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The Pet-Effect in Daily Life: An Experience Sampling Study on Emotional Wellbeing in Pet Owners

Mayke Janssens[*†], Jannes Eshuis[*], Sanne Peeters[*†], Johan Lataster[*†], Jennifer Reijnders[*], Marie-Jose Enders-Slegers[*], and Nele Jacobs[*†]

[*]*Faculty of Psychology, Open University; Heerlen, Netherlands*
[†]*Department of Psychiatry and Psychology, School for Mental Health and Neuroscience, Maastricht University Medical Centre; Maastricht, Netherlands*

*Address for correspondence:
Mayke Janssens,
Valkenburgerweg 177,
P.O. box 2960,
6401 DL Heerlen,
Netherlands.
E-mail:
mayke.janssens@ou.nl*

ABSTRACT The relationship between companion animal ownership and wellbeing has received an increasing amount of scientific attention over the last few decades. Although the general assumption is that individuals benefit from the presence of companion animals (termed the "pet-effect"), recent evidence suggests that the nature of this association is diverse and complex and that many of the studies performed so far are subject to methodological constraints. This study therefore aimed to investigate the pet-effect in the natural setting of pet-owners' daily life. Using the Experience Sampling Method (a signal contingent ecological assessment technique), 55 dog or cat owners reported for five consecutive days, at ten random time-points each day, *in the moment* whether a pet was present and to what extent they interacted with it. In addition, at each measurement moment they reported on their *current* positive and negative affect, using 11 mood-related adjectives derived from the Positive And Negative Affect Schedule (PANAS). Multilevel regression analyses showed that negative affect was relatively lower at moments when the companion animal was present (vs. absent) ($B = -0.09$, $p = 0.02$, 95%CI = -0.16; -0.02). In addition, the level of interaction with a companion animal was positively associated with positive affect ($B = 0.04$, $p < 0.001$, 95%CI = 0.01; 0.07). These results are in line with the pet-effect hypothesis in suggesting that the presence of and interaction with companion animals is associated with aspects of emotional wellbeing. More specifically, the presence of a companion animal may buffer against negative feelings, while interacting with a companion animal may generate positive feelings. This differential effect on positive versus negative affect also shows that the pet-effect is not an unequivocal effect. Different aspects of the human–animal relationship may influence different aspects of wellbeing.

Keywords: affect, ambulatory assessment, companion animals, ecological momentary assessment, human–animal interaction

Companion animals are an important part of human life: they are present in over half of the households in the western world (e.g., United States 65% [American Veterinary Medical Foundation, 2012], the Netherlands 59% [Rijksoverheid, 2015]). Additionally, they are often considered to be family members, and owners report deep attachment to them (Allen, 2003; Herzog, 2011). It is therefore not surprising that the relationship between companion animal ownership and psychological health has received a considerable amount of attention. Although the general assumption is that individuals benefit from the presence of companion animals, recent evidence suggests that the nature of this association is diverse and complex (Amiot & Bastian, 2015; Herzog, 2011; Wells, 2009) and that many of the studies performed so far are subject to methodological constraints (Gilbey & Tani, 2015; Herzog, 2011; Wells, 2009). In this study we examined if there is a relationship between the presence of and interaction with a companion animal and emotional wellbeing in the natural setting of pet-owners' daily lives, using the experience sampling method.

