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Investigating the Impact of Preschool Type on Young Children's Empathy

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Abstract: Empathy can be a powerful driver for positive social change and is relevant to the Sustainable Development Goals that serve as a global blueprint for peace and prosperity. Empathy has also gained popularity within zoos, aquariums, and other wildlife conservation organizations as a motivator for caring action toward wildlife and nature. As such, there is a need to understand and develop interventions that further people's empathy, particularly in the context of young children, given the critical developmental period of early childhood. A quantitative study was conducted with 124 children from eight preschools in Minnesota (USA). A modified version of the "Young Children's Empathy Measure with Humans and Animals" was administered at the beginning and end of a preschool year to measure the impact of preschool type (nature preschool, animal-focused nature preschool, and non-nature preschool) on empathy (cognitive, affective, and empathic behavioral intentions). Results suggest that animal-focused nature preschools and nature preschools were more effective than non-nature preschools for empathic behavioral intentions in the context of humans, as well as for cognitive and affective empathy with wildlife. Further, the animal-focused nature preschools were more effective than nature and non-nature preschools in terms of empathic behavioral intentions in the context of animals. Implications are discussed in light of the study's limitations.

Keywords: nature preschool; empathy; cognitive empathy; affective empathy; empathic behavioral intentions

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1. Introduction

Empathy, or the understanding and sharing of others' feelings [1], is integral to achieving a more kind and compassionate society [2]. Empathy is "the spark of human concern for others, the glue that makes social life possible" [3] (p. 3). Empathy is part of a broader category of prosocial actions that promote human flourishing and the collective good. Additionally, empathy is relatively established in the zoo and aquarium community as a motivator of conservation behavior [4], and it is also beginning to be recognized as a pathway toward social justice. Research suggests a relationship between one's level of empathy with others and their valuation of others' welfare and well-being, as well as their openness and willingness to see injustices [5], and it has been suggested as a key strategy for raising antiracist children [6].

Although empathy infrequently surfaces in sustainability conversations, it has great potential as a strand that weaves together environmental integrity, social equity, and shared prosperity. The cultivation of empathy is particularly relevant to Sustainable Development Goal 4, Quality Education, with its emphasis on sustainable lifestyles, human rights, peace, global citizenship, and appreciation of cultural diversity [7]. Empathy merits consideration and investigation in the context of Education for Sustainability because empathy allows us to not only sense or experience the perceived emotions of another, but also can motivate action and as such be a powerful driver for positive change.

Yet, research has revealed a decline in empathy over the last several decades, which in the U.S. is speculated to be related to increased social media use, reduced family size, and

changing parenting styles [8]. Fortunately, empathy can be cultivated through instruction, modeling, practice, and feedback [9]. It is in this context that the study at hand was conducted, to contribute to our understanding of interventions that help people develop greater skills and capacity for empathy. Specifically, this study investigated the potential for nature play to serve as a developmentally appropriate way of fostering empathy development in young children, which is not only novel but also has the potential to be impactful across the dimensions of sustainability, as children grow over time, and across contexts and settings.

2. Literature Review

2.1. Empathy and Prosocial Behavior

Prosocial behavior is behavior intended to benefit or assist others, including behaviors such as helping or supporting others, sharing and cooperating with others, volunteering, and contributing to the greater good. Prosocial behavior is associated with healthy emotional and social functioning including positive peer relations [10], but also with high self-esteem [11] and even academic and work performance [12]. While many individual and contextual factors are associated with prosocial behavior, empathy is considered to be one of the key driving factors [13]. There is a relationship between children's level of empathy and their prosocial behaviors (such as peer responsiveness and compassionate and comforting behaviors) [14]. Additionally, empathy appears to be within a broader prosocial personality trait that develops in children and motivates caring behaviors into adolescence and early adulthood, as research suggests empathy partially mediates the relationship between children's prosocial behavior and later dispositions for prosocial behavior [15].

It is important to note that empathy is a complex and dynamic process, requiring multiple higher-order functions, such as emotion awareness and recognition, multimodal sensory integration, and self-other distinction [16]. The concept of empathy is considered to include separate cognitive (understanding others' emotions), emotional (sharing emotions with another), and motivational components (feeling concerned for others) [17]. Researchers suggest emotional sharing has a positive relationship with prosocial behavior toward peers, with prosocial helping behavior most likely to occur in children with well-developed cognitive perspective-taking abilities and high moral reasoning [18]. The emotional sharing aspect of empathy, alongside the cognitive perspective-taking aspect of empathy, appears to support the empathic concern that is related to the inclination to relieve another person's suffering through responsive, caring behavior [19]. Additionally, research suggests emotion regulation skills may mediate the relationship between empathy and caring behaviors [20]. Thus, the various components of empathy work together and alongside other cognitive and social-emotional skills to influence prosocial behavior [21].

2.2. Empathy and Conservation and Sustainability-Related Behaviors

Empathy has gained ground within wildlife conservation organizations, particularly within zoos and aquariums, as a motivator of conservation behavior [4]. For example, zoo visitors had stronger compassion for animals when they assumed the viewpoint of a suffering animal; they also indicated stronger behavioral intentions toward the protection of that animal species [22]. Empathy with other animals is thought to activate dispositional empathy with nature, or in other words, empathy more broadly with the natural world [23,24]. This dispositional empathy with nature is predictive of biospheric concern and is associated with environmental behaviors [24]. Similarly, there is research suggesting pre-environmental behavior can be is sometimes encouraged by empathy [25], yet this relationship appears to be strongest when the behavior at hand is closely linked to the emotional experience [26]. Thus, similar to its role in prosocial behavior, empathy can influence conservation behavior but is likely insufficient, particularly when barriers intervene and in the case of abstract, complex, or multi-faced behaviors [26].

