

Puppy love in the time of Corona: Dog ownership protects against loneliness for those living alone during the COVID-19 lockdown

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Abstract

Background: The COVID-19 pandemic has resulted in many countries enforcing a ‘lockdown’, whereby people are instructed to stay at home.

Aim: The aim of this study was to capture the experience of such a lockdown in Australians living alone, with and without a dog or a cat.

Method: Three hundred and eighty-four participants completed an online survey evaluating their levels of loneliness, mindfulness and mood. For participants who owned a dog or a cat, a measure of dog/cat interactions was also administered as well as two open-ended questions about how being a pet owner affected their experience of COVID-19 and how COVID-19 affected their pet.

Results: Contrary to expectations, cat owners were found to be less mindful than non-owners and pet interactions did not account for levels of loneliness or levels of mindfulness. In line with our expectations, however, stress and depression positively predicted loneliness, while mindfulness and being a dog owner were protective against it. Insights from qualitative responses suggest that this might be due to the fact that dogs encourage a routine which involves getting out of the house and walking, which itself offers opportunities to socialise with other people doing the same thing.

Conclusion: These findings add to the emerging literature on mental well-being during a lockdown and the unique role that pets play in their owners’ experiences.

Keywords

COVID-19, loneliness, mindfulness, pet, dog, cat

Loneliness is a risk factor for morbidity and mortality (Holt-Lunstad et al., 2010; Luo et al., 2012) and is reported as a particularly pertinent problem in the elderly (Ong et al., 2016). A report from a 2018 study demonstrated that 50% of Australians ‘sometimes’ or ‘always’ felt alone; however, this number was found to be higher in younger compared to older adults and equal across genders (Lim, 2018). Importantly, loneliness was also a risk factor for depression and anxiety symptoms (Lim, 2018). With this as the ‘baseline’ level of loneliness in Australia, it is important to consider the effect of a pandemic-induced ‘lockdown’, such as that which was declared on 23 March 2020 in Australia.

Mental health clinicians have already published on the importance of social connection during the current COVID-19 pandemic, with many countries across the globe experiencing a government-enforced lockdown (Ng et al., 2020). Studies from China and Turkey have demonstrated increased depression and anxiety, particularly in females (Özdin & Özdin, 2020; Wang et al., 2020).

However, Banerjee and Rai (2020) posit that the way forward is to be at peace with oneself during these times of solitude. Indeed, researchers have demonstrated mindfulness – the ability to keep the mind attending to what is occurring in the present moment, to have a negative association with depression, anxiety and stress and a positive association with well-being (e.g. Cash & Whittingham, 2010; Soysa & Wilcomb, 2015). Researchers are also starting to establish a link between high levels of mindfulness and low levels of loneliness (e.g. Clear et al., 2020; Jin et al., 2020). In fact, the idea that loneliness stems from being alone is contrary to the ancient philosophy on which mindfulness is based, whereby ‘mindfulness’ practices bring awareness of our connectedness to all other living things (Nhat Hanh, 2001). Indeed, a recent

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meta-analytic investigation demonstrated a significant association between mindfulness and connectedness to nature (Schutte & Malouff, 2018). However, when people are living alone *and* not being mindful, they are at risk of becoming lonely.

Pets might enhance mindfulness via being an extension of nature or by more actively encouraging their owners into the present moment by engaging them in play, walks/time outside or simply by stimulating their senses in a tactile way (e.g., owners stroking their fur). Qualitative reports from dog owners demonstrated *enhanced awareness and mindfulness* as a core theme resulting from interacting with their dogs (Garcia, 2020), and mindful interaction with dogs has been shown to encourage a sense of connection to self and others (Jackson-Grossblat et al., 2016). Dog ownership (but not cat ownership) has been associated with reduced loneliness and social isolation in adults living alone (Hajek & König, 2019), and studies have demonstrated that dog acquisition reduces loneliness (Antonacopoulos, 2017; Powell et al., 2019). Furthermore, qualitative insights from a *Must Love Dogs* intervention programme for older Australians living alone suggest that interactions with dogs can increase positive affect in a group setting (Papotto & Oliva, 2019). However, Powell et al. (2019) found that when the level of education was adjusted for in their analyses, the effects of dog acquisition on loneliness were nullified, and a systematic review by Gilbey and Tani (2015) has cast doubt on the convincingness of the extant quantitative evidence that companion animals alleviate loneliness, expressing a need for more research to be conducted under ‘controlled’ conditions with a consideration for the time participants actually spend with their animal. One such study, a randomised controlled trial comparing a mindfulness intervention group, a dog interaction group and a control group, was able to demonstrate that similar reductions in state anxiety and depression levels could be gained from both the mindfulness intervention and dog interaction groups, as compared to the control group (Shearer et al., 2016). This might suggest that dog interactions and mindfulness practices have similar effects on the brain/mind and can therefore bring about similar positive mental health benefits.

