Developing a connection to nature: The role of pet ownership in childhood

Introduction

Nature connection

There has been an increased focus on human-nature connection due to its positive and enduring associations with wellbeing (Capaldi et al., 2014; Pritchard et al., 2019), as well as with driving pro-environmental behaviours (Whitburn et al., 2020). In fact, recent research has highlighted the importance of looking beyond mere contact with the natural world, to nurturing a closer psychological relationship with it in order to reap the full suite of benefits on our wellbeing and that of the planet we inhabit (Martin et al., 2020).

Nature connection, operationalised in several different ways, describes the relationship that a human has with the rest of the natural world and refers to a subjective sense of belonging (Mayer & Frantz, 2004). Common operationalisations include the Connectedness to Nature Scale (CNS; Mayer & Frantz, 2004), and the Nature Connection Index (NCI; Richardson et al., 2019). Most of these encompass several dimensions, including affective, behavioural and cognitive ones (Mayer & Frantz, 2004; Nisbet et al., 2009), while others are unidimensional and describe feeling of belonging, for example the Inclusion of Nature in Self (INS; Schultz, 2001). These constructs and associated measures tend to have strong convergence and are generally agreed to describe a similar latent concept (Tam, 2013).

Previous research on the process and mechanism whereby people connect with the natural world has explored various pathways. Contact, compassion and beauty have been identified as potential pathways to connection in adults (Lumber et al., 2018), although other activities in and for nature have been also identified, such as developing an emotional bond with nature through enhanced contact (e.g., more than a short walk outdoors; Lumber et al., 2017). Childhood has been identified as a potentially crucial time for the development of a meaningful relationship with the natural world (Wells & Lekies, 2006), though not to the

exclusion of current positive experiences in nature (Cleary et al., 2020). Several studies highlight childhood engagement with the natural world as being positively associated with higher levels of nature connection in adulthood (Chawla, 2020; Cheng & Monroe, 2012; Dornhoff et al., 2019). This may be driven in part by the positive relationship between parental nature connection and a positive relationship to the natural world in children that has also been noted (Barrable & Booth, 2020; Passmore et al., 2020).

Pet ownership

Humans and certain non-human animals, like dogs, have co-evolved over thousands of years, creating regular and familiar inter-species bonds (Chambers et al., 2020). Other domesticated animals, such as cats, also share a long period of enduring bonds (Crowley et al., 2020) that are reflected in the prevalence of pet ownership in the western world. In the UK, 51% of all adults own a pet, with 26% of UK adults owning a dog, 24% a cat and 2% a rabbit (PDSA, 2020). Pets have been found to be more common in households with children, at least in the US, with more than 70% of households with children also reporting owning companion animals (Melson, 2003).

Overall, having a pet is reported to provide social support for children which impacts positively on their physical and mental health (McConnell et al., 2019). It has a positive impact on children's social and emotional development (Christian et al., 2020; Melson et al., 1991), social skills and competence (McCullough et al., 2021), empathy and prosocial behaviours (Wenden et al., 2020; Wice et al., 2020), and wellbeing (McConnell et al., 2019; Muldoon et al., 2018; Reis et al., 2018). The benefits to wellbeing might be especially important for those children who lack healthy attachments to other figures in their life (Wanser et al., 2019). Mothers reported less anxiety and stress in their children where there was a pet in the family (Castro and Lindsey, 2021). Black (2012), and Hartwig and Signal

(2020), reported that having a pet reduced feelings of loneliness for adolescents. Pet-owning adolescents were more likely to both give and receive online social support (Charmaraman et al., 2020). In preschoolers, family dog ownership was associated with improved social-emotional wellbeing; those children who walked or played with their dog more frequently were more likely to exhibit prosocial behaviour (Wenden et al., 2020). Classroom pets are also linked to benefits, with McCullough et al. (2021) reporting that children with a pet in their classroom were rated by their teachers as exhibiting fewer internalising and hyperactive behaviours and improved social skills compared to those children without a classroom pet.

Castro and Lindsey (2021), McConnell et al. (2019) and Miles et al. (2017) all report positive associations between pet ownership and improved physical health, and thus better wellbeing outcomes for children growing up with a pet. Human-pet relationships might also benefit wellbeing by providing a source of healthy attachment for children who lack secure relationships with caregivers, though this strong relationship might bring along its own set of risks (e.g., much stronger grief responses when the pet dies; Wanser et al., 2019). Despite these beneficial associations, this field of research is still relatively limited (McCullough et al., 2021). Existing research also suffers from a lack of consistency in reported findings (e.g., McCullough et al., 2021; Miles et al., 2017; Wice et al., 2020), thus recommending a need for further studies in this area.

