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Title: Rabbit Relinquishment Through Online Classified Advertisements in the United Kingdom; When, Why, and How Many?

Abstract: To identify implicit causes of companion rabbit relinquishment, this study investigated whether there was annual and seasonal variation in the number of advertisements for and ages of rabbits posted as free or for sale on classified websites in the United Kingdom. The number of advertisements posted decreased between 2014 and 2016. There was an increase in the number of advertisements for free rabbits in winter compared to other seasons, which could be a result of the guardians' reduced willingness to interact with their rabbit and carry out husbandry during periods of inclement weather. Rabbits advertised as free were older than rabbits advertised for sale, and rabbits relinquished due to human-related reasons were older than those relinquished because of rabbit-related factors. It is recommended that research be undertaken to elucidate whether providing education to prospective rabbit guardians regarding the lifespan of rabbits and their substantial husbandry requirements, especially in winter, would deter the purchase of rabbits by guardians unable or unwilling to care for them in the long-term.

Keywords: Rabbit, relinquishment, online advertisements.

Introduction

It is estimated that 0.9 million rabbits are kept as companion animals in the United Kingdom, making them the third most popular mammalian companion species (Pet Food Manufacturing Association, 2016). However, they are potentially more susceptible to poorer welfare outcomes than other popular companion animals, such as cats and dogs (Howell, Mornement, & Bennett, 2015). Rabbits have a high reproduction rate which may contribute to their relatively low cost (Cotter, 2001), potentially leading to their impulse purchase by guardians who are unaware of the time and finance required to adequately care for rabbits (Edgar & Mullan, 2011). A study investigating the acquisition of rabbits found that 18% of rabbits were purchased on the same day that the decision was made to obtain a rabbit, and that the majority of guardians had little knowledge of the rabbit's needs at the point of sale (Edgar & Mullan, 2011). Additionally, rabbits are a prey species and have evolved to conceal pain so it may be difficult for guardians to accurately assess when their rabbit requires veterinary care (Keating, Thomas, Flecknell, & Leach, 2012; Mayer & Vet, 2007).

Traditionally rabbits were used as livestock for meat and fur (Davis & DeMello, 2003; González-Redondo & Contreras-Chacón, 2012). This may affect the extent to which they are perceived today in terms of people's belief about their capacity to subjectively experience pleasure and suffering. Levine *et al* (2005) found that veterinary students perceived the cognitive abilities of farm animals to be inferior to that of companion animals. Additionally, Clarke *et al* (2017) found that veterinary students rated rabbits as less sentient than cats and dogs. It is possible that the view of rabbits as companion animals with lower sentience is shared by the wider public, and could be associated with a reduced consideration of their needs.

These factors may contribute to the large number of rabbits relinquished and abandoned each year; it was estimated that 67,000 rabbits were surrendered to rescue centres in 2010 (Rabbit Welfare Association and Fund, 2012). An understanding of the current magnitude of rabbit relinquishment in the UK, and factors contributing to relinquishment, would permit the development of focused approaches to reduce the numbers of rabbits relinquished and improve companion rabbit welfare.

Previous research has found that rabbit relinquishment is most commonly the result of human factors rather than characteristics of the rabbit. Ellis *et al* (2017) found that in the UK, 87.8% of rabbits were surrendered to rescue centres as a result of human-related issues, with the most common reasons provided being ‘too many rabbits’, ‘housing problems’, and ‘child no longer interested’. Similar results have been reported in North America, where 88.9% of rabbits in a US study and 94.7% in a Canadian study were rehomed because of human-related reasons (Cook & McCobb, 2012; Ledger, 2010). Data in these studies were only collected from a small number of rescue centres, possibly due to recruitment difficulties. Thus, whilst studies that have collected data from rescue centres have provided a valuable insight into the stated reasons for rabbit relinquishment, they have not provided an accurate estimate of the number of rabbits relinquished on a national scale, or regarding implicit or less apparent reasons for relinquishment. Additionally, as the intake of relinquished rabbits is associated with the capacity of rescue centres, the number of relinquishments reported in these studies may reflect rescue centre capacity rather than actual relinquishment rates, with excess rabbits relinquished via other means such as online advertising.

