Born to roam? Surveying cat owners in Tasmania, Australia, to identify the drivers and barriers to cat containment

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ABSTRACT

Free-roaming domestic cats, *Felis catus*, are a major public nuisance in neighbourhoods across the world, and have been linked to biodiversity loss and a host of community health problems. Owners who let their cats roam, also place their cats at risk of serious injury. One management strategy that is gaining considerable support involves encouraging cat owners to contain their pets within their property. Contemporary behaviour change models highlight the importance of identifying drivers and barriers that encourage and discourage target behaviours such as cat containment. Results from a random dial phone survey of 356 cat owners in northern Tasmania identified four distinct cat containment profiles: owners who contained their cat all the time, owners who only contained their cat at night, owners who sporadically contained their cat with no set routine, and owners who made no attempt to contain their pet. Our results indicated that cat-owners' decisions to contain or not contain their cats were guided by a range of factors including owners' beliefs about their ability to implement an effective containment strategy and their views about the physical and psychological needs of their cats. The results are discussed in terms of improving the behavioural effectiveness of cat containment interventions by selecting appropriate behavioural change tools for the identified drivers and barriers, and developing targeted engagement strategies and messaging.

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1. Introduction

Campaigns urging cat-owners to limit their cats' movements have been running in Australia since the 1990s. Advocates for cat containment use a range of reasons to support their argument, including: (i) health and welfare benefits for the cats, such as the reduction in the risk of serious injury from traffic, fighting, dogs and acts of cruelty by humans, the reduced spread of cat-specific diseases and the prevention of unwanted pregnancies; (ii) community benefits with the reduction of nuisance disturbances and neighbour disputes; (iii) conservation benefits, with the predatory nature of any free-roaming cat, regardless of their ownership status, being implicated in the decline of local wildlife populations; (iv) and public health benefits with the reduction in the transmission of diseases, such as *Toxoplasma gondii*, and faecal pollution of waterways (Courchamp et al., 2000; Rochlitz, 2000; Dabritz et al., 2006; Holmes, 2006; Dabritz and Conrad, 2010; Hellard et al., 2011; Dickman, 2014). Campaigns advocating cat containment have had some success, with around a third of cat-owners now keeping their cats contained within their property at all times, and also a 20% increase in the number of cat-owners who partially restrict their cats movements by locking them up at night (Headey, 2006; Toukhsati et al., 2012). Despite these successes, there are still a large number of cat-owners who continue to let their cats roam freely and have clearly not changed their behaviour.

The primary aim of most cat management interventions is to convince cat-owners to modify their behaviour or adopt new behaviours towards their cats. Current domestic cat interventions depend heavily on the provision of information to educate and persuade individuals to change their current behaviours (McLeod et al. unpublished). These educational campaigns assume that the main barrier to action is the lack of knowledge; when cat owners are adequately informed, they will develop supportive attitudes and modify their behaviour (Kollmuss and Agyeman, 2002). The provision of information is important to create awareness and form attitudes. But having a positive attitude towards a particular behaviour is no guarantee that the behaviour will actually

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occur. There is considerable evidence that causal links between attitudes and behaviour are often weak or non-existent (Hini et al., 1995; Kollmuss and Agyeman, 2002). Many studies have found that providing information by itself is often insufficient to bridge the gap between attitudes and behaviour (Costanzo et al., 1986; Geller, 1989; Andreasen, 1995; Schultz, 2014). To initiate behaviour change, practitioners must understand the main perceived drivers (benefits) of the target behaviour, as well as the barriers that prevent the behaviour from occurring. Once drivers and barriers of behaviour are properly understood in context, appropriate behaviour change tools can be identified and implemented (McKenzie-Mohr, 2011; Michie et al., 2011; Schultz, 2014; Hine et al., 2015).

Despite a growing literature on the benefits of cat containment, little research has been conducted to understand the factors that motivate cat owners to engage or not engage in this behaviour. One recent study found that beliefs relating to the importance of containment (e.g. the protection of native wildlife, or safeguarding cats from injury) predicted the containment practices of cat-owners, as well as support for this management practice from non-owners (Toukhsati et al., 2012). These results were discussed in the context of the Theory of Planned Behaviour (Fishbein and Ajzen, 1974; Ajzen, 1991), which postulates that intentions to perform a specific behaviour (in this case containing your cat) are influenced by attitudes (a function between an individual's beliefs about a behaviour and the value of outcomes arising from that behaviour), subjective norms (the product of an individual's normative beliefs about how 'important others' want them to behave, and their motivation to comply with those expectations), and perceived behavioural control (the extent to which an individual feels able to enact a behaviour, a product of how confident they are at performing the behaviour and how much personal control they have over the outcomes). Toukhsati et al. (2012) highlighted the need for further research on psychological factors influencing cat containment decisions, a central aim of the current study.