From a sustainability perspective, it is worth noting research suggests people who were compassionate toward others were more likely to have values that were considered pro-

environmental, and they were also more likely to support nature conservation [27]. Further, people who were asked to take the perspective of people affected by an environmental issue were more likely to be supportive of action to address the issue [28]. Given the intertwining social, economic, and environmental dimensions of sustainability, links across these dimensions are significant. Yet, often in the context of sustainability, and specifically in the context of the Sustainable Development Goals (SDGs), balancing these dimensions can be challenging, particularly when the SDGs seem conflicting or entail compromises and trade-offs. What is needed is "emotionally resilient individuals who are able to navigate the complex landscape of conflicting goals and dissonance" to act in ways that promote human flourishing and attainment of the SDGs [29] (p. 58). The EMC2 framework, which aims to build such individuals, highlights four necessary competencies, one of which is empathy (E), with the others being mindfulness (M), compassion (C), and critical inquiry (C) [29].

Empathy also has entered the sustainability literature through interdisciplinary contexts highlighting place attachment and identity as influential factors affecting whether and how empathy prompts pro-social and/or pro-environmental behavior [30]. Additionally, empathy can be fostered not just for others, but for future generations, which has been shown to increase engagement with environmental problems [31]. Similarly, it is speculated that empathy with the non-human world can expand one's scope of justice beyond social, spatial, and conceptual boundaries [32], even extending considerations of fairness toward others to include fairness toward the natural world [33]. Empathy can promote solidarity with one another, vulnerable communities, other species, and the biosphere toward a global consciousness [34]. Thus, empathy offers "different pathways for realizing sustainability" [30] (p. 13).

2.3. Fostering Empathy and the Potential of Nature Play

Empathy development is influenced by neural development, as well as by genetics and also temperament [35]. The strength and effectiveness of mirror neuron functioning can be supported through socialization and supports, such as providing warm, positive environments and fostering secure attachment relationships with caregivers [36]. Early childhood is a particularly important period for nurturing empathy, as children's brains have greater plasticity, and early interactions with people and the world around them can provide a solid foundation for empathy that can be reinforced as they grow.

Empathy is also considered teachable [9]. Behavioral skills training, such as instruction, modeling, and practice with feedback, as well as communication skills training have been found effective [9]. Another common approach to supporting empathy development in children is through a social-emotional learning curriculum that involves direct instruction and guided practice [21]. Social and emotional learning (SEL) serves as an umbrella term to represent a broad collection of intrapersonal and interpersonal competencies that develop throughout life that are needed for things such as managing behavior, building relationships, processing information, and setting goals. While there are many organizing taxonomies, SEL competencies and skills are typically categorized into the three interrelated skill areas of cognitive, social, and emotional, with empathy being within the emotional area. SEL skill-building interventions that are developmentally responsive and begin earlier in childhood and continue over time are more effective and durable than interventions that begin later in childhood and are shorter in duration [37]. Additionally, repeated opportunities to practice empathy skills and SEL skills more broadly are more effective than single opportunity or infrequent practice, and extending empathy practice beyond the program into real-life scenarios is also particularly effective [38].

Play-based interventions also have been studied as an avenue for supporting SEL. A meta-analysis of the impact of play indicated its ability to help children develop a range of interpersonal skills; through the repeated social interactions that occur during peer play, children develop a variety of competencies that help them build and maintain relationships with others and relate to the world around them [39]. More recently, nature play has been

studied in the context of its impact on SEL and prosocial behavior, with outcomes such as positive peer play behaviors and relationships [40], as well as cooperation, teamwork, sharing, and helping behaviors [41,42].

Researchers have noted that through nature play, defined as play that is freely chosen, unstructured, and open-ended playful interactions with and in nature [40], children have the freedom and flexibility to choose from a variety of play activities in which creativity, cooperation, and social interaction are deeply embedded, and thus this play may facilitate more supportive peer relationships and SEL competencies [43]. Fredrickson's broaden-and-build theory [44] suggests positive emotions, such as joy and contentment, broaden one's thought-action repertoire, which expands the range of cognitions and behaviors that come to mind to act upon and serve as internal resources to draw from and build upon in future social interactions. With the playful and joyful engagement associated with nature play, this theory may partially explain the connection between nature play and the building of social and emotional competencies. A similar plausible linkage between nature play and social and emotional competencies is that access to nature fosters social interactions and supports the development of social relationships [45]. This ability of nature to draw people together and foster friendships and social ties is evident in several studies [46–48].

Other recent studies also have correlated young children's exposure to nature with higher levels of socio-emotional competencies, potentially through the stress-reducing qualities of nature, as stress can inhibit proper mental and emotional functioning [49]. There is strong evidence in the research literature regarding time in nature being associated with reduced stress, anxiety, and depression, as well as improved physical and mental health overall [50]. Nature seems to soothe children, allowing them to be present in life's deeper and emotional lessons. This is grounded in Attention Restoration Theory [51], which posits that natural environments can counter directed attention fatigue, as nature engages involuntary attention, allowing directed attention capacities to recharge. Studies [52,53] support this association between nature exposure, successful attentional capacity, and day-to-day cognitive and emotional functioning.

While these possible mediating mechanisms are in the context of social and emotional competencies and not specifically empathy, they provide foundational support for the hypothesized association between nature play and empathy. Additionally, in light of research where empathy emerged in qualitative interviews and observations as an outcome of nature play [54,55], it is useful to further study the relationship between nature play and empathy, particularly given the suggested relationship between feelings of connectedness to nature enhancing dispositional empathy with nature [56] and in light of the connections to nature that form through nature play. Thus, our study hypothesized that children who have frequent, extended, and ongoing periods of nature play, such as what happens in nature preschool, will have stronger levels of empathy (with humans and with animals) from being in nature and from the collaborative, open-ended, constructive forms of play afforded by nature. In addition, we hypothesized that children who are in nature preschools where intentional interactions with animals occur (such as zoo-based or farm-based nature preschools) will have stronger levels of empathy with animals.

