Don't Get the Ulcers*. Owl Book, Henry Holt and Co., New York, NY.
- Sachs, N.A., Rakow, D.A., Shepley, M.M. & Peditto K. (2020). The potential correlation between Nature Engagement in Middle childhood Years and College undergraduates' Nature Engagement, proenvironmental attitudes, and Stress. *Front. Psychol.* 11, 540872. <https://doi.org/10.3389/fpsyg.2020.540872>
- Soga, M., Gaston, K.J., Fukano, Y., & Evans, M.J. (2023). The vicious cycle of biophobia. *Trends Ecol. Evol.* 38 (6), 512-520. <https://doi.org/10.1016/j.tree.2022.12.012>

- Summers, J.K., Vivian, D.N. & Summers, J.T. (2019). The Role of Interaction with Nature in Childhood Development: An Under-Appreciated Ecosystem Service. *Psychol. Behav. Sci.*, 8 (6), 142-150. <https://doi.org/10.11648/j.pbs.20190806.11>
- Ulrich, R.S. (1984). View through a window may influence recovery. *Science*, 224 (4647), 224-225.
- Ulrich, R.S. (1993). Biophilia, Biophobia, and Natural Landscapes. In *The Biophilia Hypothesis*. S.R. Kellert and E.O. Wilson (Eds.). Island Press, Washington, DC, 73-137.
- Wilson, E.O. (1984). *Biophilia*. Harvard University Press, Cambridge, MA.
- Wilson, E.O. (1993). Biophilia and the Conservation Ethic. In *The Biophilia Hypothesis*. S.R. Kellert and E.O. Wilson (Eds.). Island Press, Washington, DC, 31-41.
- Wilson, E.O. (2002). *The Future of Life*. Alfred A. Knopf, New York, NY.

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Ethical Statement

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki and in full compliance with the GDPR (EU Regulation 2016/679) and the Italian Privacy Code (Legislative Decree 196/2003). The study protocol was approved by the Ethics Committee of the University of The Valle d'Aosta (Protocol No. 14, Date: May 2, 2025). Written informed consent was obtained from the parents or legal guardians of all participating children. Furthermore, the involvement of animal subjects (puppies) was strictly observational and non-invasive. All procedures involving animals complied with the ASAB/ABS Guidelines for the Treatment of Animals in Behavioural Research and Teaching, as well as the principles of the European Directive 2010/63/EU, ensuring that the animals' welfare was fully maintained, and no distress was caused at any time.

Funds

This work received no external funding.

Competing Interests

The authors hereby state that there are no financial and non-financial competing interests.

Citation

Pinna, S., Morri, E., Barbiero, G. & Santolini, R. (2026). Young children focus more on pets than on inanimate object: Experimental evidence for the innate nature of biophilia. *Visions for Sustainability*, 25, 12816, 1-17. <http://dx.doi.org/10.13135/2384-8677/12816>



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