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Fostering Empathy for People and Animals: An Evaluation of Lake Superior Zoo's Nature Preschool

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ABSTRACT

In light of the significance of empathy in prosocial and conservation behavioral contexts, and with its relevance to social-emotional learning, which is an emphasis in early childhood education, empathy is a timely and meaningful construct to study within the context of nature preschools. Thus, a program evaluation was conducted to explore the potential of a nature preschool, and specifically a zoo-based nature-preschool, to foster children's empathy. This was a small-scale evaluation, conducted with 10 preschool participants. Yet it suggests the potential for supporting children's empathy through a zoo-based nature preschool, as data indicates children's emotional sharing and empathic concern significantly increased across the three contexts of with humans, non-wildlife animals, and wildlife. Cognitive perspective-taking significantly increased in the context of humans, but not in animal contexts. Implications for further research are discussed.

***Keywords*:** nature play, nature preschool, empathy

Empathy is the understanding and sharing of others' feelings (Knafo-Noam et al., 2009). It is also described as an affective response that stems from the comprehension of another person's emotional state or condition (Eisenberg & Fabes, 1998). Empathy is at the heart of what it means to be human, as it is a foundation for ethical and humane actions, good relationships, and academic and professional success (MCC, 2018). It is surfacing as significant in conservation contexts as well. A network of zoos and aquariums, *Advancing Conservation through Empathy (ACE) for Wildlife* facilitated by Woodland Park Zoo (Seattle, Washington, USA), is leading efforts to learn how empathy for wildlife in zoos and aquariums can be a catalyst for conservation action for wildlife, ecosystems, and the planet. Within the zoo and aquarium community, empathy is defined as a stimulated emotional state that relies on the ability to perceive, understand, and care about the experiences or perspectives of another person or animal (Wharton, Khalil, Fyfe & Young, 2019).

Components of Empathy

Empathy includes both cognitive and affective cognitive components (see Figure 1). *Cognitive empathy* is the ability to understand what another is feeling or thinking, without necessarily feeling those feelings or thinking those thoughts (Spreng et al., 2009). Cognitive empathy includes *feelings identification*, which is the ability to perceive cues from another and understand what that person is feeling and thinking, and *perspective-taking*, the ability to consciously place oneself in the mind of another and imagine what that person is thinking or feeling ("putting yourself in another's shoes") (Cuff et al., 2014).

Affective empathy is an instinctive ability to sense, feel, or experience the perceived emotions of another person (Cuff et al., 2016). The affective domain of empathy includes *emotional sharing* and *empathic concern*. Emotional sharing (also called emotional empathy or emotional contagion), is sensing or experiencing the perceived emotions of another, and empathic concern (also called motivational empathy or compassionate concern), is the motivation to care. Emotional sharing may lead to empathic concern with further cognitive processing of the other person's state (Eisenberg, 2000) and with the contribution of emotion regulation skills (Hay, 2009).