The Pet-Effect

The notion that owning a companion animal can improve human health has been termed "the pet-effect" (Allen, 2003). This idea became popular in the early 1980's when an association was reported between companion animal ownership and survival rates from myocardial infarction (Friedmann, Katcher, Lynch, & Thomas, 1980). Since then, much research has been conducted on the effects that companion animals have on the health of their owners (for reviews, see Amiot, Bastian, & Martens, 2016; Herzog, 2011; Virtues-Ortega & Buela-Casal, 2006; Wells, 2009). Today, conflicting evidence exists concerning this pet-effect. When focusing on emotional wellbeing, a substantial amount of research suggests a positive effect of companion animals. Companion animals have, for instance, been reported to alleviate loneliness (Pikhartova, Bowling, & Victor, 2014) and improve self-esteem (Shoda, Stayton, & Martin, 2011). Also, owning a companion animal has been associated with lower levels of depression (Clark Kline, 2010) and with higher levels of life satisfaction (Jacobs Bao & Schreer, 2016). There are also, however, studies calling this positive effect into question, reporting null-findings or even negative effects of companion animal ownership on emotional wellbeing. A longitudinal study by Gilbey, McNicholas, and Collis (2007), for instance, showed that individuals who had acquired a companion animal were just as lonely after acquisition as they were before. In a cross-sectional study, pet owners were more likely than non-owners to suffer from psychological problems like anxiety, insomnia, and depression (Mullersdorf, Grantstrom, Sahlqvist, & Tillgren, 2010).

Thus, while there is a substantial body of research on the idea that companion animals play a beneficial role in human lives, there is a lack of conclusive evidence that pet-owners experience higher levels of emotional wellbeing than people who do not own a companion animal. These conflicting results have been linked to methodological problems in the existing Human–Animal Interaction (HAI) research (Herzog, 2011; Wells, 2009), including limited reliability of self-reports, not controlling for possible confounders, and inadequate control groups.

The Present Study

The present study therefore aimed to investigate the pet-effect in real life using the Experience Sampling Method (ESM). The ESM is a well-validated momentary self-assessment technique that provides information on people in their natural settings, gathering ecologically valid data in real time. It involves repeated (random) sampling of current behaviors and experiences over

the course of time while functioning within the natural environment (for more information, see Shiffman, Stone, & Hufford, 2008; Trull & Ebner-Priemer, 2013). Unlike previous studies on the pet-effect using retrospective self-reports, individuals are not asked to estimate the amount of time spent with their pet over the previous week or to what degree a pet generally adds happiness to their lives. Using the ESM for five consecutive days at ten random time-points each day, we asked pet owners to reflect on their *current* experiences and *current* context, questioning individuals on their momentary affective states (among others). We also asked individuals *in the moment* whether a pet was present, how its presence was appraised, and to what extent they interacted with it. This allowed us to examine in the moment whether the presence of or the interaction with a companion animal was associated with increased emotional wellbeing in terms of positive and negative affect, minimizing recall or response bias. Longitudinal data collection with the ESM made it possible to compare—within pet-owners—moments with and without the presence of a companion animal, thereby preventing confounding by pre-existing differences between pet-owners and non-owners.

Taken together, the purpose of this study was i) to investigate whether the presence of a companion animal (dog or cat) is associated with increased emotional wellbeing in terms of higher levels of positive affect and lower levels of negative affect, and ii) whether a higher level of interaction with a companion animal is associated with higher levels of positive affect and lower levels of negative affect.

Methods
Participants
The sample consisted of 55 adults from the general population, recruited by graduate students of the Open University in the Netherlands. Inclusion criteria were i) age 18+ years at time of inclusion, ii) living with at least one dog and/or one cat, iii) in possession of or having access to a smartphone, and iv) sufficient command of the Dutch language to understand instructions and give informed consent. Participation in the study was voluntary and all participants gave (digital) informed consent. The study was approved by the research ethics committee of the Open University (U2016/00165/CBO).

Procedure
Participants were asked to first fill out an online questionnaire asking them about demographic characteristics and information concerning their companion animal. After that they were instructed to install a mobile application on their smartphone, the RealLife Exp app (Lifedata LLC, 2015). With this application participants provided Experience Sampling data. For five consecutive days, at ten random time points between 7.30 am and 22.30 pm, participants received a notification to complete a brief questionnaire on their mobile phone. At each notification, participants were questioned about the presence of and interaction with their companion animal, their current affect, the social context, activities, and location. In order to minimize memory distortion, they were instructed to respond immediately upon the notification and were allowed to do so within a 15-minute interval. To optimize reliability, after 15 minutes the questionnaire expired and was no longer available to participants. For the same reason, participants with less than 17 valid reports (out of 50) were excluded from the analysis (Delespaul, 1995).