This study aims to capture the experience of the COVID-19 lockdown in an Australian population living alone. Specifically, the study will investigate whether pet owners living alone demonstrate higher levels of mindfulness as compared to non-owners living alone while adjusting for previous mindfulness training experiences. Pet ownership, mindfulness, mood, age and gender will also be explored for their ability to predict loneliness. Furthermore, in the cohort who own a dog or a cat, the study will investigate whether mindfulness mediates the relationship between the intensity of pet interactions and loneliness. The nature of the human–pet relationship during a time of heightened and extended life stress such as that experienced during the

COVID-19 pandemic lockdown period is unknown; hence, the study will utilise a mixed-methods approach to capture this unique experience.

Method

Participants

The online study was completed by 384 participants (54 men, 328 women, 1 non-binary gender, 1 unspecified; $M_{\text{age}} = 50.92$ years, $SD_{\text{age}} = 15.09$ years, age range = 23–89 years). Participants were required to be adults (18+), to be Australian residents/citizens and live alone. Most participants reported having a university education (31.5% undergraduate and 37.5% postgraduate). Of the total sample, 30.20% indicated they lived with a dog ($n = 116$), 32.81% indicated they lived with a cat ($n = 126$), and 3.65% ($n = 14$) indicated they lived with another animal. For the purposes of the study, pet owners were asked to choose the pet they were closest to or spent the most time with and were classified as either ‘dog owners’ or ‘cat owners’ (refer to Table 1); however it is possible that owners could have more than one pet. As shown in Table 1, almost 66% of the participants were self-isolated or quarantined during the time of the study. A quarter of the sample continued employment as an essential worker. Only a small proportion knew someone diagnosed with COVID-19, with no participants diagnosed themselves.

Measures

Participants initially responded to a series of questions regarding their COVID-19 experience. An opportunity was also provided to pet owners to respond to two open-ended questions about how being a pet owner impacted their experience of COVID-19 and how they perceived the COVID-19 experience affected their pet.

The Pet Interactions subscale of the Cat/Dog Owner Relationship Scale (C/DORS; Howell et al., 2017) was used to measure pet interaction frequency on a 5-point Likert-type scale *at least once a day, every few days, once a week, once a month and never*. Only dog questions were administered to dog owners and cat questions to cat owners. However, two of the dog-related questions were removed because they asked about activities not possible during COVID-19 lockdown (‘How often do you take your pet in the car?’ and ‘How often do you take your pet to visit people?’), leaving a total of seven questions for dog owners and six for cat owners. The word ‘pet’ was also changed to ‘dog’ or ‘cat’ as appropriate, and participants were instructed to reflect on the period of the lockdown when responding to the questions. In this study, the measure demonstrated acceptable reliability for the cat scale ($\alpha = .75$); however, the modified dog scale did not reach an acceptable level ($\alpha = .65$). Cronbach’s alpha is slightly

Table 1. Descriptive analysis of COVID-19 experience, by pet owner group.

	Dog owners (n = 111)	Cat owners (n = 103)	Non-owners (n = 170)
Chose to self-isolate/quarantine due to COVID-19	63 (56.8%)	62 (60.2%)	90 (52.9%)
Required to self-isolate/quarantine due to COVID-19	10 (9.0%)	16 (15.5%)	31 (18.2%)
Knew someone diagnosed with COVID-19	3 (2.7%)	3 (2.9%)	4 (2.4%)
Was diagnosed with COVID-19	0 (0.0%)	0 (0.0%)	0 (0.0%)
Employed as an 'essential worker' during lockdown	28 (25.2%)	36 (35.0%)	46 (27.1%)
Lost employment due to COVID-19 lockdown	11 (9.9%)	6 (5.8%)	20 (11.8%)
No significant change due to COVID-19 lockdown	25 (22.5%)	10 (9.7%)	34 (20.0%)

Note: Participants could choose more than one option.

lower than that previously reported for both dogs ($\alpha = .67$, Dwyer et al., 2006; $\alpha = .72$, Oliva et al., 2016) and cats ($\alpha = .82$, Howell et al., 2017); however, removal of items did not substantially improve the reliability of the scale; therefore, the scale items were retained as administered.

The Freiburg Mindfulness Inventory (FMI; Walach et al., 2006) is a 14-item questionnaire rated on a 4-point Likert-type scale *rarely, occasionally, fairly often* and *almost always*. The FMI can be used as a total score where high scores indicate high mindfulness. In this study, a time frame of 'the last two weeks' was chosen to capture participants' state of mind mid-lockdown. The measure demonstrated good reliability in this study ($\alpha = .87$), consistent with previous research on this scale (see, for example, Walach et al., 2006).