This study aims to identify the main factors that lead cat-owners to contain or not contain their pets, and then discuss how this information can be used to develop more effective engagement strategies that will result in long-term behavioural change. This research extends current knowledge by investigating a broad range of potential drivers and barriers, not just attitudes and beliefs. Audience segmentation is used to better understand how these drivers and barriers between owners with different cat containment behavioural profiles. The results are discussed in terms of improving the behavioural effectiveness of intervention designs by selecting appropriate behaviour change tools and developing targeted engagement strategies and messaging.

2. Materials and methods

2.1. Procedures and participants

A random dial telephone survey was conducted targeting cat owning households across seven local council areas in northern Tasmania, Australia. Of the 2246 households that were contacted, 1734 did not own a cat and 156 refused to engage. Responses were thus collected from 356 cat owning households (17% of households in this area). The incidence of cat ownership is below the level reported in the south of the state (24%) (Myriad Research, 2013) and the Australian average figure (29%) (Animal Health Alliance, 2013). The sample consisted of 60% urban and 40% rural households. The majority of respondents were females (71%). The age of participants ranged between 18 and 75 (mean 54.01, standard deviation 13.52).

2.2. Measures

A questionnaire was created to identify current cat containment practices, and to assess relevant drivers and barriers. We assembled our driver and barrier questions from a combination of previously identified factors in the cat and dog management literature (e.g. Grayson et al., 2002; Rohlf et al., 2010a,b; Finkler and Terkel, 2012; Rohlf et al., 2012), as well as from the results of reviewing relevant behaviour theories from the social psychology literature (McLeod et al., 2015). The variables included beliefs, social and personal norms, perceived behavioural control (self-efficacy) and affective associations, as well as facilitating external conditions, and are described in more detail below. Demographic information related to sex, age, locality and education level was collected from all respondents. The questionnaire also provided an opportunity for respondents, in the form of an open-ended question, to indicate what they considered to be the main barrier(s) to cat containment.

Respondents' current cat containment behaviour was assessed by seven items assessing how often their cat was indoors at night, outdoors at night, indoors during the day, and outdoors during the day, and whether cats that spent time outside were confined, supervised or on a lead. All responses were recorded using a 5-point scale (1 = never, 2 = rarely, 3 = sometimes, 4 = mostly, 5 = always). The perceived impact of containment on cat quality of life was measured by three items: "how confinement at night would influence a cat's quality of life; how confinement indoors all the time would influence a cat's quality of life; and how confinement within an outdoor cat-proof enclosure would influence a cat's quality of life". Each question was assessed on a 5-point scale (1 = very harmful, 5 = very beneficial).

Expected consequences of roaming cats were measured by asking two items pertaining to cat welfare (protection from serious harm) and local wildlife impact. Social normative influence was measured through two items, each addressing a different scenario on whether they would contain their cats: "if the local council made it compulsory" (injunctive norm), and "if most other people in community did so" (descriptive norm). Personal norm was measured through a single item question asking the respondent's feelings of "moral obligation to contain their cat". Respondents' perceptions of personal control over the outcomes of cat containment, their confidence in their knowledge of how to contain their cat and their confidence in their ability to contain their cat were each measured using a single item question. The influence of two specific external barriers, financial cost of containment and the possibility to contain their cat given their current residential circumstances (e.g. units, rental property) were measured by asking two single item questions. All of these questions was assessed on a 5-point scale (1 = strongly disagree, 5 = strongly agree, with six items reverse scored).

Affective association with roaming cats was assessed using an approach developed by Peters and Slovic (1996). Respondents were asked to record one main thought or image that came to mind when presented with the cue phrase "roaming cat", and then to rate it on a 5-point scale (1 = very negative, 5 = very positive).

2.3. Statistical methods

We used latent profile analysis, implemented in MPlus 7.0 (Muthén and Muthén, 2014) to classify respondents into homogenous subgroups based on their responses to the current cat containment questions. Relative model fit was assessed using the Bayesian information criteria (BIC; Schwartz, 1978), relative entropy (Ramaswamy et al., 1993) and the Lo–Mendell–Rubin likelihood ratio test (LMR; Lo et al., 2001), with a significant p value from this LMR test ($\alpha = 0.05$) indicating that the given profile

Table 1
Characteristics of the four latent profile solutions for cat containment behaviours identified from the survey of cat owners in northern Tasmania, Australia.

