Well-being: Investigating the Relationship between Attachment to Pets and Connection to Nature
**DECLARATION**

I hereby declare that this dissertation is the result of my own independent investigation under the supervision of my tutor. The various sources to which I am indebted are clearly indicated. This dissertation has not been accepted in substance for any other degree, and is not being submitted concurrently for any other degree.
Firstly, I would like to give a special thanks to my supervisor, [name]. Thank you for guiding me through my final year in university, and for your continuous influence, advice and encouragement throughout my project. I am truly grateful to have had you as my mentor.

I would also like to thank my family, particularly my parents for their unconditional love and support, both emotionally and financially, during my time at university. Thank you for always believing in me, and for always reminding me of how proud you are of me. You have been my safe haven whenever I’ve needed to get out of Cardiff. You are both a constant reminder of why I’m doing this. I love you!

To my boyfriend of 8 years, [name], thank you for being a constant source of comfort and assistance over the course of my degree, for always proofreading my assignments, and for keeping the TV volume down… You were a good distraction at times of stress. And to his mother, Angie, you will forever be my psychological inspiration!

Next, I would like to express my gratitude to my beloved friends. [name], you are the best housemate. Thank you for always being there to motivate me to keep persevering, and for keeping me emotionally balanced when I start to crumble. [name] thank you for letting me vent all of my fears and frustrations to you, and thank you for making me laugh and forget it all. [name] thank you for putting up with my absence and unavailability as a result of university work, you are a good friend to stick by me. And of course, to the girls in university, thank you all for your direction and input. It definitely made it more bearable knowing that we were all stressed and confused together at times.

Last but not least, a big thank you to every one of the participants that took part in my study. Without you, I would’ve had no thoughts or feelings to quantify!
ABSTRACT

There is an abundance of literature suggesting that pet ownership and attachment are associated with a wide range of psychological and physiological benefits. Research on the effects of pet attachment on mental health has linked it to happiness (Ory & Goldberg, 1983) and lower levels of depression (Garrity, Stallones, Marx & Johnson, 1989). There is also evidence that a connected relationship with nature is an important part of well-being (Lumber, Richardson & Sheffield, 2017). While the benefits of a connected relationship with animals and nature have been previously established, the actual routes to this connectedness remains unclear. The aim of this study was to bridge the gap between attachment to pets and connection to nature. Participants were asked to answer a series of questions online. The questionnaires that were used in the study comprised of previously designed scales which were used to measure attachment to pets, connection to nature, and well-being. It was predicted that an emotional attachment to pets and childhood pet ownership would influence a connection to nature. In addition, it was expected that a positive correlation would be found between pet attachment and mental well-being. A total of 114 participants took part in the study, 76 of which were pet owners. As expected, pet owners with high attachment scored significantly higher in nature connectedness. Surprisingly, there was no correlation found between pet attachment and well-being. There was also no association between childhood pets and connection to nature.
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INTRODUCTION

Evidence relating to the human-animal relationship suggests that owning a pet is beneficial for an individual’s psychological and physiological well-being (Friedmann & Son, 2009). There have been assumptions about the human-animal bond having similar qualities to interpersonal relationships (Smolkovic, Fajfar & Mlinaric, 2012). Much research has studied the effects of pets on their owners' health. Recently, researchers have focused on mental well-being, in addition to physical well-being (Bao & Schreer, 2016). Some researchers have found that pet ownership is associated with lower levels of depression (Clark Cline, 2010), where others have reported higher life satisfaction in pet owners than non-owners (Bao & Schreer, 2016). Formal research on the human-animal relationship is relatively scarce and findings are inconsistent (George, Jones, Spicer & Claire Budge, 1998). Although there is correlational evidence that pets may help individuals facing significant life stressors (Mcconnell, Brown, Shoda, Stayton & Martin, 2011), little is known about the well-being benefits of pets for people in everyday life. It has been suggested that some of these inconsistencies may be resolved if account is taken of the actual attachment and characteristics of the pet-owner relationship, rather than just the ownership (Case, 1987; Friedmann, 1990; Poresky & Hendrix, 1990).

The concept of attachment was originally used to conceptualise child-parent relationships (e.g., Ainsworth, Blehar, Waters, & Wall, 1978). However, several characteristics of human-pet bonds lead people to use pets as a source of love, acceptance, and emotional support, which can help to restore emotional equanimity during times of need (Zilcha-Mano, Mikulincer, & Shaver, 2011). This valuable emotional support is likely to lead to the development of a strong attachment between an individual and their pet. Attachment theory (Bowlby, 1973, 1980, 1982) is an empirically supported framework for explaining how close relationships contribute to mental health, emotional regulation, and psychological growth. Pet attachment researchers argue that relationships with companion animals are regarded by many owners to be as emotionally close as human attachment (Meehan,
Massavelli, & Pachana, 2017; Krause-Parello, 2012). According to attachment theory, the characteristics that distinguish attachments from mere affiliations include seeking proximity and resisting separation, using the attachment figure as a secure base from which to explore, and using the attachment figure as a safe haven in times of threat (Beck & Madresh, 2008). These tendencies could be observed from both an owner and their pet, as pets are likely to portray attachment behaviours in addition to the owner, possibly creating a stronger bond between the two. Levinson (1969) claimed that a companion animal is a natural object of attachment, being readily available and affectionate. Pets provide owners with companionship, unconditional love and support, and physical and mental health benefits (Meehan et al., 2017). The usefulness of attachment theory is not limited to primary relationships between caregiver and child (Beck & Madresh, 2008). Concepts and measures from attachment theory offer a robust and well-documented theoretical framework for research on the bond between humans and pets (Beck & Madresh, 2008). Attachment theory is therefore a suitable model to adopt to explain the socio-emotional and behavioural features of human-animal attachment.