Given the established relationship between pet ownership and increased time spent walking in outdoor areas (e.g., for dog owners; Zijlema et al., 2019), it is possible that owning certain types of pets could encourage people to spend more time outdoors and, thus, facilitate closer relationships with nature. Additionally, a close relationship with an animal might provide a gateway through which people form close relationships with other forms of nature. Indeed, Serpell and Paul (1994) suggested in their ‘pets as ambassadors’ hypothesis that pet ownership in childhood could promote more positive relationships with animals later in life

and an increased likelihood to enact pro-environmental behaviours generally. More recent research has found links between pet ownership/attachment and ethical concern for animals (Auger & Amiot, 2017; Possidónio et al., 2021). Extending this hypothesis, Auger and Amiot also suggest that pets could reasonably serve as an ambassador for all nature for those pet owners who include their pet in their conceptualisation of self and their findings support this assertion. Finally, a single previous study has shown an explicit link between *current* pet ownership in adults and their levels of nature connection, with adults who own pets feeling more connected to the natural world, than those who do not (Nisbet et al., 2009).

Building on these findings and exploring a developmental component in our relationship to the natural world, as per Orr (1993), in the present article, encompassing two studies, we want to see whether living in a household with companion animals as a child has a positive association with nature connection, in childhood and also in adulthood. We therefore put forward the following hypotheses:

1. Children who own pets in childhood will have higher levels of connection to nature than non-pet owners.

2. Adults who owned pets in childhood will have higher levels of connection to nature than non-pet owners.

3. Higher levels of interaction with the companion animal will be associated with higher connection to nature.

We will also be using exploratory analysis to find out whether the kind of pet owned has an effect on levels of nature connection and whether age in our childhood sample has an effect on those levels (i.e., is there a developmental component?).

Study 1

Design, participants and methods

Study 1 was an observational study aimed at exploring pet ownership and nature connection in children. We recruited 64 children (33 girls), aged 6-16, ($M_{\text{age in years}}$ = 10.1, SD = 2.59), through an online survey targeting UK parents, published through social media. The survey and all materials had secured ethics approval from the School of Education and Social Work of the University of Dundee (approval letter number E2019-94). All parents gave informed consent prior to their children participating. Children read a special, age-appropriate consent letter.

The survey included the following measures and information:

We used the Nature Connection Index, a unidimensional measure of nature connectedness designed for children aged six and up, and adults. The NCI consists of six statements relating to pathways to nature connectedness, such as ""I always find beauty in nature" and "I always treat nature with respect", answered on a 7-Likert scale. Final scores are weighted to give a maximum total of 100. In the original study (Richardson et al., 2019) the Cronbach's alpha measure of internal consistency was calculated as $\alpha = .92$, whereas in our study it was $\alpha = .78$.

We requested information on pet ownership ("yes", "no", "used to, but not currently") and type of pet, as well as the sex and age of the participating child. We also used a simplified Companion Animal Bonding Scale (Poresky et al., 1987), where we asked children to tell us which of the following they do with their pet animal during a normal week, from the following activities: feeding, grooming, travelling with, sleeping in the same room, talking to, and playing with. The answers were given in a binary yes/no.

Study 2

Design, participants and methods

Study 2 was a retrospective observational study aimed at answering Hypotheses 2 and 3, and more broadly exploring the relationship between childhood pet ownership and nature connection in adulthood. An online survey was distributed through social media (Twitter and Facebook) for two weeks in autumn of 2020. Three hundred and fifty six adults n = 356 (283 females), age range 18-80 and mean age 42.2 (SD = 12.6) responded. We did not collect data on location or any further demographics.

As above, all ethical guidelines were followed, and ethical approval was sought and received prior to data collection. All adults gave explicit informed consent with regards to data collection, storage and use.

The following measures were used:

To measure nature connection we used the Connection to Nature Scale (CNS; Mayer & Frantz, 2004) which is a 14-item scale, with a 5-Likert response scale. Statements include: “I often feel a sense of oneness with the natural world around me” and “I feel as though I belong to the Earth as equally as it belongs to me” and responses range from “Strongly agree” to “Strongly disagree” with “Neutral” as a midpoint. Scoring includes three reverse scored items. In the original study the Cronbach alpha was calculated as $\alpha = .84$, while in our study it was found to be $\alpha = .89$.

We also used the Companion Animal Bonding Scale (CAB; Poresky et al., 1987), an 8-item scale that was designed to measure the level of interaction between a person and their companion animal, conceptualised here as engagement. Questions focus on everyday tasks that one may undertake with their pet, such as “How often did your companion animal sleep in your room?” and answers are on a 5- Likert scale of “Always” down to “Never”. These were coded 5 to 1 for analysis purposes, and an overall score was calculated.

