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The role of attachment in children’s relationships with pets: From pet care to animal harm

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Abstract
Relatively little is known about how attachment influences children’s relationships to pets or mediates positive and negative interaction outcomes. We carried out in-depth interviews with 27 children, including nine children at high-risk for animal harm and 18 matched controls. We used the Child Attachment Play Assessment (CAPA), a drawing task and self-report measures including the Short Attachment to Pets Scale (SAPS) and Children’s Animal Harm Behaviours (CAHB). We also designed a novel measure, the ‘Pets In Children’s Attachment Stories’ (PICAS), to probe children’s mentalising about pets, caregiving-behaviours, comfort from pet and parental help. Children at high risk of animal harm were more likely to be classified as insecure (p = 0.002). Drawings indicated secure children tended to feel closer to mothers (p = 0.014) and siblings (p = 0.007), while pets’ proximity did not vary according to attachment strategy. Although insecure children scored lower on mentalising (p = 0.013), caregiving behaviour (p = 0.028) and parental help (p = 0.002), both groups similarly used pets as sources of comfort. There were no differences between attachment patterns on SAPS but there were differences for CAHB scores (p = 0.048). Thus, although insecure attachment was an important risk factor for harming animals, secure and insecure children had similar capacity for bonding with their pets. These results have implications both for how we treat cases of childhood animal harm and for how we understand the supportive role pets can play in children’s lives.

Keywords: attachment to pets, childhood animal harm, CAPA, mentalizing, caregiving

Introduction
Pets are part of the landscape of children’s development (Melson, 2001) and between 60–80% of children in the UK live with pets (Purewal et al., 2019; Marsa-Sambola et al., 2016a,b). Research suggests numerous psychological benefits are associated with pet bonding in childhood, including improved socio-emotional development (Poressky and Hendrix, 1990), improved self-esteem (Purewal et al., 2017), reduced anxiety (Gadomski et al., 2015) and buffering effects in cases in cases of interparental conflict (Hawkins et al., 2019). In parallel, there is a growing awareness that childhood animal harm (CAH) can act as a red flag for a range of psychological issues, including conduct problems (Walters and Noon, 2015), low empathy (Hartman et al., 2019) and exposure to family violence (Degue and DiLillo, 2009). Both the benefits of child–animal interaction and risk of childhood animal harm have been linked to attachment mechanisms, yet few studies have directly investigated the role of attachment in contributing to positive or negative outcomes in child–pet interactions.

CHILDREN’S RELATIONSHIPS WITH PETS
The extent to which attachment theory explains the nature of children’s relationships with pets is still an open question. As Barlow et al. note: ‘the term ‘attachment’ is often applied loosely […] It is un-clear whether traditional attachment theory relates directly to human-animal interaction or whether these interactions diverge from the theory in important ways’ (Barlow et al., 2012, p. 112). Julius et al. (2013) argue that relationships with pets can qualify as an attachment when they meet the following four criteria (Ainsworth, 1991): (1) they act as a secure base for exploration, (2) they are a haven of safety in times of stress, (3) they are associated with maintenance of proximity and (4) separation is associated with separation distress. Julius et al. suggest that attachment to pets operates through the same physiological pathways as human attachment relationships, including reduction in cortisol during interactions (Polheber and Matchock, 2014) and increase in oxytocin during mutual gazing (Nagasawa et al., 2015). Although this is a promising start, the focus in Julius et al.’s study

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is on adulthood and there is no discussion of the specific features of attachment to pets in childhood.

Wanser et al. (2019) provide the only review focused on childhood attachment to pets. They note the literature has a range of issues: definitions tend to be vague, research extrapolates back from studies with adults and there is a lack of appropriate methodologies. Despite this, three themes emerge: (1) children can feel very close to their pets (Jalongo, 2018), a bond which might decrease with age (Muldoon et al., 2019), (2) childhood attachment to pets may be stronger when there are fewer opportunities for human attachment relationships (Westgarth et al., 2013) and/or in cases of abuse and neglect (Yamazaki, 2010) and (3) childhood relationships with pets provide unique opportunities for children to practise caregiving behaviours (Hall et al., 2016). Contact with animals in therapy may also help scaffold positive interactions and shift insecure attachment patterns (Parish-Plass, 2008).1

Although pets cannot act as primary caregivers or protect children from danger, they may still act as secondary attachment figures. A relevant point of comparison may be sibling relationships, which can feature caregiving behaviours, may ‘complement parent–child bonds, but may also compensate for parental inadequacies in cases of stress or deprivation’ (Whiteman et al., 2011; p. 127). However, there are also important differences. Research suggests some children may have closer relationships with their pets than siblings, with lower levels of conflict and higher levels of disclosure to pets (Cassels et al., 2017). In fact, since internal working models (IWMs) of insecure attachment to parents are transmitted to relationships with siblings, this results in higher rates of conflict (Volling, 2001). In contrast, Julius et al. (2013) argue that ‘insecure attachment and caregiving representations are rarely transmitted to companion animals’ (p. 147). Despite the theoretical and practical implications, research on this topic is scarce.

**PETS: EARLY OPPORTUNITIES FOR CAREGIVING?**

The caregiving behaviour system, which fully matures in adulthood, is complementary to the attachment behavioural system and accesses associated representations of self and other (Solomon and George, 1996). Caregiving is one of the main mechanisms mediating the intergenerational transmission of attachment (Kretchmar and Jacobvitz, 2002), and mothers with insecure attachment will provide less competent caregiving than their secure counterparts (Lyons-Ruth and Block, 1996). Even though children can display caregiving behaviours, these are considered to be an immature form because they are fragmented and incomplete, and children are easily distracted (George and Solomon, 1999). Unfortunately, very little is known about how caregiving develops. Only a handful of studies investigate caregiving behaviour by preschool children towards younger siblings (see e.g. Garner et al., 1994), and little to no research is available on caregiving behaviour in middle childhood (George and Solomon, 1999), even though sociological research shows that children take care of younger siblings regularly (Morrow, 2008).