Beck and Madresh (2008) sought to extend the application of the standard model of attachment to investigate relationships between pets and their owners. The researchers compared participants’ reports of their relationships with pets and relationships with romantic partners in a web-based study of 192 pet owners. The Relationship Questionnaire (Bartholomew & Horowitz, 1991), consisting of four descriptions of relationship styles, was adapted by changing the word “others” to “pets”. The researchers found that scales developed for exploring human relationships provide meaningful results when applied to relationships with pets. The results from the study revealed that pet owners experience more security in relationships with their pets than with their romantic partners. This may be due to the unconditional love and friendship that pet owners share with their animal companions. The element of security perceived by these individuals may also reflect the quality of their attachment with their pets. However, the study only examined relationship characteristics relevant to attachment insecurity. For that reason, the fact that pet relationships were rated as more secure does not necessarily mean that they are
fundamentally more satisfying or closer than relationships between human partners. Instead, the pet relationships reported in the study may reflect a general tendency of people to tolerate more insecurity in human relationships than with pets (Beck & Madresh, 2008). For example, pets offer relationships that are relatively uncomplicated and rewarding, whereas relationships with humans are often more demanding. It seems that pets are not merely substitutes for human interaction, but fill a specific role by providing a consistent, and relatively controllable, sense of relationship security (Beck & Madresh, 2008).

Companionship has been identified as the primary human benefit gained from living with an animal (Antonacopoulos & Pychyl, 2010). Companion animals can be the source of unconditional love, support, comfort, stability, and security (Sharkin & Bahrick, 1990). It may be that it is the degree to which a person feels the aspects of companionship and attachment with their pet that determines the impact on their well-being. This has been confirmed through correlational studies using standardised scales and through neuroscientific studies. Research on the effects of pet attachment on mental health has linked it to happiness (Ory & Goldberg, 1983) and lower levels of depression (Garrity, Stallones, Marx & Johnson, 1989). There has also been evidence of an association between attachment to pets and coronary survival time (Friedmann, Katcher, Lynch & Thomas, 1980), as well as fewer ill-health symptoms and lower drug use (Akiyama, Holtzman & Britz, 1986-87). Previous neuroscientific findings confirm components of pet attachment by demonstrating links between underlying attachment processes and brain activity in both animals and humans (Sable, 2012). For example, just looking at, stroking, or talking to a dog can trigger oxytocin, a hormone which elicits feelings of pleasure and eases stress (Sable, 2012).

Another way in which relationships with pets can encourage well-being is through exercise, such as walking a dog. Dog walking may differ from other reasons for walking (i.e., recreation, transportation) because it involves the relationship with a companion animal (Curl, Bibbo, & Johnson, 2017). A meta-analysis found that dog owners engaged in significantly more physical activity than non-owners (Christian, Westgarth, Bauman, Richards, Rhodes, Evenson, & Thorpe, 2013). For those who own a dog, responsibility to
provide exercise for their dog is often the underlying motivation for dog walking (Christian et al., 2013). Secondary reasons for dog walking included strengthening their relationship with their dog, perception of the dog’s enjoyment of walking, and providing a means to socialise (Degeling & Rock, 2012; Hoester, Mayer, Sallis, Pizzi, Talley, Pihan, & Butler, 2011; Richards, McDonough, Edwards, Lyle, & Troped, 2013). These findings demonstrate the numerous benefits that can result from owning a pet. From these results, it is revealed that dog owners are experiencing valuable attachment and companionship, providing compassionate care, and maintaining positive social interactions, all of which are associated with well-being (Smolkovic et al., 2012; Mcconnell et al., 2011; Rotondi, Stanca, & Tomasuolo, 2017). The analysis also found that level of attachment with people’s dogs was positively associated with the amount of time spent dog walking (Oka & Shibata, 2012). This positive association may further explain the relationship between human-animal attachment and psychological and physiological well-being. Engaging with nature through dog walking may improve well-being beyond benefits that physical activity alone would provide, due to the additional element of emotional attachment.

A meaningful relationship with animals has also been shown to help humans connect with nature (Melson, 2001). Previous studies have reported that animals, and the natural environment in general, have restorative, calming and focusing effects (Kaplan, 1995; Ulrich, 1983). Several authors have proposed that, at an early point in our history, humans were closer, both physically and psychologically, to the natural world than they are now (Vining, 2003; Eliade, 1964; Sheldrake, 1999). Franklin (1999) suggests that we have become alienated from the natural world, and animals in their natural state, as a result of science, industrialisation, and urbanisation. As new technologies are being developed, humans are becoming less dependent on nature for survival (Vining, 2003). It may be fair to assume that an attachment to animals would facilitate this lost connection to nature. By seeking a relationship with nature – often through interactions with other animals – it may be possible to connect with what is often a spiritual sense of wonder at being part of a vast interconnected network (Vining, 2003).
Myers & Saunders (2002) suggest that caring for an animal can lead to caring for the natural world. It has been stated by Myers & Saunders (2002, p. 154) that “if you care about another – whether human or animal – you are likely to care about what that individual needs and the conditions that affect his or her well-being. This developmentally probable ‘natural care’ about animals may lead to a broader environmental caring”. However, Myers & Saunders (2002) note that determining the psychological basis for the extension of care about an individual to care about the species, and hence the natural world, remains a challenge. In addition, while the relationships between connectedness with nature, well-being and pro-environmental attitudes have been demonstrated (Lumber, Richardson & Sheffield, 2017), the specific routes to connectedness are still unclear. The relationship between humans, animals, and connection to nature is therefore certainly worth exploring.

