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The mental health effects of pet death during childhood: Is it better to have loved and lost than never to have loved at all?

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Abstract

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Ethical approval: Ethical approval for the study was obtained from the ALSPAC Ethics and Law Committee and the Local Research Ethics Committee. Informed consent for the use of data collected via questionnaires and clinics was obtained from participants following the recommendations of the ALSPAC Ethics and Law Committee at the time. More details are available on the ALSPAC website (www.bristol.ac.uk/alspac), including a fully searchable data dictionary.

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Background: Pet ownership is common. Growing evidence suggests children form deep emotional attachments to their pets. Yet, little is known about children's emotional reactions to a pet's death.

Aims: To describe the relationship between experiences of pet death and risk of childhood psychopathology and determine if it is "better to have loved and lost than never to have loved at all".

Method: Data came from the Avon Longitudinal Study of Parents and Children, a UK-based prospective birth cohort (n=6260). Children were characterized based on their exposure to pet ownership and pet death from birth to age 7 (*never loved*; *loved without loss*; *loved with loss*). Psychopathology symptoms at age 8 were compared across groups using multivariable linear regression.

Results: Psychopathology symptoms were higher among children who had *loved with loss* compared to those who had *loved without loss* (β=0.35, p=0.013; 95% CI=0.07, 0.63), even after adjustment for other adversities. This group effect was more pronounced in males than in females. There was no difference in psychopathology symptoms between children who had *loved with loss* and those who had *never loved* (β=0.20, p=0.31, 95% CI =−0.18, 0.58). The developmental timing, recency, or accumulation of pet death was unassociated with psychopathology symptoms.

Conclusions: Pet death may be traumatic for children and associated with subsequent mental health difficulties. Where childhood pet ownership and pet bereavement is concerned, Tennyson's pronouncement may not apply to children's grief responses: it may *not* be "better to have loved and lost than never to have loved at all".

Introduction

Pet ownership is common. Roughly half of households in developed countries own at least one pet [1, 2]. For example, 31% of United Kingdom households report owning a dog and 26% report owning a cat, with smaller but substantial percentages reporting ownership of other household animal types [3, 4]. Since the 1980's, an accumulating body of research into human animal interaction (HAI) and human animal bonding (HAB) suggests that people can form complex bonds to animals [5]. This research has often focused on children, given the particularly high prevalence of pet ownership during childhood [4, 6] as well as the development of child-oriented interventions that capitalize on the developmental benefits of HAI and HAB. From this literature, there is increasing evidence that children often form deep emotional attachments to their pets. These attachments can resemble secure human attachment relationships [6–8] in providing several key resources, such as affection, protection, and reassurance [6, 9]. Previous studies have shown children often turn to pets for comfort and to discuss emotional experiences [10, 11]. Childhood pet ownership and attachment has, in turn, been linked to a number of positive developmental consequences associated with healthy attachment, such as increased empathy [12, 13], self-esteem [14, 15], and greater social competence [16, 17].

Unfortunately, one consequence of the high prevalence of childhood pet ownership is that many children are exposed to the death of a pet. The two most common pet types – dogs and cats – live an average of 12 and 15 years, respectively [18]. Thus, many

youth living in households with a pet will experience the death of that pet sometime during childhood. Although relatively little research has been done to empirically study children's emotional reactions to a pet's death, children's grief in response to the loss of other important attachment relationships has been well-documented [19–21]. Though children's grief responses may be distinct from those of adults—with bereaved children displaying infantile behaviors, fearfulness [22], and somatic reactions, including headaches and stomach aches [23]—their grief may be no less intense [20, 24]. In general, the death of a family member has been associated with an increased risk of childhood psychopathology symptoms [25], including anxiety [26], post-traumatic stress symptoms [27], and depressive symptoms [27]. It has also been shown that although grief reactions for most children abate over time following the death of a loved one, some children can exhibit a high, prolonged grief response known as complicated grief. Complicated grief is a particularly potent predictor of depression in children and adolescents as far as three years after the loss [19].

Despite the prevalence of pet death as a potentially traumatic loss during childhood, very little research has examined the mental health consequences of children's exposure to the death of a pet. The few cross-sectional and retrospective studies that have explored this topic have primarily studied psychopathology symptoms in adults [28], among whom pet death has been associated with increased risk for neurotic [29] and depressive symptoms [30], though risk for major psychopathology following pet death is low [31]. Prior case reports and empirical studies have found that compared to adults, children's grief responses to a pet's death can be profound [32, 33], and can have greater intensity and duration [34].

To our knowledge, no previous studies have explored childhood mental health problems following the death of a pet. Thus, it remains unclear whether pet death is associated with psychopathology symptoms, and if the known positive effects of owning a pet outweigh any negative consequences associated with pet bereavement. In the words of British poet Alfred Lord Tennyson, the question remains: is it "better to have loved and lost than never to have loved at all"? [35]. The current study aimed to answer this question by using data from a deeply characterized prospective longitudinal population-based birth-cohort study, containing serial measures of household pet ownership and child exposure to pet death. With these data, we explored the association between pet death and subsequent psychopathology symptoms during childhood, focusing on differences between non-pet owners (*never loved*), pet owners who never experienced the death of a pet (*love without loss*), and pet owners who experienced a pet death (*love with loss*).