Just as relationships with siblings, relationships with pets can provide unique opportunities for children to practise caregiving behaviours (Melson, 2001). Muldoon et al. (2015) carried out focus group interviews with Scottish children 7–13 years old and found that there was a huge range of experience in caregiving for pets, from having full responsibility to only playing, in which case there was a sense that parental restrictions prevented children from assuming full responsibility for their pets. Hall et al. (2016) found that if a child cared for their pet dog, the dog was more responsive and likely to succeed at a pointing task, which in turn was predictive of the child’s self-reported attachment to the dog. In fact, humane education programmes (which teach compassion and respect for all living things) have argued that improving children’s behaviours towards animals is an opportunity to teach interpersonal skills and caregiving behaviours (Jalongo, 2014) and prevent violence (Faver, 2010). However, big gaps remain in our understanding of how to promote animal welfare and reduce animal harm, and the roles of attachment and caregiving in child-animal interaction.

**CHILDHOOD ANIMAL HARM: THE OTHER SIDE OF THE SPECTRUM?**

Most research on childhood animal cruelty has focused on its ability to predict violent behaviour (Gullone, 2012), its association with exposure to violence (Currie, 2006) and ‘The Link’ between animal abuse and broader cycles of abuse in families (Ascione and Arkow, 1999). There has been very little direct research on the role of attachment in child-animal interaction (Fielding et al., 2011 for a systematic review), despite attachment theory forming the basis of the AniCare Child Approach, the only published manual for the treatment of animal abuse in childhood (Shapiro et al., 2013). Insecure attachment is theorised to be both a direct and an indirect risk factor for animal abuse, self-regulation (Kerns et al., 2007) and empathy (Murphy and Laible, 2013). The only study directly investigating this link found that more securely attached adolescents had more prosocial behaviours and reduced animal harm behaviours, a correlation partially mediated by empathy (Thompson and Haas, 2010). Finally, maltreated children were more likely to use animals as sources of support, they were also more likely to commit animal abuse (Yamazaki, 2010).

There are at least three reasons there has not been more direct research on the role of attachment in cases of childhood animal harm. Firstly, varying terms (including harm, abuse and cruelty) and definition have been proposed, making synthesis of findings difficult. For this study, we adopt the following broad definition of childhood animal harm: ‘Any act, of commission or omission, where a child negatively impacts an animal’s welfare, intentionally or unintentionally’ (Wauthier and Williams, 2022). Secondly, the role of attachment in childhood animal harm is complex and likely mediated by a range of difficult-to-control environmental factors, including economic stress (Reese et al., 2020), exposure to violence, witnessing animal harm or trauma (Currie, 2006; Wauthier et al., 2022b). Finally, a lack of measures on child–animal attachment has made it difficult to investigate this topic in-depth.

**ASSESSING ATTACHMENT TO PETS AND PEOPLE**

Assessments of attachment provide valuable information on a person’s strategies for interaction with others, capacity for self-regulation and associated IWMs. Most measures of childhood attachment are designed to provide a categorization of attachment strategy, usually: secure (type B), insecure avoidant (type A) and insecure ambivalent (type C), with variations in how pathological attachment strategies are classified, either adding the ‘Disorganized’ category developed by Main and Solomon (1986) or the A+/C+ categories in the Dynamic Maturational Model (DDM) developed by Crittenden (2008). In contrast, measuring the quality of specific relationships is usually done using self-report questionnaires; these typically provide a continuum rather than a categorization (e.g. the Security Scale, Brumariu et al., 2018), but self-report and representational measures of attachment often have diverging results (Jewell et al., 2019), and there are no measures for use with young children. Developing measures of childhood attachment to pets and relating this to an overall attachment strategy are therefore complex. Existing measures mostly use brief child self-report with items investigating attachment constructs such as maintenance of proximity, separation distress and feelings of closeness. Recent examples include the Short Attachment to Pets Scale (Marsa-Sambola et al., 2016a,b) and the CENSHARE Pet Attachment Survey (Holcomb et al., 1985). Other less-targeted

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1 We note that this research relies on mammals (primarily dogs, cats and horses), and that very little research exists on relationships with other species (e.g. birds, reptiles, fish).
methods include measuring closeness to pets in drawings (Kidd and Kidd, 1995) and behaviourally oriented measures such as the Children's Treatment of Animal Questionnaire (CTAQ; Thompson and Gullone, 2003). Very little is known about whether there are different styles in child-pet relationship (e.g. secure/avoidant/ambivalent) and how this might affect the patterns of behaviour.

AIMS AND RESEARCH QUESTIONS

Using a sample of children who were identified as ‘high-risk’ of harm and classmate controls, this study sought to explore the role of attachment across the spectrum of children’s relationships with pets. This broad objective was split into three more specific aims: (1) investigating how children’s attachment impacts their relationships to pets, (2) linking attachment to caregiving and animal harm behaviour and (3) testing innovative ways of measuring children’s relationships to pets. Our methods included a drawing task, a story-stem assessment of attachment with additional pet stems and self-report measures investigating attachment to pets, acceptance of cruelty and animal harm behaviours. Aligning the aims of the research to these specific methods, we sought to answer to the following research questions:

1. How does attachment strategy relate to children’s drawings of their families and pets?
2. How does attachment strategy impact children’s story stems about pets?
3. How does attachment strategy relate to self-report of relationships with pets?
4. How well do these measurement methods correlate with one-another?