Name	Number	Characteristics
ALWAYS	117	Cat is always contained and not allowed to roam freely. Cat is either kept indoors and/or within an outdoor enclosure or cat proof yard
NIGHT CURFEW	115	Cat is always contained at night (usually indoors) but is allowed to roam freely during the day
SPORADIC	102	Cat is occasionally contained either at night or during the day but not as a routine practice
NEVER	22	Cat is allowed to wander freely and no attempts are made to control its movements

solution fits the data significantly better than the solution with one fewer profile groups.

Differences between the demographic variables and containment profiles were tested using Pearson's chi-squared test. Discriminant function analysis was used to determine how well the set of predictor driver and barrier variables could discriminate between cat containment profile groups, and hence to identify which drivers and barriers should be targeted in future interventions. All procedures except the latent profile analysis were conducted using SPSS (IBM, 2013).

Responses to the barrier open question were coded using categories developed from the responses themselves. Descriptive codes (labels that summarised the type of barrier) and emotional 'in vivo' codes (words or short phrases used by the respondents to express their voice or emotional insight) were used (Miles et al., 2014).

3. Results

3.1. Missing data

Missing values for all driver and barrier items were <3%. Little's MCAR analysis indicated that these values were missing completely at random ($\chi^2 = 1724.06$, d$f = 1711$, $p = 0.41$) and, as such were replaced using the expectation maximisation algorithm in SPSS (IBM, 2013). Seven participants failed to respond to at least one socio-demographic item. Given these items were categorical, missing values were not imputed.

3.2. Cat containment profiles

Latent profile analysis indicated that respondents could be classified according to their self-reported cat containment behaviour into four groups (BIC = 4344.15, Entropy = 0.952, LMR p value = 0.000). Although the 5-profile solution produced the lowest BIC value (4285.06), and the 3-profile solution had the highest entropy value (0.989), the LMR test indicated that the 4-profile solution (which had the second lowest BIC, and second highest entropy value) fit the data significantly better than the other profiles (3-profile p value = 0.025, 5-profile p value = 0.491). The characteristics of the four groups identified are given in Table 1 and will be referred to as ALWAYS, NIGHT CURFEW, SPORADIC and NEVER in the following discussion of results.

There was a significant difference between locality and cat containment profiles ($\chi^2 = 10.11$, d$f = 3$, $p = 0.018$): most households in the NEVER profile (68%) were rural, whereas rural households comprised only 44% of the SPORADIC profile and 35% of both the ALWAYS and NIGHT CURFEW profiles. No other significant demographic differences were found between the profiles; gender ($\chi^2 = 4.10$, d$f = 3$, $p = 0.25$), age ($\chi^2 = 13.28$, d$f = 15$, $p = 0.58$) and education level ($\chi^2 = 15.12$, d$f = 15$, $p = 0.44$).

3.3. Driver and barrier variables

Preliminary analysis of the driver and barrier variables revealed no problems with nonlinearity, multicollinearity and homogeneity of variances, although some exhibited moderate skewness. Box plots of the descriptive variables, broken down by the containment

groups, revealed outliers in four of the variables. These outliers were retained as there was no compelling evidence that they were not valid members of the groups. Significance tests on Mahalanobis distances (critical $\alpha = 0.001$) indicated that there were nine multivariate outliers when broken down by the containment groups (7 in ALWAYS, 1 in NIGHT CURFEW, 1 in SPORADIC). The analysis results reported below used untransformed data and included these multivariate outliers. The analysis was also performed with transformed data and the multivariate outliers excluded, producing the same substantive results.

As 14 predictor variables and four DV categories were used in the discriminant function analysis, three functions were produced. Squared canonical correlations indicated that Function 1 explained 44% of the variability in containment group membership (eigenvalue = 0.78, % variance = 79.0, canonical correlations = 0.66), Function 2 explained 13% (eigenvalue = 0.15, % variance = 15.5, canonical correlations = 0.37) and Function 3 explained less than 5% (eigenvalue = 0.05, % variance 5.5, canonical correlations = 0.23). Separation of containment profile groups was statistically significant using Functions 1 through 3 (Wilk's $\lambda = 0.46$, $\chi^2 = 267.6$, d$f = 42$, $p < 0.001$), and Functions 2 through to 3 (Wilk's $\lambda = 0.82$, $\chi^2 = 67.6$, d$f = 26$, $p < 0.001$). Profile separation was not significant using Function 3 alone (Wilk's $\lambda = 0.95$, $\chi^2 = 18.3$, d$f = 12$, $p = 0.11$). Thus, only the first two functions were interpreted.