3. Materials and Methods

3.1. Purpose

Considering the relevance of empathy in sustainability, prosocial, and conservation contexts, and in light of its importance within social-emotional learning, empathy is a timely and meaningful construct to study within the context of nature preschools. As nature preschools aim to support development across the domains, and with the sustained opportunities for unstructured play in nature, it seems theoretically plausible for nature preschool to be a mechanism for supporting empathy. Therefore, the aim was to explore the influence of preschool type (nature preschool, animal-focused nature preschool, and non-nature preschool) on empathy (cognitive, affective, and empathic behavioral intentions) in the contexts of empathy with humans, animals, and wildlife. The specific research

question guiding the study was as follows: When controlling for preschool participants' pretest levels, age, gender, and dosage of preschool participation, do posttest levels of cognitive and affective empathy and empathic behavioral intentions significantly differ by preschool type?

3.2. Participants

The participants in this study were three- to five-year-old children enrolled in preschool classes within a community of approximately 87,000 residents in Minnesota (USA). The median household income was approximately USD 54,000, and the community was approximately 90% White [57]. Eight preschool classes were invited to participate in this study. Five of the preschool classes were nature preschools (two of the five had a specific emphasis on animals) and three of the preschool classes were conventional (non-nature) preschools. A total of 124 children with parental consent participated in the study (37 children from non-nature preschools, 49 children from nature preschools without the animal focus, and 38 children from animal-focused nature preschools).

3.3. Design

A quasi-experimental design (pretest-posttest nonequivalent control group) was used to compare posttest levels of empathy across the three preschool types. This design is often used in education research when random assignment to groups is not possible (such as in this study, where children were already 'assigned' to preschool programs based on parental choice, independent of the study). Preschoolers' empathy scores at the beginning of the school year were used in the analysis to control for pre-existing differences in participants' levels of empathy. Data on children's age, gender, and 'dosage' (full-time or less than full-time participation) were also incorporated into the analysis to control for potential preexisting differences. Race and ethnicity of participants were not collected, as in the geographic region, there is a lack of variability.

Five of the eight participating preschools were privately operated nature preschools. Nature preschools emphasize young children's direct experiences with and in nature as a catalyst for connecting with the natural environment in ways that facilitate cognitive, social-emotional, and physical development [40]. Additionally, called forest schools or forest kindergartens, children spend their school days outside exploring, imagining, playing, creating, and interacting with nature and one another (see [41] for a more in-depth description). This child-directed approach was used at all of the five participating nature preschools, with the majority of time spent in free play outdoors in unmaintained or minimally maintained natural settings regardless of weather conditions (approximately four to five hours daily of play in and with nature). Of these five nature preschools, two of them were labeled 'animal-focused' nature preschools, as they shared the same characteristics as the nature preschools but also included interactions with live animals, due to their settings–one was located within the city's zoo, and the other on a small, privately owned farm. For these two animal-focused nature preschools, children's play was often physically near animals, and children were involved in some of the animal care, such as feeding them, cleaning cages, gathering eggs, etc. Additionally, there were opportunities to observe and interact with animals, prompting informal and loosely structured learning opportunities about the animals.

Three non-nature preschool classes served as the comparison group. They were selected due to their similar geographic location, having a similar tuition structure, being of similar demographic make-up, and their willingness to participate. One of the non-nature preschools was administered by the local university, and the other two were affiliated with a local parochial elementary school, and all three emphasized development across the domains. The majority of play was indoors; depending on the site, there were about one to four hours daily of child-directed or loosely guided play. Additionally, these three preschool classes provided opportunities for weather-permitting outdoor play (typically 30 min to 2 h daily, depending on the site). Outdoor play was primarily on typical playground

equipment in the schoolyard. Children had 15 min to 2 h of teacher-guided learning each day.

Participants across all eight preschools shared similar demographic characteristics and experienced caring and responsive teachers and a developmentally appropriate preschool program that aimed to support holistic development across the domains. The primary difference between the nature and non-nature preschools was in the proportion of the day spent outdoors in unstructured (child-led) play, as well as the play location (in nature vs. on a schoolyard playground). These shared characteristics allowed for exploring the potential influence of sustained, child-led nature play (play that takes place in and with nature) beyond what one might expect to see from a high-quality, developmentally appropriate, non-nature preschool program.

3.4. Construct and Measures

Empathy, from social neuroscience and developmental science perspectives, is a multidimensional construct that reflects a capacity to understand and share the subject states of others [58]. It is comprised of cognitive (the ability to understand what another person is feeling [59]) and affective components; the affective component includes two facets, emotional (sharing the feelings of another) and motivational (feeling concerned for another) [60]. These dimensions of empathy interact with one another, yet they can be disassociated, as they rely on partially separable information processing systems [61]. Empathy is often thought to involve being responsive to the feelings of another (caring behaviors), not just understanding, sharing, and feeling concerned for another, based on the assumption of a direct relationship between emotional attunement and interpersonal responsiveness. Yet, as mentioned prior, the various facets of empathy work together and alongside other cognitive and social-emotional skills to influence prosocial behavior [21], and there are other influences on and barriers to prosocial behavior as well, hence varying effect sizes reported in the literature regarding the relationship between empathy and prosocial behavior.

Assessing empathy with young children is difficult due to a lack of measures that are both validated for use with young children and assess its multidimensional nature. One existing instrument, the "Young Children's Empathy Measure with Humans and Animals" [62], surfaced through a literature review. The assessment has four verbal vignettes-happiness, sadness, fear, and anger, which are the four emotions typically used in tests of children's empathy [62]. For each of the vignettes, two questions are asked: "How does the child in the story feel? (assessing the cognitive dimension); and "How do you feel about the child in the story?" (assessing the affective dimension). The vignettes are read again in the context of a pet dog, with two questions asked again; this is used to assess empathy with animals, whereas the first round of vignettes assesses empathy with humans.

