Kingston Maurward College

Cat owners' perceptions towards feline microchipping

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Contents

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Abstract

Compulsory feline microchipping has become a legal requirement in 2021 for domestic cats (*Felis catus*) in the UK, following the introduction of compulsory microchipping for dogs (*Canis lupus familiaris*) in 2016. The concept of compulsory feline microchipping attracts a combination of perceptions from the public, both positive and negative. An online survey was designed to obtain cat owners' perception toward feline microchipping, evaluating attitudes and knowledge, and offering an opportunity for participants to provide insights into their reasoning for, or against, microchipping. Findings suggested that demographics are key predictors for influencing cat owners' perception toward feline microchipping. In particular, men are less likely to formulate opinions regarding feline welfare and microchipping, and concern for feline welfare and empathy toward cats increases with age across both men and women. When asked to provide more details about their decision to microchip, or not microchip, the survey responses revealed 66% agent-centred reasoning compared to 24% welfare, suggesting that regardless of a person's decision, reasoning was respectively agent-centred. This suggests that potential human benefits may influence cat owners' perception toward feline microchipping. 75% of participants support compulsory microchipping. Of those who would not support the legislation, feline welfare concerns, and a negative outlook surrounding the current database and scanning processes that support microchipping, was revealed. A focus on addressing negative perceptions toward feline microchipping could highlight approaches to change cat owners' perceptions toward the technique positively. The results herein are useful for feline welfare organisations to promote understanding about feline microchipping.

Keywords: Attitudes, Cat, Compulsory, Indicators, Influence, Knowledge, Legislation, Microchipping, Perceptions, Welfare

Introduction

A microchip can be defined as an electronic, “grain-of-rice” sized chip, enclosed in a glass capsule that emits a radio frequency signal when a scanner is passed over the area of an animal in which it was implanted (Cats.org.uk, 2020). Such microchips transmit an identification number to a handheld scanner that displays a unique 15-digit number. This number allows the scanner operator to identify the name, telephone number and address details of the individual’s owner (AVMA.org, 2020). A hypodermic needle is used to inject the microchip under the skin of the animal in between the shoulder blades. The procedure uses a large needle and is said to be about as painful as having blood drawn (Wsava.org, 2020). Veterinarians often microchip at the time of neutering, when an animal is under anaesthesia to minimise pain and distress, however without anaesthesia, the procedure causes minimal and temporary discomfort and takes only a few seconds to implant (Icatcare.org, 2018). Microchipping is routinely carried out by vets, nurses and other trained animal care professionals and costs between £20.00 - £30.00 GPB. The procedure can be carried out on dogs and cats from 5 weeks of age (Rspca.org.uk, 2020).

Why Microchipping?

The underlying purpose of microchipping is reuniting pets with their owners in the event that they become lost, stolen, or are found injured or deceased (Petlog.org.uk, 2020). It also proves ownership of pets to their owners, which is highly effective in cases where pets are stolen (National Animal Welfare Trust, 2020). Both human and animal welfare benefit from ensuring their animal is microchipped; a lost pet is likely to suffer from stress and its welfare is compromised when subjected to stress (Broom and Johnson, 1993). Protection from suffering is one of the five animal welfare needs (The Animal Welfare Act, 2006)), and when stress causes suffering; welfare is compromised (RSPCA, 2018). A microchip can advance the process of reuniting a lost, injured, or deceased animal with its owner, offering peace of mind to owners who allow pets to roam freely.

Pet owner’s liability includes the responsibility to ensure that the personal details recorded to a microchip are kept up to date, for example if a person relocates, it is their responsibility to change the address by contacting the microchip provider database company (RCVS.org.uk, 2020). The success of microchipping relies heavily on owners fulfilling their responsibility, however this does incur a small fee each time the information is changed. Updating a chip can be performed online, by telephone, or by post (Battersea.org.uk, 2020). The fee currently stands at approximately £17.00 GBP (Pet Chip Registry UK, 2020), depending on

the database company used. Currently in the UK there are 13 database companies which meet government standards (Gov.UK, 2020). There is no maintenance required once the microchip is implanted, but veterinarians often scan the microchip at routine health examinations as part of an ongoing process to ensure that the microchip is still in the correct position and working effectively (AVMA.org, 2020). If the site of implantation shows any sign of concern such as swelling or drainage then the animal should be presented to a veterinarian immediately (RCVS.org.uk, 2020).