Connection to nature could be defined as the extent to which people feel affectively attached to the natural community (Mayer & Frantz, 2004). There is growing realisation that a connected relationship with nature leads to well-being benefits, and that having a positive relationship with nature is an important part of well-being (Lumber, Richardson & Sheffield, 2017). Nisbet, Zelenski & Murphy (2009) reported that connection to nature predicts behaviours such as membership in environmental organisations and preference for green products, as well as love for animals. Contact with nature and animals in childhood also influences people’s attitudes toward nature and conservation, and their interests in these topics (Longbottom & Slaughter, 2016; Charles & Wheeler, 2012). Lumber, Richardson & Sheffield (2017) conducted three studies in order to investigate the possible pathways to nature connectedness. The results revealed that humanistic and moralistic indicators were consistent predictors of nature connectedness. Lumber, Richardson & Sheffield (2017) also found that engaging with nature through emotion, contact, beauty, compassion and meaning play a role in facilitating nature connectedness. Research into nature connectedness has also placed an emphasis on direct experiences with nature for an affective or cognitive relationship to form (Lumber, Richardson & Sheffield, 2017). This concept could be related to the idea that direct experiences, exposure and attachment to pets may result in an increased connection with nature.
Nature connectedness is subjective (Zhang, Howell & Iyer, 2014), formed through individual experiences (Zelenski & Nisbet, 2012), making the development of a theoretical account of the pathways potentially problematic. However, a suitable starting point exists within the Biophilia Hypothesis (Kellert, 1993). Biophilia has been suggested to function as the innate biological driver for the desire to connect with nature, for the benefits of well-being that nature provides (Lumber, Richardson & Sheffield, 2017). Many authors (Cobb, 1997; Pyle, 1993; Pyle, 2003; Sobel, 1993) argue that childhood bonding with natural places and organisms is the essential key to arousing biophilia and concomitant caring behaviour. Biophilia as a child could also work as a route to becoming attached to animals in later life. Humanity has been shaped both cognitively and emotionally over time through interactions with nature (Gullone, 2000), leading to the development of a need and desire to affiliate with life or lifelike processes known as the Biophilia Hypothesis (Lumber, Richardson & Sheffield, 2017).

An emotional attachment to nature may also form through the anthropomorphising of nature (Lumber, Richardson & Sheffield, 2017). As natural elements are humanised, feelings of similarity and empathy are formed (Tam, Lee & Chao, 2013). This emotional attachment to nature is also crucial to the formation of connectedness and feeling part of the natural world (Mayer & Frantz, 2004). Similar to the humanistic value of Biophilia; an attachment to nature born out of love for life, often through an attachment to animals (Kahn, 1997). Such emotional attachments to nature may also be influenced by childhood exposure to nature (Hinds & Sparks, 2008). While childhood experiences are important, anthropomorphism can still act as a route to connectedness to nature in adult populations (Tam, Lee & Chao, 2013), further indicating that childhood exposure is but one possible route to nature connectedness (Lumber, Richardson & Sheffield, 2017). If exposure to nature as a child acts as a route to an emotional attachment to nature as an adult, then it may be possible to predict attachment to pets by considering childhood pet ownership. This idea could be extended to predict nature connectedness in individuals that had a childhood pet.

The beneficial effects of pet ownership on children’s and adults’ well-being, social skills, and physical and mental health have been well established (Longbottom & Slaughter, 2016;
Friedmann & Son, 2009). Although these benefits have been popular research topics, research exploring whether childhood pet ownership influences the acquisition of environmental and biological knowledge and concepts is in its infancy. In a study involving 1,544 participants aged 6 to 15 years, Prokop, Prokop and Tunnicliffe (2008) found that children who raised pets had significantly more detailed knowledge of the internal structure of a variety of animal species compared to children who did not own a pet. These findings, which show that childhood pets can assist the development of attraction and curiosity in the natural world, may support the idea that childhood pet ownership would influence a connection to nature. However, research on this concept is both extremely limited and almost non-existent. Those studying nature connectedness have not considered early experiences with companion animals, or even attachment to pets as a predictor of connection to nature. Accordingly, measuring pet ownership as a predictor of connection to nature is important for empirical progress to be made on these issues. Understanding the factors that facilitate increased connection to nature will inform and compliment moves to increase nature connection for both nature’s and human’s well-being (Lumber, Richardson & Sheffield, 2017). Therefore, it would be beneficial to create further understanding of the relationship between pet ownership and attachment, connection to nature, and in turn, well-being.