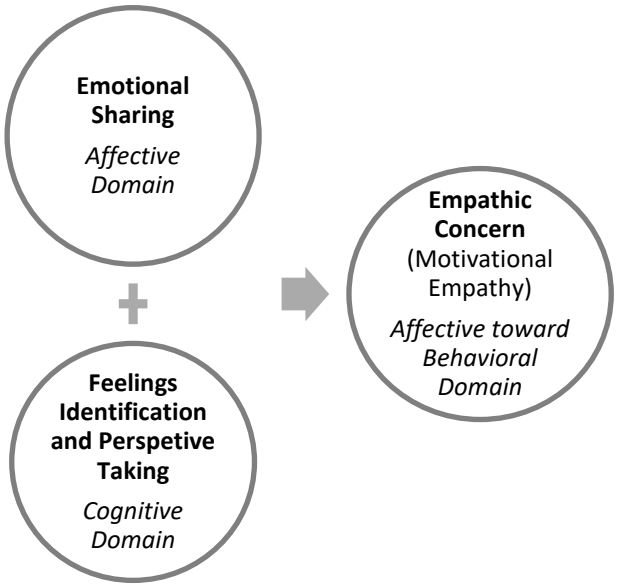

Figure 1: Relationship among Affective and Cognitive Dimensions of Empathy

Developing Empathy

Early childhood is an important period of empathy development. During the first few months of life, a foundation for empathy is built through a secure and loving relationship with the caregiver. Around 6 months of age, babies exhibit social referencing, where they "read" and use caregivers' responses to regulate their responses toward other people, situations, or objects. As they begin to associate emotions with words and expressions, babies during their first year begin imitating others' emotions and expressions (Knafo-Noam et al., 2009). Around 18 to 24 months of age, toddlers understand themselves as separate persons (Knafo-Noam et al, 2009) and are growing in their ability to recognize their own emotions, show an understanding of the emotions of others, and respond to emotional cues by expressing verbal or facial interest in and even concern over another's distress (Zahn-Waxler et al., 1992). Many toddlers can engage in helping behaviors in response to real or simulated distress by age two, moving from primarily physical helping behaviors to a wider variety of helping behaviors such as verbal comfort, distracting the person in distress, and even advice (Zahn-Waxler et al., 1992). Children's cognitive empathy increases significantly during the preschool years, with their growing abilities to use words to express emotions and as they more accurately recognize, understand, anticipate, and respond to the emotional expressions of others (Knafo-Noam et al, 2009). By the time children are four or five, they usually can see a situation from the perspective of another, which is necessary for viewing the situation of another more accurately and responding with more effective helping strategies (Wellman et al, 2001).

In neuroscience literature, and as described earlier, empathy has affective (sharing others' emotions) and cognitive (understanding others' emotions) components (Mackes et al., 2018). Affective empathy is linked to mirror neurons that allow an individual to observe another person and respond to the stimuli similarly, thus providing a neural basis

for empathy (Goldman, 2014). Most people and even many animals have this capacity, although some biological conditions affect how well mirror neurons function and grow (Gerdes et al., 2013). Cognitive empathy is also is based in mirror neurons, but unlike affective empathy, it is considered intentional, controllable, and teachable (Carr et al., 2003). Since the affective and cognitive components involve partially non-overlapping brain regions (Mackes et al., 2018), and as the brain systems relevant to the affective aspects of empathy develop earlier than those relevant to the cognitive aspects of empathy (Malti et al., 2016), there is the differential developmental pattern. Affective empathy appears very early on, with a slight increase during the first three years, and remains relatively stable across the lifespan (Davidov et al., 2013). Cognitive empathy gradually increases from early to late childhood This coincides with the intertwining of empathy and social-cognitive development, as well as emotion regulation skills, both of which increase from infancy to adolescence (Hoffman, 2000). In particular, changes from external to internal sources of regulation as children grow, along with the developing regulatory capacities of effortful control, delay of gratification, and attentional control, also promote increasing empathic capacities during the childhood years (Eisenberg & Eggum, 2009).

Strategies to Foster Empathy with People and Animals

While empathy is strongly influenced by neural development, it is also influenced by genetics and temperament (Zahn-Waxler et al., 1992), as well as socialization and developmentally responsive strategies and supports (Goldman, 2014). In other words, children are born with the capacity for empathy, yet empathy can and should be nurtured throughout their lives. The literature on empathy offers many research-based strategies for nurturing empathy, including providing young children with warm, positive environments (Zhou et al., 2002) and fostering secure attachment relationships with caregivers (Kestenbaum & Sroufe, 1989). This helps children know they are emotionally and physically supported, which in turn allows them to take more emotional risks, including reaching out to help others in need (Barnett, 1987). Additionally, helping children develop emotional and behavioral regulation skills is a strategy for furthering skills associated with demonstrating empathic concern for others (Song et al., 2018).

Another evidence-based suggestion is helping strengthen children's face-reading skills (Parker et al., 2013) because if children are unable to read facial expressions well or misidentify body language, it is hard for them to show empathy. Talking with children about their feelings, helping them find labels for their feelings and the feelings they observe in others, as well as about the causes and consequences of specific emotions supports emotional self-awareness associated with empathy (Castro, et al., 2015). Dewar (2020) suggests using "everyday moments" to notice and talk about when someone shows empathy in daily life and to discuss the consequences of showing or not showing empathy; even just asking children to stop and think about what other people are feeling can be an effective reminder for them to draw from their empathic capacity. Modeling empathy is another strategy, as children learn from experiencing adults' empathy with them and from watching adults close to them show empathy with others (MCC, 2018). Research by Ornaghi et al. (2014) suggest role-playing, fictional stories, and real-life narratives can support the development of children's perspective-taking skills, particularly when children are asked questions about what the characters think, believe, want, or feel and how we know that.

Research suggests people are more likely to empathize with those with whom they have close relationships (Gable & Reis, 2010), and thus, fostering a sense of connection and interdependence with others is another strategy for supporting empathy development in children. Similarly, since people tend to find it easier to empathize with those they perceive as similar to themselves (Smith, 1988), another strategy is helping children to look for commonalities with others. Yet while it is easier to have empathy for people close to us or similar to us, it is also important to model for children empathy with many types of people (MCC, 2018). Thus, it is recommended caregivers and teachers expand children's circles of concern and caring actions, helping children learn to "zoom in" to tune in carefully to others, but also "zoom out," taking in multiple perspectives of people, and then guiding children toward some simple but relevant and appropriate ideas for caring and service-oriented action that involve doing with and not just for others (MCC, 2018).