Advice about Microchipping

Advice about getting a pet microchipped is readily available at veterinary centres, animal welfare organisations and charities, rehoming centres and from the UK government (Wsava.org, 2020). The advice comes in the form of leaflets, websites and use of social media, helplines, campaigns, and conferences. All veterinary centres possess a scanner, and often scanners are held by local rehoming and rescue centres and in some cases by local authorities (RSPCA.org.uk 2020).

Consumers are advised that microchipping is relatively safe and tolerated by companion, laboratory, and zoo animals and that adverse side effects are extremely rare (Scott, 2011), however some scientific studies oppose this standpoint. These studies include the following:

- *A 2-year-old domestic short haired cat suffered a spinal injury (trauma) as a result of incorrect microchip implantation. The microchip was surgically removed however, the cat still suffered from mild paralysis 11 month's post-surgery* (Platt et al., 2007).
- *A 14-year-old domestic short hair presented with fibrosarcoma adjacent to the site of implantation of the microchip* (Daly et al., 2008). *However, it is important to consider that inflammation can predispose felines to tumours, and because both vaccination and implantation can cause inflammation* (Daly et al., 2007), *it was unclear if the fibrosarcoma was associated with the microchip because some vaccinations are injected into the same general area as the implanted microchip.*
- *In two separate rat studies, scientists noted a low incidence rate of tumours occurring at the site of microchip implantation resulting in early sacrifice* (Elcock et al., 2001).
- *Eleven studies between 1990 and 2006 that looked at the effect of microchips on laboratory rats and dogs were reviewed, finding that eight of the studies observed malignant tumours around the site of microchip implantation* (Albrecht, 2010).

Although a few studies have found that in some cases microchipping can induce some types of tumours (sarcomas) in animals, there is also evidence that feline vaccinations can also induce them (Vascellari et al., 2003; Aberdein et al., 2007). Therefore, it can be difficult to distinguish between post injection sarcomas and sarcomas as a result of microchipping as the microchip is implanted in a common site of vaccination injection. It is important to

consider that very few sarcomas at the site of microchip implantation have been reported and directly linked with to microchip itself (Carminato et al., 2011).

After the death of a pet the microchip does not need to be removed, however it is made from biocompatible materials (Petfinder, 2020) that do not degenerate over time, so if owners choose to bury a pet, the microchip will remain in the ground. There is very little information available about how the microchip can affect the environment in the future and how long it remains existent.

Current Status and Geographical Use

In April 2016, the UK government brought in legislation that made microchipping compulsory for dogs, with the aim to improve dog welfare by reuniting lost dogs with their owners quickly. There were positive consequences from the legislation including: an estimated saving by local authorities and charities of £33 million, a reduction in strays, and advances for the police to track down owners of reportedly aggressive dog attacks (gov.UK, 2016).

In June 2018, additional legislation was announced for horses, where microchipping of horses was to be compulsory from October 2020, with owners facing fines of £200 if their ponies, horses, and donkeys are not microchipped by this date. In 2017 the RSPCA rescued 1000 horses that had been neglected, left in horrific conditions or dead. This legislation serves to aid police to track down owners who commit such offences and reunite lost and stolen horses with their owners (gov.UK, 2018).

Previously in the UK it was not a legal requirement for cats to be microchipped unless they were travelling under the Pet Travel Scheme, which stated that you could enter and return to the UK with your cat if it was microchipped, had a passport, and had been vaccinated against rabies (gov.UK, 2020). However, in October 2019 the government launched a call for beneficial evidence for cat microchipping as part of plans to help reunite lost and stolen cats with owners and reduce strays. In May 2021 the Environment Secretary announced that microchipping pet cats will become compulsory under wide-ranging new animal welfare plans.