Online classified websites offer guardians the opportunity to advertise unwanted rabbits at no cost to themselves, providing an alternative to surrendering rabbits to rescue centres.

Currently, only one study has collected data on rabbit relinquishment from online classified advertisements, which found that the most common reasons for relinquishment stated in advertisements in Sweden were human-related i.e. 'no time' and 'housing issues', similar to studies of relinquishment to rescue centres (Ulfsdotter, Lundberg, & Andersson, 2016). However, the study by Ulfsdotter *et al.* was conducted only over a three-month period, and therefore did not provide information on the number of rabbits relinquished annually through online advertisements or the temporal dynamics of rabbit relinquishment.

The aims of this study were to quantify the number of rabbits relinquished by individuals through online classified websites in the UK, to investigate whether there were annual and seasonal trends in relinquishment, and to explore the reasons given for relinquishment. We also aimed to examine how the age of relinquished rabbits varied with season, whether they were advertised as for sale or free, and the reason for relinquishment. Based on our communication with rescue centres, we hypothesised that the number of rabbits advertised would increase between 2014 and 2016, and that there would be an increase in the number of rabbits advertised in spring as a result of being unwanted Easter presents.

Methods

Data were collected using automated and manual website data extraction. Manual website data extraction was used to obtain information about the number of advertisements for free rabbits and rabbits for sale from multiple websites, permitting investigation of seasonal and annual trends in the number of advertisements. Automated website data extraction was used to provide data on the age and reason for relinquishment of unique non-juvenile rabbits advertised for free or for sale on the Preloved website, which the manual website data extraction identified as having the highest number of advertisements for rabbits. Automated

data extraction thus permitted investigation of the age of rabbits advertised and the reason for their relinquishment. As we were interested in identifying unique rabbits using automatic data extraction, and it was not possible to identify rabbits that had been posted to multiple websites, we only collected data from one website to avoid the duplication of rabbit data in the dataset.

Manual Website Data Extraction

Data were collected from six websites which actively advertise rabbits for sale and for free across the UK between January 2014 and December 2016; these were Gumtree, Preloved, Pets4Homes, Vivastreet, Friday, and Free-Ads. These websites were identified as the most popular websites for rabbit relinquishment, based on the total number of advertisements, from an initial search using the search term 'rabbit' on classified websites which were found using the Google search engine with the search terms 'pet rabbit for sale UK' and 'classifieds pet rabbit UK'. Data collection occurred monthly with the restriction that collection occurred in consecutive months no sooner than two weeks and no later than six weeks following the previous month's data collection. The number of search results from a UK wide search with the keyword 'rabbits' within the pets for sale or rabbits for sale category on each website was recorded, depending on which option the website allowed. The number of advertisements for free rabbits were then found by applying a filter to the data where the maximum price was set to zero. The number of advertisements for rabbits for sale were recorded as the total number of advertisements minus the number of advertisements for free rabbits. Data collected in January to March were categorised as 'winter', April to June as 'spring', July to September as 'summer', and October to December as 'autumn'.

Automated Website Data Extraction

Automated agents were programmed to continuously collect publicly available advertisement content from the website Preloved. Text analysis, network analysis, and machine learning algorithms were used to parse and extract relevant data from the websites. This method produced a summary dataset which contained the date of the advertisement, the advertiser's description of the rabbit, and username and location of the advertiser.

Advertisements posted between January and March were categorised as 'winter', between April and June as 'spring', between July and September as 'summer', and between October and December as 'autumn'. If the advertisement content indicated that the rabbit was for free the rabbit was coded as such, otherwise they were coded as 'for sale'. The reasons for relinquishment, when given, were categorised as follows: aggressive behaviour, allergy, non-aggressive behaviour (e.g. destruction of property or spraying urine), bonded partner deceased, change of circumstance, financial issues, housing issues (e.g. relocation, renovation, or insufficient space in house or garden), incompatible with other non-rabbit companion animal, incompatible with other rabbit, mis-sexed, surplus to requirements (i.e. ex-breeding or ex-show rabbit), insufficient time, or unsuitable for child. These categories were adapted from those used by Ellis *et al* (2017). Our categories differed in that we split rabbit behavioural problems into 'aggressive behaviour' and 'non-aggressive behaviour', and behaviour towards another companion animal into 'incompatible with other non-rabbit companion animal' and 'incompatible with other rabbit'. We decided to alter these categories to provide more detailed information about relinquishment for rabbit-related reasons. If multiple congruent reasons were provided the catalytic reason was recorded. For example in the statement 'insufficient time due to illness', was recorded as the reason for relinquishment. If multiple incongruent reasons were provided, the reason was coded as 'multiple'.