In addition to strategies such as these, there are many, often school-based, interventions to support empathy within the context of social and emotional learning (SEL). The literature on SEL suggests interventions beginning earlier in

development and continuing longer result in greater and more enduring benefits than shorter interventions that start when children are older (Ramey & Ramey, 1998). Additionally, there is evidence to support the strategy of early intervention supplemented by later intervention, toward gaining the most beneficial and enduring outcomes (Landry et al., 2008). Developmentally-tailored intervention strategies are important, as a mismatch between a child's capacities and a practitioner's perceptions of those capacities can greatly reduce the intervention's efficacy (Noam & Hermann, 2002). And it is important to note that some children may show relatively high levels of baseline empathy-related responding relative to others, regardless of age, as age provides only a general estimate of developmental capacity (Durlak et al., 1991). In addition to the importance of developmentally-responsive interventions and embedding empathy interventions within SEL, research has shown that effective programs provide repeated opportunities to practice developing skills and behaviors within the program structure and beyond in real-life situations (Durlak et al., 2011). Particularly for young children, cognitive perspective-taking can be challenging, and thus sustained practice is important (Pecukonis, 1990). Also, the analysis by Malti et al. (2016) suggests that empathy interventions should support empathy-related responding in its entirety, as targeting higher numbers of empathy-related constructs was associated with intervention efficacy.

In the context of supporting children in developing empathy with animals, there is limited research exploring the extent to which the mirror neuron functioning of emotional sharing can take place between humans and animals (rather than only human to human and animal to animal emotional sharing). Initial evidence suggests it may (Myers, 2007), and thus children's capacity to observe another person and respond to the stimuli similarly is thought to extend to a capacity to observe an animal and similarly respond to the stimuli. Research also suggests empathy with animals develops similarly to empathy with humans (Ruckert, 2016). It develops over time and is reinforced and supported (or discouraged) through children's interactions with the world. As children's brains develop, they move from simple affective responses to more complex, nuanced, and abstract reasoning, allowing them to transition from seeing animals as anthropomorphic peers to predict or imagine the experiences and perspectives of animals very different from themselves (Ruckert, 2016).

While the psychological processes known to be associated with empathy with humans apply to empathy with animals and nature (Myers, 2007), Tam (2013) indicates they are not reducible to each other, and the exact parameters in these processes are target-specific. For example, connectedness with others fosters empathy with people, and connectedness to the natural world appears to foster empathy with nature (Tam, 2013). However, it may also be that for those who consider themselves part of nature, empathy with humans actually entails empathy with animals and/or nature and vice versa (Tam, 2013). Consequently, strategies to help children develop an environmental identity may be another way to support the development of children's empathy with animals and nature. Also, since children are biologically hard-wired to nature, children may find it easier to relate to and bond with animals, and thus learning empathy in the context of animals may serve to support the development of empathy with humans.

Significance of Empathy in Prosocial and Conservation Behavioral Contexts

Empathy is thought to play an important role in successful social interactions, enabling children to predict others' actions, emotions, and intentions (Bernhardt & Singer, 2012). Additionally, children high in empathy show more prosocial tendencies such as comforting, altruistic, and responsive behaviors toward peers (Miller & Jansen op de Haar, 1997). Similarly, Miller et al. (1996) found prosocial behavior in the form of helping a peer in distress was most likely to occur when children had both high moral reasoning and well-developed perspective-taking abilities. Thus, while affective empathy is important in motivating prosocial behavior, cognitive empathy is also needed (Malti et al., 2009), as together they appear to be closely connected with one's propensity to relieve another's suffering through action (Pittinsky & Montoya, 2016). Likewise, the analysis by Malti et al. (2016) similarly suggests the various components of empathy-related responding may work in concert to influence prosocial behavior. Empathy also may partially mediate the relationship between early prosocial behavior and later prosocial dispositions, suggesting empathy may be part of a larger prosocial personality trait that develops in children and motivates helping behaviors into adolescence and young adulthood (Eisenberg et al., 1999).

Environmental writer David Sobel has been a longstanding proponent for fostering empathy in young children, suggesting it serves as a foundation for environmental stewardship as children grow (1996). Empathy in the context of conservation seems similar to environmental sensitivity, which is a set of affective characteristics that result in an individual viewing the environment from an empathetic perspective (Sward & Marcinkowski, 2005). Conservation caring is a term also appearing in the literature. Rabb and Saunders (2005) define it as including cognitive elements toward valuing nature, affective elements stemming from experiences, and caring actions, whereas Skibins and Powell (2013) use conservation caring more generally to describe how zoo visitors think, feel, and act for a specific species.