According to the EU Dog and Cat alliance, microchipping of dogs is compulsory in 21 out of its 28 Union members, compared to cats, where there are 4 out of 28 members that require compulsory microchipping including France, Belgium, Greece and some parts of Spain (EU Dog & Cat Alliance, 2020). Outside of Europe, compulsory microchipping of dogs and cats is

law in all but one region of Australia. In those regions where it is compulsory, microchipping must be carried out by 3 or 6 months of age, depending on the region (RSPCA.org.au, 2019). In New Zealand, all dogs with the exception of working farm dogs, registered from 1st July 2006 must be microchipped, however, there are currently no laws regarding cat microchipping (DIA, NZ, 2019). In June 2019 the Japanese government passed a bill that requires all breeders to microchip cats and dogs, and enforcement is likely to come into effect within the next 5 years (The Japan Times, 2019). The US currently have no legislation for microchipping of cats or dogs (Veterinary Information Network, 2020).

There are various reasons why dogs have been more subject to compulsory microchipping than cats and this is evidence by the number of countries that have enforced legislation for microchipping dogs compared to laws for cats. One of the core reasons claimed is that dogs are more dangerous as strays to humans and other dogs, and that there is a much larger market for pedigree dogs than cats. However, dogs are far less likely to wander freely from their homes and owners than cats are. 71% of cats in the UK have access to the outdoors (PDSA, 2019) where they can roam unsupervised and potentially get stuck in outbuildings, become lost, injured or stolen.

There has long been a divide amongst people about whether they identify as a ‘cat’ person or a ‘dog’ person. Some people believe that dogs are more capable of bonding with humans, being more loving and affectionate, as well as more valuable financially (Kelly, 2019). From the information about the number of microchipping laws for dogs contrasted with cats, it can be assumed that the more valuable a pet is as a “companion” and “financially”, the more likely it will be to receive microchipping.

How Compulsory Microchipping Assists

Good animal welfare includes positive mental and physical state (health) along with protection from unnecessary suffering (Harrison, 2013). Feline welfare is compromised as a result of stress (Broom and Johnson, 1993), failure to cope in stressful situations detriments animal welfare (Broom, 2006), and therefore stress causes suffering (Dawkins, 1998).

Identification of cats is viewed as an essential component of cat welfare (Icatcare, 2020). Cats that become lost are very likely to suffer from acute or even chronic stress if they go missing for long periods of time. Stress can be defined as a normal adaptive response to a threat, or challenge in an individual, that results in an adverse change in behaviour and or physiology (McEwan, 2005). Challenges that lost cats face that subject them to stress and

anxiety include; road traffic, dehydration, hunger, dog attacks and getting locked in outbuildings. Also, because cats are notoriously creatures of habit, changes to their routine can make it difficult for them to cope. In many cases cats that are found that have been microchipped can be reunited with the owner, reducing the time of stress and suffering. The UK's largest cat welfare organisation Cats Protection has campaigned for compulsory microchipping (Microchips Reunite, 2019).

The British Veterinary Association (BVA), British Veterinary Nursing association (BVNA), British Small Animal Veterinary (BSAVA) and the Society of Practising Veterinary Surgeons (SPVS) recognise that compulsory feline microchipping has the potential to advance cat welfare, boost responsible ownership, and to establish a relationship between veterinarian and the owner, but they also recognise potential pitfalls (Table 1).

Table 1. Potential advantages / pitfalls of feline microchipping (BVA et al., 2019).

Potential Advantages	**Potential Pitfalls**
Lost, stolen and deceased cats can be reunited quickly with owners if found, resulting in faster administration of necessary veterinary treatment.	The success of reuniting cats with owners relies on responsibility of the owner to keep their personal details associated with that microchip, up to date.
Health test results can be correctly attributed to individual cats as well as population data being accurate, and facilitates identification of cats during disease outbreaks.	There is not one central database, but currently 13 in the UK, with each offering different and competitively priced processes.
At a relatively low cost, the microchip can be implanted at the time of neutering to reduce the number of veterinary visits whilst reinforcing responsibility of cat ownership to breeders and new owners under the Animal Welfare Act (2006).	A fee occurs when changing personal information associated with the microchip, adding to the initial 'low cost' every time an owner relocates. Owners might not neuter. If the breeders are responsible for microchipping costs, this would likely be incorporated into the cost of the cat, which could deter buyers.
The microchipping procedure is relatively painless and detrimental side effects are extremely rare.	The pain suffered is not actually known but assumed. Adverse implantation reactions and cancerous complications have been reported.
Easier detection and increased likelihood of prosecution of owners who cause unnecessary suffering to their cats.	Relies on compulsory scanning to check if the details match that of the person presenting the cat to those of the implanted microchip.