As we were interested in relinquishment as opposed to sale of kits, advertisements for juvenile rabbits were removed from the dataset. We defined a juvenile rabbit as one described as a 'baby', 'kit', or less than 16 weeks in age.

To ensure that multiple data were not collected for the same rabbit in the automatically extracted data, where multiple advertisements originated from identical usernames and locations, the advertiser was assumed to be re-advertising the same rabbit unless there was evidence in the description of the rabbit (e.g. age, sex, breed, or colouration) suggesting otherwise. Similarly, four rescue centres were found to advertise through Preloved and rabbits advertised by these centres were removed from the dataset, to avoid duplication of rabbits that may have initially been advertised online by the guardian. It was not possible to check for replication of advertisements in the manually extracted data.

To remain consistent with the manually extracted data, the cost of the rabbit was coded as 'free' or 'for sale'. Although it was possible to record the cost of the rabbit during automatic data extraction, the sale price did not always reflect the cost of the rabbit as it often included other items such as housing, food, or toys and might also depend on the financial situation of the vendor and cost for which they acquired the rabbit. Thus, we opted to categorise the cost of the rabbit as 'free' or 'for sale'.

Data Analysis

Negative binomial generalised linear models were fitted to the data using the MASS package in the R programming language (R Core Team, 2015; Venables & Ripley, 2002). Likelihood ratio tests (LRT) were then used to assess whether the difference in model deviance was significant when a parameter was removed from the model. Where interaction terms were found to be significant, post-hoc analyses were conducted using Tukey's HSD test. All data

analysed during this study and an R script that replicates the analyses reported are published with the article as Supplementary Information files.

We fitted two models to the data. One model was fitted to the automatically extracted data to assess whether the age of the rabbit (in months) varied depending on whether the rabbit was advertised for free or for sale, the season, reason for relinquishment, and the interaction between being for free/for sale and season and being for free/for sale and year. The other model was fitted to manually extracted data and assessed whether the number of advertisements for rabbits varied depending on whether the rabbit was advertised for free or for sale, the season, and again the interaction between being for free/for sale and season. The interaction between being for free/for sale and season and year was included as we expected that seasonal or annual variation might differ depending on whether the rabbit was for sale or available for free, the former perhaps being more greatly influenced by variation in external factors, such as demand for or supply of rabbits, the latter perhaps providing a better insight into variation in the number or age of unwanted companion rabbits that directly relates to seasonal or annual factors. The model of the manually extracted website data also included website as a factor.

Results

Manually Extracted Data

There were a total of 224,563 advertisements for rabbits posted between 2014 and 2016 across all websites. In the majority (95.64%) of these advertisements rabbits were advertised as for sale rather than available for free. The website with the greatest number of advertisements for rabbits was Preloved, which accounted for 44.1% of all advertisements.

Number of Advertisements

There were significantly more advertisements for rabbits for sale than free rabbits (LRT=1919.500, $p<0.001$).

Year was a significant predictor of number of advertisements for rabbits (LRT=92.600, $p<0.001$). Post-hoc analyses revealed a significant decrease in the number of advertisements for rabbits between 2014 and 2015 ($z=-7.116$, $p<0.001$), 2015 and 2016 ($z=-2.349$, $p=0.049$), and 2014 and 2016 ($z=-9.438$, $p<0.001$). There was a significant interaction between year and being for free/for sale (Figure 1: LRT=19.260, $p=0.007$); there was a significant decrease in the number of advertisements for free rabbits between 2014 and 2015 ($z=-6.430$, $p<0.001$), 2015 and 2016 ($z=-2.885$, $p=0.011$), and 2014 and 2016 ($z=-9.265$, $p<0.001$), and a significant decrease in the number of advertisements for rabbits for sale between 2014 and 2016 ($z=-7.074$, $p<0.001$) and 2014 and 2015 ($z=-5.763$, $p<0.001$), but not between 2015 and 2016 ($z=-1.330$, $p=0.378$).