It is thought that empathy with animals can activate empathy more broadly toward the natural world (Sevillano et al., 2007). Tam (2013) uses the broader term dispositional empathy with nature, suggesting it predicts biospheric concern more broadly and correlates with support for and frequency of environmental behaviors. Other research similarly suggests action for the environment is sometimes motivated by feelings of empathy. For example, Shelton and Rogers (1981) found those who had taken the perspective of a suffering animal exhibited stronger compassion and intention to protect that species. Research by Berenguer (2007) indicates a relationship between empathy with other living things and adults' intention to protect nature, which is consistent with Tam's finding of a positive relationship between empathy with nature and support for and frequency of environmental behaviors (2013).

Interestingly, research by Pfattheicher et al. (2016) found those who feel compassion with other humans were more likely to hold pro-environmental values and promote conservation of nature. Likewise, Czap et al. (2015) found that people who were asked to put themselves in the place of people affected by a conservation issue were more likely to support conservation action. While this may suggest a transferability between empathy with humans and empathy with nature, it also may be reflective of Tam's (2013) speculation that for those who consider themselves part of nature, empathy with humans may entail empathy with nature and vice versa.

Young et al. (2018) advise caution is needed though, as the strength of the relationship between empathy and behavior may be based on how closely the behavior is linked to the emotional experience. Gosling and Williams (2010) suggest feeling connected to nature may enhance dispositional empathy with nature, and empathy likely mediates the relationship between connection to nature and conservation behavior. Thus, empathy can play a role in environmental behaviors, but is likely insufficient toward achieving conservation behaviors, particularly when the behaviors are abstract or complex, or when barriers come into play (Young et al., 2018). While more research is needed, Tam (2013) advises taking the construct of empathy seriously in our quest to understand and promote humans' relationship to nature, as well as to motivate conservation behavior.

EVALUATION METHODOLOGY

In light of the significance of empathy in prosocial and conservation behavioral contexts, and in light of its relevance to social-emotional learning, which is an emphasis in early childhood education, empathy is a timely and meaningful construct to study within the context of nature preschools. Thus, the potential of a nature preschool, and specifically a zoo-based nature-preschool, to foster children's empathy was explored in the context of program evaluation of the Lake Superior Zoo Nature Preschool. Given nature preschools' emphasis on supporting development across the domains alongside their provision of sustained opportunities for time in nature, there seemed the theoretical potential for nature preschool to be a promoter of empathy. The guiding question was as follows: Did participants' empathy with humans, animals (non-wildlife), and wildlife increase across the duration of the preschool year, and if so, was the increase different from what would be expected developmentally and from cognitive maturation across the preschool year?

Program Description

Our evaluation utilized a pre-experimental pretest-posttest design with ten preschool participants at the Lake Superior Zoo Preschool, located in northern Minnesota (USA). This preschool is considered a nature preschool, which differs from non-nature preschools in philosophy as well as in terms of instruction and in the time allocation of the preschool day. Nature preschools have a nature-focused, child-directed play philosophy, where the majority

of the day, regardless of weather, is spent outdoors in nature play (defined for this study as child-initiated play that takes place in and with nature). As the Lake Superior Zoo Preschool intends to serve a diverse audience, the program operates as an extended-day program to meet the needs of working parents. Thus, the preschool day is 7:30 a.m. to 5 p.m. This includes approximately four to five hours of daily nature play that occurred primarily in a minimally managed outdoor space, as well as about one hour of indoor free play, and one hour of rest/nap time. Additionally, teachers typically lead loosely structured, playful learning experiences for approximately 15-30 minutes each day. While the overarching approach is considered emergent in terms of the curriculum approach, the social-emotional curriculum Second Step (see www.secondstep.org/) is utilized daily at lunchtime. As a part of this curriculum, children watch puppet shows, answer prompts about picture cards, and play games about concepts such as attention and emotion regulation. See Figure 2 for the logic model describing the Lake Superior Zoo Preschool and its theory of change.

Data Collection Instrument and Procedures

An online search for potential instruments suggests assessing empathy is challenging due to a lack of comprehensive measures that tap all three dimensions of empathy and a lack of measures that have been validated for use with children, and particularly young children. One existing instrument, the Young Children's Empathy Measure with Humans and Animals (Poresky, 1980), had the potential for use in the evaluation at hand. It is comprised of four verbal vignettes for home visitors to read to preschool children to probe their cognitive understanding and affective responses to situations involving sadness, fear, anger, and happiness. For each of the four vignettes and photos, an interviewer asks and then writes down the responses on the two aspects of empathy by asking the child "How does the child feel?" (cognitive perspective-taking) and "How do you feel about this?" (affective empathy/emotional sharing). The empathy vignettes in the original instrument are sadness ("A child has just lost its best friend."); fear ("A child is chased by a big, nasty monster."); anger ("A child really wants to go out but is not allowed."); happiness ("A child is going to his/her favorite park to play."). Additionally, the vignettes are asked a second time in the context of a pet dog to assess empathy with animals. The St. Louis Zoo (Missouri, USA) appears to have used a similar assessment (Interview Method for Empathy for Animals and Other Children, Niedbalski and Seger, n.d.), modifying the questions to be: How does the animal feel? How do you feel? The vignettes they used are as follows: The animal's/child's best friend has flown/moved away; The animal/child hears a thunderstorm with loud thunder and bright lightning; The animal/child is going to play with its favorite toy, and another animal/child steals this animal's favorite toy.

