Pet loss: The Influence of Anthropomorphism, Paedomorphism and Perceived Empathy on Pet Attachment and Grief

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Abstract

There are different influential factors that contribute to grief after the loss of a pet. It is well known and documented in research that pet attachment serves as dominant predictor of grief towards a pet. This study, however, sets out to identify other contributing factors; these include paedomorphism, anthropomorphism and perceived empathy as prediction mechanisms of grief. A sample of 96 students at the University of Cape Town completed an online questionnaire, which consists of an Anthropomorphic Tendency Scale, the Lexington Attachment to Pet Scale, Pet Bereavement Measure, Perceived Empathy Measure and Paedomorphic Scale. A hierarchical multiple regression analysis revealed that all dependent variables; perceived empathy, paedomorphism, anthropomorphic tendencies (dog) and attachment significantly (p<.001) predict the independent variable; grief. The adjusted R^2 indicates that the model explains 49% of the total variance. A second analysis revealed that anthropomorphism, paedomorphism and perceived empathy significantly (p<.001) predict attachment, the proposed model explains 54% of the variance. The results of the first analysis was consistent with the literature on grief pertaining to pet loss, the results indicate an accurate claim that attachment does predict grief to a higher degree than other factors, but the study confirms that anthropomorphic tendencies and perceived empathy influences grief scores. The study has also found that paedomorphic traits; the retention of juvenile traits or cuteness, does not increase, but decrease grief scores. In other words, people do not grieve all dogs but rather grieve the dogs to which they have been attached. Further analysis has revealed that anthropomorphism, paedomorphism and perceived empathy significantly predict attachment, and the standardized beta scores suggest that these variables predict attachment better than they predict grief.

Keywords: pet grief, pet attachment, anthropomorphism, paedomorphism, perceived empathy.

"Such short little lives our pets have to spend with us, and they spend most of it waiting for us to come home each day. It is amazing how much love and laughter they bring into our lives and even how much closer we become with each other because of them."

> — *John Grogan,* Marley and Me

Background

All pet owners will agree that pets are an intricate part of their lives. They form part of our daily routine; we devote and invest in our pets, spending time and money to love and feed them. In return, pets act as a source of security, social support (Archer, 1997; Field, Orsini, Gavish & Packman, 2009), comfort and unconditional love and acceptance (Deiscoll, Macdonald & O'Brien, 2009; Field et al., 2009; Rockett & Carr, 2013; Wrobel & Dye, 2003; Zilcha-Mano, Mikulincer & Shaver, 2011). This in turn leads to a feeling of mindfulness (Compton, 2005) which ensures a better subjective well-being, and have proved to increase health (Biswas-Diener & Diener, 2006; Ferrall, Aubry & Coulombe, 2004). People refer to pets as 'family', 'friends' and even 'children' (Field et al., 2009; Mariti, Ricci, Carlon, Moore, Sighhieri & Gazzano, 2013), which points to an almost human-like attachment. Humans and pets form bonds that seem to measure up to human relationship statuses (Field et al., 2009). Human-to-dog attachments have been documented to serve particular interests that satisfy the need for security, protection and a source of reciprocal attachment and dependence (Noonan, 1998; Voith, 1985). It is clear that a multitude of psychological processes are involved when it comes to attachment and grief towards pets/dogs.

Studies have found a significant correlation between pet attachment and grief (Archer & Winchester, 1994). Other studies have found that age, the relationship length and final arrangements was not a predictor of grief (Gosse & Barnes, 1994). The difference in life span, and a high degree of attachment between humans and pets, provides the ideal setting of potential grief. Ample research indicates that attachment significantly predicts grief, but there is a shortage of reasons that explain why people attach to their dogs, which do not relate to the egotistical ideals of attachment, such as protection and security (Archer & Winchester, 1994; Field et al., 2009; Goose & Barnes, 1994; Noonan, 1998; Voith, 1985). The literature theorises

around attachment, but very few aspects outside of these egotistical ideals have been researched.

Attachment theory

Studies have shown that humans exhibit attachment to their pets as strong as to other humans (Archer, 1997; Mariti et al., 2013; Zilcha-Mano, Mikulincer & Shaver, 2012). Some studies suggest that Bowlbey's (1975) 'Attachment theory' can be used as framework to establish the degree to which people attach to their pets and vice versa (Rockett & Carr, 2013; Zilcha-Mano et al., 2011). Research by Zilcha-Mano et al. (2012) suggests that attachment of this magnitude is due to the attachment figure (dog) serving the human's need for safety and security. Mariti et al. (2013) found that there is a mutual attachment, but interestingly found no significant difference in the attachment styles towards handlers or owners. Therefore proximity and closeness are not determinants of dog-to-human attachment (Mariti et al., 2013).

To understand this attachment and bond it is crucial to discuss how dogs came to be domesticated, how their evolution has ensured that humans adore their physical appearance and behaviour and consequently, allocate human type behaviours and feelings to them.

Evolutionary domestication

The domestication of dogs has been established to have taken place around 12000 years ago; there is no tangible reason for this domestication or how it occurred. Some have speculated that wolves, *Canis lupus,* were self-domesticated. Due to the cultivating societies who kept livestock, allowed wolves to venture towards these easy meals. The resulting integrated habitats, led to wolves tolerating human presence (Waller, Peirce, Caeiro, Scheider, Burrows, McCune & Kaminski, 2013. Others speculate that humans actively domesticated wolves for their own materialistic and economic gain. Morey (2014) suggests that humans separated wolves from the wild, and bred them in accordance to desirable traits. Discroll et al. (2009) suggest the purpose behind the domestication of dogs was because dogs served as guardians of the crops and livestock and assisted in hunting. It might be a combination of all these speculations, although literature has no definitive answer to this question. For the purpose of this research, it is important to illustrate the evolutionary changes in dogs after domestication.

Social Darwinist perspective

According to the Darwin's Theory of natural selection and survival of the fittest, pet relationships serve no purpose (Claeys, 2014). A social Darwinist theory will argue that there are no fitness benefits to caring so tenderly for pets, because they serve no economic purpose (Archer, 1997). This anomalous relationship exemplifies a form of social parasitism, where unlike other animals like cows, sheep and chickens, pets serve no materialistic or economic benefits (Archer, 1997; Serpell, 2003). Archer (1997) argues that pets manipulate human behaviour in order to benefit in a one-way capacity, where humans invest actively into their relationships with pets, whilst pets contribute in no practical way. Archer (1997) does refer to the perceived benefits like companionship and love as non-beneficial to survival. But, on the contrary, studies have shown that pets hold major benefits when it comes to well-being and health (Friedmann & Thomas, 1995; Garrity & Stallones, 1998). Beck and Meyers (1996) reported decreased levels of blood pressure and faster recovery times after surgeries in pet owners. The authors also mention that pets teach children about moral and appropriate interactional actions. Friedmann and Thomas (1995) identify animals as a stress reliever, so much so, that psychologist use animals to treat anxiety and depression, they note that pets contribute particularly to psychological health, because they promote feelings of safety and security, and provide people with companionship and comfort.

The following sections indentify possible factors that influence pet attachment and refers specifically to perceived empathy, anthropomorphism and paedomorphism; these factors are predominantly absent from pet loss studies. Perceived empathy and anthropomorphism are internal processes, while paedomorphism acts as an external influence on the internal processes.