Figure 1 about here

Season was significant predictor of number of advertisements (LRT=11.700 $p=0.008$). There were significantly more advertisements in summer compared to autumn ($z=2.774$, $p=0.028$) and winter compared to autumn ($z=3.115$, $p=0.010$), and no significant pairwise comparisons between spring and autumn ($z=1.497$, $p=0.439$), summer and spring ($z=1.277$, $p=0.577$), winter and spring ($z=1.623$, $p=0.366$), or winter and summer ($z=0.350$, $p=0.985$). There was a significant interaction between being for free/for sale and season (Figure 2: LRT=21.650,

p<0.001). Post-hoc analyses revealed that there were significantly more advertisements for free rabbits in winter compared to summer ($z=3.411$, $p=0.004$), and autumn ($z=4.603$, $p<0.001$). There was a non-significant trend for more advertisements for free rabbits in winter compared to spring ($z=2.539$, $p=0.054$), and there was no significant difference in the number of advertisements for free rabbits between spring and summer ($z=-0.876$, $p=0.817$), summer and autumn ($z=1.198$, $p=0.628$), or spring and autumn ($z=2.074$, $p=0.162$). However, there were significantly more advertisements for rabbits for sale in summer compared to winter ($z=-3.216$, $p=0.007$), spring ($z=3.679$, $p=0.001$), and autumn ($z=3.275$, $p=0.006$), and no significant difference in the number of advertisements in winter compared to spring ($z=0.449$, $p=0.970$) or autumn ($z=0.046$, $p=0.999$) and spring compared to autumn ($z=-0.405$, $p=0.978$).

Figure 2 about here

Automatically Extracted Data

Following removal of replicate advertisements and advertisements for juvenile rabbits, 7139 unique rabbits were counted. An additional 88 advertisements for multiple unspecified rabbits were recorded, and assuming at least two rabbits are available in these advertisements, we estimate that a minimum of 7315 rabbits were advertised through Preloved in 2016. Of these advertisements, where unique rabbits were specified, 49.95% of advertisers provided a reason for relinquishment, 97.23% gave the age of the rabbits advertised, and 9.23% advertised the rabbit as free.

222 *Reasons for relinquishment*

223 When the data were summarised by individual, the top reasons cited for relinquishment were
224 insufficient time (21.41%), housing issues (16.06%), surplus to requirements (15.81%), change
225 of circumstance (14.94%), unsuitable for child (10.39%), incompatible with other rabbit
226 (6.66%), allergy (4.42%), incompatible with other pet (3.61%), multiple (3.49%), bonded
227 partner deceased (1.18%), mis-sexed (1.18%), financial issues (0.37%), aggressive behaviour
228 (0.31%), and non-aggressive behaviour (0.19%).

229 *Age of rabbits*

230 The mean age of rabbits relinquished through Preloved was 14.43+/-0.15 (mean+/-SE)
231 months.

232 Season (LRT=47.58, $p<0.001$), being for free versus for sale (LRT=196.03, $p<0.001$), and reason
233 for relinquishment (LRT=183.43, $p<0.001$) were significant predictors of age. Rabbits
234 advertised for free were significantly older than rabbits advertised for sale. Rabbits advertised
235 in the summer were significantly younger than rabbits advertised in winter ($z=2.985$, $p=0.015$)
236 and spring ($z=-6.481$, $p<0.001$), and rabbits advertised in spring were significantly older than
237 rabbits advertised in autumn ($z=4.827$, $p<0.001$) and winter ($z=-3.554$, $p=0.002$). There was
238 no significant difference in the age of rabbits advertised between autumn and winter ($z=-$
239 1.488 , $p=0.444$), or autumn and summer ($z=-1.333$, $p=0.542$).