There is a noticeable gap in the research regarding pet ownership and attachment as a predictor of connection to nature. While the psychological and physiological benefits of owning a pet and engaging with nature have been shown to be successful, no previous research has addressed the possibility of a connection between the two. The route to overall well-being may indeed be a bridge between these factors. Therefore, this study is interested in exploring the relationship between attachment to pets, childhood exposure to pets, connection to nature, and mental well-being. Although there is still much to be learned, in carrying out the present study, it may be possible to establish the specific routes to nature connectedness, and in turn, well-being. It is predicted that pet ownership, childhood exposure to pets and attachment to pets will facilitate a connection to nature, and that a positive interaction will be observed between these variables. It is therefore
assumed that an individual who owned a childhood pet, who owns a pet currently and has a strong attachment with their pet, is more likely to have a powerful relationship with nature. It is also predicted that a positive correlation between connection to nature and well-being will be found.
METHOD

PARTICIPANTS

The sample for this study included a total of 114 participants. An opportunity sampling method was used to recruit participants through a number of means. These included email distributions, social media (Facebook), oral communication and personal contacts, and the survey website SurveyCircle. SurveyCircle is accessed by users internationally, and so the current survey was open to responses from across the world. Many of the participants were university students, with the remaining sample including individuals from a range of different professions. As this study is interested in also exploring the experiences of non-pet owners, the only exclusion criteria for the current study was that participants must be over the age of 18.

DESIGN

This study used a between-subjects correlational design, which allows for the testing of the expected relationships between and among the variables. The variables for this study comprise two categorical variables: type of pet ownership (pet owner – lives with pet/pet lives elsewhere, non-pet owner – wants a pet/does not want a pet) and childhood pet exposure (had a childhood pet/did not have a childhood pet), and three continuous variables: pet attachment, connection to nature, and well-being.

MATERIALS

Human-animal bond researchers mainly use subjective questionnaires and interviews when exploring owners’ attachments to their pets (Meehan et al., 2012; Anderson, 2007). Human-animal attachment has also been measured using objective methods, such as measuring psychological parameters including oxytocin, cortisol, and blood pressure (Julius, Beetz,
Kotrschal, Turner, & Uvnas-Moberg, 2013). The current study used self-report methods as these are effective in measuring individuals’ thoughts and perceptions, and are practical and convenient. For the present study, the researcher designed statements in the form of a questionnaire to measure childhood pet exposure (had a childhood pet/did not have a childhood pet) and type of pet ownership (pet owner – lives with pet/pet lives elsewhere, non-pet owner – wants a pet/does not want a pet; see Appendix 1). Previously designed scales will be adopted to measure attachment to pets, nature connectedness, and mental well-being. Each of the scales used in this study have been previously tested for reliability and validity and were therefore selected to guide the data collection for the study.

The Lexington Attachment to Pets Scale (LAPS; Johnson, Garrity & Stallones, 1992) is perhaps the most widely used questionnaire to assess emotional attachment to pets (Douglas, 2005). The scale has excellent psychometric properties (Cronbach’s alpha: 0.94; Johnson et al., 1992), and is therefore a reliable instrument for the assessment of pet attachment. The LAPS has three factors: general attachment, people substitution, and animal rights, all of which effectively capture the important concepts of animal attachment. The scale contains 23 statements, including items such as “My pet means more to me than any of my friends” and “Quite often I confide in my pet”. All items are scored on a 4-point Likert scale (1 = strongly disagree; 4 = strongly agree). The LAPS was employed to assess pet attachment among the participants.

The Connectedness to Nature Scale (CNS; Mayer & Frantz, 2004) was used to measure participants’ connection to nature. The CNS is a valid and reliable measure of connection to nature. The authors’ analysis of the scale achieved an alpha score of 0.84, and previous studies have enabled the verification of the internal positive consistency of the scale within a psychometrically acceptable range (Navarro, Olivos, & Fleury-Bahi, 2017). The CNS is a 14-item scale, consisting of items such as “I often feel a kinship with animals and plants” and “I think of the natural world as a community to which I belong”. Participants responded on a 5-point scale (1 = strongly disagree; 5 = strongly agree).
Finally, the Warwick-Edinburgh Mental Well-being Scale (WEMWBS; Tennant, Hiller, Fishwick, Platt, Joseph, Weich, Parkinso, Secker, & Stuart-Brown, 2007) was adopted to measure well-being amongst the participants. The WEMWBS has robust psychometric properties, and shows high levels of internal consistency and reliability (Tennant et al., 2007). Various studies have shown that the WEMWBS is normally distributed in the general population and hence can be used in parametric analyses (Warwick Medical School, 2018). The WEMWBS comprises 14 positively worded items, including statements such as “I’ve been feeling optimistic about the future” and “I’ve been feeling relaxed”. Participants scored their feelings on a 5-point scale, where 1 = none of the time and 5 = all of the time. Information sheets and consent forms were also designed by the researcher (see Appendix 2), and these were presented to the participants prior to completing the study.

**PROCEDURE**

Participants were asked to answer a series of surveys online, made available using Qualtrics software. The questionnaires were able to be completed individually and on any computer, and all data were collected anonymously. The participants were informed about the study and were given the right to withdraw prior to completing the questionnaires.