Perceived empathy

Perceived empathy refers to how well a person feels understood (Hodges, Kiel, Kramer, Veach, Villanueva, 2010). According to Hodges' et al. (2010) findings empathetic accuracy does not influence the perception of empathy, but the prospect of understanding reinforces the illusion of being understood (Hodges et al., 2010). Perceived empathy can thus, be paralleled in relation to dog owners. Owners refer to their dogs as understanding, when they're feeling happy the dog is happy, and when they're feeling sad the dog is sad. Actual emotion is not at the centre of perceived

empathy, the fact that the dog acts in accordance to the human's 'energy' (Millan, 2007), does mean that the dog understands the motivations and situations behind the emotion. A study by Cohen, Schulz, Weiss and Waldinger (2012) found that the degree to which both men and women perceive empathic effort, strongly predict relationship satisfaction in romantic settings. Owners do, however, believe that their dog understands and empathizes with their feelings, and thus, perceived empathy could be an important aspect to consider in relation to attachment and grief towards one's pet.

Anthropomorphism

Other factors may clarify why humans attach to and grieve for pets. Anthropomorphic tendencies are "the act of attributing human mental states, like thoughts, feelings, motivations and beliefs to nonhuman objects", and it's been suggested to be influential to the attachment of humans to animals (Serpell, 2003, p. 35). Epley, Waytz, Akalis & Cacioppo (2008) found that there are two motivational determinants that increase anthropomorphic tendencies; the need for social inclusion and connection and the need for control and understanding. These motivations relate to what Archer (1997) referred to as perceived benefits. This phenomenon is also highly dependent on social desirability (Chin, Yordon, Clark, Ballion, Dolezal, Shumaker & Finkelstein, 2005).

According to Chin et al. (2005) people are less likely to report situations of negative anthropomorphic behaviour, like slapping a non-human, as this would be highly frowned upon by society. Serpell (2003) suggests that 'animals have become symbolically diminished' (p. 93) by the application of anthropomorphism towards pets, but also notes that anthropomorphism is beneficial to the human race. Humans are afforded an alternative source of social and emotional support (Serpell, 2003). Anthropomorphism does not stand alone in this endeavour, as paedomorphic features and behaviour in dogs makes anthropomorphism more probable (Epley et al., 2008). Paedomorphic behaviour is particularly implicated is the tendency to anthropomorphise.

Paedomorphism

Anthropomorphism is a cognitive affective perception to dogs' behaviour and thoughts, and paedomorphism is an evolutionary physical change that includes the

retardation of the normal growth and development pattern found in wolves (Goodwin, Bradshaw & Wickens, 1997). Morey (2014) indicates that paedomorphism affects both physical and behavioural development. Physically dogs seem more juvenile in comparison to wolves; being generally smaller in size with shorter snouts, big eyes, wider heads and a rising foreheads. Behaviourally dogs embody juvenile behaviours such as excitability and play. Morey (2014) also notes that it has been hypothesized that these features were bred, due to the desirability of these traits, whilst others have argued that these traits developed as a result of the changes in environment and food sources since domestication. Waller et al. (2013) identifies a distinctive change in dog's facial construction, noting that associations with cuteness are largely dependent on large eyes in contrast to the rest of the face.

A study found that the adoptability of dogs that exhibit paedomorphic features (specifically facial features) was a significant indicator for adoption success. Adoption was highly dependent on the dog's ability to raise its eyebrows, amongst other things, and that tail wagging and proximity was not deterministic (Waller et al., 2013). This suggests that humans do not necessarily respond consciously to paedomorphism, but rather to the perceived vulnerability of the dog (Waller et al., 2013). Humans perceive dogs as babies, due to the degree of paedomorphic characteristics and consequently, in constant need of affection and care.

Summary

The effect of perceived empathy, paedomorphism and anthropomorphism speaks to the degree of anticipated attachment to and grief for one's pet. The evolutionary changes and manipulations of dogs, such as paedomorphic characteristics and psychological processes, such as anthropomorphic tendencies (Ancher, 1997; Epley et al., 2008; Goodwin et al., 1997; Serpell, 2003; Waller et al., 2013), may influence how humans attach to their dogs, and serve as an extension in predicting grief. Research has shown that the role of attachment and bonds between dogs and humans predict grief to a high degree (Field et al., 2009; Rockett & Carr, 2013; Zilcha-Mano et al., 2011). There are, however, no indication in the literature that accounts for the degree to which humans perceive empathy and how this may impact attachment style.

Aims and Hypotheses

Based on the above, this study aimed to identify which of these aspects that may contribute to attachment and grief pertaining to pets. The following aspects had been identified as possible influential aspects to the attachment and grieving process; perceived empathy, paedomorphism and anthropomorphism. This study aimed to explain the significance of these mediators to attachment and the potential grief process. The idea that humans can attach to animals with bonds as strong as human to human relationships, suggests that severe cases of grief in pet loss are a real possibility (Horowitz, Siegel, Holen, Bonanno, Milbrath, & Stinson, 1997).

The research question is as follows: What does anthropomorphism, paedomorphism and perceived empathy have on attachment and grief regarding pet loss? The aim of this research is to establish whether these aspects influence attachment and grief, and if so to what extent. This study aimed to produce a model through which grief and attachment in dog owners can be predicted. The identified aspects include both internal and external determinants; the internal aspects consist of anthropomorphic tendencies, attachment and perceived empathy by the pet owner, these are aspects that have little to nothing to do with the actual dog, but rather internal psychological processes within the human. For interest sake, an external aspect was included in the study, which would indicate to what degree the traits and characteristics of the dog contribute to attachment and grief. The external determinant is paedomorphic characteristics

The following hypotheses have been tested:

1. Attachment, anthropomorphism, paedomorphism and perceived empathy significantly predict grief.
   a. Attachment explains the largest amount of variance pertaining to grief.

2. Anthropomorphism, paedomorphism and perceived empathy predict attachment better than grief.
   a. Anthropomorphism explains a large amount of variance concerning attachment levels.
   b. Anthropomorphism, paedomorphism and perceived empathy are better predictors of attachment, in comparison to grief.

3. Paedomorphism significantly predicts grief and attachment.
   a. Paedomorphism does not explain a large amount of variance.

Method

Design

The study was quantitative in nature (Maree, 2007) and consisted of an online questionnaire created in GoogleDocs. The questionnaire consisted of five sections, and all questions are measured on Likert scales, ranging from 1; Strongly Disagree – 5; Strongly Agree. Section One was an Anthropomorphic Tendencies Scale (ATS) ($α=.62)$ designed by Chin et al. (2005), which consists of 30 items measured on a 5 point Likert scale. The scores suggested the propensity to which the dog owners attribute human emotions, thoughts and feelings to their dogs. Other non-human or non-pet items are included, in order to evaluate the difference in anthropomorphic tendencies toward other objects, like cars and computers, compared to pet items. This establishes whether the owner has a tendency to anthropomorphize all objects or more so their pets. Section Two consisted of the Lexington Attachment to Pet Scale ($α=.76$), which included 20 items measured on a 5 point Likert scale (Anderson, 2007). Section Three measured the grief experienced by the owner after the loss of his/her dog. Archer & Winchester (1994) employ a Pet Bereavement Measure ($α=.84$), which consisted of 20 items, measured on a 5 point Likert scale. Measuring perceived empathy was problematic, as there were no tests designed to measure how people approximate their dog's empathetic attempts. Consequently, Section Four included an adjusted version of the Jefferson Scale of Patient Perceptions of Physician Empathy (JSPPPE), which measures patients' awareness of their physician's empathy. Adjustments were made to the questionnaire, doctor or physician was replaced by dog, which allowed for measurement of the owners' perceived empathy. The scale includes 4 items, measured on a 5 point Likert scale (Hojat, Gonnella, Nasca, Mangione, Vergare, & Magee, 2002). In Section Five, participants were expected to assess the juvenile or paedomorphic behaviour of their dogs. The measure consisted of 12 items on a 5 point Likert scale (1 – no juvenile behaviour; 5 – extremely juvenile). Due to the lack of a questionnaire, a questionnaire was compiled, using Morey's (1994): *The early evolution of the domestic dog*, as a framework.