This instrument was selected for the study at hand, as it was designed for children as young as three years old and because it was a direct measure (not a trait self-report, nor an indirect measure completed by parents or caregivers) and tapped multiple dimensions of the construct. The reliability of this instrument is 0.69, and validity was established through correlations with other assessments (see [62] for details). Importantly, the instrument did not correlate with children's vocabulary scores, indicating the instrument was not measuring verbal comprehension, further validating the appropriateness of its use with young children [62]. Further, research suggests that if participants reached the minimum verbal ability needed to talk about emotions, their verbal ability would not influence their assessment score if a valence-based coding structure is used (e.g., the responses of happy, ecstatic, pleased, and elated would all be equally "correct" and given the same score as they have the same emotional valence, or in other words are located in the same quadrant of pleasant and high arousal, using the two axes of pleasant to unpleasant and high arousal to low arousal) [5].

The instrument was modified and pilot tested before use in the study at hand (see [63] for a description of the vignettes used in the pilot study and again in the study at hand).

In addition to the original instrument's vignettes with children (assessing empathy with humans) and the vignettes with the dog (assessing empathy with animals), the modified version of the instrument included vignettes with a squirrel to assess empathy with wildlife, as the study at hand was in the context of prosocial, conservation, and sustainability-related behaviors. A squirrel was selected to represent wildlife because it is very familiar to children in this geographic location. Additionally, the modified version of the instrument included a third question for each vignette to assess empathic behavioral intentions ("What would you say to or do for this [child or animal at hand]?"). As mentioned prior, while various dimensions of empathy are related to prosocial behavior, having a more direct indication of the likelihood for engagement in caring behaviors was desired given the study context.

A final modification from the original instrument was adding the use of photos to accompany the vignettes toward a more ecologically valid assessment (more illustrative of authentic emotion recognition situations, where verbal as well as visual clues are used; see [62]). Additionally, in the pilot study, photos helped keep children engaged in the assessment, particularly since there were more vignettes and questions than in the original instrument. For the photos that accompanied the vignettes, gender was not clearly apparent, and the children in the photos and vignettes were referred to as a 'child', instead of being referred to specifically as a boy or a girl. For the vignettes measuring empathy in the context of animals (non-wildlife), photos of dogs and cats were available. Children were first asked if they wanted to see the pictures of dogs or cats, whereas in the original instrument the vignette was about a dog. Since it is not uncommon for children to have had unpleasant experiences with dogs, this inclusion of the option for cats was to reduce the potential risk of harm to participants, even though it potentially introduced a confounding variable.

3.5. Data Collection Procedures

Following Institutional Review Board approval of the research protocol, which serves to assure, both in advance and by periodic review, that appropriate steps are taken to protect the rights and welfare of humans participating as subjects in the research, all children at the participating preschools were invited to participate through the parental consent process. Teachers at the preschool sites collected the consent forms and filled out a code sheet regarding children's age, gender, prior participation, and dosage of participation (half v. full day; days per week), allowing the researchers to work with de-identified data. Empathy pretests were conducted at the beginning of the school year (September and October 2021) and post-tests were conducted at the end of the school year (May 2022). Testing was conducted during normal preschool hours, in an area of the classroom that was out of the way of other activities, yet still in the view of the teacher.

Children's responses were scored in a manner patterned after what was used in the original measure [62] and used in the pilot study [63]. Responses to the questions measuring cognitive empathy and affective empathy were scored as follows:

3 = a response that is an emotion that is relevant to the vignette *and* photo (children say an emotion that is congruent with the vignette and photo);
2 = emotional response that is relevant to either the vignette *or* photo;
1 = emotional response that does not fit either the vignette or photo; and
0 = non-emotional response (for example, commenting on the photo or describing what happened), or no response, or stating "I don't know".

Empathic behavioral intentions, which were assessed for the vignettes with the emotions sadness, fear, and anger (as the emotion happiness does not lend itself to a helping behavior), scoring was as follows:

3 = response that indicates an intention to respond through caring words or actions (response indicates an intention for interpersonal responsiveness) *and* is relevant to the vignette *and* photo;
2 = response that indicates an intention to respond through caring words or actions *and* is relevant to the vignette *or* photo;

1 = response that indicates an intention to respond through caring words or actions that lacks relevance to either the scenario or photo; and
0 = response that is not an intention to respond through caring words or actions, or no response, or stating "I don't know".

Due to the potential subjectivity in scoring, the responses were reviewed and scored by two researchers, with any discrepancies discussed until a common score was reached. Ultimately, the scoring process yielded for each participating child a pretest score and a posttest score for: (a) cognitive empathy (derived by summing the scores from across the vignettes/photos for the four emotions for a possible score of 12); (b) affective empathy (derived by summing the scores from across the vignettes/photos for the four emotions for a possible score of 12); and (c) empathic behavioral intention (derived by summing the scores from across the vignettes/photos for the three emotions for a possible score of 9). Children had these three pretest and posttest scores for empathy with people, for empathy with non-wildlife animals, and for empathy with wildlife, which resulted in a total of nine pretest and nine posttest scores per child. These were the scores used in the analysis.