Measures
Companion Animal: The presence of a pet and the interaction with it was measured in the moment. Pet-presence was assessed using the question "at this moment my pet is present"

(0 = no, 1 = yes). Pet-interaction was measured conditionally upon the presence of the companion animal (pet presence = 1), using the (follow-up) statement "we are interacting." This item was rated on a 7-point Likert scale (1= not at all, 7 = very much).

Momentary Affect States: Momentary affect was assessed in concordance with previous ESM studies using a positive and negative affect scale. Both scales consisted of several mood-related adjectives that were derived from the Positive And Negative Affect Schedule (PANAS, Crawford & Henry, 2004), using items that showed high loadings on negative affect (NA) and positive affect (PA) latent factors and sufficient within-person variability in previous ESM studies (e.g., Jacobs et al., 2005; Jacobs et al., 2007; Peeters, Berkhof, Delespaul, Rottenberg, & Nicolson, 2006; Wichers et al., 2007) and assessing a broad range of affect across the dimensions of "valance" (positive–negative) and "arousal" (high–low) (Kuppens, Tuerlinckx, Russel, & Barret, 2013). Items were rated on a 7-point Likert scale (1 = not at all, 7 = very).

Positive affect was assessed with the mean score on the items "I feel cheerful," "I feel satisfied," "I feel happy," and "I feel enthusiastic." All items were scored on a 7-point Likert scale (1 = not at all, 7 = very).

Negative affect was assessed using the mean score on the items "I feel insecure," "I feel lonely," "I feel anxious," " I feel irritated," "I feel sad," and "I feel guilty" (Cronbach's alpha $_{(within)}$ = 0.73, Cronbach's alpha $_{(aggregated)}$ = 0.85). All items were scored on a 7-point Likert scale (1 = not at all, 7 = very).

Statistical Analyses

ESM data have a hierarchical (multilevel) structure: multiple observations (level 1) are nested within subjects (level 2). To take this multilevel structure into account, multilevel regression modeling was performed using the lme function in R. First, to test whether the presence of a companion animal was associated with higher levels of positive affect and lower levels of negative affect, two models were tested. In model 1, PA was entered into the model as a dependent variable and pet-presence was entered as an independent variable. In model 2, NA represented the dependent variable and pet-presence the independent variable. Second, to test whether the interaction with companion animals was associated with higher levels of PA and lower levels of NA, two similar models were tested. In these models the dependent variables were again PA and NA, but the independent variable was now pet-interaction. As PA and NA have shown to be partly independent (though correlated) constructs, the opposite affective state was added as a covariate (i.e., controlling for NA in the PA models and vice versa). This allowed us to assess the relative contribution of pet-presence and pet-interaction to PA and NA. Age, gender, and the presence of other people ("are you alone" yes/no) were also considered as possible confounders in all analyses and were included in all models as covariates. All four models accounted for serial dependency allowing residuals to be correlated over time (satisfying AR(1) model) and allowed for intercepts and slopes to vary randomly across individuals.

Results

Sample Characteristics

Of the 71 participants who entered the study, 16 were excluded based on (technical problems leading to) insufficient valid ESM-reports. The final study sample thus consisted of 55 participants (Table 1).

Table 1. Sample characteristics.

		Female	Male
n	55	34	21
Mean Age (SD, range)	46.5 (11.7, 21–71)	43.6	51.2
Education (%)			
Primaryeducation	3.6	2.9	4.8
Secondary education	18.2	8.8	33.3
Vocational education	16.4	8.8	28.6
Bachelor's level	40.0	52.9	19.0
Master's level	21.8	26.5	14.3
Marital Status (%)			
Single	12.7	11.7	14.3
In a relationship	5.5	8.8	0.0
Married/living together	70.9	67.6	76.2
Divorced	9.1	11.7	9.5
Widowed	1.8	2.9	0.0
Occupational Status (%)			
Unemployed	18.6	15.2	25.0
School/education	9.3	15.2	0.0
Part-time employed	37.0	36.4	35.0
Full-time employed	33.3	30.3	40.0
Companion Animals (%)			
Dog	54.5	55.9	52.4
Cat	29.1	29.4	28.6
Both	16.4	14.7	19.0
Responsible for Companion Animal (%)			
Sole responsibility	38.2	42.4	33.3
Shared responsibility	61.8	57.6	66.7
Mean Number of Notifications (SD, range)	30.9 (9.3, 17–46)	31.6	29.8
Score on ESM Measures			
% of notifications in presence of companion animal	65.7	71.0	56.7
Mean activity level when interacting with companion animal (*SD*)	3.4 (2.2)	3.4	3.4
Mean PA (*SD*)	4.7 (1.2)	4.7	4.8
Mean NA (*SD*)	1.6 (0.8)	1.6	1.5