Methods

ETHICAL APPROVAL

This study was approved by the Department of Clinical and Health Psychology Ethics Research Committee at the University of Edinburgh [reference number: CLIN629] and Local Authority consent was obtained prior to establishing contact with schools where children were interviewed.

PARTICIPANTS

There were two groups of participants for this study: ‘high-risk’ children had been referred to Animal Guardians (AG), a humane education programme run by the Scottish SPCA for children who have harmed animals or where referring adult is concerned about the child's behaviour around animals. ‘Low risk’ children were recruited as matched controls from the referred child’s school class. Recruitment of ‘high-risk’ children was done alongside the referral process for AG, which was aimed at primary school-aged children (4–12 years old) in central Scotland. Referrals received between August 2019 to March 2020 were included in the current research. Sources of referrals included: teachers, parents, social work and Scottish SPCA animal cruelty incidents. Referrals were always processed through the child’s school, which was where research interviews and the AG intervention were carried out. Parental consent for research was separate, and parents could refuse for their child to participate in research without affecting their child’s eligibility for the AG programme. Once a referral was made, the child’s class teacher was contacted and asked to hand out parental consent forms for up to four children who would act as matched controls. All children provided informed consent on the first day of interviews and were free to withdraw at any time.

Twenty-seven children were interviewed, each one over three sessions: nine children referred to the AG (three girls and six boys, mean age 8.8 years) and 18 matched-control children (ten girls and eight boys, mean age 8.6 years). Of the nine referred children, two were ‘at-risk’ of animal harm behaviour (e.g. prone to lashing out, family history of animal harm), five were referred to for ‘minor harm/rough handling’ of animals and two were referred for ‘moderate harm’ (animal had been hurt but had not needed veterinary treatment). Most children came from families that owned pets (n = 19): dogs (n = 9), cats (n = 8), small mammals (n = 5) and fish or reptiles (n = 3).

MEASURES

Data were collected as part of a wider research project investigating psychological risk factors for animal harm, and a detailed account of the other constructs assessed, such as empathy, executive functioning and teacher-reported behaviours, can be found in Wauthier et al. (2022a). We used three approaches to assess different aspects of children’s attachment and relationships (story stem, drawing and self-report) in order to triangulate results, since convergent validity between different types of attachment measure is often low (see Jewell et al., 2019). This was complemented with three additional self-report measures on belief in animal sentience, attitudes towards animal cruelty and animal harm behaviours.

The Child Attachment Play Assessment

The Child Attachment Play Assessment (CAPA; Farnfield, 2016) is a narrative story-stem procedure designed to assess attachment strategy in 3–11-year-old children and has good convergent validity with other measures using the Dynamic Maturational Model (DMM) of attachment. Story stems are drawn from the MacArthur Story Stem Battery (MSSB; Bretherton and Oppenheim, 2003) and the Story Stem Assessment Profile (SSAP; Hodges et al., 2003). The CAPA uses the DMM (Crittenden, 2006) to classify children’s attachment strategies. The DMM provides a different classification of a child’s attachment strategy than the ABCD model (Main and Solomon, 1986); rather than interpreting the Type D (disorganized) behaviours as a disruption of strategy, the DMM interprets these behavioural patterns as strategies that develop under conditions of non-normative danger, producing the DMM classification of A+ (non-normative avoidant) and C+ (non-normative ambivalent). For this research, children’s attachment strategies were categorized using either a binary split comparing secure (type B) to insecure secure patterns (all type As and type Cs), or a three-way split, either comparing secure classifications (type B), with insecure ‘normal’ (A1/2 and C1/2) and insecure ‘pathological’ classifications (A+ and C+), or comparing secure classifications (type B) with anxious avoidant (all type A) and anxious ambivalent (all type C) classifications.

The CAPA uses the established narrative story stem procedure whereby the interviewer gives the child the beginning of a story ending at a point of conflict and asks the child to ‘tell me and show me what happens next’. The stories are told with a set of simple props, including doll and animal figures, a doll house and some furniture. The procedure is videotaped so that it can be coded. For this study, children were given six ‘human stories’, which were taken from the standard story stem procedures, followed by three ‘pet stories’. Videos were double coded by certified reliable CAPA coders. All videos were coded by the first author and blind coded by a second reliable coder who was not aware of the child’s condition or background. Any disagreements in coding were conferenced until a consensus classification was reached.

Pets In Children’s Attachment Stories (PICAS)

Three children’s pet stories were designed for this study using themes from Wauthier et al. (2022b) drawing on common sources of conflict in children’s relationships with pets. The pet stories explore increasingly challenging points of conflict with the pet: a pet refusing to fulfil a desire for comfort, a pet breaking a child’s toy and a pet biting/scratching a child (see Table 1). The pet stories were analysed in two ways. First, they were reviewed to obtain an attachment classification using the same procedure as the ‘human stories’; this was done to test if the child’s overall attachment strategy remained the same when the focus was interaction with animals. Second, a new measure was developed, the Pets In Children’s Attachment Stories (PICAS) to investigate different aspects of children’s internal representations of their relationships with pets.
The PICAS went through an iterative design process, which aimed to capture three underlying constructs: mentalizing about pets, reciprocal relationship between child and pet and parental help in resolving conflict. A 9-item pilot version of the PICAS, scored on a four-point scale (0–3), was trialled by all authors and two reliable CAPA coders using a random selection of four children, to establish if items and scoring system were clear, matched theoretical dimensions, and likely to produce reliable results. Based on feedback, the scale was streamlined to increase clarity and reliability, by decreasing the number of items and scoring options. In the final version, ‘mentaling’ was measured using two items scoring how well children discussed pets’ thoughts and emotions, ‘reciprocal relationship’ was measured using two items, scoring caregiving towards pets and instances where the pet comforted the child, and ‘parental help’ was measured using a single item scoring whether parents helped resolve conflicts with pets in the stories. For each dimension, a child’s story could receive a score of 0 (not evidenced), 1 (some evidence) or 2 (well evidenced); Table 2 shows the coding scheme.