For the evaluation at hand, we further modified this instrument to use slightly different vignettes and have a total of 12 vignettes with accompanying photos (4 for empathy with humans, 4 with pets, and 4 with backyard wildlife). We also included the question "What would you do" (to assess empathic concern). Thus, the three questions, and the associated empathy component, for each vignette are as follows:

- How would the child/animal feel? (cognitive empathy: feelings identification and perspective-taking)
- How do you feel about the child's/animal's situation/scenario? (emotional empathy: emotional sharing)
- What would you do or say to the child/animal? (motivational empathy) (asked for all vignettes but the happy one).

For the photos, a decision was made to use faces where gender is not clearly apparent, and refer to the child in the picture as a child (rather than girl or boy), to avoid adding in a confounding variable and having the responses potentially be influenced by the degree of familiarity/similarity to the preschool participant. Because of the possibility of a child having prior negative experiences with dogs, the child was also asked if they would like to see pictures of/talk about a dog or a cat, and then based on the child's response, that set of pictures would be used (recognizing that it introduces a confounding variable, as the pictures used – cat v. dog – may not illustrate the same degree of emotion, and thus photo variability could explain differing responses, rather than differing degrees of empathy).

Also, the decision was made to retain Poresky's (1980) approach of the child generating the name of the emotion in the scenario, rather than having the child choose from a set of four choices (does this child feel happy, sad, scared, or mad?) that could be more objectively scored. This decision was guided by a set of studies by Cassels and Birch (2014) that investigated the differences between open-ended and fixed choice response formats in assessing empathy in children. They found using an open-ended response option allowed young children to provide responses that captured emotional significance using age- or ability-appropriate language. In their study, responses were unrelated to verbal ability, which would seem counterintuitive due to the verbal demands of generating words; however, Cassels and Birch (2014) speculated that if study participants reached the minimum verbal ability required to simply speak about emotions, verbal ability wouldn't influence scores on the assessment due to the valence-based nature of the coding system (a child who responds with "Happy" to a positive-valence item would be as correct as a child with a higher verbal ability who may identify it as "Ecstatic" or "Joyful"). Further, the open-ended responses allowed researchers to focus on the perceptual recognition of the expression (rather than a combination of expression recognition and word recognition), and thus they concluded it provided a more accurate assessment of a child's ability to read perceptual cues to emotions and served as more representative of real-life emotion recognition situations and consequently a more ecologically-valid task (Cassels & Birch, 2014).

The scoring approach patterned after what was used in the Poresky (1980) measure, where the open-ended responses were assigned a numerical score according to a predefined scoring system. For cognitive and affective empathy, scoring was as follows:

- 3 = emotional response relevant to the domain (cognitive or empathy) and to the scenario and photo facial expression (situation described and the facial expression combined; for example, for scenario about going to the playground, the response of "happy" or "excited" or "joyful")
- 2 = emotional response relevant to the domain (cognitive or empathy) and the scenario or the photo facial expression (for example, response of "surprised" to the playground as it matches the scenario but not the photo)
- 1 = emotional response relevant to the domain (cognitive or empathy) but doesn't fit the scenario or the photo (for example, "scared" in response to the playground scenario)
- 0 = no response (or "I don't know"), or a non-emotional response (describing what the child is doing in the picture), or a response that doesn't match the empathy domain at hand (stating how they'd help when the question prompt was how do you feel or how do you think the child feels).

For motivational empathy, scoring was as follows:

- 3 = response that reflects care or concern and is relevant to the scenario and photo expression (for example, for the child who lost the toy, "I would help look for it" or "I would give the child one of my toys" or 'I would try and cheer her up")
- 2 = response that reflects care or concern that is relevant to either the scenario or photo (but not both) (for example, "I would get her a band-aid" as it could be relevant to the girl with a sad face but not the scenario of losing a toy)
- 1 = response that reflects care or concern that is not relevant to either the scenario or photo (for example, "I would give her a drink of water")
- 0 = response that doesn't reflect care or concern or no response/"don't know"

At the beginning of the school year, parents were provided an invitation letter that explained the evaluation and asked for permission for their child's participation. Because of COVID-related restrictions regarding outside visitors in the preschool program, the evaluation instrument (four vignettes across human, animal/pet, wildlife contexts for a total of 12 vignettes) was administered by the preschool director to each child individually at the beginning of the preschool year and again at the end of the school year. Responses were coded using the scoring system described above. Due to the potential subjectivity in scoring, two people (the evaluator and the preschool director) reviewed the responses and provided a numerical score, toward coming to an agreed-upon score for each response.