Participants were also asked to indicate their previous mindfulness and meditation experience on a 5-point Likert-type scale: *I've never had any mindfulness or meditation training experience, I've tried mindfulness or meditation before but only briefly (<10 times), I have experimented with mindfulness or meditation training several times (i.e., 10 times or more) but never picked up a consistent practice, I have had (either now or in the past) a frequent (once a week or more) mindfulness or meditation practice but for less than six consecutive months and I have had (either now or in the past) a frequent (once a week or more) mindfulness or meditation practice for more than 6 months*. This scale was created specifically for this study.

The 3-item University of California, Los Angeles (UCLA) Loneliness Scale (Hughes et al., 2004) is a short version of the longer questionnaire developed by Russell et al. (1980) specifically designed for use in large surveys. It was originally developed for surveys administered over the phone to be rated on a 3-point Likert-type scale; however, as this survey was administered online, it was decided to maintain the 4-option ratings as per the original scale (*never, rarely, sometimes, often*). Participants were asked to consider how often they felt they lacked companionship, were left out or felt isolated during the COVID-19 lockdown period. In this study, the measure demonstrated good reliability ($\alpha = .87$), which is higher than previous research using this scale ($\alpha = .72$; Hughes et al., 2004).

Participants were also asked to indicate how often they had 'felt lonely during COVID-19 lockdown' as a single-item (i.e., direct) measure of loneliness, as recommended by the Office for National Statistics (2018) and by Antonacopoulos (2017) for measuring loneliness in a pet owner sample. The same rating options as the 3-item UCLA Loneliness scale were used for consistency across questions. This single item correlated highly with the UCLA Loneliness scale ($r = .82$ and $p < .001$), demonstrating good convergent validity between the two measures.

The Depression, Anxiety and Stress Scale 21-item Version (DASS-21; Lovibond & Lovibond, 1995) is a 21-item questionnaire rated on a 4-point Likert-type scale *never, sometimes, often* and *always*. It was chosen as a widely accepted and psychometrically sound measure of mood which emphasises mood state over clinical diagnosis. As expected from previous research (e.g., Crawford & Henry, 2003), the measure demonstrated excellent overall reliability in this study ($\alpha = .93$ Total Scale; $\alpha = .90$ Depression, $.80$ Anxiety, $.87$ Stress).

Design and Procedure

The study utilised a cross-sectional non-experimental survey design and was completed online by clicking on a secure link to a Qualtrics platform hosting the study. Ethics was approved by the Monash University Human Ethics Committee. Promotion of the study occurred via social media and personal networks, with no payment or incentive offered for participation. Participants of the study self-selected between 5 May and 13 2020 (COVID-19 stage 3 lockdown period in Australia commenced 23 March, with individual states commencing initial easing of restrictions on 11 May 2020). During this time, the only valid reasons to be out of one's house were (a) shopping for food, (b) accessing medical services or providing care, (c) exercising, and (d) going to work as an 'essential worker'.

Data analysis. Data were exported from Qualtrics to Statistical Package for Social Sciences (SPSS). Missing data were managed using listwise deletion. Bootstrapping was applied to all analyses. Initial comparisons were made between

Table 2. Means, standard deviations and ranges for study variables, by pet owner group.

	Dog owners (<i>n</i> = 111)			Cat owners (<i>n</i> = 103)			Non-owners (<i>n</i> = 170)		
	Range	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>
Loneliness (three items)	3–12	7.67	2.88	3–12	8.43	2.42	3–12	8.37	2.56
Loneliness (one item)	1–4	2.41	1.05	1–4	2.86	0.86	1–4	2.77	1.00
Mindfulness	17–53	36.34	6.96	20–53	35.70	6.85	19–55	37.67	7.82
Depression	0–42	10.32	8.70	0–42	11.03	9.28	0–36	10.41	8.30
Anxiety	0–28	4.97	5.81	0–36	5.67	6.73	0–30	5.57	5.70
Stress	0–34	9.96	7.21	0–42	11.26	8.92	0–40	10.86	8.00

SD: standard deviation.

mindfulness levels of participants for those who do not own a pet and those who nominated their primary pet as a dog and those who nominated their primary pet as a cat, adjusting for previous mindfulness experiences. Two hierarchical multiple regressions (HMRs) were used to determine the relative value of pet ownership, mindfulness, mood, age and gender in the prediction of loneliness, one using the 3-item UCLA and one using the direct measure. Regression analysis using PROCESS macro for mediation was used to explore the role of mindfulness in the relationship between more frequent pet interactions and decreased loneliness (using the 1-item measure), separately for dog owners and cat owners. The experience of COVID-19 and pet ownership, as described in the two open-ended questions, was analysed using thematic content analysis to identify key themes.