Intra-rater and inter-rater reliability were calculated using weighted Kappa (see Gisev et al., 2013). For the calculation of intra-rater reliability, the whole data set was coded twice by the first author, six months apart, and with the second coding blind to the first; this yielded an average weighted Kappa of 0.78, which corresponds to substantial agreement (McHugh, 2012). For the calculation of the inter-rater reliability, the whole sample was coded blind by the second author, after an initial training coding using a random subset of children. This was then compared to the second round of coding carried out by the first author and yielded an average-weighted Kappa of 0.66. Supplementary Table 1 gives more detail on the reliability scores for each item on the PICAS scale.

### Hierarchical Mapping Drawing Task

Children’s closeness to family, friends and pets was assessed using a drawing task with concentric circles, where children were asked to draw themselves in the middle and ‘anyone important like family, friends or pets’ around them. This ‘bull’s eye’ hierarchical mapping task is similar to a task used with children in Wauthier et al. (2022b). Julal et al. (2017) used this procedure with adults to map attachment and found that insecure relationships were more likely to be placed further away from the core self or excluded from the image altogether. Children were able to draw up to eight people/animals in their pictures (there was no minimum). For analysis, the distance between the centre of the child and the centre of each figure was measured in centimetres. Children’s relationships were divided into categories and where more than one character appeared in any category, the distances were averaged. The categories were: mother, father, pet(s), sibling(s) and other. Children’s relationship ‘score’ for each category was calculated using the reciprocal of the distance (i.e. 1/distance measured in cm) so that low scores corresponded to a larger distance to the self and were continuous with no figure being drawn, which received a score of zero.

### Short Attachment to Pets Scale

The SAPS is a brief nine item self-report measure of attachment to pets designed for use with children (Marsa-Sambola et al., 2016a, b). It uses a five-point Likert scale for each item, from ‘Strongly Agree’ to ‘Strongly Disagree’ and has one item which needs to be reverse-coded. An overall average across the nine items was taken for each child, so that a higher score corresponded to higher attachment to pets. The scale has excellent internal reliability with a sample children aged 7–12 (α = 0.85; Hawkins and Williams, 2017). The items relate to three of the four criteria an attachment figure must fulfil (Ainsworth, 1991; Trinke and Bartholomew, 1997): haven of safety (e.g. ‘My pet knows I am upset and tries to comfort me’), maintenance of proximity (e.g. ‘I spend time every day playing with my pet’), separation distress (e.g. ‘There are times I would feel lonely without my pet’). For this study, each item also had the text ‘or would if I had one’, so that children who did not have pets could also answer the questions.

### Childhood Belief in Animal Minds

The children’s view on animal sentience was measured using the Child’s Belief in Animal Minds (Child-BAM; Hawkins and Williams, 2016). This measure presents a range of animals and asks children to say whether they think each animal: (1) is clever, and can feel (2) some emotions, (3) happiness, (4) sadness and (5) fear. The original measure was developed for children 6–13 years and had excellent reliability (α = 0.92) using a set of seven animals. For this study, we reduced this to a set of four animals for brevity, targeting the most common pets in the UK: dogs, cats, rabbits and birds (PFMA, 2021). This shortened version of the scale retained good reliability in the current sample (α = 0.81). Each item was scored on a five-point Likert scale, and each child’s overall BAM score was calculated by averaging their scores, with a higher score corresponding to higher belief in animal sentience.

### Attitudes and Behaviours Towards Animals

Children’s risk of animal harm was assessed using two questionnaires, the Children’s Attitudes towards Animal Cruelty (CAAC; Connor et al., 2021) and an expanded version of Children’s Animal Harm Behaviours (CAHB; Connor et al., 2021). The CAAC is a self-report questionnaire originally tested with adolescents (Connor et al., 2021), but has successfully been used with primary school children and has good reliability (α = 0.70; Hawkins et al., 2020). It has 11 items describing harmful behaviours towards animals, including physical harm (e.g. ‘Kick an animal on purpose’), emotional harm (e.g. ‘Tease an animal’), neglect (e.g. ‘Forget to give a pet food’) and accidental harm (e.g. ‘Hurt an animal by accident’). For this study, children were asked ‘Is it OK to...’ and had to rate each item on a five-point scale from ‘Very bad’ to ‘Very good’. The CAHB also has good reliability in an adolescent sample (α = 0.79; Connor et al., 2021) and has the same 11 items as the CAAC. However, instead of investigating how acceptable the children find the behaviours, it investigates how often children have done the behaviours. For this study, children were asked ‘How often have you done the following?’ and could select the options.

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**Table 1. Description of the pet story prompts.**

<table>
<thead>
<tr>
<th>Prompt</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comfort from pet</td>
<td>‘X is coming home from school and some of the children at school weren’t very nice to him/her. When X comes home s/he wants a cuddle from [pet name]. But [pet name] has spent all day playing and wants to go to sleep, and doesn’t want cuddles right now. Tell me and show me what happens next’.</td>
</tr>
<tr>
<td>Broken toy</td>
<td>‘X has a favorite toy (option to prompt child what their favorite toy is). Pretend this is the toy, and X and [pet name] start playing with the toy. At first, they start playing fetch (show playing) but then they start playing tug-of-war, and then uh-oh! The toy rips, and X says “Hey you ripped my favorite toy!” Tell me and show me what happens next’.</td>
</tr>
<tr>
<td>Pet bite/scratch</td>
<td>‘X goes to see [pet name], and they start playing. But then something happens, maybe you can tell me what, and [pet name] bites/scratches X, and X says “Ow! That really hurt, you bit/scratched me!” Tell me and show me what happens next’.</td>
</tr>
</tbody>
</table>
‘Never’, ‘Sometimes’, ‘Often’ and ‘Very often’, along with a ‘I don’t have a pet’. We supplemented the 11 items of the CAHB with three items investigating additional harm behaviours emerging from previous research ‘Play rough with a pet’, ‘Yell at or punish a pet if it misbehaves’ and ‘Treat an animal in a harsh way when angry or annoyed’ (Wauthier et al., 2022b).