Methods

Sample and Procedures

Data came from the Avon Longitudinal Study of Parents and Children (ALSPAC), a prospective, longitudinal birth cohort of children born to pregnant mothers who were living in the county of Avon England (120 miles west of London) with estimated delivery dates between April 1991 and December 1992 [36, 37]. Approximately 85% of eligible pregnant women agreed to participate (N=14,541), and 76% of eligible live births (N=14,062) who were alive at 12 months of age (N=13,988 children) were enrolled. Response rates to data

collection have been good (75% have completed at least one follow-up), with 56% (N=7912) of the original sample participating in the age 8 assessment. Ethical approval for the study was obtained from the ALSPAC Ethics and Law Committee and the Local Research Ethics Committee. More details are available on the ALSPAC website, including a fully searchable data dictionary: http://www.bristol.ac.uk/alspac/researchers/our-data/.

Measures

Pet Ownership and Exposure to Pet Death—Pet ownership and exposure to pet death were determined through mailed questionnaires completed by the mothers.

Pet ownership was assessed in a questionnaire about living arrangements, where the mother indicated if she owned a pet and if so, how many. This questionnaire was completed at five time periods, when the child was 8 months, 21 months (1.75 years), 33 months (2.75 years), 47 months (3.9 years), and 84 months (7 years) of age.

Children's exposure to pet death was determined through an item in a stressful life events inventory, asking the mother to indicate whether or not the child had been exposed to pet death since the last questionnaire. This questionnaire was completed at six time periods, when the child was 18 months (1.5 years), 30 months (2.5 years), 42 months (3.5 years), 60 months (5 years), 72 months (6 years), and 84 months (7 years) of age. Age of exposure was defined as the age of the child at the time the mother completed the questionnaire indicating her child had experienced pet death. For example, if the mother indicated at the age 30 month assessment that the death of a pet had occurred at some time since the previous assessment (at 18 months), the age of exposure was coded as 30 months.

We used these data to categorize children into one of three mutually exclusive groups: *never loved*, meaning children who were non-pet owners throughout the entire time period; *love with loss*, meaning children who were pet owners and experienced the death of at least one pet (in a time period subsequent to the report of pet ownership); and *love without loss*, meaning children who were pet owners who did not experience the death of a pet.

Given that the focus of ALSPAC is on children and their development rather than pet ownership specifically, these survey measures did not allow us to identify certain relevant details, such as the type of pet that died or the strength of the child's attachment to that pet. These child-centric measures were, however, unparalleled in their attention to the timing of exposure and measurement of co-occurring adversities. The limitations of these measures are addressed in further detail in the Discussion section.

Child Psychopathology—Child psychopathology symptoms were assessed using the Strengths and Difficulties Questionnaire (SDQ) [38, 39], which mothers completed by mail when the child was 8 years old. The SDQ is one of the most commonly used dimensional rating scales of child psychopathology in epidemiology studies and has excellent psychometric properties [40, 41]. The SDQ contains 25 items, rated on a three-point scale (0=not true, 1=somewhat true, or 2=certainly true), capturing the child's behavior and feelings within the past six months. We calculated a total SDQ score by summing across items on the first four subscales (conduct problems; emotional symptoms; hyperactivity;

peer problems; range 0–40), with higher scores indicating more emotional and behavioral difficulties (α=0.82). This total score has been shown in studies from across the globe to correlate highly with questionnaire and interview measures of psychopathology, including the Child Behavior Checklist as well as clinician-rated diagnoses of child mental disorder [42, 43].

Covariates—We controlled for the following baseline covariates, measured at the time of the child's birth: child sex; child race/ethnicity; number of previous pregnancies; maternal marital status; highest level of maternal education; maternal age; homeownership; parent social class; singleton or multiple birth; and maternal depression, as assessed by the Edinburgh Postnatal Depression Scale (EPDS) [44]. Covariates were selected for inclusion because they were found to be potential confounders in our sample, or because they have been included routinely in longitudinal birth cohorts when studying child mental health outcomes [45–47]. For example, prior studies have found higher levels of pet ownership among families with lower education levels [4, 48] and lower parent social class (as defined by occupation) [4, 49]. Adjustment for maternal depression allowed us to reduce potential impacts of common rater bias [50], as mothers reported about both their child's exposure to pet death as well as their child's emotional and behavioral problems, and maternal mood or other factors may influence reports of adversity exposure [51] and psychopathology [52, 53].

Recognizing that childhood adversities often co-occur, and that the effects of pet death on psychopathology could be confounded by experiences of other adversities, we additionally adjusted for exposure to three major types of childhood adversity: financial hardship, caregiver physical or emotional abuse, and physical or sexual abuse by anyone (see Supplemental Materials for details).

Primary Analyses—To reduce potential bias and minimize loss of power due to attrition [54, 55], we conducted all analyses using multiply imputed datasets, where missing exposure (i.e., pet ownership and pet death) and covariate information were imputed using the MICE package in R [55] (see Supplemental Materials).