RESULTS

Table 1 summarizes the pretest and posttest scores, as well as the results of the repeated measures statistical analyses (dependent t-test). Results suggest children's empathy with humans increased across all three components (cognitive perspective-taking, emotional sharing, and empathic concern). Results for empathy with non-wildlife animals were the same as results for empathy wildlife animals, with significant increases in the emotional sharing and empathic concern, but not in the cognitive perspective-taking component.

Table 1
Empathy Pretest and Posttest Statistical Data for Lake Superior Zoo Preschool Participants

Construct domains	Pretest M (SD)	Posttest M (SD)	Significance of Change from Pre to Posttest
Empathy with Humans			
Cognitive Perspective Taking	10.20 (1.13)	11.90 (.32)	t(9) = 2.91; p = .02*
Emotional Sharing	7.10 (2.41)	11.10 (.87)	t(9) = 2.71; p = .02*
Empathic Concern	1.50 (2.54)	7.80 (2.09)	t(9) = 5.16; p = .001*
Empathy with Animals (Pets/non-wildlife)			
Cognitive Perspective Taking	10.20 (2.57)	11.80 (.42)	t(9) = 2.09; p = .07
Emotional Sharing	6.20 (4.61)	10.70 (1.25)	t(9) = 3.00; p = .02*
Empathic Concern	1.80 (3.79)	6.90 (3.47)	t(9) = 1.86; p = .02*
Empathy with Wildlife			
Cognitive Perspective Taking	10.10 (2.33)	11.40 (.84)	t(9) = 1.86; p = .10
Emotional Sharing	6.60 (4.29)	11.20 (1.23)	t(9) = 2.78; p = .02*
Empathic Concern	1.80 (3.22)	6.60 (3.94)	t(9) = 2.58; p = .03*

Note: Maximum score for Cognitive Perspective Taking and Emotional Sharing is 12; Maximum score for Empathic Concern is 9.

DISCUSSION

This evaluation focused on the *potential* for nature-based, zoo preschool participation to support empathy development in young children. The data from this small-scale evaluation indicate children's emotional sharing and empathic concern significantly increased over the preschool year across the three contexts of empathy with humans, non-wildlife animals, and wildlife. In light of literature suggesting affective empathy develops in the first few years of life and is relatively stable thereafter (Davidov et al., 2013), the increase in preschool participants' emotional sharing and empathic concern is perhaps different than what would be expected developmentally and through cognitive maturation alone.

While cognitive perspective-taking significantly increased in the context of empathy with humans, it did not increase in the two animal contexts. It is important to note that for all three contexts (humans, non-wildlife animals, and wildlife), cognitive perspective-taking scores were already quite high at the beginning of the year (average scores were over 10, with the maximum score being 12), whereas pretest scores for emotional sharing and particularly empathic concern were much lower. Thus, the lack of significant increase in cognitive perspective-taking in the context of animals may be reflective of a ceiling effect (and children already possessing that component of empathy before the start of the preschool year). Also, the difference in cognitive perspective-taking in the context of humans v. animals could be reflective of the concrete thought characteristic at this age; taking the cognitive perspective of an animal might entail more abstract thought than taking the perspective of another person.

It is important to note COVID-related restrictions limited the number of preschool participants in the program, and also limited interactions with other preschool sites. And given the stress COVID placed on early educators and caregivers, and amid uncertainty regarding in-person attendance, quarantine, and other related issues, it was not feasible to build control groups into this evaluation at hand. Thus, in light of the small sample size and lack of a control group, it is not possible to attribute these increases in empathy to program participation, as increases could be due to some other external influence in concert with developmental maturation over the school year. Nor does the evaluation at hand allow us to determine if the nature-based approach, zoo setting, or any other particular aspect of the program were responsible for any increases in empathy. Further research is needed to investigate if, why, and how these program components work individually and in concert with each other to support empathy development, alongside cognitive maturation across the preschool year.

Looking forward, future research could be designed to investigate how changes in zoo nature preschool participants' empathy compare to the empathy development of children attending farmyard nature preschools, non-animal focused nature preschools, and more traditional (non-nature) preschools. Also, further research should include measures of fidelity of implementation to document and describe what teachers are doing (how the philosophies/strategies translate into on-the-ground practices) to better understand how the practices and strategies support empathy development. And ideally, future research would explore how nature preschool influences empathy development in a larger and broader sample of children toward establishing the extent to which findings are generalizable. A larger sample would also allow for correlational analyses among the components of empathy and across the human, non-wildlife, and wildlife contexts; this would add to what is known about the extent to which empathy with humans and empathy with wildlife overlap, particularly when children have strong environmental identities, as suggested by Tam (2013). In addition to the inclusion of control groups and utilizing a larger sample, future research would benefit from a mixed-methods approach that could better illuminate how children's empathy develops in response to specific contexts, strategies, and settings, as well as its transferability across human and animal contexts.