Saving Rehoming Centre Resources

The new legislation brought in for compulsory dog microchipping was thought to save rehoming centres £33 million annually. The same or similar savings could apply to hundreds of cat rehoming centres across the UK if cats that are microchipped are subsequently reunited with their owners rather than waiting to be adopted, in some cases, unnecessarily. Kennel space could also be saved, leaving more available to cats that are most in need.

Human Welfare

There has long been studies that support health and well-being benefits to humans from companion animal interactions (Barker and Wolen, 2008). Early studies reveal physiological benefits, such as cardiovascular health, where pet ownership predicted survival one year post myocardial infarction (Friedmann and Thomas, 1995). Studies also reveal psychosocial benefits from human – animal interaction, where pet owners likened their relationship with their pet cat to that of a family member (Stammbach & Turner, 1999), and sexual abuse victims described their pets as more supportive emotionally than friends or family members (Barker *et al.,* 1997). Recent studies continue to support a positive association between pet ownership and human health and wellbeing. Cats and other companion animals have been used in studies to ascertain mental health benefits of animal-assisted therapy and pet ownership in elderly people, finding that animals can relieve boredom, provide purpose and responsibility, and reduce social isolation and loneliness (Cherniack and Cherniack, 2014). These studies support a theory that pets become an important part of everyday life for a lot of humans, for example; if a singular living elderly person's cat went missing or had been killed in a road traffic accident (RTA) and the cat was microchipped, it can be returned (alive or deceased). If the cat has deceased, this news brings closure to the worry that owners endure and therefore microchipping can lessen the time of suffering for the owner.

Evaluation of Compulsory Microchipping

Since the introduction of compulsory dog microchipping on April 2016 in the UK, according to PDSA (2019) 92% of all dogs are now microchipped and the number of reported strays has decreased by 15% (Dogs Trust, 2018). This research suggests that compulsory microchipping is beneficial for identifying and reuniting dogs with their owners. One study evaluated data evidence from one English local authority about the record of stray dogs during 3 time periods between 2010 and 2018, and found a significant effect on the return of stray dogs since imposing the legislation (Siettou, 2019).

However, there are reported flaws with the current mandatory dog microchipping system (British Veterinary Association, 2020). Even though it is compulsory for owners to microchip their dogs, it is not compulsory for veterinarians, rehoming centres and local authorities to routinely scan the pets that they encounter, nor do they have to check the microchip against the details held on a database and contact the registered person if the details do not match that of the person in possession. This flaw can result in missed opportunities to reunite lost or stolen dogs. Rival commercial databases are a potential problem, there are 13 different databases which have varying processes and some fail to meet government standards but are still trading online. The British Veterinary Association do not support compulsory scanning but are accepting that the database system needs to be modified (British Veterinary Association, 2020).

Unlike dogs, cats are not protected by the Road Traffic Act 1988 whereby drivers who run over a dog, must report the incident by law. Consequently, the issue exists that cats that are injured or killed in RTAs are not being reported, and thus the chance of reuniting the cat dead or alive becomes compromised (Cats Matter, 2020). It is evident that as well as enforcing compulsory microchipping for cats, the UK government also need to modify current and future legislation, such as compulsory scanning by local authorities if cats are brought to them, and revising the Road Traffic Act 1988 to include cats.

Influencing Cat Owners' Decisions about Microchipping

Cost - At the cost of between £20.00 and £30.00 GBP (Cats Protection, 2020) for the procedure, as well as ongoing costs each time the personal details are updated, cost is likely to be influential for cat owners when deciding if they are going to microchip, especially for those with lower income. According to the PDSA (2020), there are opportunities for cat owners to have their cats microchipped at local charities and events in their area at reduced costs and sometimes free of charge. The RSPCA (2020) also offer a scheme for subsidised veterinary care, such as microchipping, for people on state benefits.

Time - Full time workers might intend to microchip their cats but simply just have not gotten round to it yet, compared to retired or part-time workers whom might have more time opportunity. This might also apply to workers with unsociable working hours, who cannot visit their vets during traditional veterinary opening times. It could also be considered that people believe that the time they do have off work is better spent on other activities.

Gender - Studies reveal that females have more empathy toward animals, and more positive attitude in general toward animals (Paul and Podberscek, 2000; Martens, Hansart and Su, 2019). Therefore, gender could be a significant factor that influences an owner's decision for microchipping.