Results

Missing data were discarded, as per complete case analysis (Zhu, 2014), leaving 62 participants in study 1, and 353 participants in study 2 for the analysis. All statistical analyses were undertaken using Jamovi Desktop version 2.3.26solid (The jamovi project, 2022). We calculated descriptive statistics for the main variables, namely nature connection, the CAB scale, age (reported above), and pet ownership. In study 1, mean nature connection, as measured by the NCI, with a total possible score of 100, was 57.4 (*SD* = 24.2) with a range of 14-100. In study 2, mean nature connection, measured by the CNS, with a total possible score of 70, was 53.4 (*SD* = 9.67) and a range of 17-70. Descriptive statistics for both studies are presented in table 1.

The mean score for the child CAB scale was scored out of a maximum of 6 (1 for a 'yes' answer, 0 for a 'no') was 4.06 (*SD* = 1.1) with the full range of scores given. The mean score for the adult CAB scale, out of a maximum of 40 was 26.3 (*SD* = 6.52) with the full range of scores given (8-40). In study 1, 52 (83.9%) of the 62 children reported they had a pet. In study 2, of the 356 respondents, 321 (90.2%) reported that they had a companion animal in their childhood.

In terms of type of pet, for the children's group (study 1), *n* = 21 children reported having a cat, *n* = 32 had a dog, *n* = 1 had a rabbit, *n* = 1 had a horse, *n* = 4 had a rodent, *n* = 3 had a fish, and no children reported having a reptile or an insect as a pet. In the adult group (study 2), *n* = 169 adults reported having a cat as children, *n* = 219 had a dog, *n* = 94 had a rabbit, *n* = 16 had a horse, *n* = 105 had a rodent, *n* = 135 had a fish, *n* = 40 reported having a reptile, and *n* = 8 reported an insect as a pet.

In children (study 1), females had significantly higher levels of nature connection score than males, $t(61) = 3.11$, $p = .003$, as was also the case for adults in study 2, $t(345) = 3.06$, $p = .002$.

To answer hypothesis 2, we found no significant difference between nature connection in children who owned pets when compared to those who did, $t(60) = .34$, $p = .735$. Similar results were found in adults who owned pets as children compared to those who did not, $t(345) = -.661$, $p = .51$. For hypothesis 3, we looked at correlations between level of engagement with their pets and nature connection in both children and adults who owned pets. We found a significant positive correlation between adult nature connection and level of engagement with their pet as a child, $r(345) = .23$, $p < .001$, but no significant correlation was found between nature connection in children and level of engagement with their pet, as measured by the modified CAB, $r(61) = .025$, $p = .862$.

Exploratory analysis suggests that in children there was no significant correlation between age and nature connection, $r(61) = -.16$, $p = .26$, while in adults we did find a positive correlation between age and nature connection, $r(345) = .16$, $p = .02$. To answer the second exploratory question, regarding type of companion animal and nature connection, for study 1, the numbers were too small to undertake quantitative analysis. For study 2, we ran multiple linear regression for each set of data with connection to nature as the dependent variable and different animals as predictors. After correction for multiple comparisons, no significant predictors were identified. We also analysed the data splitting pets into two categories of mammals vs non-mammals. In children, the difference between nature connection for those owning mammals (cats, dogs, horses, rodents and rabbits), as opposed to non mammals (birds, fish, insects) was not significant, $t(51) = .69$, $p = .49$. Similarly, in adults, connection to nature was not significantly different between type of pet when split between mammals and non-mammals as above, $t(320) = 1.26$, $p = .21$.

Discussion

In this series of two studies, we sought to determine the relationship between childhood pet ownership and connection to nature, both in childhood and later in adulthood. We also considered the level of engagement the participant reported having with their pet during childhood as well as the type of pet. Across these two samples, we did not find significant differences in mean levels of connection to nature in either children or adults when comparing those who owned pets in childhood and those who did not. While there was a significant positive relationship between adult nature connection and level of engagement with their pet during childhood, the same relationship was not significant when considering childhood connection to nature in study 1.

These findings suggest that simply passively owning a pet during childhood could be unlikely to promote higher connection to nature in childhood or later in adulthood compared to not owning a pet at all. However, higher levels of interaction with that pet during childhood does seem to predict later connection to nature; this lends support to Serpell and Paul's (1994) pets as ambassadors hypothesis. In their work further evaluating the pets as ambassadors hypothesis, Auger and Amiot (2019) reported that contact with pets was significantly positively associated with feelings and concerns about animals more generally and negatively associated with speciesism and intergroup anxiety towards animals; Possidónio et al. (2021) reported similar findings in their sample of Portuguese respondents. Auger and Amiot's (2019) important work in identifying potential mechanisms predicting the relationship between pet ownership and feelings of care towards other animals helps elucidate the role that pets could play in inspiring higher connection to nature. The findings in the adult participants in our study seems to support the idea that closer contact (or engagement in the present study) with pets is associated with connection to nature, which encapsulates care for pets and animals as a type of nature.