PROCEDURE

Interviews were organised with the schools’ head teacher and children’s class teachers to be minimally disruptive and fit around children’s schedules. One-to-one interviews were carried in a quiet room at the child’s school over three 30-minute sessions on separate days. Children were first taken through the child consent procedure and were informed that they could withdraw at any time. Children were supported with reading and writing as necessary by the interviewer and were free to complete any self-report questionnaires by themselves if they preferred. Session 1 included questionnaire measures carried out on a digital tablet using Qualtrics survey software (basic demographics, SAPS, CAAC), as well as the drawing task. Session 2 was comprised entirely of the CAPA procedure, which was carried out using a Playmobil® house and assorted figures and furniture. Session 3 comprised measures of empathy and executive functioning (not analysed here) and finished with the remaining self-report questionnaire items in Qualtrics (CAHB). Session 1 was not audio- or video-recorded, as it was interrupted. As a result, analyses comparing results based on attachment strategy have a sample size of 24, while analyses correlating between measures have sample sizes ranging from 24 to 27. Of the 24 children with CAPA attachment classifications, eight children were anxious avoidant (type A), with five children classified as A+, and three children classified as A1/2, 11 children were classified as secure (type B) and five children were anxious ambivalent (type C), with three children classified as C+ and two children as C1/2. Supplementary Table 2 provides anonymized information on the same statistical power (Scottish SPCA stationary or small animal figurine).

DATA HANDLING AND ANALYSIS

Data were inputted into Excel for preliminary handling, including downloading answers from Qualtrics, entering scoring from pencil-and-paper measures, reverse coding items and calculating mean scores. The finalized data set was imported into Jamovi version 1.6 for statistical analysis. To retain robustness despite the small sample size, we used Fisher’s exact test (rather than Pearson’s Chi square) for tests of frequency, since it is robust even when expected values in cells fall below five. Statistical analyses which compared scores based on attachment strategy were primarily carried out using a binary classification system, comparing all secure children (type B) to insecure children (type A or C), to retain statistical power without violating assumptions of parametric testing. Tests of mean difference were always carried out using versions robust to violations of equality of variance (Welch’s t-test and Welch’s ANOVA) as these are more reliable while retaining nearly the same statistical power (Ruxton, 2006). Normality of residuals was established using Shapiro-Wilk test, visual exploration of the data and Grubbs’ test to identify outliers. Where assumptions for parametric tests were not met, we used non-parametric equivalents, such as Mann-Whitney U test, Kruskal-Wallis test and Spearman’s rho. Tests are supplemented with boxplots showing the difference between A, B and C strategies and by exploratory analysis using three-way classifications, where relevant.

Results

ATTACHMENT CHARACTERISTICS OF THE SAMPLE

Of the 27 children interviewed, 24 had useable video data for CAPA classification (two video recordings malfunctioned and one was interrupted). As a result, analyses comparing results based on attachment strategy have a sample size of 24, while analyses correlating between measures have sample sizes ranging from 24 to 27. Of the 24 children with CAPA attachment classifications, eight children were anxious avoidant (type A), with five children classified as A+ and three children as A1/2, 11 children were classified as secure (type B) and five children were anxious ambivalent (type C), with three children classified as C+ and two children as C1/2. Supplementary Table 2 provides anonymized information on the basic characteristics of the sample.

Referred children were significantly more likely to be classified as having an insecure attachment pattern (n = 8, 89% of referred
children) than control children \((n = 5, 33\%\) of control sample; Fisher’s exact test, \(p = 0.013\); Cramer’s \(V = 0.540\)). Specifically, referred children were more likely to be classified as having a pathological insecure attachment pattern \((n = 7, 78\%\) of referred children) than control children \((n = 1, 7\%\) of control sample; adjusted residual = 3.6; \(p = 0.002\), Cramer’s \(V = 0.735\)). Rates of normal insecure were comparable between referred children \((n = 4\); adjusted residual = 0.9).

ATTACHMENT CLASSIFICATIONS AND DRAWINGS (HIERARCHICAL MAPPING TASK)

For research question 1, we sought to understand how children’s drawings of ‘the most important people, including, family, friends, and pets’ related to their attachment classification. Assumption checks identified one child’s data as an outlier \((p < 0.01\); Grubbs, 1969) as they drew almost all their figures extremely close to themselves and so had very high values (see Figure 2, child #7), so their data were removed from this analysis. For the remaining children, there was a significant difference in the drawings of securely attached children compared to those drawn by insecurely attached children. Specifically, secure children placed mothers and siblings significantly closer to themselves than insecurely attached children did, and a trend in the same direction existed for father (but was not significant). However, there was no significant difference in children’s closeness to pets and in fact the relationship tended in the other direction. Table 3 presents results for the Welch’s t-tests carried out for each type of relationship, while Figure 1 shows the distribution of distances for each relationship by attachment strategy.

Taking a more qualitative approach, Figure 2 shows annotated examples of five representative drawings for each attachment category. A few trends appear when inspecting these images. Firstly, several insecure children had a ‘pet only’ drawing, where they included only pets and no human figures. This never occurred in the securely attached children, who seemed to have more complex attachment networks. When given the choice, a higher percentage of secure children drew the people in the image themselves (75%) compared to the insecure children (36%). Finally, we notice what might be the beginning of a ‘bimodal’ pattern in the type A children, where they either drew very sparse attachment networks, or very fully attachment networks; we have too few examples of type C children to determine whether this bi-modal pattern might emerge as well.