Age - One study suggested that elderly people are less concerned about animals than younger generations (Driscoll,1992), however another has revealed contrasting findings, suggesting that older generations are more concerned with, and have, emotional empathy towards animals, exhibiting stronger beliefs about animal sentience than younger generations (Cornish et al., 2018). Emotional empathy, concern for animals generally, and strong beliefs about animal sentience are likely to be an influencing factor for cat owners' decision to microchip.

Value - The value of a pet cat as a companion might have significant influence on the likelihood of microchipping. People that are singularly living might find it more important to take the necessary steps to prevent permanent loss of their cat than those who do not suffer from loneliness. Financial value is significant for breeders and owners of pedigree cats, because microchipping is useful to deter cat theft or reunite stolen cats. Therefore, financial value and value as a companion might influence cat owners' perceptions toward microchipping.

Ethnicity and Religion - Little is known about how, or if, ethnicity and religion influences cat owners' decision to microchip. The general Christian ethos towards animals is avoid cruelty and treat them with kindness, however animals are not considered as sacred, as they can lack reason and significant right to live, and can also be used for human benefit. Jainism, Hinduism, and Buddhism Religions adopt the belief that they will return to life after death in animal form, therefore animals should be treated with the same respect as humans. The Islamic religion teaches Muslims that Allah gives humans the power over animals and that mistreating them goes against His will (Szűcs et al., 2012).

Media - The media is increasingly influential towards human attitudes and how people behave (Ferreira, 2014), with a combination of positive and negative consequences. Social media is useful to charities and organisations in order to publish engaging material such as images, promoting campaigns and information relating to their organisation.

Charity and Campaign Organisations - People who follow animal welfare organisations and charities might be more likely to be influenced by the material presented to them, for

example, those that follow or support Cats Protection, the largest feline welfare charity in the UK, would have likely had an interest in cat welfare for them to begin supporting or following the organisation. Cats Protection aim to educate people of all ages about cats, and how to meet their welfare needs (Cats Protection, 2020), by publications, help, and advice via telephone lines and campaigns. A current campaign ‘Microchips reunite’ (Cats Protection, 2019) is promoting the importance of feline microchipping, which could influence cat owners’ perceptions.

Rationale

This study aimed to determine cat owners’ perceptions about feline microchipping and what factors influence their decision to microchip, or not microchip, their cats. It comprised a survey of a sample of current cat owners’ perceptions towards feline microchipping. Data collected was analysed, highlighting any associations between cat owners and what influences their choices about microchipping. The findings are directed toward helping feline welfare charities advance methods of raising awareness about microchipping.

We hypothesised that demographics can be used as key predictors for cat owners’ perceptions towards feline microchipping and that further knowledge and comment based questions in this survey can provide deeper insights regarding cat owners’ knowledge and attitudes towards feline microchipping.

Methodology

Data Collection

A questionnaire was designed using Google Forms™ to obtain cat owners’ perceptions of feline microchipping (Appendix 1). Questions were designed to attain some details about the respondent, information about their cats, and their perceptions of feline microchipping. Questions required a mixture of short to long answers, and multiple choice. The survey was distributed via email and social media platforms and obtained quantitative and qualitative data. A pilot survey was distributed amongst a small class of BSc Animal Welfare students to test its appropriateness for ethical public use.

Data was retrieved from Google Forms as a direct download of a comma separated excel file (.CSV) which was cleaned and abbreviated manually in Excel™ before being used for further statistical analysis. To facilitate easier naming in spreadsheets the following abbreviations were used for the selected questionnaire (Table 2).

Table 2. Participant response codes to questions. Factors in yellow were not included in analysis as comprised open answers.