4. Results

General linear modeling was conducted to address the study's research question: When controlling for preschool participants' pretest levels, age, gender, and dosage of preschool participation, do posttest levels of cognitive and affective empathy and empathic behavioral intentions significantly differ by preschool type? In this analysis, the between-factor (independent variable) was preschool type, with three levels (animal-focused nature preschool, nature preschool, and non-nature preschool). The posttest levels of cognitive empathy, affective empathy, and empathic behavioral intentions across empathy with human, animal, and wildlife contexts served as the nine dependent variables. Due to the potential for a spiraling Type I error rate from running nine inferential analyses within the same family of data, the Bonferroni method [64] was used to adjust the level of significance to $p < 0.006$ ($\alpha = 0.05/9$). The covariates in the analysis were pretest, age, gender, and dosage of participation. Regarding the covariate of dosage, the duration of participation varied both across sites and within sites. Thus, this data was coded at the individual participant level, as either full-time attendance (full day, five days per week) or less than full-time attendance (anything other than full day, five days per week). Prior preschool participation was not used as a covariate, due to its significant correlation with age ($p = 0.004$), and in light of trying to maintain a balance of covariates to the overall sample size (balancing the benefit of including multiple covariates with the possibility of overfitting the model).

The results suggest a significant difference across preschool types for empathic behavioral intentions in the context of empathy with humans, cognitive empathy in the context of empathy with wildlife, and affective empathy in the context of empathy with wildlife (see Table 1). Estimated posttest marginal means by preschool type are reported in Table 2 and are visually displayed for ease of interpretation in Figures 1–3.

Table 1. Results of the Between-Subjects Tests for Effect of Preschool Type on Empathy.

Context	Dependent Variable	df	F	Sig.	Partial Eta Squared
Humans	Cognitive	2	2.00	0.14	0.03
	Affective	2	2.70	0.07	0.04
	Empathic Behavioral Intention	2	5.80	0.004	0.09
Animals	Cognitive	2	0.84	0.44	0.01
	Affective	2	1.63	0.20	0.03
	Empathic Behavioral Intention	2	4.63	0.01	0.07
Wildlife	Cognitive	2	5.96	0.003	0.09
	Affective	2	11.48	<0.001	0.164
	Empathic Behavioral Intention	2	2.63	0.07	0.04

Table 2. Estimated Posttest Empathy Means and Standard Errors by Preschool Type.

	Animal-Focused Nature Preschool	Nature Preschool	Non-Nature Preschool
Empathy with Humans			
Cognitive Empathy	11.71 (0.15)	11.82 (0.13)	11.42 (0.15)
Affective Empathy	10.71 (0.48)	10.42 (0.43)	9.23 (0.48)
Empathic Behavioral Intentions	8.07 (0.41)	8.07 (0.36)	6.43 (0.40)
Empathy with Animals (Non-wildlife)			
Cognitive Empathy	11.71 (0.21)	11.46 (0.19)	11.33 (0.21)
Affective Empathy	10.33 (0.44)	10.61 (0.39)	9.54 (0.44)
Empathic Behavioral Intentions	8.50 (0.42)	8.00 (0.37)	6.82 (0.40)
Empathy with Wildlife			
Cognitive Empathy	11.49 (0.22)	11.53 (0.20)	10.58 (0.22)
Affective Empathy	10.27 (0.44)	10.67 (0.39)	7.89 (0.45)
Empathic Behavioral Intentions	7.78 (0.42)	8.06 (0.37)	6.82 (0.41)

Note. Covariates were pretest scores, age, gender, and dosage of participation.

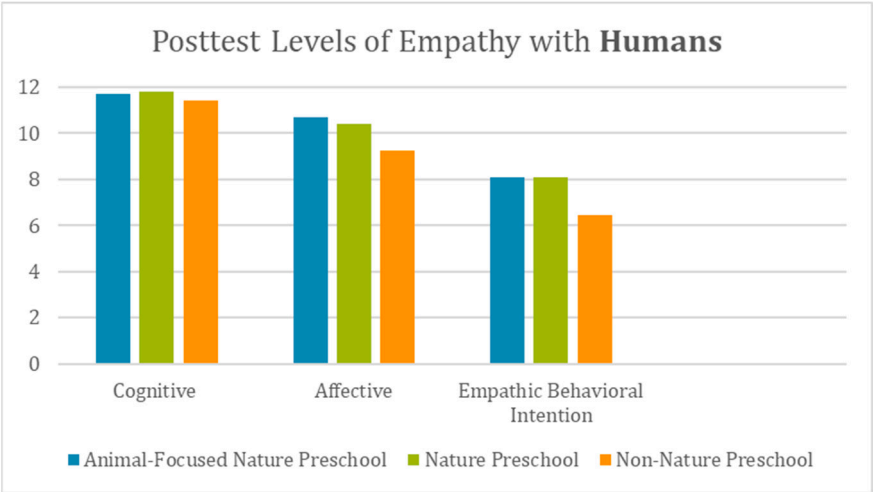

Figure 1. Comparison of estimated posttest marginal means by preschool type for empathy with humans, when controlling for pretest means, age, gender, and dosage of participation.

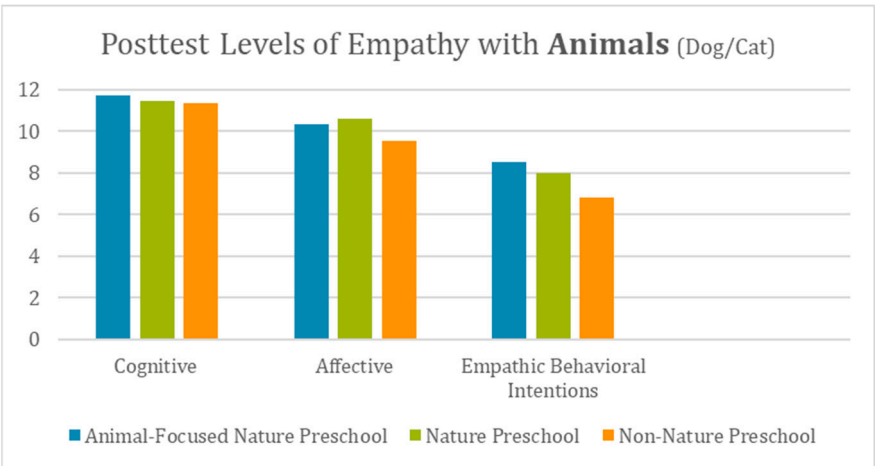

Figure 2. Comparison of estimated posttest marginal means by preschool type for empathy with animals, when controlling for pretest means, age, gender, and dosage of participation.