**METHOD OF ANALYSIS**

In predicting the role of pet ownership, pet attachment and childhood pet exposure in connection to nature, and ultimately well-being, the data collected during this study was analysed through multiple tests using IBM SPSS Statistics. Once data collection was complete, the raw data from Qualtrics was exported into SPSS for analysis. Firstly, the negatively worded items from two of the three scale variables (i.e., pet attachment and nature connectedness) were reverse scored. Then, each of the scales were transformed into new variables by calculating the mean for each participant. A new variable was also created to represent attachment levels (high/low) using a median split. In addition to this,
the variable for type of pet ownership (pet owner – lives with pet/pet lives elsewhere, non-pet owner – wants a pet/does not want a pet) was transformed into a new variable to indicate that 1 = owner and 2 = non-owner.

The first test that was carried out was a three-way ANOVA as the independent variables were nominal data with two or more groups (i.e., pet ownership type – lives with/lives elsewhere/wants a pet/does not want a pet; high attachment/low attachment; childhood pet/no childhood pet), and the dependent variable was ratio data (i.e., nature connectedness). Another reason a three-way ANOVA was selected is because this statistical test allows the researcher to investigate any interactions between and among the variables. Independent t-tests were then carried out in order to assess any differences between the groups (pet owner/non-owner; high attachment/low attachment; childhood pet/no childhood pet) regarding connection to nature. Independent t-tests were used as the groups were nominal data and connection to nature was ratio data. Pearson’s correlation was then used to test for linear relationships between the continuous ratio data (pet attachment and nature connectedness; pet attachment and well-being; nature connectedness and well-being).

Figure 1 shows a model displaying the interactions between the categorical independent variables (pet ownership type, pet attachment, childhood pet) and the continuous dependent variables (nature connectedness and well-being).
RESULTS

The outcome of the participant collection revealed that survey responses were drawn from a range of countries. 114 participants took place in the present study, and 23 (20%) were from outside of the United Kingdom. Qualtrics software allowed the researcher to establish that 9.6% of respondents were living in Europe (excluding the UK), 8.7% were from North America, and 1.7% were from Asia.

Table 1 shows the number of participants that had a childhood pet. From this table, it can be seen that 101 (88.6%) of the participants had a childhood pet and 13 (11.4%) did not.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Childhood pet ownership</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td>Yes</td>
<td>101</td>
<td>88.6</td>
<td>88.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>13</td>
<td>11.4</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>114</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 2 shows the participants categorised by type of pet ownership. Of the 114 participants that took part in the study, 76 (66.7%) were pet owners and 38 (33.3%) were not pet owners.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Type of pet ownership</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I am a pet owner and my pet lives with me.</td>
<td>55</td>
<td>48.2</td>
<td>48.2</td>
<td>48.2</td>
</tr>
<tr>
<td></td>
<td>I am a pet owner and my pet lives elsewhere.</td>
<td>21</td>
<td>18.4</td>
<td>18.4</td>
<td>66.7</td>
</tr>
<tr>
<td></td>
<td>I do not own a pet but I would really like one.</td>
<td>26</td>
<td>22.8</td>
<td>22.8</td>
<td>89.5</td>
</tr>
<tr>
<td></td>
<td>I do not own a pet and I wouldn't want one.</td>
<td>12</td>
<td>10.5</td>
<td>10.5</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>114</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

A three-way ANOVA was conducted to determine the main effects of pet ownership type, attachment to pets, and childhood pets on connection to nature. All the assumptions for
the analysis were considered. There were three outliers assessed in the data as a value greater than 3 box-lengths from the edge of the box. Connection to nature scores were normally distributed ($p > .05$), as assessed by Shapiro-Wilk’s test of normality. There was homogeneity of variances, as assessed by Levene’s test for equality of variances, $p = .414$. However, the ANOVA revealed that there was not a statistically significant three-way interaction between type of pet ownership, pet attachment, and childhood pets for connection to nature, $F(1,100) = .967$, $p = .328$ (see Table 3).

Tests of Between-Subjects Effects

<table>
<thead>
<tr>
<th>Dependent Variable: Mean nature connectedness score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 3</td>
</tr>
<tr>
<td>Type III Sum of Squares</td>
</tr>
<tr>
<td>Corrected Model</td>
</tr>
<tr>
<td>Intercept</td>
</tr>
<tr>
<td>Ownership Type</td>
</tr>
<tr>
<td>Childhood Pet</td>
</tr>
<tr>
<td>Attachment</td>
</tr>
<tr>
<td>Ownership Type * Childhood Pet</td>
</tr>
<tr>
<td>Ownership Type * Attachment</td>
</tr>
<tr>
<td>Childhood Pet * Attachment</td>
</tr>
<tr>
<td>Ownership Type * Childhood Pet * Attachment</td>
</tr>
<tr>
<td>Error</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Corrected Total</td>
</tr>
</tbody>
</table>

a. R Squared = .161 (Adjusted R Squared = .052)

Three independent t-tests were then carried out to determine whether any significant differences existed between the groups (pet owners and non-owners; high attachment and low attachment; childhood pet and no childhood pet) for connection to nature. As expected, the nature connectedness scores were higher for pet owners ($M = 3.51$, $SD = 0.58$) compared to non-owners ($M = 3.15$, $SD = 0.68$), a statistically significant difference, $t(112) = 2.940$, $p = .004$. Childhood pet owners ($M = 3.37$, $SD = 0.62$) and non-childhood pet owners ($M = 3.45$, $SD = 0.64$) showed no significant difference in mean nature connectedness score, $t(111) = -.420$, $p = .675$. However, individuals with high attachment to
pets scored higher on nature connectedness scores ($M = 3.25$, $SD = 0.69$) compared to those with low pet attachment scores ($M = 3.51$, $SD = 0.54$). The difference was significant, $t(112) = -2.167$, $p = .032$.