Our analysis was based on an analytic sample of 6260 children out of a possible 7912 (79%) who completed the age 8 assessment, which was the last time point of data examined in the current analysis. The analytic sample met two inclusion criteria. First, given that methods for imputation of missing outcomes may induce additional noise [56], we restricted our analyses to children who had a completed outcome measure. This criterion omitted 436 children from the sample who participated in the age 8 assessments. Second, in the interest of deriving exposure groups that were as homogenous as possible, we omitted children from our primary analysis whose mothers reported that the child had experienced the death of a pet although no pet had been indicated to reside in the household in prior assessments (n=1216; 16%) Supplemental Figure 1). The experience of pet loss in the absence of pet ownership was likely due to the child experiencing a pet loss outside of the home (e.g., at a grandparent's home or in a school classroom, where children often encounter pets with whom they may bond [57, 58]). Further details can be found in Supplemental Materials.

We began the analysis by running univariate and bivariate analyses to examine the distribution of baseline covariates in the total analytic sample and by our three exposure groups. We then used multivariable linear regression to compare child psychopathology symptom scores across the three exposure groups (*never loved*, *love without loss*, and *love with loss*), after adjustment for baseline covariates (Model 1). To ensure these results were not explained by exposure to other types of adversities, we ran a set of models – building from Model 1 – to additionally adjust for the role of exposure to financial hardship (Model 2), caregiver physical or emotional abuse (Model 3), physical or sexual abuse by anyone (Model 4), and all three adversities considered simultaneously (Model 5).

Secondary Analyses

We conducted three sets of secondary analyses. First, given documented differences between girls' and boys' grief responses to pet death [59], as well sex differences in psychopathology symptoms [60, 61], we reran the primary analyses stratified by sex.

Second, based on evidence from life course theory that the effects of childhood adversity on risk for childhood psychopathology may vary depending on the characteristics of the exposure, including when it occurs in development, how many times it occurs, and how recently it occurred [62, 63], we capitalized on the availability of the repeated measures of pet death and pet ownership to examine the potential time-dependent effects of pet death on childhood psychopathology symptoms. Specifically, we used a structured life course modeling approach grounded in least angle regression [64, 65] to evaluate which of the three life course theoretical models explained the most variability in child psychopathology symptoms, as determined by r^2 values [66]. The life course models tested were: (1) a sensitive period model [66]; (2) an accumulation model [67]; and (3) a recency model [68] (see Supplemental Materials).

Third, recognizing that the experience of pet death may still be impactful for children who lost non-household animals, we examined the effects of being ever exposed to pet death without differentiating between explicit and ambiguous pet ownership. Thus, we reran all models to include the 1216 children who likely experienced pet loss outside of home and were excluded from our primary analysis. These results are reported as Models 6–10.

Results

Sample Characteristics and Distribution of Exposure to Pet Death

The analytic sample was sex-balanced (50.7% male) and comprised of predominately White (97.0%) children from families whose parents were married and owned their home (Table 1). Pet death was common in this sample, with most children experiencing the death of a pet at some point in their lives (52.7%; N=3296). A large percentage of children had pets that were still living (*love without loss* group N=1682; 26.9%), with only 808 children (12.9%) belonging to the *never loved* group. These three subgroups differed on some demographic characteristics. Specifically, children in the *love with loss* group were more likely to be female (p=0.001), non-White (p<0.001), from families with less parental education (p<0.001) and lower parental social class (p<0.001), and were exposed to other

forms of childhood adversity (Table 1). Among children in this *love with loss* group, the most frequent age at first exposure to the death of a pet was 4.75 years (24%) (Figure 1).

Primary Analyses: Association between Pet Death and Child Psychopathology Symptoms

As shown in Table 2 and Figure 2 for Model 1, there were no differences observed in psychopathology symptoms between children in the *love without loss* group and the children who *never loved* (p=0.45) after adjustment for baseline covariates. Similarly, there were also no differences in psychopathology symptoms observed between the *love with loss* group and the *never loved* group (p=0.31).

However, psychopathology symptom scores were higher among children who experienced pet death (*love with loss*), compared those who had pets that were still living (*love without loss*) (β=0.35, p=0.013; 95% CI=0.07,0.63). This relative increase in psychopathology symptoms persisted, though was slightly attenuated, after adjustment for financial hardship (Model 2), caregiver physical or emotional abuse (Model 3), and physical or sexual abuse by anyone (Model 4). When all three types of adversity were included simultaneously as covariates (Model 5), the difference in psychopathology symptoms associated with pet loss was marginally statistically significant (β=0.26; p=0.06). Notably, in visually examining the magnitude of the difference in psychopathology symptoms between the *love with loss* group compared to the *love without loss group*, we can see across Models 2–5 that this effect was at least one third as large as the magnitude of having ever been exposed to each of the adversity covariates (Table 2).

Secondary Analyses: Association between Pet Death and Child Psychopathology Symptoms

Figure 3 shows that the increase in psychopathology symptoms in the *love with loss* group compared to the *love without loss* group was more pronounced in males than in females (Model 1: β_{male}=0.45, p_{male}=0.035; β_{female}=0.28, p_{female}=0.14). The patterns of between-group differences in males were similar to the results from the primary analysis; however, we did not observe any group effect in females.

There were no meaningful differences in risk for psychopathology symptoms based on the developmental timing, recency, and accumulation of exposure to pet death. That is, all life course theoretical models were weak and inconclusive predictors of child psychopathology in both the full sample and among the sample of pet owners (p>0.05; Supplemental Table 1).