Association Between the Presence of a Companion Animal and Affect

The reliability of both affect scales was sufficient: Cronbach's alpha $_{(within)}$ = 0.84; Cronbach's alpha $_{(aggregated)}$ = 0.88 for momentary PA and Cronbach's alpha $_{(within)}$ = 0.73; Cronbach's alpha $_{(aggregated)}$ = 0.85 for momentary NA.

The results of the multilevel regression analysis revealed a significant association between the presence of a companion animal and NA ($B = -0.09$, $p = 0.02$, 95%CI = -0.16; -0.02). No significant association was found between the presence of a companion animal and PA ($B = 0.07$, $p = 0.20$ 95%CI = -0.04; 0.17).

Association Between the Interaction with a Companion Animal and Affect

Multilevel random regression analyses indicated an association between the interaction level with a companion animal and PA. Higher levels of interaction with a companion animal were associated with higher levels of PA ($B = 0.04$, $p < 0.001$, 95%CI = 0.02; 0.07). No significant association was found between pet-interaction and NA ($B = 0.01$, $p = 0.31$, 95%CI = -0.02; 0.01).
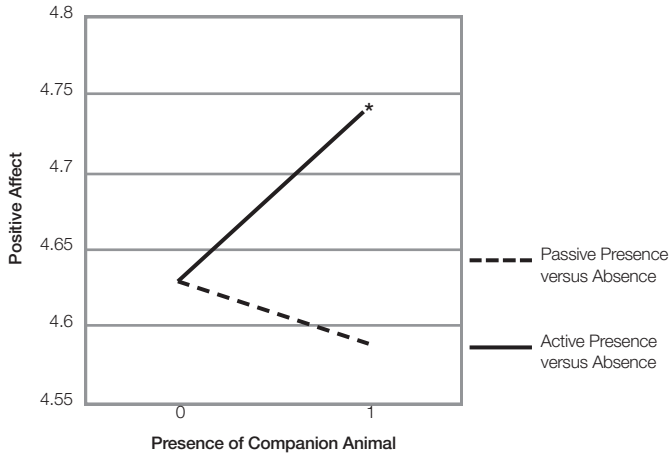
Figure 1. The association between active/passive presence (versus absence) and Positive Affect. *Significant at the 0.05 level.
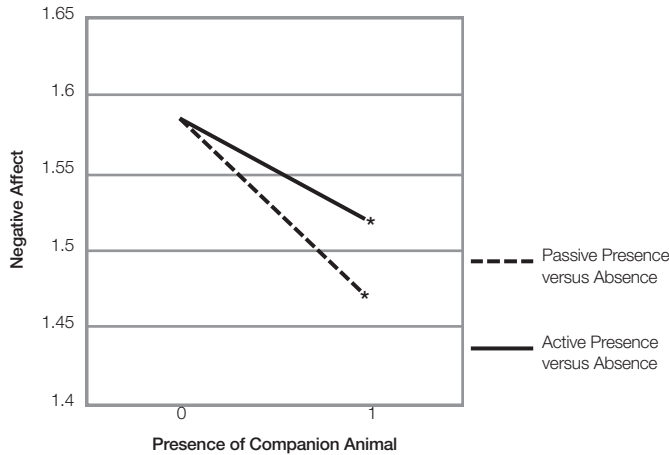

Figure 2. The association between active/passive presence (versus absence) and Negative Affect. *Significant at the 0.05 level.