Question	Abbreviation	Full Question
Q1	Age	What is your age?
Q2	Gender	What is your Gender?
Q3	Ethnicity	What is your ethnicity? (optional)
Q4	Religion	What is your religion? (optional)
Q5	Employ	Current employment status
Q6	N_cats	How many cats do you own?
Q7	N_micro	How many of your cats are microchipped?
Q8		Explain your reason for microchipping or not microchipping your cat
Q9	C_age	How old are your cats? (in years)
Q10	Breed	What breed are your cats?
Q11	Res_cat	State how many of your currently owned cats have been rescued
Q12	Liv_con	Select which of the following best describes your cat's living conditions
	All_in	All of my cats live indoors only
	All_out	All of my cats live outdoors only
	All_both	All of my cats have the option of living indoors or outdoors
	S_io	Some of my cats have to stay indoors but others can go outdoors
Q13		Outline the purpose of cat microchipping based on your current belief/knowledge
Q14	Cost	How much money do you believe the microchipping procedure costs?
Q15		Outline the current UK legislation regarding microchipping for cats
Q16		To what extent do you agree with the following statements?
a	Mi_ben	Microchipping is beneficial for cats
b	Adv_acc	Seeking advice about microchipping is accessible
c	Plss_pro	Microchipping is a painless procedure
d	Loc_scan	If you found a lost cat you would know where to take it to be ID scanned
e	Mi_comw	The microchipping procedure compromises feline welfare
f	Mi_iw	Microchipping can improve feline welfare
g	Mi_exp	Microchipping a cat is expensive
h	Mi_tc	Microchipping a cat takes a lot of time
i	Mi_dogs	Microchipping is more important for dogs
j	Mi_leguk	Microchipping should be compulsory for cats in the UK

k	Fi_help	There should be financial help available to support compulsory microchipping of cats in the UK
l	Sup_pet	I would support a petition for compulsory microchipping of cats in the UK
Q17		Explain why you would, or would not, support a petition for compulsory microchipping of cats in the UK
Q18	Enf_comp	Did you know that in April 2016, UK legislation enforced compulsory microchipping of dogs?

Data Analysis

A multivariate Generalised Linear Model (GLM) was used to contrast the responses of participants from different Age, Gender, Ethnicity, Religion, Employment, Number of Cats Owned and Number of Cats Microchipped. Data was transposed from categorical to numerical binary using package varhandle (Mahmoudian, 2017) and placed in a response matrix combined with a separate predictor matrix. Two multivariate GLM models were made, both with the same structural design but with differing family assignment for analysis. For both models the function manyglm in package mvabund was used to assess relationships (Wang et al., 2012). The independent models were written as;

Mi~p$f.Age+p$f.Gender+p$f.Ethnicity+p$f.Religion+p$f.Employ+
p$f.N_cats+p$f.N_micro+p$f.Breed+p$f.Liv_con…,

reflecting the participants answers as responses and command (p$) for each predictor variable. The manyglm models were fitted using binomial(link = “cloglog”) and binomial(link = “logit”) families with block resampling of rows for multivariate inference. The models were fitted using a log-linear model, with the mean model as;

$$\log(\mu_{ij}) = \ldots \; Y_{ij} \sim Bin\ (\mu_{ij},\ \Phi_j)$$

where; The model for the number of responses *j* found for each participant survey answer *i*(Y_{ij}) is binomial (*Bin*) and *ij* is p$f.Age+p$f.Gender….+p$f.Pets. The overdispersion parameter Φ_j is constant across participants but can vary across responses, and the mean of Y_{ij} is μ_{ij}, a log-linear function of block and treatment.

Model fit was confirmed by inspection of Dunn Smyth residual-fits and quantile-plots (Dunn and Smyth, 1986). AIC values were used to inspect differences between binomial family link methods. Significance summary tables were derived using multiple univariate ANOVA tests from model subsets to contrast significance. Resampling of ANOVA testing was performed

using Monte-Carlo permutation bootstrapped to 999 iterations. Coefficients were also inspected, where significant, for model results, and heat plot matrices built in package ggplot2 (Wickham, 2016) to help contrast and describe results. All analyses were conducted in R and R-Studio (R Core Team, 2019) with matrix handing utilizing package reshape2 (Wickham, 2007).