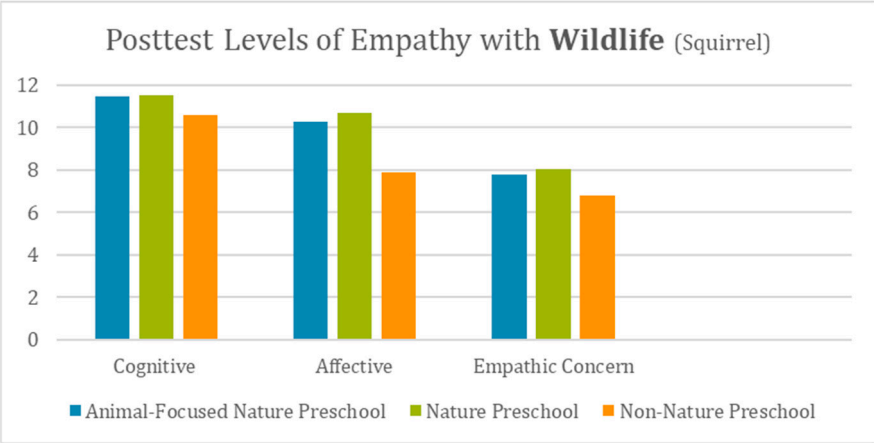

Figure 3. Comparison of estimated posttest marginal means by preschool type for empathy with wildlife, when controlling for pretest means, age, gender, and dosage of participation.

In the context of empathy with humans, pairwise comparisons of estimated posttest marginal means suggest children in the animal-focused nature preschools and in the nature preschools had significantly higher levels of empathic behavioral intentions than children in the non-nature preschools (MD = 1.65, SE = 0.55, $p = 0.004$; MD = 1.65, SE = 0.58, $p = 0.005$, respectively). In the context of empathy with animals (non-wildlife), children in the animal-focused nature preschool had significantly higher levels of empathic behavioral intentions than children in the non-nature preschools (MD = 1.70, 0.58, $p = 0.004$). In the context of empathy with wildlife, children in the animal-focused nature preschools and in the nature preschools had significantly higher levels of cognitive empathy (MD = 0.95, SE = 0.30, $p = 0.002$; MD = 0.90, SE = 0.31, $p = 0.005$, respectively) and affective empathy (MD = 2.78, SE = 0.62, $p < 0.001$; M = 2.38, SE = 0.63, $p < 0.001$, respectively) than children in the non-nature preschool. The data for all of the pairwise comparisons by preschool type is reported in Table 3. In sum, the animal-focused nature preschools and nature preschools were more effective than non-nature preschools for empathic behavioral intentions in the context of humans, as well as for cognitive and affective empathy with wildlife. The animal-focused nature preschools also were more effective than nature and non-nature preschools in terms of empathic behavioral intentions in the context of animals.

Table 3. Pairwise Comparisons of Estimated Posttest Means by Preschool Type.

Dependent Variable	Preschool Comparison	Mean Difference	SE	*p*
Empathy with Humans				
Cognitive	Non-Nature and Nature	−0.40	0.20	0.05
	Non-Nature and Animal-Focused Nature	−0.28	0.21	0.19
	Nature and Animal-Focused Nature	0.12	0.21	0.57
Affective	Non-Nature and Nature	−1.19	0.67	0.08
	Non-Nature and Animal-Focused Nature	−1.48	0.68	0.03
	Nature and Animal-Focused Nature	−0.29	0.67	0.67
Emp Beh Intentions	Non-Nature and Nature	−1.65	0.55	0.004 *
	Non-Nature and Animal-Focused Nature	−1.65	0.58	0.005 *
	Nature and Animal-Focused Nature	−0.001	0.58	0.99

Table 3. *Cont.*

Dependent Variable	Preschool Comparison	Mean Difference	SE	*p*
Empathy With Animals				
Cognitive	Non-Nature and Nature	−0.13	0.29	0.66
	Non-Nature and Animal-Focused Nature	−0.38	0.36	0.21
	Nature and Animal-Focused Nature	−0.26	0.30	0.39
Affective	Non-Nature and Nature	−1.07	0.61	0.08
	Non-Nature and Animal-Focused Nature	−0.79	0.62	0.21
	Nature and Animal-Focused Nature	0.28	0.60	0.64
Emp Beh Intentions	Non-Nature and Nature	−1.18	0.56	0.04
	Non-Nature and Animal-Focused Nature	−1.70	0.58	0.004 *
	Nature and Animal-Focused Nature	−0.50	0.59	0.040
Empathy with Wildlife				
Cognitive	Non-Nature and Nature	−0.95	0.30	0.002 *
	Non-Nature and Animal-Focused Nature	−0.90	0.31	0.005 *
	Nature and Animal-Focused Nature	0.04	0.30	0.89
Affective	Non-Nature and Nature	−2.78	0.62	<0.001 *
	Non-Nature and Animal-Focused Nature	−2.38	0.63	<0.001 *
	Nature and Animal-Focused Nature	0.40	0.61	0.51
Emp Beh Intentions	Non-Nature and Nature	−1.24	0.56	0.03
	Non-Nature and Animal-Focused Nature	−0.96	0.60	0.11
	Nature and Animal-Focused Nature	0.28	0.58	0.63

Note: * Statistical significance at the 0.05/9 or 0.006 level.