As shown in Table 3, children exposed to the death of a pet, whether that pet resided in their household or not, had psychopathology symptoms scores that were slightly higher than their peers who did not experience a pet death (β=0.26; 95% CI=0.03, 0.50; p=0.03), after adjustment for covariates (Model 6). This effect was still observed after accounting for exposure to financial hardship (Model 7), but no longer statistically significant after adjustment for the other two abuse-related adversities (Model 8–10). Compared to the primary analyses, where subgroups were defined based on pet loss and pet ownership status, the effect sizes in this model associated with the ever versus never exposed analyses were smaller, suggesting that defining the pet loss experience with more precision allowed us to see more meaningful patterns.

Discussion

To our knowledge, the current study is the first to test the association between exposure to a pet's death and psychopathology symptoms in childhood. Three main findings emerged from this prospective study. First, we found that pet ownership was common, with most children (88%) in our sample having owned a pet at some point in childhood. Second, pet death was also a common childhood experience, with a substantial proportion (63%) of children having lost a pet during the first seven years of life. Third, we found that these experiences of pet death were associated with elevated psychopathology symptoms. This association was observed even after accounting for other adverse factors known to increase child risk for poor mental health, such as low socioeconomic status, maternal history of depression, and exposure to child abuse. These findings align with previous work in adult grief documenting increased neurotic and depressive symptoms following the death of a pet [28–30]. Our findings also align with the few case reports and empirical studies exploring the psychological sequelae of pet bereavement in childhood [33, 34], which have found that children's grief responses to a pet's death can surpass adults' responses in intensity and duration [34]. Most previous studies of pet bereavement in children and adults have not accounted for the potential psychological benefits of pet ownership. From what we can determine, this is the first study to compare groupings of pet ownership in this manner and thus our findings regarding the differences between *love with loss* and *love without loss* are novel.

Three additional findings were observed as well. First, the association between pet death and elevated psychopathology symptoms was stronger in male children than in female children, which was somewhat unexpected given previous research in adolescents suggesting that females reported a more intense grief response to a pet's death than did males [59]. Additionally, this association was stronger for household pets versus non-household pets; however, even in the case of the death of a non-household pet, children still showed an increase in psychopathology symptoms. Finally, the strength of this association did not vary as a function of when the pet's death occurred during childhood, how many times it occurred, or how recently it occurred. This finding was somewhat surprising in light of emerging work suggesting that exposure to adversity in the first five years of life may be especially important in shaping risk for psychopathology symptoms in childhood [62] and beyond [69, 70]. We did not, however, find evidence to suggest similar timing effects here.

This study had three major strengths. First, despite the ubiquity of pet ownership [1, 2] and the fact that a pet's death is likely the first major loss a child will encounter [59], few studies have systematically explored the effect of pet death on children's risk for experiencing psychopathology symptoms. Our study therefore addresses an important, but understudied issue. Second, we addressed this issue by analyzing data from a large, longitudinal, and population-based sample of children, who were followed from birth and whose mothers had provided repeated measures that allowed us to track experiences of pet ownership and pet loss across time. These serial measurements enabled us to capture events during childhood without relying on retrospective reporting, which is commonplace among studies examining the consequences of childhood adversities. The depth of measurement in ALSPAC also allowed us to adjust for other important potential confounders, notably experiences of

co-occurring adversity. Third, we could characterize experiences of pet death in ways that moved beyond the simple classification of children as ever versus never exposed.

Several limitations are noted. Although ALSPAC contains rich data collected from parents and children, the study was not designed to investigate pet ownership and pet death experiences, thus these measures of these constructs lacked some granularity. For example, while there was information available about the type of pet the child had, there was no data available to identify which of the pets had died. Moreover, we were unable to examine the effects of pet death for specific types of pets, including cats or dogs. This was a limitation because prior studies have shown that children tend to form stronger bonds with dogs and cats, and less strong attachments with pet birds or fish [6, 71]. Future studies could extend these findings by examining the role of the type of pet death to elucidate differences that may emerge from different types of animal bonding. Additionally, while earlier child psychopathology may be linked to pet ownership and later psychopathology symptoms, we did not adjust for psychopathology symptoms before age 8, as this would prove difficult for maintaining temporality in the exposure-disease association. In brief, our first indicator of exposure to pet death at age 18 months occurred before the first assessment of psychopathology symptoms in ALSPAC. Thus, inclusion of psychopathology measured after this time point would create temporal ambiguity with respect to our exposure-outcome association. That is, while psychopathology symptoms were assessed at 48 months, adding this measure as a covariate would be problematic as it would likely mediate the relationship between exposure to pet ownership and pet death that occurred before 48 months and psychopathology symptoms at age 8. We hope future studies will be able to more carefully account for time-varying covariates so that the prospective and longitudinal association between pet death and child psychopathology can be studied. Finally, the high prevalence of pet death (above 50%) in the analytic sample indicated that the classification likely covered a wide range of experiences spanning in severity. In future studies, the experience of pet death could be further characterized to capture more subtle distinctions within the *love with loss* group, which likely reflect not only different pet types but different durations of pet ownership and the strength of attachments between children and their pets.