Results

A summary of responses is presented in Table 3 and Table 4. *Table 3.* Demographic responses to the online survey;

Demographic Question	**Criteria**	**Number & % of Respondents**
Total number of participants	Number	326 (100%)
Gender	Female	289 (88.7%)
	Male	36 (11%)
	Prefer not to say	1 (0.3%)
Age (years)	18 – 25	25 (7.7%)
Mean:38.13	26 – 40	90 (27.6%)
	41 – 60	159 (48.8%)
	Over 60	52 (16%)
Employment Status	Full-time	164 (50.3%)
	Part-time	50 (15.3%)
	Retired	42 (12.8%)
	Unemployed	14 (4.3%)
	Student	10 (3%)
	Other	32 (9.8%)
	No answer	14 (4.3%)
Ethnicity	White British	112 (34.3%)
	White	39 (11.9%)
	British	38 (11.6%)
	Other	40 (12.2%)
	No answer	97 (29.7%)
Religion	Church England	29 (8.8%)
	Christian	18 (5.5%)
	None	12 (3.6%)
	Agnostic	10 (3%)
	Atheist	10 (3%)
	Other	52 (15.9%)
	No answer	195 (59.8%)
Number of cats owned	Min.:	0.000
	1stQu	1.000

	Median:	2.000
	Mean:	2.144
	3rdQu.:	2.750
	Max:	16.000
Number of microchipped cats	Min.:	0.000
	1stQu	1.000
	Median:	2.000
	Mean:	1.966
	3rdQu.:	2.000
	Max:	13.000
Cat Breed	Mixed breed	55 (17%)
	Non-pedigree	213 (65%)
	Pedigree	26 (8%)
	No answer	19 (6%)
	Unknown	13 (4%)
Cat living conditions	All in & out	204 (62%)
	All live indoors	98 (29.7%)
	All live outdoors	1 (0.3%)
	Some live in & live out	23 (8%)

Table 4. Extent of agreement to statements in Question 16 and response to Question 18.

Statements	**Agreement / Disagreement**	**Number & % of Respondents**
Microchipping is beneficial for cats	Agree	93 (29%)
	Strongly Agree	204 (63%)
	No opinion	4 (1%)
	Disagree	4 (1%)
	Strongly disagree	21 (6%)
Advice about microchipping is accessible	Agree	141 (43%)
	Strongly Agree	138 (42%)
	No opinion	17 (5%)
	Disagree	15 (5%)
	Strongly disagree	15 (5%)
Microchipping is a painless procedure	Agree	129 (40%)
	Strongly Agree	72 (22%)
	No opinion	24 (7%)
	Disagree	84 (26%)
	Strongly disagree	16 (5%)
If you found a lost cat you would know where to take it to be ID scanned	Agree	101 (31%)
	Strongly Agree	193 (59%)
	No opinion	2 (0.6%)
	Disagree	13 (4%)
	Strongly disagree	17 (5.4%)

The microchipping procedure compromises cat welfare	Agree Strongly Agree No opinion Disagree Strongly disagree	19 (6%) 9 (3%) 15 (5%) 97 (30%) 186 (56%)
Microchipping can improve cat welfare	Agree Strongly Agree No opinion Disagree Strongly disagree	107 (34%) 143 (44%) 34 (10%) 21 (6%) 21 (6%)
Microchipping a cat is expensive	Agree Strongly Agree No opinion Disagree Strongly disagree	36 (12%) 7 (2%) 25 (9%) 124 (38%) 128 (39%)
Microchipping takes a lot of time	Agree Strongly Agree No opinion Disagree Strongly disagree	6 (1.5%) 10 (3%) 11 (3.5%) 107 (34%) 192 (58%)
Microchipping is more important for dogs	Agree Strongly Agree No opinion Disagree Strongly disagree	21 (6%) 16 (5%) 11 (3%) 100 (31%) 178 (55%)
Microchipping should be compulsory for cats in the UK	Agree Strongly Agree No opinion Disagree Strongly disagree	82 (24%) 168 (52%) 28 (9%) 19 (6%) 29 (9%)
There should be financial help available to support compulsory microchipping of cats in the UK	Agree Strongly Agree No opinion Disagree Strongly disagree	115 (35%) 79 (24%) 44 (13%) 57 (18%) 31 (10%)
I would support a petition for compulsory microchipping of cats in the UK	Agree Strongly Agree No opinion Disagree Strongly disagree	90 (28%) 154 (47%) 37 (11%) 14 (4%) 31 (10%)
Did you know that in April 2016, UK legislation enforced compulsory dog microchipping?	Yes No	262 (80%) 64 (20%)