The final questionnaire consisted of 82 items; see Appendix 1. Upon completion of the questionnaire participants had the choice to submit or email a photograph of their deceased dog. The questionnaire included statements altered in

the negative direction, to avoid participants answering without reading the statements. These scores were reversed when the data was analysed.

Participants

The study sampled 96 participants, which consisted of students currently studying at the University of Cape Town. Convenience and purposive sampling techniques were employed, to ensure a good sample representation. Requirements for participation stipulated that participants must have lost a dog to death, in the last two years and must study at the University of Cape Town. A Priori sample size estimation was calculated a for multiple regression analyses using G*Power (Version 3.1). Assuming $\alpha = .05$, a directional hypotheses, 4 predictors, with a target power of .95 and a medium effect size (Cohen's $f2 = .15$), a minimum of 89 participants were suggested for the regression. The sampling process included a recruitment message which was posted on the SRPP site, containing the specific participant requirements and the further information and procedures pertaining to the study. One SRP point was allocated to the participants as remuneration.

Procedure

The research protocol was approved by the University of Cape Town's Department of Psychology Ethical Committee. An informed consent form (Annexure 2) was presented to the participants, and upon consideration, the informed consent was signed to indicate that they are willing to participate in the study. The first question of the online questionnaire stated the following; "I hereby declare that I have read the informed consent form, which was included in the email containing this link. Upon answering this question, I declare that I understand and agree with the procedure of the study. I also declare that my participation in the study is voluntary".

Sharkin and Knox (2003) note that grief by pet owners should not be underestimated, as the bonds and attachments in these relationships are as strong as human relationships. Therefore, the participants were encouraged to contact either the researchers to withdraw from the study or contact the Student Wellness Centre, if they experienced any distress caused by the study. Upon completion of the questionnaire, participants were given the choice to send a picture of their deceased dog; the pictures would give the researcher some indication on the paedomorphic

appearance of the collective sample. Due to the unstandardized nature of the pictures and the lack of a scientific analysis guide for paedomorphic traits, the pictures could not be analysed in order to establish the exact level of paedomorphic characteristics.

Data Analysis

Hypothesis 1: A multiple regression analysis was conducted on the data in order to test the hypothesis. The hypothesis tested the significance of all the independent variables; attachment, anthropomorphism, paedomorphism and perceived empathy and the dependent variable; grief. Upon the establishment of the model's significance ($p<.001$), the standardized beta of attachment was assessed to confirm its high predictability.

Hypothesis 2: A second analysis was conducted to determine whether anthropomorphism, paedomorphism and perceived empathy significantly predicted attachment. The standardized betas was assessed and compared to the previous model's standardized betas, to establish whether anthropomorphism, paedomorphism and perceived empathy had stronger prediction ability concerning attachment, rather than grief.

Hypothesis 3: Based on the above models, the standardized betas of paedomorphism were analysed, to assess the effect on attachment and grief. Both showed small effects in relation to the other variables.

Picture analysis: The pictures supplied by the participants were divided into small, medium and large breeds, to get a sense of equal representation of paedomorphic characteristics. Small breed dogs seem more juvenile than large breed dogs and thus, size was used to assess the paedomorphic possibility of each dog (Irion, Schaffer, Famula, Eggleston, Hughes and Pedersen, 2003). A large number (50%) of the dogs were large breeds, which included German Shepherds, Golden Retrievers, Rottweilers, Eskimo Dogs and Wolf Dogs. Medium breeds included Labrador Retrievers, Boxers, Spaniels, Bull Terriers, Shepherd Sheep Dogs and Border Collies, but the representation was poor (15.8%). Small breeds were relatively well represented in the sample (33%) and included Yorkshire Terriers, Poodles, Dachshund dogs, Papillon Dogs, Boston Terriers, Jack Russell Terriers and Chihuahuas (Irion et al., 2003) (see Appendix 4).

Results

Data was analysed using the statistical software package SPSS (Version 22). An Alpha of .05 was used for all inferential significance. All scores were standardized to ensure accurate and interpretable results. Cronbach's alphas was calculated to determine the internal consistency of the each of the five questionnaires; Lexington Attachment Scale (α = .914), Anthropomorphic Tendency Scale (α = .763), Paedomorphic Scale (α = .647), Perceived Empathy Scale (α = .874) and The Pet Bereavement Measure (α = .920). Assumptions of normality, independence, multi-colinearity and homogeneity were tested for every model (see appendix), there was no indication of problematic normality, multicolinearity or homogeneity (see Appendix 3).

Descriptive statistics: Table 1 summarizes the means (M) and Standard Deviations (SD) of all the variables. Note in Table 1, there are two anthropomorphic scores, the first indicates the mean, standard deviation, maximum and minimum of the whole Anthropomorphic Tendency Scale, whilst the second, Anthropomorphism DOG represented the scores of all the items in the questionnaire section that relate to dogs (see Table 1). Comparing general anthropomorphic tendencies to dog specific anthropomorphic tendencies lead to an interesting sample specific finding. Participants in this particular sample were neutral concerning anthropomorphic tendencies (M= 3.0) in general. The range of scores varied between 1: Strongly disagree and 5: Strongly Agree, thus a mean of 3 indicated that the overall tendency to anthropomorphize non-human objects is neutral. The second mean was computed, pertaining in particular to the anthropomorphic tendencies towards dogs (M= 4.1), this suggests that the sample mostly agreed with the statements concerning anthropomorphizing dogs. This suggests that this particular sample was more inclined to anthropomorphize dogs. The second subscale was used - Anthropomorphism Dog; how anthropomorphic the humans are towards their dog - in the multiple regression analysis rather than their overall anthropomorphic tendencies score.

Table 1

Statistics

		Anthro-pomorphism	Anthropomor-phismDog	Attachment	Grief	Perceived Emapthy	Paedomorphism
N	Valid	96	96	96	96	96	96
	Missing	0	0	0	0	0	0
Mean		3.01185	4.09301	3.93281	3.07357	3.43490	3.38333
Std. Deviation		.360722	.468689	.627142	.828114	1.013881	.506519
Minimum		2.000	3.000	2.050	1.250	1.000	1.867
Maximum		3.933	4.929	4.950	4.875	5.000	4.800

Analysis 1:

Model: A multiple regression analysis was conducted to determine if the independent variables; attachment to pet, anthropomorphism, paedomorphism and perceived empathy, predicted the dependent variable; grief. A hierarchical regression analysis was conducted using the Blockwise enter method. The variables were entered in the following sequence; in Step 1, perceived empathy was added into the model, followed by paedomorphism as Step 2. In Step 3, anthropomorphism was added to the model. In Step 4 attachment was added to the model. The model set forward by the analysis found that attachment, anthropomorphic tendencies (dog), paedomorphism and perceived empathy significantly predict grief (see table 2), $F(4, 91) = 23.86$, $p<.001$, $R^2 = .51$, and that the model explains 49% (Adjusted $R^2 = .49$) of the total variance.