In conclusion, Tennyson's pronouncement may not, in fact, apply to children's grief responses to pet bereavement: where childhood pet ownership is concerned, it may *not* be "better to have loved and lost than never to have loved at all". Our study results suggest that pet death may be traumatic for children and that children who have pets may show signs of mental health difficulties if their pet dies. Especially when pets feel like members of the family and children are attached to their pets, parents and other caregivers may find it beneficial to recognize children's short- and long-term psychological reactions, which may mimic responses to the loss of other important human attachments. The death of a pet should be treated as the loss of other strong emotional attachments, and parents and physicians should be prepared to treat it as such.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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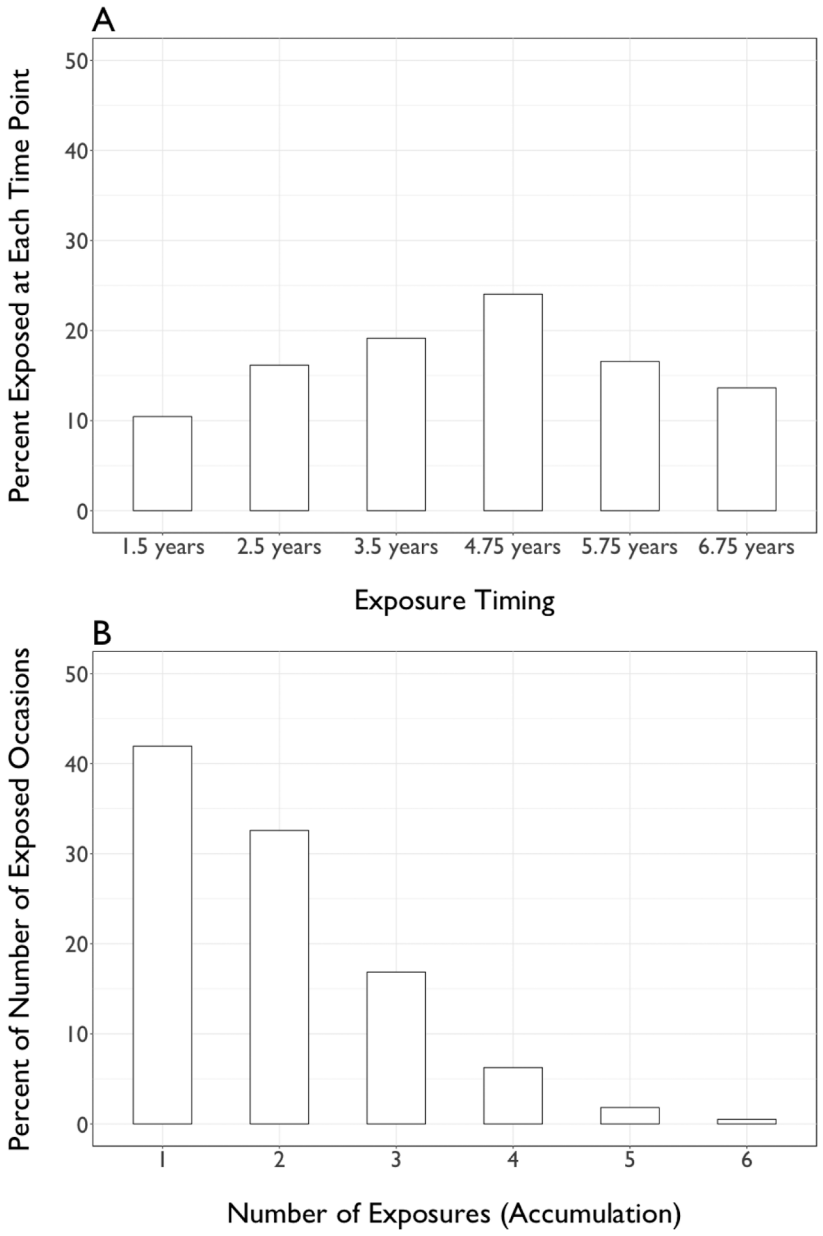

Figure 1.

Child age at first exposure to pet death and number of occasions exposed among the *Love with Loss* group, meaning children who were pet owners and experienced pet death