240 The significant association between reason for relinquishment and age appeared to be driven
241 by the high ages of rabbits which were relinquished due to a bonded partner dying (mean=
242 23.524, SE=3.208), change of circumstance (mean=16.670, SE=0.586) , housing issues
243 (mean=17.721, SE=0.634), insufficient time (mean=16.296, SE=0.541), and being unsuitable

for a child (mean=17.842, SE=0.965), and the low ages of rabbits relinquished due to an allergy (mean=12.462, SE=1.149), incompatibility with other rabbit (mean=12.770, SE=0.863), being mis-sexed (mean=9.296, SE=0.886), and surplus to requirements (mean=14.130, SE=0.469).

Table 1 outlines the parameters from the significant pairwise comparisons.

Table 1 about here

There was also a significant interaction between being for free versus for sale and season (Figure 3: LRT=9.195, $p=0.027$). There was no significant difference in the age of rabbits advertised for free between winter and spring (winter: mean=19.892, SE=1.167; spring: mean=21.324, SE=1.611; winter vs. spring: $z=-0.728$, $p=0.886$), winter and summer (summer: mean=22.101, SE=1.196; winter vs summer: $z=-0.769$, $p=0.868$), winter and autumn (autumn: mean=19.023, SE=1.621; winter vs autumn: $z=0.387$, $p=0.980$), spring and summer ($z=0.006$, $p=0.999$), spring and autumn ($z=1.057$, $p=0.716$), or summer and autumn ($z=-1.113$, $p=0.681$). However, the age of rabbits advertised for sale were significantly older in spring compared with winter (spring: mean=15.221, SE=0.305; winter: mean=13.982, SE=0.277; spring vs winter: $z=3.490$, $p=0.003$), summer (summer: mean=12.717, SE=0.261; spring vs summer: $z=-7.049$, $p<0.001$), and autumn (autumn: mean=13.388, SE=0.349; spring vs autumn: $z=4.783$, $p<0.001$). Rabbits advertised in winter were also younger than rabbits advertised in summer ($z=-3.628$, $p=0.002$). There was no significant age difference between rabbits advertised in winter and autumn ($z=1.501$, $p=0.434$) and summer and autumn ($z=-1.934$, $p=0.214$).

Figure 3 about here

Discussion

We investigated the relinquishment of rabbits through online advertisements, specifically quantifying the number of advertisements posted to classified websites and exploring how this varied annually, seasonally, or depending on whether rabbit was advertised for free or for sale. We also assessed the age of the rabbits advertised and examined how this varied with season, being advertised for free or for sale, and reason given for relinquishment. In addition to manually collecting data from online classified websites, our study also made use of automated website data extraction allowing a large amount of detailed data to be collected and avoiding the possibility of human error in data collection. It is important to note that one limitation of data collected on the relinquishment of companion animals is possible ignorance or dishonesty regarding the age of the animal or reason for relinquishment, or typographical errors. We acknowledge the data collected may have reduced reliability due to this insoluble issue.

Contrary to our prediction, we found that the number of advertisements posted on online classified websites decreased between 2014 and 2016, with the greatest reduction occurring in the number of advertisements for free rabbits. One possible explanation for the reduction in advertisements is the introduction of the Pet Advertising Advisory Group (PAAG) which sought to promote regulation of animals advertised online. In September 2013, a voluntary scheme was launched in which advertisements on several UK classified websites, including those investigated in this study, which contravened PAAG's Minimum Standards posted were removed from the websites (Pet Advertising Advisory Group, 2014). However, the reduction

in the number of advertisements posted could also reflect a shift towards alternative advertising websites which are not as stringently regulated, or towards alternative non-classified websites such as Facebook. The proposed introduction in 2017 of UK governmental regulation of online classified advertisements for companion animals which places non-voluntary strictures on advertising may lead to further reductions in the number of advertisements posted online; a repeat of our study for data collected between 2017 and 2019 would assist in determining the efficacy of these new regulations (House of Commons, 2017).