ATTACHMENT CLASSIFICATIONS AND PET STORIES (PICAS)

For research question 2, we explored children’s representation of their relationship to pets using the PICAS. Welch’s t-tests showed that insecure children received significantly lower scores \((M = 0.81, SD = 0.45)\) than secure children \((M = 1.39, SD = 0.54)\).

Table 3. Results for Welch’s t-test on the hierarchical mapping task for closeness to mother, father, siblings and pets. A higher score corresponds to a closer relationship. Bolded values correspond to significant \(p\)-values: \(p < 0.05\).

<table>
<thead>
<tr>
<th></th>
<th>Secure Mean (SD)</th>
<th>Insecure Mean (SD)</th>
<th>df</th>
<th>t</th>
<th>p</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother</td>
<td>0.25 (0.04)</td>
<td>0.14 (0.13)</td>
<td>13.6</td>
<td>2.81</td>
<td>0.014</td>
<td>1.15</td>
</tr>
<tr>
<td>Father</td>
<td>0.21 (0.12)</td>
<td>0.08 (0.13)</td>
<td>18.6</td>
<td>1.94</td>
<td>0.067</td>
<td>0.80</td>
</tr>
<tr>
<td>Sibling</td>
<td>0.22 (0.08)</td>
<td>0.10 (0.12)</td>
<td>20.9</td>
<td>2.97</td>
<td>0.007</td>
<td>1.23</td>
</tr>
<tr>
<td>Pet</td>
<td>0.11 (0.14)</td>
<td>0.22 (0.25)</td>
<td>20.6</td>
<td>−1.76</td>
<td>0.094</td>
<td>−0.73</td>
</tr>
</tbody>
</table>

Fig. 1. Distances to family members in drawings across attachment strategies. Boxplots with labelled means showing the distances between children’s drawings of themselves and their drawings of mother, father, sibling(s), and pet(s).
on mentalizing about pets, $t(20.6) = 2.702, p = 0.013$; insecure children received significantly lower scores ($M = 0.41, SD = 0.41$) than secure children ($M = 0.89, SD = 0.54$) on caregiving towards pets $t(18.5) = 2.385, p = 0.028$ and insecure children received significantly lower scores ($M = 0.64, SD = 0.52$) than secure children ($M = 1.48, SD = 0.62$) on parental help in resolving conflict $t(19.7) = 3.544, p = 0.002$. However, there was no difference between insecurely attached children ($M = 0.78, SD = 0.61$) and

Fig. 2. Anonymized examples of children’s drawings across attachment strategies.

- Several insecure children had a “pet only” pattern, which never occurred in the secure children’s drawings.
- Images marked with an *asterix are drawn by the interviewer, which is something the child could ask for. In this case the child indicated the location and identify of figures, but the interviewer drew them.
securely attached children (M = 0.83, SD = 0.46) on comfort from pets t(18.5) = −0.238, p = 0.815. Figure 3 visualizes the differences between the three categorisations of attachment across these four dimensions using boxplots.

ATTACHMENT CLASSIFICATIONS AND SELF-REPORT MEASURES
For research question 3, we explored whether attachment strategy impacted children’s answers on four self-report measures on their relationships and interactions with pets. The CAHB and child-BAM scales violated assumptions or normality, and so were compared using Mann–Whitney U tests, while the CAAC and SAPS were suitable for parametric testing and so groups were compared using Welch’s t-test. There were no significant differences between securely attached and insecurely attached children across any of these measures. For the non-parametric tests, there was no difference between securely attached children (Median = 1.14) and insecurely attached children (Median = 1.14) on CAHB score U = 53.5, p = 0.761 and there was no difference between securely attached children (Median = 4.85) and insecurely attached children (Median = 4.85) on child-BAM score U = 57.5, p = 0.619. For the parametric tests, there was no difference between securely attached children (M = 1.57, SD = 0.24) and insecurely attached children (M = 1.64, SD = 0.31) on CAAC score t(20.4) = −0.57, p = 0.570 and there was no difference between securely attached children (M = 4.57, SD = 0.28) and insecurely attached children (M = 4.42, SD = 0.58) on SAPS score t(16.2) = 0.791, p = 0.440.

We ran additional tests of mean differences using three-way groupings: based on the ‘severity’ of attachment insecurity (secure [type B, n = 11], normative insecure [A1/2 or C1/2, n = 5] and insecure ‘pathological’ [A+ or C+, n = 8]) and based on attachment strategy (secure [type B, n = 11], anxious avoidant [all type A, n = 8] and anxious ambivalent [all type C, n = 5]). Assumption checks showed that the child-BAM and CAHB measures would be compared using Kruskal-Wallis tests, while SAPS and CAAC scores were compared using Welch’s ANOVAs. There was a significant difference in CAHB scores when grouping based on attachment severity (H = 6.06, p = 0.048), with post hoc tests suggesting that the ‘pathological’ insecure group (Median = 1.34) had higher rates of harmful behaviours than the ‘normal’ insecure group (Median = 1.00; p = 0.047). Furthermore, there was a significant difference in CAAC scores when grouping based on attachment strategy, F(2, 8.08) = 6.84, p = 0.018. A Games-Howell post hoc test suggests that anxious-ambivalent children (M = 1.98, SD = 0.23) had higher rates of acceptance of cruelty than anxious avoidant children (M = 1.47, SD = 0.16; p = 0.033), a difference which was nearly significant with secure children (M = 1.57, SD = 0.23, p = 0.067). This suggests that groupings can be an important consideration when considering the effects of attachment; however, these findings should be interpreted with caution as we were unable to correct for the number of tests performed due to the small sample size.