Based on the literature regarding the development of empathy, it also is interesting to consider the pretest levels of three components of empathy. Across all three contexts of empathy with humans, non-wildlife animals, and wildlife, cognitive perspective-taking was higher than emotional sharing. This is important to note in light of the child development literature referenced earlier suggesting the differential developmental pattern, with the affective components of empathy emerging during toddlerhood, whereas cognitive components gradually increase from early to late childhood (Davidov et al., 2013). Thus, it seems plausible that the preschool children in this evaluation developmentally had the capacity for affective emotional sharing, yet possessed levels (evidenced by pretest scores) that left room for being nurtured through preschool participation, thus making the growth observed within the zoo preschool participants at hand even more meaningful. Also, the lower levels of empathic concern at the pretest level make sense, in light of the literature suggesting emotional sharing may lead to empathic concern with further cognitive processing of the other person's state (Eisenberg, 2000) and with the contribution of emotion regulation skills (Hay, 2009). Through the course of the preschool year, participants' level of emotional sharing increased; and in light of the high pretest and posttest scores for perspective-taking, it makes sense that preschoolers' empathic concern scores also significantly increased. Given the intertwining of self-regulation with empathic concern, future research might also include measuring changes in self-regulation, especially in light of research suggesting nature play/nature preschool's positive impact on self-regulation (Kochanowski & Carr, 2014; Ernst et al. 2021).

In summary, while the significant increases in empathy components are important to highlight, their meaningfulness increases when considered in the context of the differential developmental pattern of empathy components, as in doing so suggests further reason to speculate that something more than developmental maturation is at play. Whether the source of increase is time in nature, the social-emotional learning curriculum activities, peer socialization, or the opportunities to practice empathy for others and empathy for animals within the preschool and extending outward in the context of the zoo setting, it is encouraging that children's empathy increased. This evaluation underscores the need for further study regarding nature-based preschool as a strategy for nurturing and reinforcing children's empathy development. Peter Kahn, a researcher at the University of Washington, suggests time in nature can soften negative-conditioned mental patterns: "If you can find nature, engage with it and get your heart rate down, then your mind begins to settle. When your mind isn't ruminating, it can then open to a wider world, where there's great beauty and healing" (Ma, 2020, para. 13). Nature's calming qualities allow children to attend to the deeper, more emotional lessons of life. Perhaps empathy may be one of those "lessons" that can be attended to and nurtured through nature preschool.

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Lake Superior Zoo School Logic Model