Loadings in the structure matrix indicated that two predictors measuring perceived behavioural control (personal control and containment confidence) loaded strongly and positively on Function 1, followed by the perceived impact of containment on cat quality of life predictors and the injunctive social norm predictor. Respondents who scored high on Function 1 were confident that they could contain their cats and that doing so was beneficial for their cat and the community. The curfew-quality-of-life variable was the only predictor to load strongly on Function 2. Respondents who scored high on this function believed that containing their cat at night was beneficial for the cat. Variables relating to the ability of cat containment given current residential circumstances and the general feelings to roaming cats made little contribution to either function.

Post-hoc comparisons using Tukey's HSD revealed that there were significant differences between all containment profiles on Function 1. Owners who always contained their cats (ALWAYS profile) scored significantly higher ($M = 1.08$) than members of the NIGHT CURFEW profile ($M = 0.001$), who in turn scored significantly higher than members of the SPORADIC profile ($M = -0.88$). Owners in the NEVER profile ($M = -1.66$) scored significantly lower than members of all other profiles ($p < 0.001$ for all comparisons). Similar comparisons for Function 2 revealed that members of the NIGHT CURFEW profile ($M = 0.53$) scored significantly higher than members of the other three profiles ($p < 0.001$ for all comparisons) who did not differ significantly from each other (NEVER $M = -0.70$; ALWAYS $M = -0.29$; SPORADIC $M = -0.12$). Thus owners who always contained their cats had more confidence and control over the outcomes of containing their cats than those owners who only partially or made no effort to contain their pets, as well as having more positive attitudes towards containment and their cats quality of life. Those owners who only locked up their cats at night strongly believe that this behaviour was beneficial to their cats.

Table 2
Identified barrier categories and sub-categories, their descriptions and total percentage of responses.

Barrier	Description	Total
Ability		
Physical	Cats too difficult to physically contain	7%
Psychological	Cat perceived to be dominant personality so get their own way	4%
External barriers		
Time	Too busy, no time to organise	1%
Cost	Too costly to contain cat/build enclosure	5%
Resource	Lack of resources to contain their cat	1%
Social norms		
History	Historical precedence for letting cats wander	1%
Current norm	Other people do not contain their cats so why should I	1%
Regulation	Not law/not compulsory	3%
Beliefs		
Cat nature	Cats need to wander to be happy/for exercise/natural behaviour and perceived as cruel to lock them up	27%
Roaming	Not necessary as cat do not roam far anyway	6%
Issue	Pet/urban cats not the issue, feral cats cause the problems	1%
Locality	Not important in rural areas as opposed to urban areas	1%
Pest control	Roaming cats are important for controlling rodents	2%
Awareness		
How to	No knowledge as to how to contain a cat	2%
Consequence	Perceived not a threat or problem (wildlife, welfare or disease)	8%
Motivation		
Enthusiasm	Lack of interest/cannot be bothered	13%
Convenience	Inconvenient to clean up litter trays or other mess	5%
Emotional detachment	Lack of emotional attachment to animal, do not care	12%

Cross-validation indicated that owners in the ALWAYS profile were classified correctly 73% of the time based on their scores on the predictor variables, owners in the NEVER profile classified 64% of the time, and owners in the NIGHT CURFEW profile were correctly classified 61% of the time. In contrast, owners in the SPORADIC profile correctly classified only 44% of the time, indicating self-efficacy and quality of life predictors were less useful for identifying members of this profile.

3.4. Perceived barriers to containment: open-ended responses

With multiple responses allowed for the open question on barriers to cat containment, 520 responses were available for analysis. This number excluded the eight respondents who replied that they 'did not know'. Responses were categorised into eight main descriptive categories and 16 sub-categories (Table 2).

Beliefs were the most commonly perceived barrier group, in particular the belief that it is natural behaviour for cats to wander so they should be allowed to do so. Also mentioned was the belief that cats do not roam far enough to cause the necessity for containment, particularly when they are de-sexed and/or well fed. The next common barrier category identified was owner motivation (e.g. "they just cannot be bothered") followed by emotional detachment (e.g. "do not care enough about them"), capability and awareness. External barriers identified included financial cost, lack of time and lack of resources (such as suitable fencing materials). Regulation and social norms were only occasionally mentioned.

The open-ended responses provided insights into how respondents thought and felt about cat containment. Interestingly, thirty-eight percent of respondents associated cat containment with exclusive indoor restriction ("it is cruel to keep cats indoors all the time", "it is a cat's right to be outside, have some fresh air and explore"). Negative terms associated with containment such as 'cruel', 'caged', 'put in jail', 'locked up', 'not fair' and 'mean', were found in 10% of responses. Positive terms referring to containment such as 'happy' and 'safe' were only found in 1% of responses.