The trend in the number of advertisements for rabbits for sale appeared to reflect seasonal variation in rabbit reproduction, with the greatest number of advertisements posted in summer reflecting that most rabbits are born in spring (Boyd & Myhill, 1987). However, the number of advertisements for free rabbits was greatest in winter. Our findings could indicate that children lose interest in caring for rabbits following the Christmas period, or alternatively that the husbandry of companion rabbits, most frequently housed outdoors in hutches, becomes less pleasant in colder months causing owners to relinquish their rabbits (Mullan & Main, 2006; Rooney *et al.*, 2014). Moreover, the interaction between the rabbit and guardian may be reduced in winter when the guardian is less willing to spend time outdoors observing or interacting with the rabbit; Rooney *et al* (2014) found that fewer owners reported allowing their rabbit free access to a garden in winter compared with summer. This reduced interaction might also cause the guardian-rabbit relationship to deteriorate leading to relinquishment.

One study found that guardians that allowed their rabbit inside the house were significantly more confident in handling the rabbit, perhaps due to the increased frequency of interactions (Mullan & Main, 2007). The custom of keeping rabbits outdoors in hutches dates to the late

nineteenth century when rabbits were reared for meat and fur (Lebas, Coundert, de Rochambeau, & Theabault, 1997). However, despite improvements in our knowledge of rabbit welfare and the shift to keeping rabbits as companion animals since then, housing rabbits in hutches is still very common. The use of indoor accommodation might improve the rabbit-guardian relationship by increasing interactions and making husbandry and handling a more pleasant task. It would therefore be worthwhile to explore whether encouraging the uptake of indoor accommodation for rabbits could lead to a reduction in the number of rabbits relinquished

The average age of relinquished rabbits advertised on Preloved in 2016 was 14.43 months, which is very young relative to the 7-12 years (84-144 months) life expectancy of rabbits (Cotter, 2001). This is similar to the findings of the study by Ulfsdotter *et al* (2016) which reported an average relinquishment age of 17.6 months. Our study found that rabbits advertised in summer were younger than those in other months which may reflect seasonal variation in reproduction; there are more new-born rabbits in warmer months. As we were investigating the use of online classified advertising to sell or relinquish unwanted rabbits as opposed to advertisements of rabbits bred specifically to be sold, our study excluded rabbits younger than 16 weeks from the analysis. So, this result may suggest that either guardians relinquish rabbits very soon after acquisition or that breeders advertising through Preloved wait until the rabbit is older to attempt to rehome them, either through choice or because they have been unable to sell them as kits. Similarly, fewer rabbits will be born in winter, and so rabbits advertised in spring may be older because there are fewer advertisements from breeders with potentially unsold kits. Rabbits advertised as free were older than those that were advertised for sale, suggesting that younger rabbits may be perceived as more valuable. This perhaps reflects that people may believe that older rabbits will be less desirable and so

336 harder to sell, and thus advertise them as free to increase the likelihood of finding a new
337 guardian for the rabbit.

338 We found trends in reasons for relinquishment that corroborated the findings of previous
339 studies, with attributes of the rabbit infrequently being cited as a reason for relinquishment.
340 The two most common reasons for relinquishment in this study, time and housing issues, and
341 fourth most common reason, that the rabbit was unsuitable for a child were identical to those
342 found in a previous study (Ulfsdotter *et al.*, 2016). Our study provides further evidence that
343 many owners may have an unrealistic expectation of rabbit guardianship; lacking knowledge
344 of the effort and level of commitment required to care for rabbits (Edgar & Mullan, 2011).
345 Thus, a greater effort to educate owners at the point of sale or to reduce the impulsive
346 purchase of rabbits could help to reduce the number of rabbits that are relinquished online.
347 The third most common reason for relinquishment identified in our study was that the rabbit
348 was surplus to requirements; these advertisements primarily came from individuals who no
349 longer required the rabbit for breeding or showing. Historically, rabbits that did not meet
350 breeding or show standards would be culled, and thus the large proportion of rabbits
351 advertised by breeders and showers may indicate a shift towards concern for the welfare of
352 the rabbits from these groups of individuals (Lukefahr, Cheeke, & Patton, 2013; Miller &
353 Parker, 1956).