Results

Quantitative analyses

Prior to analyses, the models were assessed for violations of the assumptions underlying analysis of variance (ANOVA) and multivariate regression. No problematic issues were noted for any of the models being tested; therefore, analyses proceeded with the original data.

Descriptive analysis of the key variables is presented in Table 2. Scores on the DASS-21 were doubled to allow for normative comparison; mean scores indicated that in the week prior to survey, the sample experienced relatively low levels of emotional distress, as evidenced by a mean score in the normal range for anxiety (0–6), normal range for stress (0–10) and mild range for depression (10–12). It is important to note, however, that the DASS scores should be regarded as providing an individual's score on an underlying dimension; therefore, these cut-offs are provided purely for comparative purposes (Crawford & Henry, 2003). Most participants had engaged in previous mindfulness or meditation; 25.6% (*n* = 82) had tried it briefly, 26.9% (*n* = 103) had experimented but not established a consistent practice, 6.3% (*n* = 24) had a frequent practice currently or in the past of less than 6 months' duration and 19.8% (*n* = 76) had a

frequent practice currently or in the past of more than 6 months' duration. In addition, 38.5% (*n* = 148) reported that they had engaged in a mindfulness practice during the lockdown, with approximately equal frequencies across non-owners, dog owners, and cat owners.

There were significant correlations between depression, anxiety, stress, loneliness and mindfulness scores, as shown in Table 3.

A one-way analysis of covariance (ANCOVA) was used to compare mindfulness levels between those who owned a pet (dog owner *n* = 111 and cat owner *n* = 101) and those who did not own a pet (*n* = 167). A covariate was included to partial out the effects of previous mindfulness training/experience from the analysis. The ANCOVA indicated that, after accounting for the effects of previous mindfulness training/experience, there was a statistically significant effect of pet ownership on mindfulness, $F(2, 375) = 3.27, p = .039, \eta_p^2 = .017$. Simple contrasts revealed that there was a significant difference between cat owners and non-owners ($p = .015$), but not between dog owners and non-owners ($p = .097$).

To ascertain the relative importance of pet ownership, mindfulness, mood, age and gender in the prediction of loneliness using the 3-item UCLA, a hierarchical multiple regression analysis (MRA) was conducted. Variables were entered in accordance with their established connection to loneliness in the previous literature. Hence, dog/cat ownership and mindfulness were entered in the first block, mood (depression, anxiety, stress) in the second block, and age and gender in the third block. At Step 1, dog ownership, cat ownership and mindfulness accounted for a significant 10% of the variance in loneliness, $R^2 = .10, F(3, 368) = 13.87, p < .001$. At Step 2, depression, anxiety and stress added to the regression equation accounted for an additional 19% of the variance in loneliness, $\Delta R^2 = .19, \Delta F(3, 365) = 31.68, p < .001$. At Step 3, age and gender accounted for a non-significant amount of the variance in loneliness, $\Delta R^2 = .00, \Delta F(2, 363) = .70, p = .497$. A statistical post hoc power analysis using G Power software 3.1 confirmed that the non-significant findings in Model 3 were not due to inadequate power ($1 - \beta > .99$). Hence, as the variables entered at Step

Table 3. Correlations for study variables.

	1	2	3	4	5	6	7
1. Dog interaction	–	–	–	–	–	–	–
2. Cat interaction	–	–	–	–	–	–	–
3. Loneliness (three items)	.08	.06	–	–	–	–	–
4. Loneliness (one item)	.02	–.02	.82***	–	–	–	–
5. Mindfulness	.02	–.07	.29***	–.35***	–	–	–
6. Depression	.09	.03	.51***	.49***	–.45***	–	–
7. Anxiety	–.06	.07	.36***	.35***	–.32***	.61***	–
8. Stress	.02	.02	.44***	.42	–.44***	.65***	.71***

*** $p < .01$.

3 did not significantly improve the Model, Model 2 was deemed to be the 'best fit'. In combination, the five predictor variables in Model 2 explained 29.0% of the variance in loneliness ($R^2 = .29$, Adj. $R^2 = .28$).

Unstandardised (B) and standardised (β) coefficients, and squared semi-partial correlations (sr^2) for each predictor in Models 1 and 2 of the hierarchical MRA are reported in Table 4. As can be seen, there were three significant predictors of loneliness in Model 2: depression ($sr^2 = .07$), stress ($sr^2 = .01$) and dog ownership ($sr^2 = .01$).

Table 4. Unstandardised (B) and standardised (β) regression coefficients, and squared semi-partial correlations (sr^2) for each predictor variable in Steps 1 and 2 of a hierarchical multiple regression predicting loneliness as measured by the 3-item UCLA Loneliness Scale.