Association Between Active or Passive Presence of a Companion Animal and Affect

To investigate the hypothesis that the differential effect on PA versus NA is related to the difference between passive and active presence of a companion animal, we performed additional post-hoc analyses. We divided the pet-presence variable into two separate dichotomous variables based on the specific type of activity reported: passive presence (0 = absent, 1 = passively present) and active presence (0 = absent, 1 = actively present). This distinction was made based on the specific activity with the companion animal reported by the owner. Passive presence entails only the moments in which the companion animal was present but no interaction took place (individuals indicated that the companion animal was present but they were "doing nothing"), active presence entails only the moments in which the companion animal was present and individuals reported to be in an activity (e.g., "walking," "playing," "cuddling," "seeking comfort"). Similar to the analyses for the (global) pet-presence predictor, two sets of multilevel

regression analyses were performed testing the association i) between passive presence and PA/NA, and ii) between active presence and PA/NA, again correcting for age, gender, and the presence of other people. The results show that the passive presence of a companion animal was associated with less negative affect (B = –0.12, p = 0.017, 95%CI = –0.22;–0.02) but not more positive affect (see Figures 1 and 2). The active presence was associated with higher levels of PA (B = 0.11, p = 0.041, 95%CI = 0.01; 0.22) as well as lower levels of NA (B = –0.08, p = 0.038, 95%C I = –0.16; –0.00) (see Figures 1 and 2).

Discussion

The purpose of this study was to examine the pet-effect in the daily lives of companion animal owners. In order to investigate the association between companion animals and emotional wellbeing in daily life, the presence and interaction with companion animals was associated with momentary positive and negative affect, using the ESM. The results show that individuals experience less negative affect when in the presence of their companion animal. Additionally, a higher level of interaction with their companion animal was associated with higher levels of PA. These results not only suggest that the *presence* of a companion animal may buffer against negative feelings, but also that there may be an additive effect of the *interaction* with a companion animal on positive affect.

The overall conclusions from these results are indicative of a pet-effect in daily life and are in line with our hypotheses. However, the discrepancy between the presence and the interaction with a companion animal is striking. Whilst the *presence* of a companion animal is associated with lower levels of NA, the *interaction* with a companion animal is associated with higher levels of PA. This could be indicative of a differential effect of "passive" presence of the companion animal (the companion animal merely being present) versus "active" presence of the companion animal (the owner is interacting with the companion animal).

Active Versus Passive Presence of the Companion Animal

Although there seems to be a differential effect of passive presence versus active presence, in the variables used to test the original hypotheses it is not entirely clear how the passive and active presence of a companion animal relate to each other. On the one hand, the pet-presence variable enables the comparison between absence and presence of a companion animal but does not differentiate between passive presence and active presence (interaction). On the other hand, the pet-interaction variable does differentiate between passive presence (a low score on pet-interaction) and active presence (a high score on pet-interaction) but does not allow for a comparison with the absence of a companion animal. To investigate the hypothesis that the differential effect on PA versus NA is related to the difference between passive and active presence of a companion animal, we performed additional post-hoc analyses using separate variables for passive presence (the companion animal is present but no interaction took place) and active presence (the companion animal is present and individuals reported to be in an activity) of the companion animal as predictors. The results show that the passive presence of a companion animal is associated with less negative affect but not more positive affect. This supports the notion that the (passive) presence of a companion is distinctly associated with lower levels of NA. The active presence is associated with higher levels of PA as well as lower levels of NA. The effect of active presence on NA is, however, likely a transfer effect of the (passive) presence as this variable also entails low levels of activity (reflected in activities like "cuddling" or "seeking comfort"). This is supported by the finding that a higher level of interaction with a companion

animal is only associated with higher levels of PA, not with lower levels of NA. Together, these results indicate that there is indeed a discrepancy between the (passive) presence of a companion animal and the (active) interaction with a companion animal. The presence of a companion animal leads to a decrease in negative affect while the interaction with a companion animal increases only positive affect.