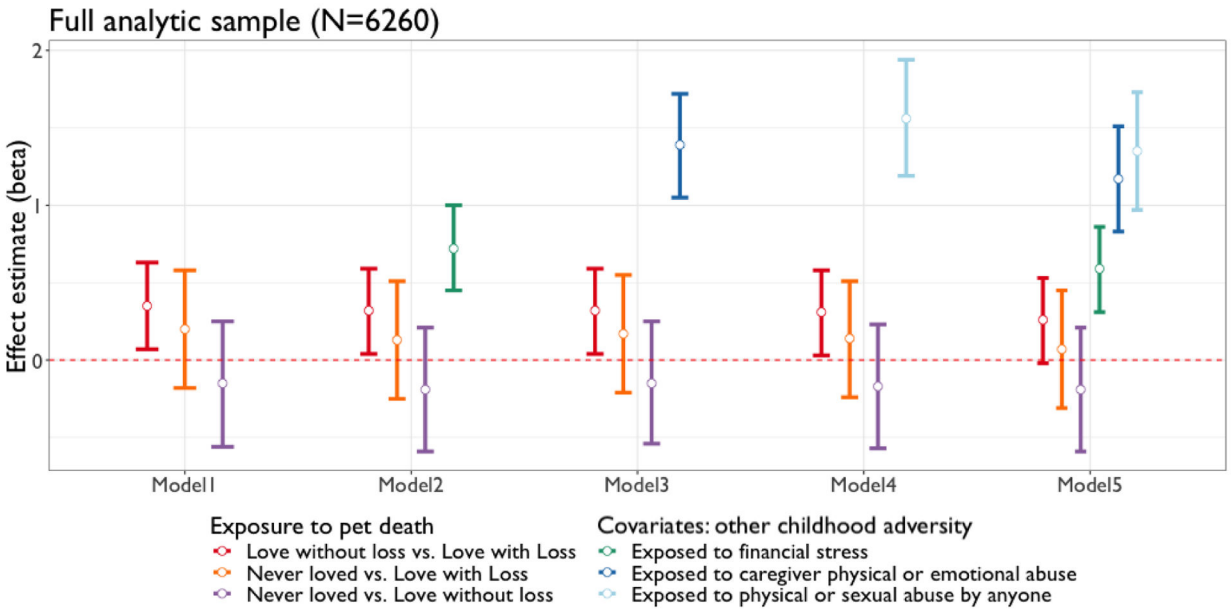

Figure 2.

Results of linear regression models examining difference in child psychopathology symptom scores between groups in the full ALSPAC analytic sample, adjusting for covariates and exposure to other adversity.

Note. Each vertical line represents point estimates and the corresponding confidence interval. The psychopathology symptoms in the *love with loss* group, compared to the *love without loss* group were significantly higher in Models 1–4, although the magnitude of effect was not as large as the effects of other major types of childhood adversity.

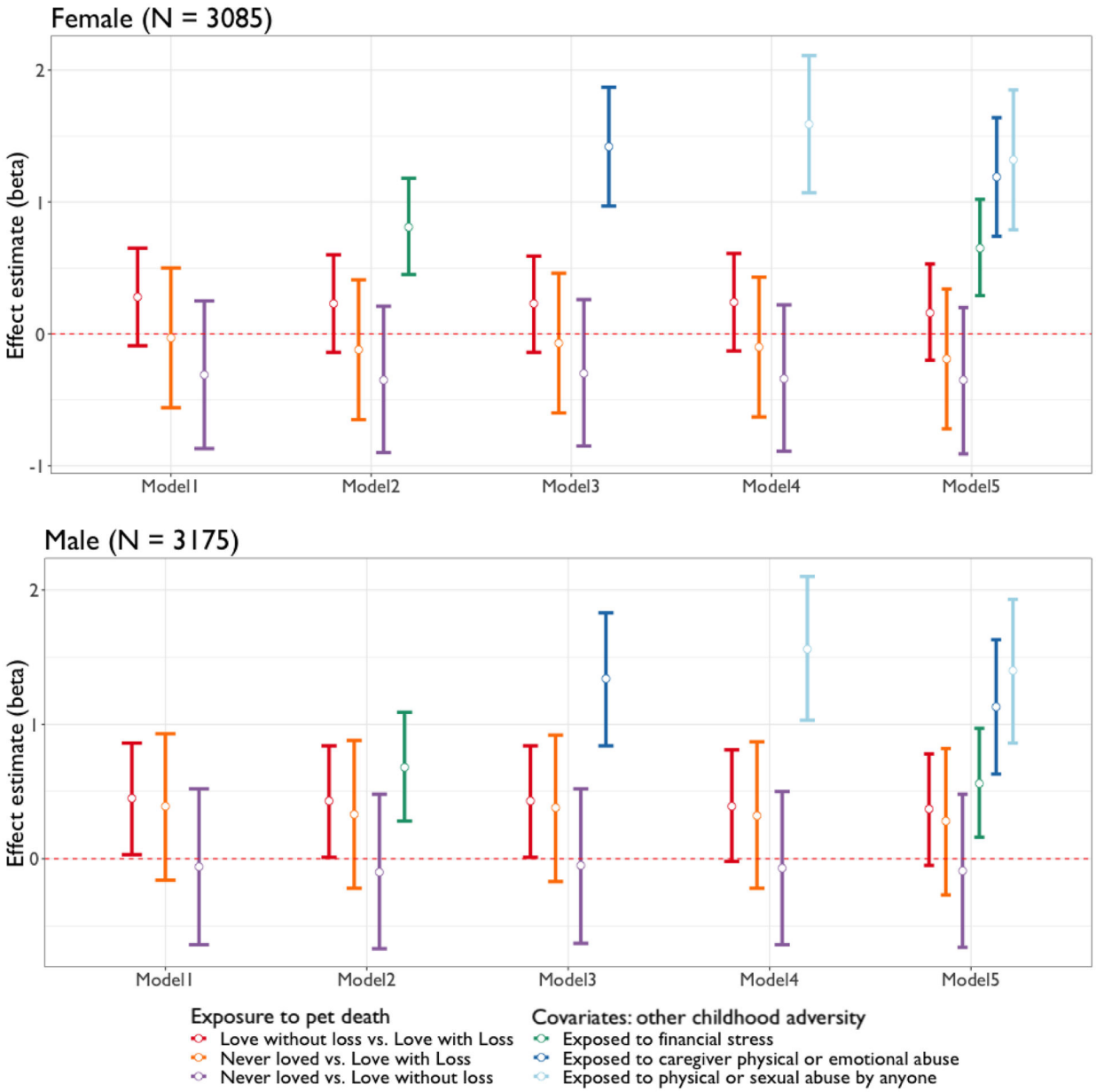

Figure 3.