Table 2

Model Summary[e]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.471[a]	.222	.214	.88670182	.222	26.828	1	94	.000	
2	.510[b]	.260	.244	.86965152	.038	4.722	1	93	.032	
3	.592[c]	.351	.329	.81884979	.091	12.897	1	92	.001	
4	.715[d]	.512	.490	.71383515	.161	30.060	1	91	.000	1.854

a. Predictors: Grief, Perceived Empathy

b. Predictors: Grief, Perceived Empathy, Paedomorphism

c. Predictors: Grief, Perceived Empathy, Paedomorphism, Anthropomorphism

d. Predictors: Grief, Perceived Emapthy, Paedomorphism, Anthropomorphism, Attachment

e. Dependent Variable: Grief

Bivariate correlations: A Pearson product-moment correlation coefficient was computed to assess the relationship between each dependent variable and the independent variable. The bivariate correlations (see Table 3) suggested that attachment and anthropomorphic tendencies (r=.71 and r=.56, respectively) had strong correlations with the independent variable, grief. The bivariate correlation for perceived empathy and paedomorphism (r=.47 and r=.29) suggest a medium and low correlation, respectively (Field, 2005).

Table 3

Coefficients

	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
4 Grief	.073		.000	1.000					
Perceived Empathy	.096	.042	.438	.663	.471	.046	.032	.582	1.718
Paedomorphism	.084	-.039	-.460	.646	.294	-.048	-.034	.765	1.307
Anthropomorphism Dog	.109	.138	1.270	.207	.562	.132	.093	.452	2.211
Attachment	.110	.603	5.483	.000	.706	.498	.402	.444	2.254

Parameter estimates: The beta values (see Table 3) suggested, firstly, that for every one standard deviation of attachment, grief increases by β = .60 units, the semipartial correlation suggeseds that 16% unique variance can be explained by attachment, even when controlling for the other variables. Attachment is the most predictive variable. Secondly, for every one standard deviation of anthropomorphic tendency, grief increases by β = .14 units. Thirdly, Paedomorphism has a negative relationship to grief, suggesting that for every one standard deviation of paedomorphic traits, grief declines by β = .04 units.

In conclusion, the multiple regression analysis model proves to be useful in predicting (or understanding) grief. The overall R^2 of the model was .51 (or .49, once adjusted for degrees of freedom), and the overall model was statistically significant (F [4, 91] = 23.86; p < .001). Examination of the Standardized Beta coefficients suggested that attachment was the strongest predictor, in conjunction with the bivariate correlation (r=.71), the semipartial correlation suggested attachment shares more unique variance (16%) with the dependent variable, grief, than the other variables.

Analysis 2:

Model: A second multiple regression was conducted to determine the predictability of the independent variables; anthropomorphism, paedomorphism and perceived empathy on the dependent variable; attachment. A hierarchical regression analysis was conducted using the enter method. The variables were entered in the following sequence; in Step 1, perceived empathy was added to the model, followed by paedomorphism as Step 2. In Step 3 anthropomorphism was added to the model. The model set forward by the analysis (see Table 4) suggest that the model containing anthropomorphic tendencies (DOG), paedomorphism and perceived empathy is statistically significant, F (1, 94) = 38, 45, p<.001, R^2 = .56 and found that the model explains 54% (Adjusted R^2 = .54) of the total variance.

Table 4

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.592[a]	.351	.344	.81012114	.351	50.752	1	94	.000	
2	.670[b]	.448	.437	.75062350	.098	16.492	1	93	.000	
3	.746[c]	.556	.542	.67687237	.108	22.370	1	92	.000	1.855

a. Predictors: Grief, Perceived Empathy

b. Predictors: Grief, Perceived Empathy, Paedomorphism

c. Predictors: Grief, Perceived Empathy, Paedomorphism, Anthropomorphism

d. Dependent Variable: Attachment

Bivariate correlations: A Pearson product-moment correlation coefficient was computed to assess the relationship between each dependent variable and the independent variable. The bivariate correlations (see Table 5) suggests that anthropomorphic tendencies towards dogs and perceived empathy (r=.6.9 and r=.59) has the strongest correlations with the independent variable; attachment. The correlation between paedomorphism (r=.44) and attachment, had a moderate correlation.

Table 5

Coefficients

Model	Standardized Coefficients		Correlations		
	Std. Error	Beta	Zero-order	Partial	Part
3 Grief	.069				
Perceived Empathy	.086	.295	.592	.338	.240
Paedomorphism	.077	.181	.437	.238	.163
Anthrpomophic Dog	.093	.438	.689	.442	.328

Parameter estimates: The Standardized Beta values (see Table 5) suggests, firstly, that for every one standard deviation of anthropomorphic tendencies (DOG), attachment increases by β = .44 units, the part correlations suggests that 10% unique variance can be explained by anthropomorphic tendencies (DOG), even when controlling for the other variables. Anthropomorphic tendencies are the strongest predictor of attachment. Secondly, for every one standard deviation of perceived empathy, attachment increases by β = .30 units and thirdly, for every one standard deviation of paedomorphism, attachment increases by β = .18 units. This finding suggests that paedomorphism predicts attachment better than grief, because in relation to grief, paedomorphism had a negative relationship, whereas, in relation to attachment, paedomorphism had a positive relationship

In conclusion, the multiple regression analysis model was successful in predicting (or understanding) attachment. The overall R^2 of the model was .55 (or .54, once adjusted for degrees of freedom), and the overall model is statistically significant (F [3, 92] = 38.45; $p < .001$). Closer examination of the size of the Standardized Beta coefficient suggests that anthropomorphism was the strongest predictor, in conjunction with the bivariate correlation (r=.69), the semipartial correlation suggested that anthropomorphism shares more unique variance (11%) with the dependent variable, attachment, than the other variables.

Discussion

The results of the first analysis was consistent with the literature on grief pertaining to pet loss, the results indicate an accurate claim that attachment does predict grief to a higher degree (Archer, 2003; Archer & Winchester, 1994; Rynearson, 1987; Field et al., 2009). The study also found that paedomorphic traits; the retention of juvenile characteristics or cuteness (Goodwin et al., 1997; Morey, 2014; Waller et al., 2013), do not increase grief scores. This suggests that the physical appearance of the dog does not increase grief towards pets. This led the study to a second analysis, being that people do not grieve all dogs but rather grieve the dogs to which they have been attached. What predicts this attachment becomes important and thus, the intent of the second analysis.

The second analysis set out to determine whether anthropomorphic tendencies towards dogs, paedomorphic traits of the particular dog and perceived empathy, predict attachment. The study found that anthropomorphic tendencies,

paedomorphic traits and perceived empathy significantly predict attachment, and that the model explains 54% of the variance. The results propose that anthropomorphic tendencies towards dogs influence attachment more so than perceived empathy and paedomorphism.

Comparing the Standardized Beta values from the first and second analysis, suggested that perceived empathy, paedomorphism and anthropomorphism predicted attachment better than grief. Firstly, the parameter estimates indicated that grief increased by β= .04 units for every one standard deviation of perceived empathy, whereas attachment increased by β=.30 units for every one standard deviation of perceived empathy. Secondly, grief decreases by β= -.04 for every one standard deviation of paedomorphism, whereas attachment increases by β= .18 units for every one standard deviation of paedomorphism. The fact that paedomorphism has a positive relation to attachment, where there was a negative relationship towards grief, suggests that owners grieve only if there is an attachment with the particular dog. Thirdly, the parameter estimates indicated that grief increases by β= .14 units for every one standard deviation of anthropomorphism, but attachment increases by β= .44 for every one standard deviation of anthropomorphism.

Paedomorphism, however, influences attachment considerably less in comparison to anthropomorphic tendencies (DOG) and perceived empathy, once again suggesting that the appearance, size or cuteness of the dog does not influence attachment or grief. The large amount (50%) of large breed dogs indicated that attachment and grief is not dependent on paedomorphic traits. In other words, owners will grieve for their dog, whether they appear paedomorphic or not.   Waller et al. (2013) notes that humans perceive dogs as babies, due to the degree of paedomorphic characteristics and consequently they are in constant need of affection and care, but the results of this study suggests that paedomorphic traits is not an important predictor for attachment of grief.