A Pearson’s correlation was undertaken to establish whether there was a relationship between attachment to pets, connection to nature, and well-being. There was a small positive correlation between attachment to pets and connection to nature scores (see Table 4), $r(112) = .279$, $p < .005$. There was also a moderate positive correlation between nature connectedness and well-being $r(112) = .398$, $p < .005$ (see Table 5). Surprisingly, there was no correlation between the scores for attachment to pets and connection to nature, $r(112) = .006$, $p > 0.05$ (see Table 6).

### Table 4  Pearson’s correlation

<table>
<thead>
<tr>
<th>Mean pet attachment score</th>
<th>Mean nature connectedness score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Correlation</td>
<td>$1$</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>$=.279^{**}$</td>
</tr>
<tr>
<td>$N$</td>
<td>$114$</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
</tr>
<tr>
<td></td>
<td>$=.003$</td>
</tr>
<tr>
<td></td>
<td>$N$</td>
</tr>
<tr>
<td></td>
<td>$114$</td>
</tr>
</tbody>
</table>

### Table 5  Pearson’s correlation

<table>
<thead>
<tr>
<th>Mean well-being score</th>
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### Table 6  Pearson’s correlation

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<table>
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The purpose of this study was to explore the role of an emotional attachment to pets on nature connectedness, whilst accounting for childhood pets and different types of pet ownership. This study also aimed to investigate the possible routes to mental well-being by considering pet ownership, pet attachment, and nature connectedness. It was predicted that pet ownership, childhood pet ownership, and pet attachment would collectively and individually have a positive impact on nature connectedness. It was also predicted that mental well-being would be greater in individuals with a high attachment to pets, and individuals with a strong connection to nature.

Individuals participating in the investigation completed an online survey which was designed to measure nature connectedness, mental well-being, and various aspects of pet ownership. In order to analyse possible interactions or main effects, the first test that was carried out was a three-way ANOVA. However, the results from the test revealed no significant interactions or main effects between or among the variables. These results imply that the effect of each of the independent variables (i.e., pet ownership, pet attachment, and childhood pet ownership) on the dependent variable (nature connectedness) did not depend on the level of the other independent variables. These findings represent a challenge to the predictions made.

Three t-tests were used to determine if any group differences existed in mean nature connectedness scores between pet owners and non-owners, high and low attachment to pets, and childhood pet owners and non-childhood pet owners. As expected, nature connectedness scores were significantly higher in pet owners when compared to non-pet owners. A significant difference was also found between the groups of high attachment and low attachment. These findings indicate that pet owners and people with high attachment to their pets are significantly more likely to have a strong connection to nature, compared to those who do not have a pet, or an emotional attachment to a pet. The results gained from these tests coincide with the predictions proposed for this study, in that, pet owners with...
high attachment to their pets are more likely to have a connected and meaningful relationship with nature. However, a portion of the hypothesis; childhood pet ownership, did not reflect the results from the analysis. There was no evidence that supports the idea that owning a pet as a child influences an individual to engage with the natural world as an adult.

Pearson’s correlations were administered to assess the relationship between nature connectedness and well-being, in addition to pet attachment and well-being. Connection to nature was shown to have a significant relationship with well-being, supporting one of the predictions made for this study. This confirms that an affective connection to nature is likely to result in increased well-being benefits; benefits that are greater than if a disconnected relationship with nature is formed. The unexpected outcome of a significantly non-existent relationship between pet attachment and well-being was also found, results that are inconsistent with the hypothesis.

The present study has produced findings that share both similarities and differences with past research relating to the human-animal bond. Despite the much-researched belief that an emotional attachment to pets contributes to improved well-being, the results from the current study suggest otherwise. It was observed that there was no significant relationship between pet attachment and well-being. However, this finding is in line with some previous investigations. Researchers have suggested that there is little or no relationship between companion animals and psychological well-being (Wells & Rodi, 2000), while others have even reported negative mental outcomes associated with keeping pets (Peacock, Chur-Hansen, & Winefield, 2012). Examples of these include higher reports of depression (Antonacopoulos & Pychyl, 2012) and increased levels of emotional distress (Garrity et al., 1989). Likewise, Keil (1995) reported a positive correlation between attachment to pets and loneliness.

It has been suggested that it may be the responsibility of caring for a pet that causes negative mental health outcomes such as loneliness and boredom (Peacock et al., 2012). On the other hand, there have been many studies to acknowledge reduced loneliness as a
benefit gained from living with a pet. Researchers investigating older adults found that pet owners with strong attachment reported less loneliness than non-pet owners (Branson, Boss, Cron, & Turner, 2017), and other researchers have found that attachment to pets may substantially lessen emotional distress (Garrity et al., 1989). These mixed findings may be the result of a process in which an increase in loneliness causes an increase in attachment to pets due to the development of a comfort-seeking relationship between an owner and their pet. This could perhaps pose an issue when assessing these relationships empirically.