5. Discussion

5.1. Limitations

It is important to consider these findings within the limitations of this study. Construct validity is limited due to the single instrument used. External validity is limited given the lack of variation in terms of race, ethnicity, and socio-economic status of the sample at hand, as well as by being conducted during a pandemic, and periods of quarantine for individual children or temporary preschool closures were not factored into the study. Internal validity is limited, due to the lack of random assignment, making it difficult to attribute results solely to differences in preschool type. While pretest scores and demographic data were incorporated into the analyses to account for possible pre-existing differences, and despite participants being from the same geographic area, cautious interpretation and generalization are necessary as not all possible confounding factors were explored.

One confounding factor that was explored was the possibility that empathy may have been influenced in the context of families and/or in out-of-school time, beyond the influence of preschool. As such, an analysis of variance test was conducted to determine whether pretest means differed significantly across the three groups. Results of the comparison of pretest levels indicate there were significant differences across the animal-focused, nature, and non-nature preschools, when controlling for gender and age, for four of the nine dependent variables: cognitive empathy and empathic behavioral intentions in the context of humans ($F(2) = 9.88$, $p < 0.001$; $F(2) = 8.76$, $p < 0.001$); and empathic behavioral intentions

in the context animals (F(2) = 14.68, $p < 0.001$) and in the context of wildlife (F(2) = 9.54, $p < 0.001$). However, in each case, the children in the animal-focused nature preschool had significantly lower pretest scores than children in the nature and non-nature preschools, and empathy pretest levels did not significantly differ between the children in the nature and non-nature preschools. This suggests that family level nature engagement outside of preschool time is less of a concern in terms of interpreting the effects of animal-focused and nature preschool participation. If out-of-school time in nature or with animals, particularly in families that had chosen the animal-focused or the nature preschools, were having a positive influence on empathy, there likely would have been pretest scores that were significantly higher (not lower) for children in the animal-focused preschools and in the nature preschools.

Another limitation stems from the "nesting" of data (participating children were nested within classes within teachers within categories of preschools). Multi-level modeling was not used because of an insufficient sample size at the program level and due to the groups being a fixed rather than a random factor [65,66]. Due to the possibility of differences across preschools within the same categories of preschools, initial analyses were conducted first to check for significant within-group variations before the between-groups multivariate tests were conducted. Despite likely within-group variations in terms of program implementation, there were no significant within-group differences for any of the nine dependent variables and consequently, the preschools within a category type were assumed to be more similar than different. Yet, there is the possibility of inaccurate statistical estimates from not accounting for the hierarchical structure of the data and the resulting risk of partitioning variance incorrectly [67].

5.2. Discussion of Findings

The results suggest preschool type is influential on children's cognitive and affective empathy with wildlife, and also on children's empathic behavioral intentions toward humans and animals. This study was set in the context of the intertwining dimensions of sustainability, social equity, environmental quality, and shared prosperity. It is meaningful and noteworthy that nature preschools and animal-fostered nature preschools appeared to be effective for supporting empathic behavioral intentions toward others, beyond what would be expected from high-quality non-nature preschools. Particularly given the relationship between childhood prosocial behaviors and dispositions for adulthood prosocial behaviors [15], nature preschools can be another avenue for consideration in the quest for sustainability, fostering in children the inclination to not only be responsive to others around them but toward on-going inclinations for helping behaviors as they grow into adolescence and young adulthood.

In terms of cognitive and affective empathy, nature preschools and animal-focused nature preschools were more effective than non-nature preschools in terms of fostering empathy with wildlife. This finding is timely and relevant, particularly in light of the efforts by wildlife conservation organizations to foster empathy toward conservation caring, described as caring actions toward or on behalf of wildlife stemming from one's thoughts, feelings, values, and experiences [68]. Additionally, these findings are significant, as empathy with wildlife can activate dispositional empathy with nature [23,24], which is predictive of biospheric concern and associated with environmental behaviors [24]. While that relationship was in the context of adults, it seems likely that the empathy with wildlife that develops in children could motivate caring behaviors into adolescence and young adulthood, similar to what has been found in the context of prosocial behavior, where empathy partially mediates the relationship between early prosocial behavior and later prosocial dispositions [15]. This finding of the effectiveness of nature and animal-focused nature preschools on children's affective empathy is also particularly significant, as affective empathy remains relatively stable beyond the first few years of life and does not tend to increase alongside cognitive maturation like cognitive empathy does [69]. Thus

an intervention that appears to foster affective empathy with wildlife is meaningful, as increased affective empathy would unlikely happen on its own.

Despite nature preschoolers and animal-focused nature preschoolers having significantly higher cognitive and affective empathy than their peers in non-nature preschool, their levels of empathic behavioral intentions toward wildlife were not significantly higher. Children in the animal-focused nature preschool did have significantly higher empathic behavioral intentions toward non-wildlife animals, but they did not differ significantly from their nature and non-nature preschool peers in the context of wildlife. This may suggest that the concept of caring behaviors toward wildlife may be too abstract for children of this age, particularly given the vignettes used in the study. (For example, a squirrel who runs up a tree after being chased by a barking dog may not easily elicit an empathic behavioral intention response to the question of what would you do or say to help this squirrel, whereas a child may more easily be able to respond to the vignette of the dog/cat who is hiding under the bed during a thunderstorm). Perhaps these differences in cognitive and affective empathy with wildlife may translate into differences in empathic behavioral intentions toward wildlife and actual behaviors as children's abstract thinking capabilities grow. Alternatively, the lack of differences in empathic behavioral intentions toward wildlife also may be reflective of a lack of construct validity on the dimension of empathic behavioral intention for wildlife.