The descriptive statistics suggested that the sample tend to anthropomorphize pets/dog (M= 4.1) more than other non-human objects (M= 3.0). Anthropomorphism; the ascription of human emotions, like thoughts, feelings, motivations and beliefs to dogs, have been suggested to be influential to the attachment of humans to animals (Serpell, 2003). The results of this study reaffirm this finding. The current study suggests that anthropomorphic tendencies towards dogs, predicts attachment (β

=.44) better than grief (*β* =.14). This suggests that the attribution of human emotion strengthens attachment and bonds more so than the severity of grief. Epley et al. (2008) indicates that there are two motivational determinants that encourage increased anthropomorphic tendencies; the need for social inclusion and connection and the need for control and understanding, and both of these determinants are imperative to forming bonds and attachments rather than motivation for grieving.

Overall, the findings suggest that both the attachment and grieving processes are largely dependent internal factors, such as anthropomorphic tendencies and perceived empathy. The findings clearly demonstrated that paedomorphic traits or how cute the dog appears, does not significantly increase attachment or grief. These processes heavily depend on internal psychological processes towards the pet/dog.

Limitations and Future Research

The first limitation encountered in this study was the availability of reliable and tested questionnaires. Although a very reliable questionnaire for anthropomorphic tendencies, grief and attachment was found, paedomorphism and perceived empathy proved to be a problem. Future research might find it beneficial to enquire about such questionnaires from the academics in the field; some of the authors were e-mailed, but due to time restrictions, late and non-responses, changes could not be made to the methods.

Relating to this, and the second limitation, was that no scientific guidelines on analysing paedomorphic traits were available. Efforts were made to approach PhD students from the University of Cape Town's Zoology Department, who pointed out the lack of such guidelines. Due to time restraints and unstandardized pictures, the researcher was unable to use alternative methods to establish the paedomorphic traits. Future research, when confronted with the same problem, should consider a cuteness analysis. Assessing this, from a subjective point of view, might be more relevant because people do not analyse paedomorphic traits, but rather cuteness. I would suggest if the researcher has unstandardized pictures, as in the case of this study, that the pictures be given to external observers and requested to position all the pictures on a scale from not cute to extremely cute.

The third limitation was the relatively small sample group; this, however, could have been solved if the there was more time. Fourthly, the study was limited in both

its accuracy and generalization ability, due to students not currently living with their pets. Future research should aim to replicate this study with older participants.

Future studies and replications of this, or a similar study should aim to either include, or change the methods to a qualitative method; a few of the participants were eager to tell their stories of what their pets meant to them, and how hard the grieving process was for them.

Conclusion

Pets form part of our daily routine; we devote ourselves to spending time with them and spend our money to love and feed them. In return, pets present as a source of security, social support (Archer, 1997; Field et al., 2009), comfort and unconditional love and acceptance (Driscoll et al., 2009; Field et al., 2009; Rockett &Carr, 2013; Wrobel & Dye, 2003; Zilcha-Mano et al., 2012). Owners refer to their pets as 'family', 'friends' and even 'children' (Field et al., 2009; Maritiet al., 2013), and this resembles an almost human to human-like attachment. Consequently, humans form bonds that measure up to human relationship statuses (Field et al., 2009). Ample research indicated that attachment significantly predicts grief and this study's findings are consistent with the literature on grief pertaining to pet loss. The results indicate an accurate claim that attachment does predict grief to a higher degree (Archer, 2003; Archer & Winchester, 1994; Rynearson, 1987; Fieldet al., 2009), but there is a shortage of reasons that explain why people attach to their dogs, that do not relate to the egotistical ideals of attachment, such as protection and security (Ancher & Winchester, 1994; Field et al., 2009; Goose & Barnes, 1994; Noonan, 1998; Voith, 1985). This study found that other psychological processes are influential to attachment and grief. The internal and external aspects of attachment and grief yielded an important finding. Attachment and grief are influenced most by internal psychological processes, such as perceived empathy and anthropomorphic tendencies.

Perceived empathy refers to the illusion of understanding; people perceive their dogs to have (Hodges et al., 2010). Owners refer to their dogs as accepting and empathetic. For instance, owners note that when they are feeling happy the dog is happy, and when they are feeling sad the dog is sad. This notion is a fallacy, because actual emotion is not at the centre of perceived empathy, but rather the dog acting in accordance to its humans' 'energy' (Millan, 2007). This perceived

empathetic attempt has been documented to increase relationship satisfaction, and consequently, increase attachment and grief (Hodges et al., 2010). In other words, a dog does not understand the motivations and situations behind the emotion. Owners do, however, believe in that their dog understands and empathizes with their feelings. This study has shown that perceived empathy increases attachment towards one's pet.

Anthropomorphic tendencies, "the act of attributing human mental states, like thoughts, feelings, motivations and beliefs to non-human objects" has proven to be influential to the attachment between humans and animals (Serpell, 2003, p. 35). The findings suggested that the sample tend to anthropomorphize pets/dog (M= 4.1) more so than other non-human objects (M= 3.0). The study found that anthropomorphic tendencies towards dogs, predicts attachment better than it predicts grief. This finding was in concurrence with Serpell's (2003) statement; that the attribution of human emotions strengthens attachment between pet and owner. Anthropomorphism is a cognitive affective perception towards dogs' behaviour and thoughts, and thus an internal contributor towards attachment. In other words, anthropomorphic tendencies and perceived empathy are aspects of human nature, which in actual fact has nothing to do with the dog/pet. For interest sake, an external aspect was included in the study, which would indicate to what degree the traits and characteristics of the dog, contribute to attachment and grief.

Paedomorphism is an evolutionary physical change that includes the retardation of the normal growth and development pattern found in wolves (Goodwin et al., 1997). Physically, dogs seem more juvenile in comparison to wolves; being generally smaller in size with shorter snouts, bigger eyes, wider heads and rising foreheads. Behaviourally dogs embody juvenile behaviours such as excitability and play (Morey, 2014). This study found that paedomorphism had a positive relationship with attachment, where in relation to grief, paedomorphism had a negative relationship. This suggests that owners grieve for their pets because of the attachment, rather than the behaviour or appearance of the dog. Paedomorphism contributes a small amount of variance towards attachment, signifying that the appearance, size or cuteness of the dog does not have a large amount of influence on attachment or grief. The high percentage of representation of large breed dogs, suggests that attachment and grief is not dependent on paedomorphic traits. In other words, owners will grieve for their dog, whether they appear paedomorphic or not.

Overall, the findings showed that both the attachment and grieving processes are largely dependent internal aspects, such as anthropomorphic tendencies and perceived empathy. The findings clearly demonstrated that paedomorphic traits or cuteness does not significantly increase attachment or grief, suggesting that these processes heavily depend on internal psychological processes towards the pet/dog.

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Appendix 1

Pet Loss: Questionnaire

The Influence of Anthropomorphism, Paedomorphism and Perceived Empathy on Pet Attachment and Grief

Leonie van Niekerk
Supervisor: Pedro Wolf

The following questionnaire consists of five sections.

- *Section 1: Anthropomorphic Tendency scale*
- *Section 2: Lexington Attachment to Pet Scale*
- *Section 3 - Pet Bereavement Scale*
- *Section 4: Perceived Empathy Scale*
- *Section 5: Behavioural Characteristics Scale*

Questionnaire

Please read each statement carefully. Indicate the strength of your agreement with each statement by circling the appropriate number on the 5-point scale. There are no right or wrong answers to any of these statements. I am interested in your honest reactions and opinions.