Similar to much of the previous research, the current study did not find a relationship between attachment to pets and well-being. It would be beneficial to increase knowledge on the benefits of pet ownership and attachment, however, many of the studies researching this topic have been characterised by methodological weaknesses. Few controlled studies have been conducted to provide empirical support for positive physical or mental health outcomes gained from interacting with animals (Peacock et al., 2012). Past research has been mostly descriptive and conducted with specific populations of convenience such as older adults (Barker & Wolen, 2008). Much of the previous research has also focused on companion animal ownership, rather than the attachment. However, research has indicated that it is not the ownership aspect that is associated with well-being but the degree of attachment to that pet (Garrity et al., 1989; Peacock et al., 2012). It is therefore necessary to increase knowledge in this area, while accounting for generalisability and actual attachment; strong experimental studies are required to direct the research.

This study was motivated by the concept that pet ownership and attachment to pets would play a role in a connected relationship with nature. It has been previously stated by Clayton and Myers (2015) that pet-keeping expresses a desire to connect with nature. However, literature exploring the bridge between attachment to pets and connection to nature is extremely limited. Therefore, the objective of the current study was to address the lack of evidence on this topic. The results from the study were congruent with the predictions made; nature connectedness was significantly higher in pet owners and individuals with high pet attachment, compared to non-pet owners and individuals with low pet attachment. Connection to nature was also shown to be positively correlated with attachment to pets.
These findings provide evidence for the idea that an emotional attachment with animals is a measurable pathway to nature connectedness. This relationship could be also understood by considering the Biophilia hypothesis. The Biophilia hypothesis predicts that people’s psychological health is strongly associated with their relationship to nature (Howell, Dopko, Passmore, & Buro, 2011). This theory asserts that humans possess a genetically based propensity to attend to, and be attracted by, other living organisms (Kahn, 1997). It could be argued that people with a meaningful connection to nature would most likely own a pet, or at least be drawn to other living creatures, an idea that was explored during this study. Biophilia is also often used to understand children’s desires to be immersed in nature. Children are expected to show a particular interest in living non-humans, especially other animals (Melson et al., 1992).

Childhood pet ownership was a concept that was of interest to the present study. It was hypothesised that individuals who owned a pet as a child were more likely to have a connected relationship with nature as an adult. Myers and Saunders (2002) suggest a developmentally potent route in which children think of animals as individuals and care about them on the same level, possibly leading to an affiliation with the natural world. This investigation was considered because it has been previously shown that children more attached to their pets expressed greater empathy towards peers (Melson, Peet, & Sparks, 1992), and others who reported more ‘intimate talks’ with pets also reported more empathy (Melson, 2003). It could therefore be argued that greater empathy for living things as a child would influence a connection to nature as an adult. However, the results from the current study do not support this idea. There were no differences in nature connectedness between childhood pet owners and individuals who did not have a childhood pet. This could simply mean that Biophilia may have been observable equally across the participants.

The results from the current study reflect much of the previous research on the association between nature and well-being. A strong relationship was established between nature connectedness and well-being, an expected outcome of the study. These findings are supported by empirical evidence. There is almost no literature opposing the belief that a connected relationship with nature improves well-being. For example, Mayer and Frantz
demonstrated a significant correlation between nature connectedness and life satisfaction. Others have reported that outdoor natural environments lead to significantly higher levels of vitality, a state that involves a sense of enthusiasm, aliveness, and energy (Ryan, Weinstein, Bernstein, Brown, Mistretta, & Gagné, 2010). It would make sense that the addition of an animal companion would enhance any experience with nature. It would be interesting to assess whether pets act as a positive source of nature for people during times that nature is not accessible. For example, pets may be seen as substitutes for nature in areas that are highly urbanised, allowing people to connect with the natural world, even when nature is out of reach.

The current study was able to determine an association between a connected relationship with nature and emotional attachment with pets, a finding that is in line with the literature. Attachment to pets was measured using the LAPS for this study, however the results from the well-being scale were lower than anticipated when tested with attachment. The choice of previously designed scales must be considered when unexpected results are produced. However, the LAPS was developed by using two attachment scales from previous studies (the Pet Attachment Scale; Templer, Salter, Dickey, Baldwin, & Veleber, 1981; the Pet Attachment Inventory; Wilson, Netting, & New, 1987) plus items from the Companion Animal Bonding Scale (Poresky, Hendrix, Mosier, & Samuelson, 1987). The LAPS is therefore a reliable tool in measuring attachment to pets. It could be possible that the WEMWBS did not capture well-being very effectively for the participants in this study. On the other hand, the use of self-report measures can produce both meaningful and damaging results to the research. Self-report measures come with the assumption that the participant is being truthful and honest in answering the questions. Social desirability must be considered when using self-report measures, as some participants will answer the questions according to how they think they should be answering. Controlled environments should also be considered with future research, as these can produce more absolute results. However, the ability to observe meaningful attachment interactions in their own natural environment is also undoubtedly invaluable. Maybe a combination of quantitative and qualitative measures would provide the most substantial outcomes.
Another limitation of the current study is possibly the use of the CNS. Some of the items on the scale may have been perceived by the participants as too philosophical or abstract; such as “Like a tree can be part of a forest, I feel embedded within the broader natural world” and “When I think of my life, I imagine myself to be a part of a larger cylindrical process of living”. These statements may have been difficult to relate to for some, even those with a strong sense of nature connectedness. This could be improved by designing a new scale, by combining the CNS with an additional scale that measures connection to nature, such as the Nature Relatedness Scale (NRS; Nisbet, Zelenski, & Murphy, 2009). The NRS comprises more relatable, and less profound, statements such as “I enjoy being outdoors, even in unpleasant weather” and “My relationship to nature is an important part of who I am”. These items are more likely to be accepted by a wider range of people, however, it is important to note that the CNS is a frequently used instrument for measuring nature connectedness, and so for that reason it was selected to be applied in the study.