5.3. Recommendations for Further Research

While this study suggests nature preschools and animal-focused nature preschools are effective in the context of fostering empathy in young children, there are some areas where further research is necessary. The study at hand was not designed to allow for attributing a positive impact to any particular preschool program characteristic. Nor is it clear from this study if it is the preschool as a whole that is responsible for the significantly higher levels of empathy, or if instead, they are an effective vehicle for providing time for children to engage in nature play or even to simply be in nature, with nature play or time in nature as the source of positive impact. The research literature regarding the mental health benefits associated with nature and the social-emotional outcomes associated with nature play would make these factors quite plausible in speculations about the source for the differences across preschool types detected in this study. Similarly, nature play, as well as play more broadly, is considered developmentally responsive and in light of this study being set in the context of preschool, the study's findings are consistent with research suggesting interventions that are developmentally responsive and begin early in childhood and continue over time result in greater and more enduring benefits [37]. Additionally, since repeated opportunities to practice empathy skills are more effective than infrequent practice, and practicing the empathy skills in real-life situations is also particularly effective [38], it also seems likely that the daily, sustained child-directed play in nature, which is the hallmark feature of nature preschools, is responsible for these differences.

Researchers have noted that nature play affords and even necessitates positive peer interactions such as cooperation and helping behaviors [43]. The dynamic aspect of nature and nature play offers a plethora of opportunities for social, emotional, and cognitive development from trial and error, problem-solving, taking risks, processing new information, and constructing new meanings [70]. Given the less-structured, child-directed approach of nature preschool combined with the natural spaces for children to wander, play, explore, and roam, there is more child autonomy from less supervision and increased distance from teachers [71]. This affords opportunities for children to not only come up with ideas regarding what to play and to solve problems when they arise, but also to assist each other as they encounter and initiate challenging activities, comfort each other when they are sad or scared, and support and help each other as they play and explore, rather than relying on a teacher for help [72].

While the literature provides such clues as to what might account for this relationship between nature preschool and empathy, research that allows for more than speculation

on the mechanisms is critical for guiding practice, particularly in light of animal-focused nature preschools being relatively unstudied to date. Further research is needed to better understand which preschool program characteristics are most influential and how the preschool program and even teacher characteristics interact to support the development of all dimensions of empathy across the different contexts. For example, the role of the teacher in a traditional preschool could be considered more hands-on, whereas in nature preschools, child-directed free play results in potentially less interaction, or at least a different type of interaction, with teachers. With research suggesting empathy is related to preschoolers' attachment style [73], this might be an aspect to incorporate into future studies regarding the effect of nature preschool on children's empathy.

Additional research regarding the instrument itself is also needed. The modified version of the instrument has now been used twice (the pilot study and the study at hand). The instrument was reasonably quick to administer (typically 5 min per child) and the photos seemed to be particularly appealing to the children, as it was not uncommon for a child to ask to "play" the assessment again or to ask to look at more pictures. Further research on the psychometric properties of the instrument would be useful, particularly in light of the challenge it was to locate an instrument that directly measured multiple dimensions of empathy and was validated for use with young children.

One area in particular that needs attention in future use and warrants further research is the affective dimension measured through the instrument. As noted in the literature, the affective component of empathy includes two facets, emotional (experiencing or feeling the perceived emotions of another) and motivational (feeling concerned for another) [60]. In both the original instrument and the modified version, these two facets are not measured separately, as there is a single question that asks the child how they feel about the child or animal in the vignette. This elicits an affective response, yet one that is indistinguishable in terms of emotional (feeling with another, such as I feel sad as/with that child) v. motivational (feeling for another, such as I feel sad for that child). While both emotional empathy and motivational empathy can prompt caring behaviors, research suggests that in the absence of skills such as self-regulation, feelings of agency, or an internal locus of control, emotional empathy can lead to personal distress rather than empathic behavioral responding [69]. Similarly, it is thought that motivational empathy in the absence of emotional empathy can lead to an undesirable power imbalance (feelings of "I am here 'above' you to help you,' rather than "I am here alongside you to help you"), which might counter the desirable relationship between empathy and social justice Additionally, further complicating the issue is that motivational empathy can lead to helping behaviors, but through either altruistic (wanting to relieve the suffering of another) or egoistic (wanting to relive one's own distress at seeing the suffering of another) motivations. Emotional empathy may factor into which motivation is driving the behavior and potentially the durability and transferability of the behavior [74]. Thus, future iterations of this instrument should consider differentiating these empirically separable facets of affective empathy (emotional and motivational), rather than lumping them together, which has been shown to result in inconsistencies in research findings [69].

Another aspect of the instrument mentioned earlier in the discussion relates to developmentally appropriate assessment of empathic behavioral intentions, particularly in the context of wildlife, in light of children's concrete thinking at this age (illustrated by one nature preschool child's response, "Why would I need to help a squirrel? They are a part of nature and they can help themselves!"), and in light of the somewhat limited scope of conservation behaviors that are meaningful, authentic, and developmentally appropriate for preschool-aged children (for example, children wanting to offer a toy or lemonade to the sad squirrel). The construct and context are significant, and thus it seems worthwhile to further explore the construct validity and scoring of this dimension of the instrument, particularly in the context of wildlife, to guide and pilot test further modifications.

A final aspect to note regarding the instrument and the need for further research is that while the instrument was designed for quantitative scoring and analysis, there were

nuanced differences in children's responses. For example, children in the nature preschools often used the phrasing that they would "make" a toy to give the child in the vignette whose toy had been broken, as opposed to "buying" or "finding" a new toy, which was often stated by the non-nature preschoolers. This may connect to the creative thinking that is often associated with nature play, and thus may offer clues into what about the intervention is influencing empathy. Additionally, another pattern of responses that was noticed during the administration of the instrument was that some children in the nature preschools, and in particular the animal-focused nature preschools, commented on the posture of the animal, the way the animals' ears were (pointed upright or drooping), the raised fur on the angry animals, or animals' paws and arms that were droopy and not straight and tight. It appeared they were using these visual clues to guide their identification of the emotion at hand. While this was not systematically captured nor analyzed as it was beyond the study scope and design, further study into this emergent phenomenon could be useful in guiding interventions to support the development of cognitive empathy, such as feelings identification and perspective-taking, particularly in the context of animals (wildlife and non-wildlife).

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