Variable	B [95% CI]	β	sr^2
Model 1			
Constant	12.35 [10.99, 13.70]	–	–
Dog owner	–0.88 [–1.48, –0.27]**	–.15	.02
Cat owner	–0.24 [–0.87, 0.380]	–.04	.00
Mindfulness	–0.10 [–0.14, –0.07]***	–.30	.09
Model 2			
Constant	7.31 [5.72, 8.91]	–	–
Dog owner	–0.71 [–1.25, –0.16]*	–.12	.01
Cat owner	–0.13 [–0.69, 0.43]	–.02	.00
Mindfulness	–0.02 [–0.05, 0.02]	–.05	.00
Depression	0.11 [0.07, 0.15]***	.37	.07
Anxiety	–0.01 [–0.07, 0.05]	–.02	.00
Stress	0.06 [0.02, 0.11]**	.19	.01

UCLA: University of California, Los Angeles; CI: confidence interval. $N = 372$.

* $p < .05$; ** $p < .01$; *** $p < .001$.

In line with recommendations by Antonacopoulos (2017) for measuring loneliness in a pet owner sample, the same hierarchical MRA was re-run using the single-item loneliness score as the outcome variable. At Step 1, dog ownership, cat ownership and mindfulness accounted for a significant 15% of the variance in loneliness, $R^2 = .15$,

$F(3, 366) = 22.28$, $p < .001$. At Step 2, depression, anxiety and stress added to the regression equation accounted for an additional 14% of the variance in loneliness, $\Delta R^2 = .14$, $\Delta F(3, 363) = 23.19$, $p < .001$. At Step 3, age and gender accounted for a non-significant amount of the variance in loneliness, $\Delta R^2 = .01$, $\Delta F(2, 361) = 1.45$, $p = .235$. A statistical post hoc power analysis using G Power software 3.1 confirmed that the non-significant findings in Model 3 were not due to inadequate power ($1 - \beta > .99$). As the variables entered at Step 3 did not significantly improve the model, Model 2 was deemed to be the 'best fit'. In combination, the five predictor variables in Model 2 explained 29.0% of the variance in loneliness ($R^2 = .29$, Adj. $R^2 = .28$).

Unstandardised (B) and standardised (β) coefficients, and squared semi-partial correlations (sr^2) for each predictor in Models 1 and 2 of the hierarchical MRA are reported in Table 5. As can be seen, there were three significant predictors of loneliness in Model 2: depression ($sr^2 = .07$), stress ($sr^2 = .01$) and dog ownership ($sr^2 = .01$).

Table 5. Unstandardised (B) and standardised (β) regression coefficients, and squared semi-partial correlations (sr^2) for each predictor variable in Steps 1 and 2 of a hierarchical multiple regression predicting the direct measure of loneliness.

Variable	B [95% CI]	β	sr^2
Model 1			
Constant	4.55 [4.06, 5.05]	–	–
Dog owner	–0.43 [–0.65, –0.20]***	–.20	.03
Cat owner	–0.03 [–0.26, 0.20]	–.01	.00
Mindfulness	–0.05 [–0.06, –0.03]***	–.35	.12
Model 2			
Constant	2.96 [2.35, 3.56]	–	–
Dog owner	–0.38 [–0.58, –0.17]***	–.17	.02
Cat owner	0.01 [–0.20, 0.22]	.004	.00
Mindfulness	–0.02 [–0.03, –0.01]**	–.15	.02
Depression	0.04 [0.02, 0.05]***	.33	.05
Anxiety	0.00 [–0.02, 0.02]	–.001	.00
Stress	0.02 [–0.00, 0.03]	.13	.01

CI: confidence interval.

$N = 370$.

** $p < .01$; *** $p < .001$.

To test the hypotheses that pet interaction is predictive of lower levels of loneliness, and that this relationship may also be indirect in nature via mindfulness, two mediation models were conducted (Model 1: dog owners and Model 2: cat owners) using the single-item loneliness measure. Bootstrapping and heteroscedasticity-consistent approach to estimating standard errors (HC3) were applied as part of the model testing procedure. Previous mindfulness experience/training was included as a covariate mediator.

The first mediation model ($n=111$) indicated that dog interaction and mindfulness accounted for 15% significant unique variance in loneliness, $R^2=.19$, $F(3, 107)=11.91$, $p<.001$. The hypothesis predicting that the direct effect of dog interaction predicted unique variance in loneliness, holding the levels of mindfulness consistent, was not supported by the model, $c'=.06$, lower level of confidence interval (LLCI)/upper level of confidence interval (ULCI)=0, $p=.74$. The hypothesis predicting that mindfulness would mediate the relationship between dog interaction and loneliness was also not supported by the model, $ab=-.02$, LLCI/ULCI=0, $p>.05$. Examination of the pathways indicated that there was a significant inverse relationship between mindfulness and loneliness ($B = -.16$, $p < .001$), however no other model pathways were significant.