4. Discussion

This study aimed to identify the main drivers and barriers behind cat-owners containing or not containing their pets, and then to use this information to make recommendations for developing more effective behavioural change interventions. The segmentation of cat-owners allowed a novel method of demonstrating these main drivers and barriers. We found that cat owners who contained their cats at all times differed from other cat owners in their perceptions of behavioural control, several key cat-related beliefs and normative influences. The locality of the cat-owners, whether they were in an urban area or rural setting also played a role in their containment behaviour.

Consideration of these identified drivers and barriers within the different cat-owner 'containment groups' provides the opportunity to design more effective intervention strategies by tailoring and targeting messages and selecting the most appropriate behavioural change strategies. There are a range of behaviour change strategies available (McKenzie-Mohr, 2011; Michie et al., 2011), so interventions can be developed to not only educate and persuade their audience to modify their behaviour, but where appropriate, to train, enable or motivate.

A review of our results suggests that full time, and in some instances even part-time, containment is perceived to have relative high barriers (less personal control and confidence to act as well as strong beliefs against containment) and low benefits (strong beliefs that cats should wander, less normative influence). To induce owners to alter their cat containment behaviour, interventions must aim to lower these perceived barriers and at the same time increase the perceived benefits (McKenzie-Mohr, 2011). Motivation strategies, in the form of regulations and legislation, are an obvious choice (Schultz, 2014). In fact legislation, and the associated penalties, has become an increasingly popular strategy in most Australian States and Territories to get cat-owners' to contain their cats. But unfortunately our results have highlighted that those cat-owners who do not already contain their cats in our study area (i.e. the SPORADIC and NEVER profiles) are not likely to be swayed by threat of regulations and making cat containment compulsory (injunctive

norm). Also there have been problems encountered with enforcement of such regulations and a reliance on voluntary compliance which decreases the effectiveness of this strategy (Woods, 1993; Headey, 2006; Rohlf et al., 2010a).

Alternate strategies that can be used to lower barriers include making the behaviour more convenient to perform or asking for commitments (McKenzie-Mohr, 2011; Schultz, 2014). For our non-containment profiles this could mean designing interventions that increase the confidence of these owners to implement an effective containment strategy and lower their perception of the external barriers (e.g. developing more convenient methods to contain cats, providing personal advice on how to contain their cat), at the same time as increasing the perceived benefits using normative influence (e.g. use of a credible and influential messenger and local positive examples). The strong beliefs prominent in these profiles would pose a more difficult challenge, however our qualitative analysis provides some insight into how this could be attempted. Many of the negative emotions towards cat containment were associated with cats being kept solely indoors. An intervention that was designed to debunk this perception by promoting outdoor containment options, as well as the enrichment of indoor environments, might be better received.

4.1. Limitations and future research

Three main limitations should be kept in mind when interpreting the results of this study. First, although we conducted this study in one locality, the two main barriers we discovered – a lack of perceived efficacy for cat containment and beliefs that cats must roam to have physically and emotionally fulfilling lives – are likely to be applicable to other locales. Nevertheless, caution should be exercised in generalising the findings beyond our study area and it would be important for future researchers to confirm this conclusion in their locale.

Second, although we assessed the broadest range of drivers/barriers of any cat containment study to date, it is important to acknowledge that our list was not comprehensive. Recent reviews of the social and health psychology literatures on behaviour change suggest that there are a large number of additional factors which influence human behaviour (e.g., habits, perceived response efficacy, altruistic values) that were not directly addressed in our study (e.g. Darnton, 2008; Michie et al., 2013).

Finally, our design limits the ability to make strong inferences about the causality and the direction of effects. Further research, including experimental and longitudinal studies, would be required to help clarify all the influential factors and the precise nature of the observed effects.

5. Conclusion

The adoption of cat containment behaviours by Australian cat-owners is highly variable and current interventions that rely on educational campaigns and legislation have proven ineffective in most areas (Headey, 2006; Animal Health Alliance, 2013). We identified four distinct cat-owner containment profiles: those that always contained their cats, those that contained their cats only at night, those that contained their cats sporadically with no set routine, and lastly those that have never made an attempt to contain their cats. Our results suggest that a cat-owner's decision to contain their cat is influenced by a range of factors, but two appear to be particularly important. Cat-owners who only sometimes or never contain their cats, relative to those who keep their cats contained, are: (1) more likely to believe that cats have strong physical and emotional needs to be outdoors, and (2) less confident in their abilities to effectively contain their cats. When developing interventions aimed at encouraging households to contain their cats, local councils and animal welfare organizations should ensure that they focus on these two key factors.

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