A further limitation of the study is that the scores for pet attachment may have been skewed by the questionnaire design. People who identified as non-pet owners were still required to answer the LAPS, possibly creating a problem within the data. This could be accounted for in future research by creating a skip function in the survey to ensure that non-pet owners are not being measured on pet attachment. Nonetheless, there is the possibility that people who are not owners at present are still able to fill out the pet survey adequately. This is because the LAPS requires the individual to rate the statements based on the animal they have lived with the longest, meaning the individual may have lost a beloved pet in the past, or had a long-term childhood pet, and so would still be providing valid scores on attachment.

When considering pet attachment and nature in future research, it may also be interesting to establish any demographic similarities or differences between the participants. There may be large contrasts in the samples for different age groups, culture, and gender. There may also be observable differences in attachment characteristics when comparing the ownerships of a variety of pets. These factors could be assessed by administering a simple
demographics questionnaire at the start of any future studies. The current study was able to establish the various locations of each of the survey responses, however the assessment of any culture differences was not possible due to the study design. It may be that keeping different animals as pets produce different attachment styles, well-being, and nature connectedness. For example, dog owners engage with nature through dog walking (Oka & Shibata, 2012). Therefore, levels of nature connectedness could be higher in dog owners compared to, for example, cat owners. This is an interesting concept, and so future research should acknowledge these differences in order to gain a further understanding of nature connectedness and well-being in pet owners.

The present study was guided by the assumption that attachment to pets and childhood pet ownership would result in an increased connection to nature, and as a result, well-being. It was also expected that there would be a strong association found between attachment to pets and well-being. Results from the study demonstrated that pet owners with high attachment scored significantly higher on nature connectedness compared to non-pet owners with low attachment. These findings strengthen the idea that animals act as a mediating role between humans and nature. In addition to the idea that pet attachment influences a connection with nature, it could also be true that pet ownership may be but one possible outcome of nature connectedness.

A connection to nature was also found to be positively related to well-being, a finding that is highly consistent with the literature. However, the primary prediction for this study, that a strong attachment to pets will influence a connection to nature, was not met with evidence. Although not necessarily contradictory to the majority of the literature on this subject, it is not clear why there was no positive association between pet attachment and well-being. Future studies need to address the mixed findings surrounding this topic. As humans are becoming progressively distant from the natural world from which they derived, it is becoming more important that people recognise nature as an essential part of well-being; for the good of the mind, as well as the earth.
Although these findings do not provide an understanding for the underlying mechanisms for nature connectedness, they may simply provide just enough information to gain a little more understanding of the possible routes to nature connectedness, and also well-being. As a connection to nature is strongly related to physical and psychological flourishment, it is important to extend the research on these affiliations with natural settings; for humankind to understand the well-being benefits that are readily available to them. In conclusion, future studies should aim to expand on the relationship between humans and the natural world. It would be worthwhile to further explore the many advantages that can arise from living with a pet and having a connected relationship with nature. These findings could be applied to a large number of people for which the overall goal is well-being.
REFERENCES


APPENDICES

Appendix 1: Pet ownership statements designed by the researcher

Appendix 2: Information sheet and consent form

Title of Project: Well-being: Investigating the Relationship between Attachment to Pets and Connection to Nature

Participant information sheet
The study

This study is interested in exploring the relationship between childhood exposure to pets, attachment to pets, connection to nature, and mental well-being.

What would happen if you agree to participate?

Participants will be asked to answer a series of surveys online, which can be completed individually and on any computer. This should take approximately 10 minutes.

Exclusion criteria

The only exclusion criteria are that you must be over the age of 18.

Potential Risk

Mild emotional distress due to memories of previous pets may occur, however this is the only anticipated risk to the participant that may occur.

Potential benefits

Participants recruited through the Participant Panel will receive course credits for completing this study.

Withdrawal, anonymity and confidentiality

Data from this study will be anonymous as there will be no names associated with each participant. Data will be confidential, and will only be seen by the supervisor and the researcher. Participants will be given the right to withdraw prior to completing the questionnaires. It is not possible to withdraw data after submission of the questionnaire as all data are anonymous.

If you have any questions about the study, please contact:

Dr Debbie Clayton (DClayton@cardiffmet.ac.uk)
PARTICIPANT CONSENT FORM

Reference Number:

Participant name or Study ID Number:

Title of Project: Well-being: Investigating the Relationship between Attachment to Pets and Connection to Nature

Name of Researcher: [redacted]

Participant to complete this section: Please initial each box.

1. I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

2. I understand that my participation is voluntary and that I am free to withdraw at any time before leaving the experiment, without giving any reason.

3. I agree to take part in the above study.
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