The second mediation model ($n=101$) indicated that cat interaction and mindfulness accounted for 10% significant unique variance in loneliness, $R^2=.10$, $F(3, 97)=3.18$, $p=.033$. The hypothesis predicting that the direct effect of cat interaction predicted unique variance in loneliness, holding the levels of mindfulness consistent, was not supported by the model, $c'=-.06$, LLCI/ULCI=0, $p=.81$. The hypothesis predicting that the indirect effect of cat interaction via mindfulness would account for significant unique variance in loneliness was also not supported by the model, $ab=.03$, LLCI/ULCI=0, $p>.05$, indicating no mediation. Examination of the pathways indicated that the only significant pathway was a significant inverse relationship between mindfulness and loneliness ($B = -.11$, $p < .05$).

Qualitative analyses

To better capture the personal experiences of pets and owners, owners were asked how being a pet owner affected their experience of COVID-19 and how COVID-19 affected their pet. The two authors of this article independently identified themes on the first 10 cases and through discussion created mutually agreed upon theme names and definitions that were used to independently code the next block of 10 cases. Then, their coding was compared and theme names and definitions refined where necessary. This process continued until an acceptable inter-rater reliability ($r > .80$) was reached. Once achieved, a single rater (J.L.O.) completed the coding and then K.L.J. reviewed it

and any discrepancies were resolved through discussion. Themes endorsed by 5% of either the cat or dog owner populations are presented in Tables 6 and 7.

The most commonly endorsed way that being a pet owner affected the experience of the COVID-19 lockdown in Australia was, for example, *made the isolation easier, reduced loneliness and/or increased companionship*. While this was consistent across dog and cat owners, dog owners placed more importance on the physical connection aspect of this theme, for example, *'I have someone to cuddle having dogs'*, while both dog and cat owners expressed the importance of having someone to talk to: *'She gives me a reason to talk out loud'*. Similarly, how the pet improved the *mental state/well-being* of the owner also appeared to differ between dog and cat owners, with cat owners endorsing the 'mood improvement' aspect over the 'greater sense of purpose, motivation and routine' aspect, at a ratio of approximately 3:1, and dog owners endorsing both aspects approximately equally. All other themes showed similar patterns of endorsement across dog and cat owners, except for *source of worry*, which was more common in cat owners, and themes which were unique to dog owners.

In addition to the themes presented in the table, 13 dog owners and 8 cat owners provided unique responses. Two dog owners and one cat owner provided responses that did not address the question, and one dog owner and one cat owner did not provide any response and were therefore not included in the sample size calculation for this question.

The most commonly endorsed way that a pet was affected by the experience of the COVID-19 lockdown in Australia was that they received *more companionship or attention*, and this was consistent across both cat and dog owners. However, the second most commonly endorsed theme differed between dog and cat owners, with dogs experiencing *little to no difference* and cats demonstrating a *change in emotion or behaviour*. In dogs, changes were most commonly an increase in happiness and being more settled and relaxed, or they had become more clingy/ needy. Conversely, cats showed a greater range of emotional or behaviour changes, with some appearing happier and more relaxed, while others were described as 'put-out' or disturbed by their owner being home more. Other changes included being more needy, demanding, affectionate or playful. More exercise was unique to dog owners, and the impact on regular activity was more common among dog owners than cat owners. Concern for pet post-isolation was similar across both dog and cat owners.

In addition to the themes presented in the table, 11 dog owners and 9 cat owners provided unique responses. Two dog owners provided responses that did not address the question and three cat owners expressed that they had obtained their cat prior to or during the lockdown and were therefore unable to provide a comparison and were

Table 6. Common themes relating to how being a pet owner affected people's experiences of COVID-19.

Theme	Definition	Examples	Frequency dog owners (n = 108)	Frequency cat owners (n = 101)
Makes isolation easier/reduces loneliness/provides companionship	States that being a pet owner makes isolation easier and/or that the pet offers its owner companionship, someone to talk to, physical connection and protects against loneliness	Didn't feel so alone. Had someone to keep me company At least there is someone to talk to and see during the days/nights, although they don't answer, it is a distraction from the nothingness	72	73
Improves mental state/well-being	Pet interaction improves owner's mental state or well-being via regulation of emotions and/or mood, for example, via amusement, or provides the owner with a routine, purpose and/or motivation for life	Positive influence on my mood They have given me a reason to get up and to get through the day Having my dog to care for gives me purpose	25	24
Excuse to leave the house/encourages exercise	States that having a pet is a valid excuse for the owner to leave the house during the lockdown and/or encourages exercise	Was a great excuse to get out for a walk when strict controls were first introduced They also ensure I go out for walks daily. I also didn't walk daily when they weren't here	23	–
Little to no difference	States that being a pet owner has resulted in no difference to the experience COVID-19 or that the owner has experienced no difference in life since pre-COVID-19	No significant difference to before COVID-19	15	11
Beneficial for owner–pet connection	States that the extra time at home with their pet has benefitted the owner–pet connection, for example, via increased bonding or appreciation for the pet	Spending more time at home has strengthened the bond between us	9	5
Opportunity to socialise with people	States that the pet acts as an opportunity to socialise with people	At least I can still go for walks at least once a day and interact with other people at the dog park	7	–
Source of worry	States that the pet is a source of worry for the owner	I'm more aware of [her] and what she's doing and concerned when she is not nearby.	1	5