LINKS BETWEEN MEASURES
For research question 4, we ran three partial non-parametric correlation matrices while controlling for pet ownership. The main correlation matrix (Supplementary Table 3) used the whole sample of 27 children but did not account for the effects of different attachment strategies. The second and third correlation matrices partially address this issue by splitting the sample, with one set of correlations for securely attached children (n = 11, Supplementary Table 4) and one set of correlations for insecurely attached children (n = 13, Supplementary Table 5). However, splitting the sample in this way significantly reduced statistical power, and so results should be viewed as exploratory. Figure 4 visually summarizes results using a correlogram created in Affinity Designer, with the top-right half showing significant correlations in the split samples, while the bottom-left of the figure shows all correlations using the full sample. There are some marked differences in the patterns of correlation for the securely and insecurely attached children, with the only shared
significant correlation being closeness to mother and closeness to pets. For example, closeness to pets is only significantly correlated to the self-report measures child-BAM and SAPS for the sample of insecure children. The different patterns may be due either due to measurement artefacts such as floor or ceiling effects, or to genuine differences in the way secure and insecure children form relationships. This highlights the importance of taking attachment strategy into account and is crucial to keep in mind for the analysis with the whole sample, as certain effects may be averaged out.

In the overall sample, closeness to mother and closeness to siblings both correlated with amount of Parental Help, which is suggestive that children who feel closer to their family are more able to use parental figures for help in resolving issues. Regarding self-report measures, closeness to pets and closeness to mother were significantly negatively correlated with CAAC score, while closeness to father was significantly correlated to child-BAM score. Although closeness to pets was not significantly correlated with SAPS score (p = 0.08) or child-BAM (p = 0.09), the fact these relationships were significant in the sub-sample of insecure children suggest there may be an interaction with attachment strategy. Three of the PICAS dimensions were highly correlated with one another. Specifically, Mentalizing was significantly correlated with Caregiving, and Caregiving was significantly correlated with Parental Help. However, Comfort from pets was not correlated with any of the other PICAS dimensions, suggesting it taps a separate aspect in children’s relationships to pets. None of the PICAS dimensions correlated significantly with the self-report measures, highlighting that these measurement techniques likely assess different constructs.

**Discussion**

This study aimed to investigate the link between attachment strategy, children’s relationship to pets and risks of child animal harm using a sample of children with both high- and low-risk for animal harm. We found children at high risk of animal harm were more likely to have insecure attachment than control children, while self-report measures suggest that pathological attachment strategies may be especially linked to higher rates of animal harm.
behaviour. Our results also suggest that children’s relationships with pets do not necessarily follow the same patterns as their human attachment relationships. Insecure children drew pets just as close to themselves as secure children, there was no difference between secure and insecure children’s self-reported attachment to pets, and insecure children perceived pets as sources of comfort just as much as securely attached children. However, it is important to note that lack of statistical differences might be a result of the small sample size, as the study was underpowered. Attachment did affect other dimensions of children’s relationships with pets: insecure children had poorer mentalizing about pets, a reduced tendency to demonstrate caregiving behaviours, and were less able to use parents to help scaffold positive interactions with pets. Finally, correlations across measures confirm we cannot use measurement modalities interchangeably.

CONCEPTUALIZING CHILDREN’S RELATIONSHIPS WITH PETS

Our results suggest that pets occupy a distinct place in children’s attachment networks. Insecure children felt just as close to and comforted by pets as secure children, despite marked differences in their closeness to mothers and siblings. This supports the theory that IWMs do not transfer to relationships with pets in the same way that they transfer to human relationships (Julius et al., 2013). To date, this idea has only received sparse attention: one study with adult dog-owners found no link between human- and pet-attachment using questionnaires (Kurdek, 2008), while an unpublished study found no link between children’s attachment strategy as measured by the Separation Anxiety Test and a questionnaire on closeness to pets (Julius et al., 2010). What does this mean for how we conceptualise children’s relationships with pets? Although attachment theory is certainly relevant, relationships with pets seem to diverge from other attachment relationships in important ways. More research will be needed to determine whether this is best conceptualised as a special type of secondary attachment, or whether we need to supplement this with theories such as ‘biophilia’ from evolutionary psychology (Kellert and Wilson, 1993), ‘zooeia’ from the One Health movement (Hodgson and Darling, 2011), or ‘multispecies kinship’ from sociology (Charles, 2014), to have a full theoretical account of the processes involved.

Insecure children’s poorer mentalizing about pets, reduced caregiving towards pets and inability to use parents to scaffold positive resolutions seem particularly relevant in explaining how attachment links to risk of animal harm. These dimensions are known to link attachment and poor outcomes in human interactions: for example, poor mentalizing has been shown to mediate the relationships between insecure attachment and peer problems in adolescence (Venta and Sharp, 2015), while insensitive caregiving is known to mediate the intergenerational transmission of insecure attachment (Kretchmar and Jacobvitz, 2002). There is also a well-established relationship between low empathy and childhood animal harm (Akdemir and Göble, 2020; Hartman et al., 2019) and these results support the idea that attachment mechanisms underly this association. Poor mentalizing has been linked to lower cognitive empathy (Schnell et al., 2011), while insecure attachment interferes with compassionate caregiving (i.e. behavioural empathy; Mikulincer et al., 2005).

However, the link between insecure attachment and risk for animal harm is not necessarily bi-directional. There was no difference between secure and insecure children’s self-reported rates of animal harm; the difference only emerged when children with DMM pathological (A+C+) attachment strategies were analysed separately. This may suggest that it is predominately more serious forms of insecure attachment that lead to higher risks of animal harm, possibly through more pronounced deficits in mentalizing and caregiving, but also through other attachment-related mechanisms such as reduced emotional regulation (Mikulincer and Shaver, 2019). More research is needed to understand how this interacts with additional factors, including exposure to violence (Degue and DiLillo, 2009) and negative cultural attitudes towards animals (Plant et al., 2019).