Results of linear regression models examining difference in child psychopathology symptom scores between groups stratified by sex, adjusting for covariates and exposure to other adversity.

Note. Each vertical line represents a point estimate and the corresponding confidence interval. After stratifying by sex, the effects of the *love with loss* group relative to the *love without loss* group were no longer significant in girls, but they were still observed in Models 1–3 in boys.

Table 1.

Distribution of covariates in the total ALSPAC analytic sample and by the three subgroups defined by pet ownership and pet death

	Total sample (N=6260)	Love with Loss (N=3296)	Love without Loss (N=1682)	Never Loved (N=808)	*P*-value
	N (%)	N (%)	N (%)	N (%)	
Sex					0.001
Males	3175 (50.7)	1609 (48.8)	877 (52.1)	451 (55.8)	
Females	3085 (49.3)	1687 (51.2)	805 (47.9)	357 (44.2)	
Race					<0.001
Non-White	184 (3.0)	67 (2.1)	58 (3.5)	42 (5.3)	
White	5884 (97.0)	3134 (97.9)	1582 (96.5)	751 (94.7)	
Maternal education					<0.001
less than O-level	1290 (21.0)	697 (21.5)	340 (20.5)	109 (13.6)	
O-level	2174 (35.3)	1234 (38.1)	533 (32.1)	252 (31.5)	
A-level	1668 (27.1)	880 (27.1)	473 (28.5)	217 (27.1)	
Degree or above	1023 (16.6)	431 (13.3)	315 (19.0)	222 (27.8)	
Maternal marital status					0.326
Never Married	764 (12.4)	384 (11.8)	212 (12.7)	86 (10.7)	
Widowed/Divorced/Separated	304 (4.9)	171 (5.3)	72 (4.3)	35 (4.4)	
Married	5115 (82.7)	2700 (82.9)	1380 (82.9)	680 (84.9)	
Home ownership					<0.001
Mortgage/own home	5149 (83.8)	2691 (83.1)	1400 (84.7)	697 (88.3)	
Rent home	828 (13.5)	446 (13.8)	215 (13.0)	87 (11.0)	
Other	164 (2.7)	100 (3.1)	37 (2.2)	5 (0.6)	
Age of mother at child birth					0.029
Ages 15–19	99 (1.6)	47 (1.4)	29 (1.7)	3 (0.4)	
Ages 20–35	5616 (89.7)	2971 (90.1)	1503 (89.4)	720 (89.1)	
Age >35	545 (8.7)	278 (8.4)	150 (8.9)	85 (10.5)	
Parental social class (occupation)					<0.001
Professional	909 (14.5)	399 (12.1)	277 (16.5)	185 (22.9)	
Managerial and technical	2424 (38.7)	1261 (38.3)	663 (39.4)	335 (41.5)	
Skilled, non-manual	1354 (21.6)	760 (23.1)	347 (20.6)	144 (17.8)	

	Total sample (N=6260)	Love with Loss (N=3296)	Love without Loss (N=1682)	Never Loved (N=808)	*P*-value
	N (%)	N (%)	N (%)	N (%)	
Skilled, manual	348 (5.6)	209 (6.3)	93 (5.5)	22 (2.7)	
Semi-skilled, manual	103 (1.6)	63 (1.9)	25 (1.5)	5 (0.6)	
Unskilled, manual or other	1122 (17.9)	604 (18.3)	277 (16.5)	117 (14.5)	
Number of previous pregnancies					<0.001
0	2782 (45.5)	1314 (40.9)	786 (47.8)	464 (58.7)	
1	2222 (36.4)	1195 (37.2)	624 (37.9)	253 (32.0)	
2	837 (13.7)	533 (16.6)	181 (11.0)	54 (6.8)	
3+	267 (4.4)	174 (5.4)	54 (3.3)	20 (2.5)	
Singleton vs. multiple birth					0.156
Singleton	6128 (97.9)	3239 (98.3)	1645 (97.8)	786 (97.3)	
Multiple birth	132 (2.1)	57 (1.7)	37 (2.2)	22 (2.7)	
Financial hardship					<0.001
Never exposed	4092 (69.4)	2073 (66.7)	1237 (75.7)	634 (78.7)	
Exposed	1802 (30.6)	1033 (33.3)	397 (24.3)	172 (21.3)	
Caregiver physical or emotional abuse					0.029
Never exposed	4444 (83.0)	2295 (81.6)	1329 (84.4)	656 (84.3)	
Exposed	908 (17.0)	519 (18.4)	246 (15.6)	122 (15.7)	
Physical or sexual abuse by anyone					0.002
Never exposed	4533 (87.5)	2370 (86.0)	1500 (89.2)	659 (89.4)	
Exposed	645 (12.5)	385 (14.0)	182 (10.8)	78 (10.6)	
	Mean (SD)	Mean (SD)			0.012
Maternal depression	5.16 (4.54)	5.27 (4.55)	5.00 (4.50)	4.81 (4.39)	0.041

Note. The groups reported here were determined *before* imputation using complete-case data, meaning any child who had complete pet ownership and pet death exposure data (n=5786). The actual group proportions varied slightly across the 20 imputed datasets. The p-values corresponded to chi-squared tests when the covariate was a categorical variable (testing the null hypothesis that the covariates were equally distributed among the three exposure subgroups). For maternal depression (continuous), ANOVA was performed and the corresponding p-value was reported. Since most covariates and the pet death exposure variables had missingness, the cell counts do not sum to the total sample size.