Frequencies were calculated by summing the number of participants who endorsed a theme. Individual participants were only able to endorse a theme once but could endorse more than one theme.

therefore not included in the sample size calculation for this question.

Discussion

The aim of this study was to capture the experience of the COVID-19 lockdown in an Australian population living alone, with and without a dog or a cat. The hypothesis that pet owners would score higher on mindfulness than non-owners was not supported. While there was a difference in mindfulness scores between cat owners and non-owners, it was the non-owners who demonstrated significantly higher levels, and no differences were observed between non-owners and dog owners. The hypothesis that mindfulness would mediate the relationship between more frequent pet interactions and loneliness was also not supported.

The finding that pet ownership offers no benefits in terms of mindfulness is in contrast to findings supporting an association between mindfulness and pet ownership (Garcia, 2020), and mindfulness and connectedness to nature (Schutte & Malouff, 2018). However, the notion that animals are an extension of nature and therefore connection to our pets is akin to connectedness to nature may not work for domesticated animals. Perhaps interacting with animals in a human, technology-heavy environment has blocked our ability to have a sense of connection to nature through them. The findings that cat owners are less mindful than non-owners might be explained by the fact that more cats than dogs were shown to be a source of worry for their owners (Table 6) and were less predictable in terms of their reaction to their owners being home more, with many cats being 'put out' or disturbed by this (Table 7).

Table 7. Common themes relating to how owners perceived COVID-19 affected their pets.

Theme	Definition	Example	Frequency dog owners (n = 109)	Frequency cat owners (n = 100)
More companionship/attention	Expresses that the pet has been getting more companionship or attention than pre-COVID-19	She is enjoying having me around more and getting more attention	38	40
Emotional or behaviour change	States the pet is demonstrating an emotion or behaviour reflective of a change in the emotional state	I'm not sure she likes me being home all the time. She doesn't sit with me on the couch as much and don't sleep on the bed anymore She has more time with me and thus experiences less separation anxiety He has become somewhat nervous	25	38
Little to no difference	States there has been no observable change to the pet's experience of life since COVID-19	Not at all. Maybe she's happier with me home. Maybe not. She hasn't discussed it with me	35	30
More exercise	Expresses that the pet is getting more exercise during the lockdown than previously	She has had lots more exercise	17	–
Impact on regular activity	Expresses that the pet's regular activities have changed as a result of the lockdown	He has not seen as much of his best friends	10	3
Concern about pet post-isolation	The owner expresses concern about how the pet will adjust when the restrictions start to lift again	I am worried how he will be when I have to return to work outside the home	4	6

Frequencies were calculated by summing the number of participants who endorsed a theme. Individual participants were only able to endorse a theme once but could endorse more than one theme.

Alternatively, it is possible that cat owners are just inherently less mindful. Similar differences have been observed with other traits (e.g. 'cat people' have been shown to score significantly higher on neuroticism than 'dog people'; Gosling et al., 2010). This is further supported by the differences in how cats and dogs were reported to improve the *mental state/well-being* of their owners (Table 6), with more cat owners endorsing the mood enhancement aspect of this theme, as compared to the 'greater sense of purpose, motivation and routine' aspect.

While dog interactions were not found to reduce loneliness scores, dog ownership was found to significantly protect against loneliness (using both the 1-item and 3-item measures), while negative mood states, specifically depression (and stress using the 3-item measure), predicted it. The loneliness buffering effect of dog ownership is in line with the previous literature (Antonacopoulos, 2017; Hajek & König, 2019); however, unlike the study by Antonacopoulos, this study was able to demonstrate this using both the 3-item UCLA Loneliness Scale and the single-item measure, albeit more strongly with the single-item measure. This difference might be explained by the fact that the three items of the 3-item UCLA Loneliness Scales differed across the two studies. However, other differences were observed when using the different measures, for example, when predicting scores on the 3-item measure with only dog ownership, cat ownership and

mindfulness scores in the model (Model 1, Table 4), mindfulness was a significant predictor of loneliness; however, in Model 2, with the addition of depression and stress scores, it no longer was. In contrast, when predicting scores on the 1-item measure, mindfulness continued to be a predictor at Step 2, but stress was not. This suggests that although the loneliness measures demonstrated high convergent validity, they may not be tapping into the exact same construct and highlights the importance of considering whether traditional loneliness scales are appropriate for evaluating the loneliness reducing power of pets.