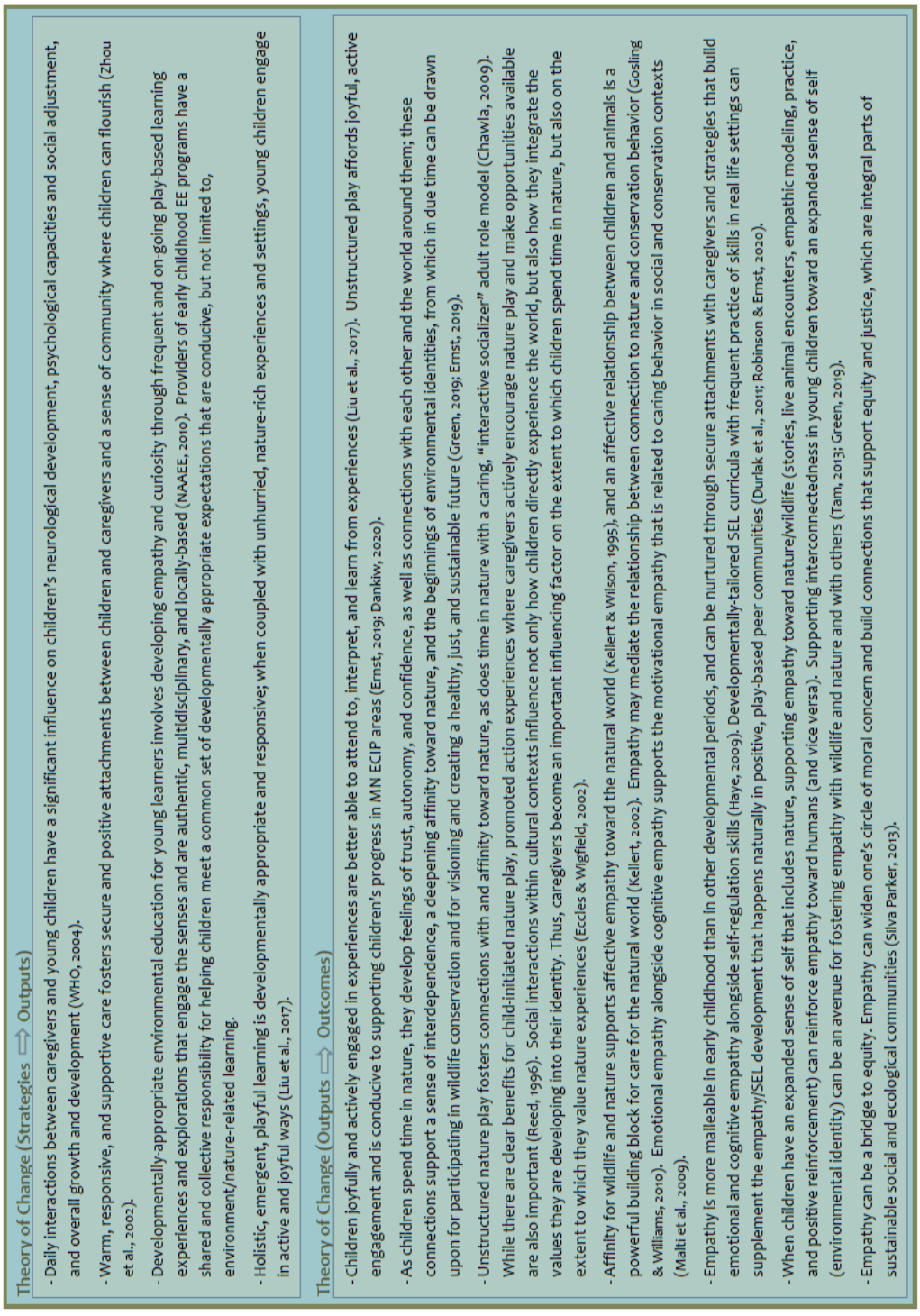
Situation: Given local childcare shortages (Wilder Research, 2018) and SES, racial, and ethnic inequities within the nature preschool movement (Schimke, 2018), the Lake Superior Zoo is uniquely positioned to further their conservation mission and serve the community by providing fulltime care that expands and diversifies the number of preschool age children reaping the physical, cognitive, and social developments of nature play during the critical developmental window of early childhood.

Zoo School Vison: All children will develop the knowledge, mindset, and skills to love the diverse world around them and to flourish in Kindergarten and beyond.

Zoo School Mission: To inspire the healthy social emotional, physical, creative, and cognitive development of young children through close-up experiences with animals & nature.

Inputs	Strategies	Outputs	Learning Outcomes	Desired Behavior	Intended Impact
Staff with knowledge, skills, and dispositions for supporting nature-based ECH learning and dev Evidence base Stakeholders Resources Zoo grounds, animals Indoor and outdoor learning/playing spaces	Consistent warm, responsive, & supportive care Learning experiences across developmental domains that emerge from: - daily, sustained periods of child-directed, unstructured nature play - holistic, developmentally appropriate, teacher-directed, nature-rich, playful learning experiences - developmentally-responsive, social-emotional learning opportunities grounded in SEL curriculum (Second Step and Conscious Discipline) - nature- and animal-rich storytelling and literature - close-up animal observations and interactions - opportunities to care for animals and nature Interactive socialization regarding children's interest in wildlife, nature and the world around them Modeling of empathy, prosocial behavior, nature affinity, and stewardship	Full day, full week nature preschool Preschoolers who have secure attachments with teachers, positive relationships with peers, and engaged in active, joyful, and meaningful nature-rich experiences	Learning and development across MN ECIP areas: - Approaches to Learning - Social and Emotional Learning (SEL) (*including empathy and self-regulation skills) - Language, Literacy & Communication - Arts - Social Systems - Physical Movement Dev Mathematics - Scientific Thinking Environmentally-Oriented Outcomes: - Curiosity and wonder toward nature - Reawakening/deepening of an affinity toward nature - Feelings of trust, autonomy and confidence within nature interactions - Wildlife and nature connections - Sense of interdependence & expanded sense of self/env. identity - Emerging ecological/wildlife knowledge - Affective, cognitive, and motivational empathy	Demonstration of skills and furthering of progress across developmental domains Respectful and caring behaviors toward others, animals, and nature *As children grow:* - Prosocial behavior (interacting with/ responding to others in prosocial ways) - Environmental stewardship & conservation behavior	Children flourishing in Kindergarten and throughout their lives Strong and sustainable social and ecological communities with citizens who co-exist compassionately, collaboratively, equitably, productively & peacefully and who respect, value & conserve wildlife and wild places

Lake Superior Zoo → Close up animal encounters → Visitors engaged in free choice learning → Connections to Wildlife → Conservation Behavior → Wildlife Conservation



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