Table 2.

Results of linear regression models examining difference in child psychopathology symptom scores between groups in the ALSPAC analytic sample (N=6260), after adjustment for covariates and exposure to other childhood adversities.

	Beta	SE	P-value	95% CI
Model 1: Baseline covariates only				
Exposure				
Never loved vs. Love with Loss	0.20	0.19	0.311	(−0.18, 0.58)
Never loved vs. Love without loss	−0.15	0.20	0.452	(−0.56, 0.25)
Love without loss vs. Love with Loss	0.35	0.14	0.013*	(0.07, 0.63)
Model 2: Model 1 + Financial hardship				
Exposure				
Never loved vs. Love with Loss	0.13	0.19	0.507	(−0.25, 0.51)
Never loved vs. Love without loss	−0.19	0.20	0.358	(−0.59, 0.21)
Love without loss vs. Love with Loss	0.32	0.14	0.025*	(0.04, 0.59)
Covariate				
Never vs. ever exposed to financial stress	0.72	0.14	<.001**	(0.45, 1)
Model 3: Model 1 + Caregiver physical or emotional abuse				
Exposure				
Never loved vs. Love with Loss	0.17	0.19	0.369	(−0.21, 0.55)
Never loved vs. Love without loss	−0.15	0.20	0.476	(−0.54, 0.25)
Love without loss vs. Love with Loss	0.32	0.14	0.023*	(0.04, 0.59)
Covariate				
Never vs. ever exposed to phys/emo abuse	1.39	0.17	<.001**	(1.05, 1.72)
Model 4: Model 1+ Physical or sexual abuse by anyone				
Exposure				
Never loved vs. Love with Loss	0.14	0.19	0.485	(−0.24, 0.51)
Never loved vs. Love without loss	−0.17	0.20	0.401	(−0.57, 0.23)
Love without loss vs. Love with Loss	0.31	0.14	0.029*	(0.03, 0.58)
Covariate				
Never vs. ever exposed to phys/sex abuse	1.56	0.19	<.001**	(1.19, 1.94)
Model 5: Model 1+ All three childhood adversities				
Exposure				
Never loved vs. Love with Loss	0.07	0.19	0.722	(−0.31, 0.45)
Never loved vs. Love without loss	−0.19	0.20	0.351	(−0.59, 0.21)
Love without loss vs. Love with Loss	0.26	0.14	0.066	(−0.02, 0.53)
Covariate				
Never vs. ever exposed to financ. hardship	1.35	0.19	<.001**	(0.97, 1.73)
Never vs. ever exposed to phys/emo abuse	0.59	0.14	<.001**	(0.31, 0.86)
Never vs. ever exposed to phys/sex abuse	1.17	0.17	<.001**	(0.83, 1.51)

Note. In these analyses, the first group listed, meaning before the vs., was the referent group. The names of the models indicate what variables were adjusted for when estimating the effects of the pet ownership and exposure status in the regression analyses. The covariate and exposure to other adversity variables are described in the Methods section.

*The corresponding beta estimate was significantly different from 0 at $p<.05$.

**The corresponding beta estimate was significantly different from 0 at $p<.0001$.

Table 3.

Results of linear regression models examining difference in child psychopathology symptom scores between those ever versus never exposed to pet death regardless of pet ownership (N=7476), after adjustment for covariates and exposure to other major childhood adversities.

	Beta	SE	P-value	95% CI
Model 6: Baseline covariates only				
Never vs. ever exposed to pet death	0.26	0.12	0.029 *	(0.03,0.5)
Model 7: Model 6 + Ever/never exposed to financial hardship				
Never vs. ever exposed to pet death	0.24	0.12	0.047 *	(0,0.48)
Never vs. ever exposed to financial stress	0.53	0.13	<.001 **	(0.27,0.79)
Model 8: Model 6 + Ever/never exposed to caregiver physical or emotional abuse				
Never vs. ever exposed to pet death	0.23	0.12	0.052	(0,0.47)
Never vs. ever exposed to caregiver physical or emotional abuse	1.32	0.18	<.001 **	(0.97,1.66)
Model 9: Model 6 + Ever/never exposed to physical or sexual abuse by anyone				
Never vs. ever exposed to pet death	0.21	0.12	0.076	(−0.02,0.45)
Never vs. ever exposed to physical or sexual abuse by anyone	1.56	0.18	<.001 **	(1.19,1.92)
Model 10: Model 6 + Ever/never exposed to all three major childhood adversities				
Never vs. ever exposed to pet death	0.18	0.12	0.138	(−0.06,0.41)
Never vs. ever exposed to financial hardship	1.36	0.19	<.001 **	(0.99,1.73)
Never vs. ever exposed to caregiver physical or emotional abuse	0.36	0.13	0.005	(0.11,0.62)
Never vs. ever exposed to physical or sexual abuse by anyone	1.11	0.18	<.001 **	(0.76,1.46)

Note. In these analyses, the never exposed group was the referent. The names of the models indicate what variables were adjusted for when estimating the effects of exposure to pet death in the regression analyses. The covariate and exposure to other adversity variables are described in the Methods section.

* The corresponding beta estimate was significantly different from 0 at p<.05.

** The corresponding beta estimate was significantly different from 0 at p<.0001.