Section 1 - Anthropomorphic Tendencies Scale (ATS)

1. My DOG had a spirit or life-force like people do.
   Strongly disagree   1   2   3   4   5   Strongly agree

2. I talk to my COMPUTER, and believe that it understands me.
   Strongly disagree   1   2   3   4   5   Strongly agree

3. I use to yell at my PET if he/she did something I did not like.
   Strongly disagree   1   2   3   4   5   Strongly agree

4. I apologised to my PET for accidentally hurting him/her.
   Strongly disagree   1   2   3   4   5   Strongly agree

5. My COMPUTER has a spirit or life-force like people do.
   Strongly disagree   1   2   3   4   5   Strongly agree

6. If I am upset, my CAR does not know that I am upset.
   Strongly disagree   1   2   3   4   5   Strongly agree

7. My DOG could communicate with me.
   Strongly disagree   1   2   3   4   5   Strongly agree

8. I treated my PET like a human.
   Strongly disagree   1   2   3   4   5   Strongly agree

9. My CAR does not communicate with me.
   Strongly disagree   1   2   3   4   5   Strongly agree

10. My PET liked certain people more than others.

Strongly disagree   1   2   3   4   5   Strongly agree

11. I use to buy my PET presents.

Strongly disagree   1   2   3   4   5   Strongly agree

12. I mourned my PET like I will mourn another human.

Strongly disagree   1   2   3   4   5   Strongly agree

13. My PET use to do things that annoyed me.

Strongly disagree   1   2   3   4   5   Strongly agree

14. If my COMPUTER is stolen, I will feel abandoned.

Strongly disagree   1   2   3   4   5   Strongly agree

15. I will buy presents for my CAR.

Strongly disagree   1   2   3   4   5   Strongly agree

16. My DOG had a personality like any other person has a personality.

Strongly disagree   1   2   3   4   5   Strongly agree

17. If my PET were to get lost, I would have felt abandoned.

Strongly disagree   1   2   3   4   5   Strongly agree

18. My COMPUTER does not have intelligence like humans do.

Strongly disagree   1   2   3   4   5   Strongly agree

19. My CAR has a personality like any other person has a personality.

Strongly disagree   1   2   3   4   5   Strongly agree

20. I would praise my PET if he/she did something I liked.

Strongly disagree   1   2   3   4   5   Strongly agree

21. My PET had intelligence like humans do.

Strongly disagree   1   2   3   4   5   Strongly agree

22. I would appraise my COMPUTER if it does something I like.

Strongly disagree   1   2   3   4   5   Strongly agree

23. I will yell at my COMPUTER if it did something that I did not like.

Strongly disagree   1   2   3   4   5   Strongly agree

24. I apologise to my CAR for accidentally hitting it.

Strongly disagree   1   2   3   4   5   Strongly agree

25. I treat my CAR like a human.

Strongly disagree   1   2   3   4   5   Strongly agree

26. I talked to my PET, and believed that he/she could understand me.

Strongly disagree   1   2   3   4   5   Strongly agree

27. My COMPUTER likes certain people more than others.

Strongly disagree   1   2   3   4   5   Strongly agree

28. I will mourn my CAR like I will mourn another human.

Strongly disagree   1   2   3   4   5   Strongly agree

29. If I was upset, my DOG did not know I was upset.

Strongly disagree   1   2   3   4   5   Strongly agree

30. My COMPUTER does things that annoy me.

Strongly disagree   1   2   3   4   5   Strongly agree

Section 2 - Lexington Attachment to Pet Scale

1. My pet meant more to me than any of my friends.

    Strongly disagree   1   2   3   4   5   Strongly agree

2. Quite often I confided in my dog.

    Strongly disagree   1   2   3   4   5   Strongly agree

3. I believe my dog was my best friend.

    Strongly disagree   1   2   3   4   5   Strongly agree

4. Quite often, my feelings toward people were affected by the way they react to my pet.

    Strongly disagree   1   2   3   4   5   Strongly agree

5. I loved my dog because he/she was more loyal to me than most of the people in my life.

    Strongly disagree   1   2   3   4   5   Strongly agree

6. I enjoy showing other people pictures of my dog.

    Strongly disagree   1   2   3   4   5   Strongly agree

7. My dog was not just a pet.

    Strongly disagree   1   2   3   4   5   Strongly agree

8. I loved my dog because he/she never judged me.

    Strongly disagree   1   2   3   4   5   Strongly agree

9. My pet knew when I was feeling bad.

    Strongly disagree   1   2   3   4   5   Strongly agree

10. I often talk to other people about my deceased pet.

    Strongly disagree   1   2   3   4   5   Strongly agree

11. My dog understood me.

Strongly disagree   1   2   3   4   5   Strongly agree

12. I believe that loving my dog helps me to stay healthy.

Strongly disagree   1   2   3   4   5   Strongly agree

13. Pets deserve as much respect as humans do.

Strongly disagree   1   2   3   4   5   Strongly agree

14. My dog and I had a very close relationship.

Strongly disagree   1   2   3   4   5   Strongly agree

15. I would have done almost anything to take care of my dog.

Strongly disagree   1   2   3   4   5   Strongly agree

16. I played with my dog quite often.

Strongly disagree   1   2   3   4   5   Strongly agree

17. I considered my pet a great companion.

Strongly disagree   1   2   3   4   5   Strongly agree

18. It felt like my dog was part of my family.

Strongly disagree   1   2   3   4   5   Strongly agree

19. My dog contributed to my happiness.

Strongly disagree   1   2   3   4   5   Strongly agree

20. I considered my pet to be a friend.

Strongly disagree   1   2   3   4   5   Strongly agree

Section 3 - Pet bereavement measure

1. After the death of my pet I experienced a general loss of interest towards hobbies and pastimes.

   Strongly disagree   1   2   3   4   5   Strongly agree

2. I found it more difficult to fall asleep after my pet died.

   Strongly disagree   1   2   3   4   5   Strongly agree

3. I often had the feeling that things I did after my dog died were not worthwhile.

   Strongly disagree   1   2   3   4   5   Strongly agree

4. My appetite was affected after the loss of my pet.

   Strongly disagree   1   2   3   4   5   Strongly agree

5. I found I couldn't concentrate because I was thinking about my dog.

   Strongly disagree   1   2   3   4   5   Strongly agree

6. I felt restless after my pet died.

   Strongly disagree   1   2   3   4   5   Strongly agree

7. I felt anger or bitterness.

   Strongly disagree   1   2   3   4   5   Strongly agree

8. After the death of my dog I quarrelled more than usual with family and friends.

   Strongly disagree   1   2   3   4   5   Strongly agree

9. After the death of my pet I felt anxious.

   Strongly disagree   1   2   3   4   5   Strongly agree

10. When my pet died I felt that part of me had gone.

    Strongly disagree   1   2   3   4   5   Strongly agree

11. I return again and again to thoughts about my deceased pet.

Strongly disagree   1   2   3   4   5   Strongly agree

12. I found it difficult to come to terms with the death of my pet.

Strongly disagree   1   2   3   4   5   Strongly agree

13. When my pet died I felt I'd lost something important in my life.

Strongly disagree   1   2   3   4   5   Strongly agree

14. When the death occurred. It felt surreal.

Strongly disagree   1   2   3   4   5   Strongly agree

15. At times I have found myself wanting to be near places and objects that were closely associated with my lost pet.

Strongly disagree   1   2   3   4   5   Strongly agree

16. At certain times, the image of my pet seemed so strong that for a split second I believed that I had seen or heard him/her in their usual places.