The association between increased mindfulness and decreased loneliness is consistent with emerging literature (Clear et al., 2020; Jin et al., 2020), and the association between loneliness and mood is consistent with findings reported by Lim (2018). Also in line with findings by Lim (2018), neither of the loneliness measures were found to be associated with gender; however, contrary to Lim's findings, neither was age. This might reflect that the impact of a lockdown on loneliness affects people of all ages equally, rather than these feelings being associated with any one particular stage of life.

It is interesting that while dog interactions were not found to reduce loneliness scores, simply owning a dog did appear to buffer the effects of loneliness in some way. Qualitative insights offered in this study suggest that this is by the pet acting as a companion through the lockdown

experience. For dog owners more so than cat owners, an important aspect of this was the existence of a physical connection, that is, being able to touch and feel another living creature in the house. Both dog and cat owners expressed the importance of the pet as an excuse to talk out loud, which has been shown to improve concentration and performance on cognitive tasks (Kirkham et al., 2012; Lupyan & Swingley, 2012) and may also play an important role in well-being during solitude.

While owning a cat was not found to predict lower loneliness scores, it is interesting that the most commonly endorsed theme for cat owners was that their pet makes isolation easier/reduces loneliness/increases companionship, similar to what dog owners expressed. This might suggest a lack of sensitivity in the loneliness scale in adequately measuring this construct as it relates to pet owners. However, dog owners also endorsed two themes that were unique to them: that their dogs encouraged them to take them for a walk and offered them an opportunity to socialise with other people. Walking has been shown to positively impact mood and well-being (Hallam et al., 2018) and offers opportunity for connection with others, as has been previously reported (Campbell et al., 2016); therefore, this may explain why these differences in the prediction of loneliness scores were observed in dog versus cat owners. Hence, it would be interesting for future studies to investigate this in countries where going out for walks during the lockdown was prohibited.

Finally, this study sought to understand how the COVID-19 lockdown impacted pets themselves. The most commonly perceived way both dogs and cats were affected was that they received *more companionship or attention*. However, this was closely followed by *little to no difference* for dogs and a *change in emotion or behaviour in cats*. While dogs generally became happier/more relaxed or more clingy/needy, cats experienced a greater variety of changes, including being 'put-out', happier, more needy, demanding, affectionate or playful. In light of these changes, it is not surprising that common across both dog and cat owners was concern for their pet post-isolation, when owners will start to return to their normal routines. Future studies should investigate not only the impact of the COVID-19 lockdown but also the ripple effects of such an event when things return to 'normal'.

The strength of this study is that data were collected during the period of the government-enforced lockdown in Australia during the COVID-19 pandemic, allowing the construct of social isolation to be largely controlled for in a sample of people living alone. However, the study was limited by the fact that approximately one-quarter of our sample were deemed 'essential workers' and were therefore still potentially able to interact with others in a face-to-face manner in their workplace. The social media recruitment strategy used in this study has been demonstrated to be effective for collecting rapid survey data in a short period

time during health crises such as COVID-19 (Ali et al., 2020); however, it is also commonly biased by a higher number of female responders, as was observed in our sample. Further, the proposed mediation models would benefit from replication using a larger sample as it is unclear whether the non-significant mediation is genuine or a statistical artefact due to suppression effects and inadequate power. Finally, this study was limited by the fact that the dog interactions scale did not reach an acceptable level of reliability. This may suggest that the items comprising this scale are not accurately capturing owner–dog interactions during a period of lockdown and/or the factor structure of this scale may need to be re-evaluated.

In conclusion, this study provided evidence that dog ownership and high levels of mindfulness protect against loneliness during a lockdown, while negative mood states make one more susceptible to it. While dog ownership does not appear to influence mindfulness levels, its buffering effect against loneliness might be via opportunities to keep a routine involving leaving the house to walk and potentially interact with other dog owners, which are opportunities not associated with being a cat owner. Despite cat ownership not being a significant predictor of loneliness scores, qualitative insights suggest that both dog and cat owners perceived their experience of the lockdown to have been made easier by having a pet to share it with. However, our findings suggest that the increased demand for pets observed by Australian animal shelters prior to the COVID-19 lockdown (Roy, 2020) may offer no additional benefit than going outside for a walk or striking up a conversation with neighbours. Results do suggest, however, that dogs might be wonderful catalysts for these activities. Adopting a pet at any time should be a well-thought-out decision, reflecting a commitment to care for and enrich the life of the animal for the duration of its lifetime. This study adds to the current literature on the experience on loneliness during a lockdown, as well as the impact of pet ownership for Australians living alone.

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