This discrepancy is not surprising considering that these two aspects of human–animal relations are actually quite different. The *interaction* with a companion animal generally reflects the conscious choice of the pet owner to spend time with his or her companion animal. It is therefore very much a reflection of the need or wish to engage with a companion animal. Likewise, social interaction between humans has been shown to correlate differentially with PA and NA, affecting PA but not NA (McIntyre, Watson, & Clark, 1991; Watson, 1988). The fact that this pattern also emerges in interaction with a companion animal is not surprising as this discrepancy between PA and NA has been found consistently over studies looking at several types of social interaction and for both between-subjects and within-subjects analyses (McIntyre et al., 1991). The *presence* of a companion animal, however, can be the result of a pet owner seeking proximity to his or her pet but can also be instigated by the companion animal (seeking proximity to its owner) or be a result of chance (just happening to be in the same room). Therefore, the presence of a companion animal is much less the result of a pet-owner's conscious decision. This (often unconscious or unintended) presence does, however, seem to exert its influence on the affective state of the owner as the presence of a companion animal is associated with lower levels of NA, showing that it is the mere presence of a companion animal that buffers against negative feelings.

Strengths and Limitations

The main strengths of this study are related to the use of an ecologically valid research design that allowed us to capture the daily life presence and interaction with companion animals as well as momentary affective states. In addition, the ESM allowed us to study the influence of companion animals on affective states implicitly, thus revealing the true nature of the effect as opposed to individuals' cognitive interpretation. Also, assessment does not ask for recall or summary over long periods but focusses on the current state. This minimizes the error and bias associated with retrospection (Scollon, Kim-Prieto, & Diener, 2003; Shiffman et al., 2008; Trull & Ebner-Priemer, 2013). Additionally, the multiple assessments over time allow for each individual to be their own control condition, preventing confounding by pre-existing differences between pet owners and non-owners.

The results should, however, be viewed in the light of some methodological issues. First, as pet-presence/-interaction and affect were assessed simultaneously, the direction of the relationships found between the companion animal and affect cannot be conclusively determined. An alternative explanation to our findings, though considered less plausible, is that a positive emotional state (high PA, low NA) leads individuals to seek proximity to, or interaction with, their companion animal. Future ESM research should use time-lagged analyses to investigate the association between the presence of the companion animal and the emotional state of the owner over time to determine the direction of the effect conclusively.

Second, this study required individuals to be in possession of a smartphone for the ESM data collection. The data collection process is very time consuming and possibly resulted in a selection bias.

Third, the correlation between PA and NA results in shared variance. When correcting for NA, part of the (true) effect on PA represented in this shared variance is also eliminated and vice versa. This might have led to an underestimation of the effect.

Finally, the correction for the opposite affective state combined with the lower amount of variance for NA and the fact that there are less data for pet-presence might also pose a power problem in detecting the specific association between pet-presence and NA. The conclusions concerning this specific relationship should therefore be considered tentative.

Conclusions

In summary, the present work indicates that companion animals can be beneficial to human wellbeing, supporting the pet-effect hypothesis. The presence of a companion animal seems to buffer against negative feelings, and interacting with a companion animal generates positive affect. However, the differential effect of the presence of and interaction with a companion animal on positive and negative affect also shows that the pet-effect is not an unequivocal effect. Different aspects of the human–animal relationship seem to influence different aspects of emotional wellbeing. These differential effects may help to explain the inconsistencies in previous research findings. Depending on the type of interaction measured and the aspects of (emotional) wellbeing used as outcome measure, findings may differ.

As the direction of causality cannot be conclusively determined with the present design, future studies should focus on the longitudinal investigation of the association between the presence of the companion animal and human wellbeing. Further disentanglement of the elements of human–companion animal interaction and their impact on specific aspects of (emotional) wellbeing is also warranted. This will not only specify and solidify the scientific basis of the pet-effect but can also influence animal-assisted interventions, providing insight into the specific elements of interaction with an animal that result in particular effects on human psychology.

Conflicts of Interest

The authors declare no conflicts of interest.

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