Strongly disagree   1   2   3   4   5   Strongly agree

Section 4 - Perceived empathy

1. My pet can view things from my perspective.

Strongly disagree   1   2   3   4   5   Strongly agree

2. My pet seems concerned about me and my family.

Strongly disagree   1   2   3   4   5   Strongly agree

3. My pet understands my emotions, feelings and concerns.

Strongly disagree   1   2   3   4   5   Strongly agree

4. I have an understanding pet.

Strongly disagree   1   2   3   4   5   Strongly agree

Section 5 - Behavioural characteristics scale

1. My dog seeks attention all the time.

   Strongly disagree   1   2   3   4   5   Strongly agree

2. My dog used to grovel after doing something wrong.

   Strongly disagree   1   2   3   4   5   Strongly agree

3. My dog was never aggressive towards other people and dogs.

   Strongly disagree   1   2   3   4   5   Strongly agree

4. My dog used to whine for attention and love.

   Strongly disagree   1   2   3   4   5   Strongly agree

5. My dog braked profusely for no reason.

   Strongly disagree   1   2   3   4   5   Strongly agree

6. My dog was very submissive.

   Strongly disagree   1   2   3   4   5   Strongly agree

7. My dog was not territorial at all.

   Strongly disagree   1   2   3   4   5   Strongly agree

8. My dog wanted to play all day long.

   Strongly disagree   1   2   3   4   5   Strongly agree

9. My dog use to sleep on his/her back or other funny positions.

   Strongly disagree   1   2   3   4   5   Strongly agree

10. My dog use to generously lick my face.

    Strongly disagree   1   2   3   4   5   Strongly agree

11. My dog was extremely excitable.

    Strongly disagree   1   2   3   4   5   Strongly agree

12. My dog was considerate when I was busy or working.

Strongly disagree   1   2   3   4   5   Strongly agree

13. My dog would not have been able to survive in the wild.

Strongly disagree   1   2   3   4   5   Strongly agree

14. My dog's tail was always wagging.

Strongly disagree   1   2   3   4   5   Strongly agree

15. My dog was able to move his eyebrows.

Strongly disagree   1   2   3   4   5   Strongly agree

Thank you!!

Appendix 2

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Pet Loss: The Influential Factors of Grief

You are hereby invited to participate in a study; the study aims to determine grief in pet owners. I specifically refer to attachment, the characteristics of your pet and what the nature of your interactions and relationship was. The study aspires to propose a model through which grief in pet owners can be predicted.

Procedures

The study consists of a questionnaire, which includes five sections. You will be expected to fill out the questionnaire either online or a hard copy, depending on what is more convenient for you. It will also be expected that you bring along a copy of a picture of your deceased dog for further analysis. The picture of your dog will be quantitatively analysed by two Zoology PhD students, the reason for this is to position your pet on a scale according to their physical characteristics.

Should you decide you <u>do</u> want to take part in the study, the following information will be important:

- **Withdrawal:** Your participation in the study is completely voluntary, and you are free to withdraw from the study at any time, no questions asked.
- **Anonymity:** I will ensure that your identity is protected throughout the study. I do not request your name on the questionnaire or on the picture of your deceased dog. If there is any inconvenience concerning the picture of your dog revealing your identity, I will not exclude your dog from the analysis. If this may be the case please <u>do not</u> check the box at the end of this document.
- **Benefits:** Participation in this study will contribute 1 point towards your SRPP points.
- **Data confidentiality:** The data will be kept confidential for the duration of the study. On completion of the **study**, they will be retained for a further **five years** and then destroyed.

- **The results:** The thesis may be read by future students on the course. The study may be published in a research journal.

- Distress: **You may experience some distress when remembering a pet you loved, if this is overwhelming, please contact the student wellness centre on 021 650 1017 / 1020.**

Questions

Should you at any point have any enquiries about the study, you participation, your rights as a participant or concerns regarding the research process, please do not hesitate to contact any the following researchers.

Leonie van Niekerk – 079 344 0154

Pedro Wolf – 021 650 3430

Please tick the boxes you wish to permission.

☐   I hereby confirm that I am willing to fill out the questionnaire.

☐   I hereby give permission that a copy of a picture of my dog may be analysed by two Zoology PhD students.

If you would like to take part in this study and understand all of the above, please sign below.

Signature: Date:

_____   _____

Please complete the following section for SRPP point allocation.

Student number: ……………………………

Module you wish to allocate to: ……………………………..

Please also note that as proof of participation a screen shot of the 'survey completed'
notice should be emailed to vnkleo002@myuct.ac.za.

Appendix 3

Analysis 1: Model

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Zscore(PEtotal)[b]	.	Enter
2	Zscore(PAEDtotla)[b]	.	Enter
3	Zscore(APTdog)[b]	.	Enter
4	Zscore(LAStotal)[b]	.	Enter

a. Dependent Variable: Zscore(GRIEFtotal)

b. All requested variables entered.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21.093	1	21.093	26.828	.000[b]
	Residual	73.907	94	.786		
	Total	95.000	95			
2	Regression	24.665	2	12.332	16.306	.000[c]
	Residual	70.335	93	.756		
	Total	95.000	95			
3	Regression	33.313	3	11.104	16.561	.000[d]
	Residual	61.687	92	.671		
	Total	95.000	95			
4	Regression	48.630	4	12.157	23.859	.000[e]
	Residual	46.370	91	.510		
	Total	95.000	95			

a. Dependent Variable: Zscore(GRIEFtotal)

b. Predictors: (Constant), Zscore(PEtotal)

c. Predictors: (Constant), Zscore(PEtotal), Zscore(PAEDtotla)

d. Predictors: (Constant), Zscore(PEtotal), Zscore(PAEDtotla), Zscore(APTdog)

e. Predictors: (Constant), Zscore(PEtotal), Zscore(PAEDtotla), Zscore(APTdog), Zscore(LAStotal)

Model Summary[e]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
						Change Statistics				
1	.471[a]	.222	.214	.88670182	.222	26.828	1	94	.000	
2	.510[b]	.260	.244	.86965152	.038	4.722	1	93	.032	
3	.592[c]	.351	.329	.81884979	.091	12.897	1	92	.001	
4	.715[d]	.512	.490	.71383515	.161	30.060	1	91	.000	1.854

a. Predictors: (Constant), Zscore(PEtotal)

b. Predictors: (Constant), Zscore(PEtotal), Zscore(PAEDtotla)

c. Predictors: (Constant), Zscore(PEtotal), Zscore(PAEDtotla), Zscore(APTdog)

d. Predictors: (Constant), Zscore(PEtotal), Zscore(PAEDtotla), Zscore(APTdog), Zscore(LAStotal)

e. Dependent Variable: Zscore(GRIEFtotal)

Model	Std. Error	Standardized Coefficients Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
					Correlations			Collinearity Statistics	
4 (Constant)	.073			.000	1.000				
Zscore(Perceived Empathy)	.096	.042	.438	.663	.471	.046	.032	.582	1.718
Zscore(Paedomorphism)	.084	-.039	-.460	.646	.294	-.048	-.034	.765	1.307
Zscore(Anthropomorphic tendanciesDog)	.109	.138	1.270	.207	.562	.132	.093	.452	2.211
Zscore(Attachmnet)	.110	.603	5.483	.000	.706	.498	.402	.444	2.254

Casewise Diagnostics[a]

Case Number	Std. Residual	Zscore(GRIEFtotal)	Predicted Value	Residual
5	-3.130	-2.12660	.1077843	-2.23438516

a. Dependent Variable: Zscore(GRIEFtotal)

Testing Assumpions

Casewise diagnostics table

According to the casewise diagnostics table there are 1 (case no. 5) case that fall outside of the three standard deviations limit.