While the present study did not capture data which sought to explain this relationship in particular, our conceptualisation of engagement - in the form of caring for the pet, allowing the pet to sleep with the owner, holding the pet, and feeling a close relationship with the pet - could offer a partial explanation. Jacobs et al. (2023) report that those participants who believed pets have emotional experiences were more likely to engage in pro-environmental behaviours. It is possible that pet owners who are closely involved in monitoring the wellbeing and care of their pet are more likely to see their pets as creatures who feel emotions and pain, which may then extend to their views of other animals and forms of nature, too. Further research using qualitative methods would be useful in providing further insight into this relationship and the specific types of contact and care for pets which might be more strongly associated with later connection to nature.

We did not find any significant differences in levels of connection to nature depending on the type of pet owned in childhood, either when splitting pets into mammal versus non-mammal categories or when categorising by species of pet. This is particularly interesting when considering the role that engagement with pets might play in facilitating an association between pet ownership and later connection to nature; it seems reasonable to hypothesise that pets which require more hands-on, direct care (e.g., dogs) might help to facilitate nature connection in their owners more frequently than those pets which are more hands-off (e.g., certain reptiles). Similarly, based on findings reported by Jacobs et al. (2023) regarding the role that perceiving pets to have emotional experiences plays in predicting pro-environmental behaviour, it would be reasonable to assume that pets which demonstrate outward displays of ‘emotion’ might be more commonly associated with higher connection to nature in pet owners. In the current samples, however, the type of pet did not seem to matter when comparing mean levels of nature connection between groups.

Additionally, our finding that females were more highly connected to nature than males in both samples replicates previous research (Lengieza & Swim, 2021). For instance, Rosa et al. (2020) reported in their samples from the United States and Brazil that women scored higher on a measure of connection to nature than men. Similarly, the positive relationship between age and connection to nature in adulthood has been reported in some previous work (Richardson et al., 2019), though other studies have reported no such relationship (Lengieza & Swim, 2021).

Limitations

There are several limitations to this research to acknowledge. First, we regrettably did not collect demographic information beyond gender and age; thus, we were unable to account for the many demographic factors (e.g., socioeconomic status, ethnicity, geographic location, cultural background) which might influence these relationships. Additionally, the simplified questionnaire used with children to capture their interaction and care levels (i.e., a binary yes/no question about specific care behaviours) might not have been sensitive enough to capture the relationship between interaction and connection to nature. As with any study using common measures of connection to nature, it is possible there was a ceiling effect. Finally, there is a possibility that study 1 (with children) was underpowered, which might explain why our results did not align with our hypotheses around pet ownership and nature connection in childhood.

Future research

In future, qualitative methods would be useful to find out what might be driving these associations (or lack thereof). For instance, interview or focus group work could investigate what elements of caring for a pet seem to underpin a later positive relationship with nature. Similarly, allowing participants to expand upon and explain their responses in depth would allow us to better understand the lack of association between pet type and connection to nature in the present study.

Future research might also replicate a similar study design to what we have carried out in the present study, though with much larger and more diverse samples. In the case of such work, it will be important to capture demographic information and other potential confounding variables in order to control for these in further analyses. A large-scale survey study of this kind will also serve to illuminate potential mechanisms underlying these relationships. Future research with children should employ a more complex measure of interaction and care for pets to more accurately capture their likelihood to engage in these behaviours.

Conclusion

In this series of two survey studies, we sought to find out how childhood pet ownership and engagement with pets during childhood was associated with connection to nature both in childhood and later in adulthood. In these samples, mean levels of connection to nature did not significantly differ between children or adults who owned pets in childhood and those who did not. However, those adults who were more highly engaged with their pets during childhood were also more likely to have a higher level of connection to nature. This could support the pets as ambassadors hypothesis, though further qualitative research should be undertaken to ascertain what elements of engaging with pets underpin this relationship and why the type of pet owned in childhood did not seem to matter in predicting connection to nature. Based on the findings presented here, encouraging closer engagement with pets in childhood through caring for animals and having them in close proximity (e.g., sleeping near them) could be one way to encourage lifelong connection with nature.

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461 *Table 1. Descriptive statistics for sex, age and nature connection scores for Study 1 and*

462 *2.*

	Total n	Sex (Female/Male)	Age (M, SD)	Age range (years)	Nature connection range	Nature connection score
Study 1	62	33/29	M=10.1 (SD=2.59)	6-16	14-100*	M=57.4 (*SD*=24.2)
Study 2	353	283/70	M= 42.2 (SD=12.6)	18-80	17-70**	M=53.4 (*SD*=9.67)

463 *NCI, **CNS