METHODS FOR MEASURING ATTACHMENT TO PETS

Research on children’s relationships with pets has tended to rely on self-report, which is known to be prone to a range of issues, including social desirability bias (Camerini and Schulz, 2018), recall bias (e.g. in medical research; Van den Brink et al., 2001) and issues due to limited introspective abilities (Pronin, 2009) and verbal reasoning (Marsh, 1986). This study used a range of techniques, providing an opportunity to consider whether different methods measure the same underlying constructs. Self-reported attachment to pets (SAPS), closeness to pets (drawing task) and ‘comfort from pets’ (PICAS) did not correlate with each other. While there may be methodological reasons for the lack of correlation, these measures may be assessing different latent constructs. In fact, reviews have found quite low correlations between interview and self-report measures of attachment (Jewell et al., 2019), perhaps because self-report measures tap into conscious processes, while interview or projective methods tap into unconscious schemas and experiences. In another example, ‘mentalizing about pets’ did not correlate with child-BAM scores, even though both relate to children’s concepts of animal sentience. However, ‘mentalizing about pets’ likely assesses an ability, while the child-BAM measures self-reported beliefs. Again, this is consistent with other research showing low equivalence between self-reported and task-based measures (Murphy and Lilienfeld, 2019). Ultimately, it may be necessary to develop observational measures of child-animal interaction to have valid and reliable data.

IMPLICATIONS FOR CLINICAL PRACTICE

Our results suggest that insecurely attached children can form close relationships to pets and join a growing literature on the positive buffering effects pets can have in children’s lives, including in cases of inadequate human relationships (Wanser et al., 2019) and exposure to violence (Hawkins et al., 2019). It also supports the finding that it is a child’s bond to their pet which is likely to have positive socio-emotional effects, rather than the simple presence of a pet (Poresky and Hendrix, 1990). In a family medicine context, asking about pets has been suggested to be useful to build rapport and leverage the health benefits of pet ownership (Hodgson et al., 2017); asking children about pets in a psychological context may have similar benefits. Our results may also have implications for animal-assisted therapy, since children’s insecure attachment strategies did not seem to transfer to their relationships with animals. This supports the idea that therapy animals can act as ‘transitional objects’ aiding the formation of a therapeutic alliance when patients struggle to trust their (human) therapist (Levinson, 1965; Zilcha-Mano et al., 2011). However, there is very little research on whether positive relationships with animals can transfer back to human relationships, and we would caution against simply assuming this. Still, some research suggests that animal-assisted interventions can have positive effects on children and adolescents’ social and relational functioning (Pendry and Roeter, 2013).

Finally, our results have implications for how childhood animal harm is treated. Our results support the model proposed by Shapiro et al. (2013) that attachment disturbances underly risk factors for childhood animal harm and suggest this may occur via poorer mentalizing, reduced caregiving skills and lack of parental support. These deficits could precipitate situations where an animal is harmed because its needs or intentions are misunderstood. These results may also provide a developmental perspective for issues in adulthood. For example, in animal hoarding, pathological attachment may lead owners to consider animals as primary sources of comfort, without having the mentalising capacity to see negative impacts on animal welfare (Patronek and Nathanson, 2009; Patronek and Weiss, 2012). We recommend
that practitioners who work with children (or adults) at high risk of animal harm screen for potential attachment issues.

LIMITATIONS AND FURTHER RESEARCH

The small sample size is the most significant limitation of this study. This was due in large part to the difficulty in reaching children who have harmed animals. Although every effort was made to perform statistical tests which would not introduce bias, our results should be viewed as exploratory. Furthermore, our sample was quite homogenous, comprised of predominantly white children drawn from primary schools in central Scotland, and whose parents consented to research. Future research should attempt to replicate these results with larger samples drawn from different countries, ethnicities and social backgrounds, to determine whether our findings generalize to broader populations. Measures such as drawing tasks or small vignette-based assessment may strike a balance of being scalable while providing detailed information complimentary to self-report typically seen in studies with larger samples. Finally, demographic factors not measured here, such as socio-economic status (Reese et al., 2020) or exposure to Adverse Childhood Experience (Bright et al., 2018), may be confounding factors which partially or completely underpin the association between certain variables, and future research may which to tease apart these effects.

One of the gaps in the child attachment literature is the dearth of measures available to understand children's experiences of specific relationships (e.g. parents, siblings, friends, extended family and pets). The PiCAS was developed to probe children's representations of relationships with pets using a story-stem task, and it may be interesting to explore whether it could be adapted for use with a wider range of relationships. For example, it may be interesting to know whether there is a correspondence between pet and sibling relationships, since both may occupy the space of secondary attachment figures. More broadly, it could provide insights into how children's IWMs and schemas transfer between primary caregivers and increasingly distant relationships (e.g. sibling, kinship, friends, peers).

Conclusions

Pets occupy a unique place in children's attachment networks and can act as sources of comfort even in cases of insecure attachment. However, pathological insecure attachment patterns may be a predisposing risk for animal harm, and insecurely attached children may not have the interpersonal skills or parental support to resolve points of conflict with pets. Further research is required to validate these findings across a wider sample and to gain a fuller understanding of how pets fit within children's wider attachment networks. This research has implications for how we understand the role pets play in children's development, how we understand the way attachment transfer between relationships and how we address cases of animal harm.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

ETHICS STATEMENT

The authors confirm that the research meets any required ethical guidelines, including adherence to the legal requirements of the study country.

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AUTHORS' CONTRIBUTIONS

All authors contributed equally to the development of this article.

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DATA AVAILABILITY

Data available on request from the authors.

References


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