The residual statistics table includes mahalanobis and cooks values, which indicate the presence of influential cases. The mahalanobis distance suggests a maximum of (7.49) which is expectable for the sample size (less than 10). Cooks distance indicate a value of (.20), this is acceptable as it does not surpass 1. Thus we can conclude that the residual case does not influence our data and thus does not need to be deleted.

Multicollearity

The descriptive statistics table show no violation of multicolinearity, as none of the standard deviations are =0.
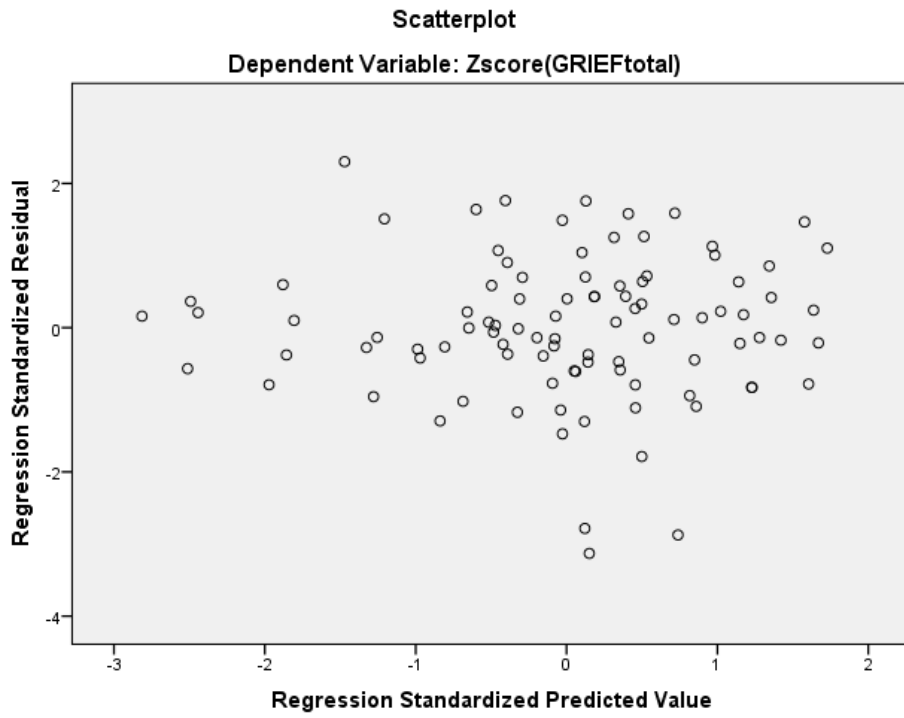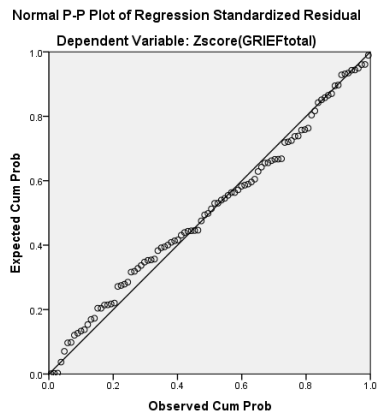
The correlation matrix table show that there are no correlations higher than .8. All the predictor variables have a tolerance close to 1, and the VIF values are not close to 1. Thus multicollinearity does not seem to be a problem.

Normality

The Durban-Watson test is (1.85), which suggests that the residuals are independent.

Scatter plots of the residuals should be randomly scattered around the y=0 line, this indicates normally distributed residual scores and does not take a particular shape.

Histogram
Dependent Variable: Zscore(GRIEFtotal)

Mean = 2.16E-17
Std. Dev. = 0.979
N = 96

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: Zscore(GRIEFtotal)

Scatterplot

Dependent Variable: Zscore(GRIEFtotal)
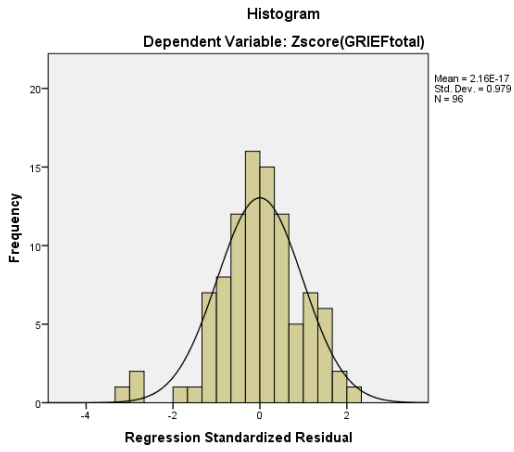
Analysis 2: Model

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Zscore(PEtotal)[b]	.	Enter
2	Zscore(PAEDtotla)[b]	.	Enter
3	Zscore(APTdog)[b]	.	Enter

a. Dependent Variable: Zscore(LAStotal)

b. All requested variables entered.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	33.308	1	33.308	50.752	.000[b]
	Residual	61.692	94	.656		
	Total	95.000	95			
2	Regression	42.600	2	21.300	37.804	.000[c]
	Residual	52.400	93	.563		
	Total	95.000	95			
3	Regression	52.850	3	17.617	38.451	.000[d]
	Residual	42.150	92	.458		
	Total	95.000	95			

a. Dependent Variable: Zscore(LAStotal)

b. Predictors: (Constant), Zscore(PEtotal)

c. Predictors: (Constant), Zscore(PEtotal), Zscore(PAEDtotla)

d. Predictors: (Constant), Zscore(PEtotal), Zscore(PAEDtotla), Zscore(APTdog)

Coefficients[a]

Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.	Correlations Zero-order r	Partial	Part	Collinearity Statistics Tolerance	VIF
3 (Constant)	1.236 E-15	.069		.000	1.000					
Zscore(Perceived Empathy)	.295	.086	.295	3.450	.001	.592	.338	.240	.657	1.521
Zscore(Paedomorphism)	.181	.077	.181	2.353	.021	.437	.238	.163	.811	1.233
Zscore(Anthrpomophic Dog)	.438	.093	.438	4.730	.000	.689	.442	.328	.562	1.779

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	Zscore(PEtotal)	Zscore(PAEDtotla)	Zscore(APTdog)
1	1	1.000	1.000	.50	.50		
	2	1.000	1.000	.50	.50		
2	1	1.224	1.000	.00	.39	.39	
	2	1.000	1.106	1.00	.00	.00	
	3	.776	1.255	.00	.61	.61	
3	1	1.845	1.000	.00	.12	.10	.13
	2	1.000	1.358	1.00	.00	.00	.00
	3	.788	1.530	.00	.27	.69	.01
	4	.367	2.241	.00	.61	.21	.86

a. Dependent Variable: Zscore(LAStotal)

Testing Assumpions

Multicollearity

The descriptive statistics table show no violation of multicolinearity, as none of the standard deviations are =0.

The correlation matrix table show that there are no correlations higher than .8. All the predictor variables have a tolerance close to 1, and the VIF values are not close to 1. Thus, multicollinearity does not seem to be a problem.

Normality

The Durban-Watson test is (1.86), which suggests that the residuals are independent.

Scatter plots of the residuals should be randomly scattered around the y=0 line, this indicates normally distributed residual scores and does not take a particular shape.

Histogram
Dependent Variable: Zscore(LAStotal)

Normal P-P Plot of Zscore(APTdog)

Scatterplot
Dependent Variable: Zscore(LAStotal)