354 There was a significant relationship between the reason given for relinquishment and age of
355 the rabbit, with rabbits relinquished due to a change of circumstances, the rabbit's
356 companion dying, housing issues, lack of time and suitability for children, tending to be older,
357 and rabbits relinquished due to allergies, mis-sexing, being surplus to requirements, and
358 incompatible with other rabbits tending to be younger. It is logical that rabbits relinquished

due to allergies, mis-sexing, or incompatibility with other rabbits are younger, as these are issues which are likely to arise very early in rabbit ownership. Similarly, as breeders do not keep rabbits for companionship and may have unsold kits, we would expect that they would advertise younger rabbits. Conversely, it is reasonable to suppose that a rabbit's companion dying is likely to occur later in rabbit ownership, and so we would expect this to be a common reason given when relinquishing older rabbits. The residual reasons for relinquishing older rabbits relate to the guardian's lifestyle or unforeseeable issues, suggesting that whilst owners can plan how the rabbit may fit into their life for at least a year following acquisition of the rabbit, they may not appreciate that rabbits require a much longer-term commitment which they or their children may not be able to provide.

Conclusion

Our study revealed annual and seasonal trends in rabbit relinquishment through online classified advertisements that depended on whether the rabbit was advertised for free or for sale. We found that the number of online advertisements for rabbits declined between 2014 and 2016, and that more free rabbits were advertised in winter than any other season, whilst there were more advertisements for rabbits for sale in summer. The most common reasons for relinquishment were a lack of time, housing issues, the rabbit being surplus to requirements, and a change of circumstance. We also found that rabbits advertised for free and as a result of their guardians' lifestyle or change of circumstances tended to be older, whilst rabbits advertised due to attributes of the rabbit or from breeders tend to be younger. Educating prospective guardians about the lifespan of rabbits and their significant husbandry requirements may deter the purchase of rabbits by guardians unable or unwilling to care for them in the long-term, thereby potentially reducing the number of rabbits subsequently

382 relinquished through online advertisements. However, further research would be needed to
383 determine the efficacy of education as a means to reduce rabbit relinquishment.

384

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447 **Table 1.** Significant results from Tukey's HSD tests comparing the age of rabbits advertised
 448 between different reasons for relinquishment.

Pairwise Comparison		Z-value	P-value
Allergy	Bonded partner deceased	3.630	0.014
Allergy	Change of circumstances	3.972	<0.01
Allergy	Housing	4.243	<0.01
Allergy	Time	4.067	<0.01
Allergy	Unsuitable for child	4.298	<0.01
Bonded Partner Deceased	Incompatible with other rabbit	-3.441	0.027
Bonded Partner Deceased	Mis-sexed	-4.603	<0.01
Change of circumstances	Incompatible with other rabbit	-3.866	<0.01
Change of circumstances	Mis-sexed	-4.491	<0.01
Financial	Mis-sexed	-3.858	<0.01
Housing	Incompatible with other rabbit	-4.167	<0.01
Housing	Surplus to requirements	-3.553	0.020
Housing	Mis-sexed	-4.646	<0.01
Incompatible with other non-rabbit companion animal	Mis-sexed	-4.152	<0.01
Incompatible with other rabbit	Time	3.984	<0.01
Incompatible with other rabbit	Unsuitable for child	4.200	<0.01
Surplus to requirements	Mis-sexed	3.687	0.012
Time	Mis-sexed	4.529	<0.01
Unsuitable for child	Mis-sexed	4.728	<0.01
Time	Surplus to requirements	3.356	0.037
Unsuitable for child	Surplus to requirements	3.462	0.026

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Figure 1. Mean number of advertisements posted to six online classified websites either for free or for sale in 2014, 2015, and 2016. Error bars represent one standard error. Brackets are used to indicate a significant or marginally non-significant difference in the number of advertisements between different years, with the p-value for the pairwise comparison displayed above the bracket.

Figure 2. Mean number of advertisements posted to six online classified websites either for free or for sale in winter, spring, summer, and autumn. Error bars represent one standard error. Brackets are used to indicate a significant or marginally non-significant difference in the number of advertisements between different seasons, with the p-value for the pairwise comparison displayed above the bracket.

Figure 3. Mean age of rabbits posted to Preloved either for free or for sale in winter, spring, summer, and autumn. Error bars represent one standard error. Brackets are used to indicate a significant or marginally non-significant difference in the age of rabbits between different seasons, with the p-value for the pairwise comparison displayed above the bracket.