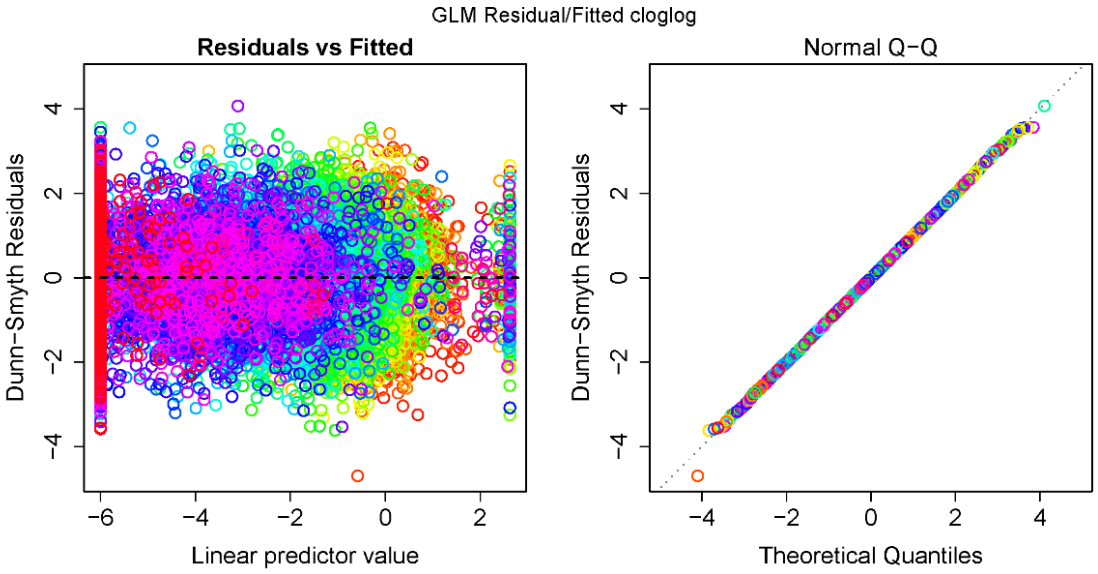

Figure 1a. Dunn-Smyth residual fits plots for Model 1 (family = Binomial(link = “cloglog”))

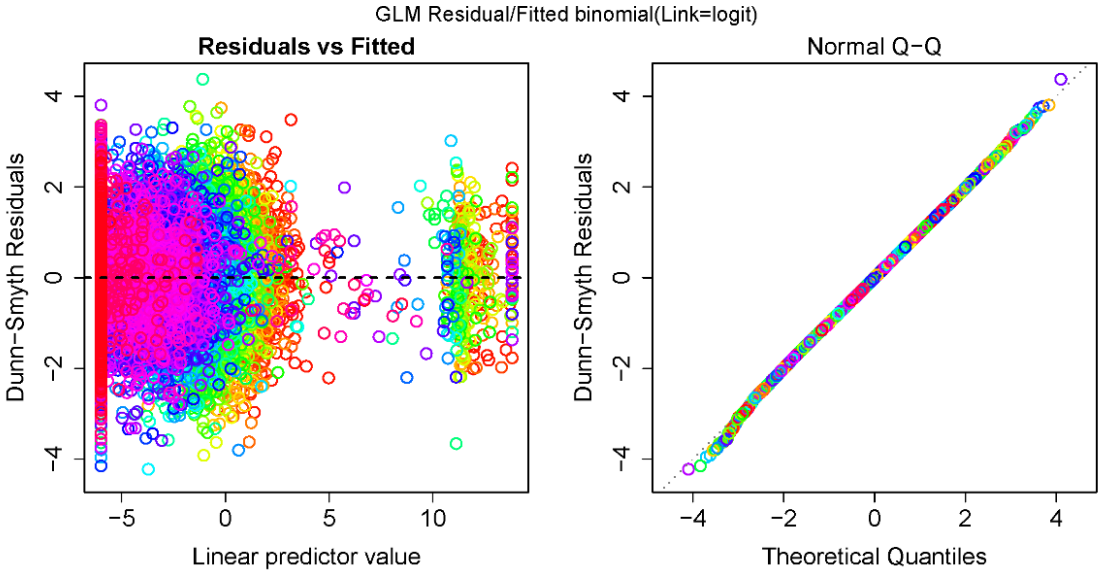

Figure 1b. Dunn-Smyth residual fits plots for Model 2 (family = binomial(link = “logit”))

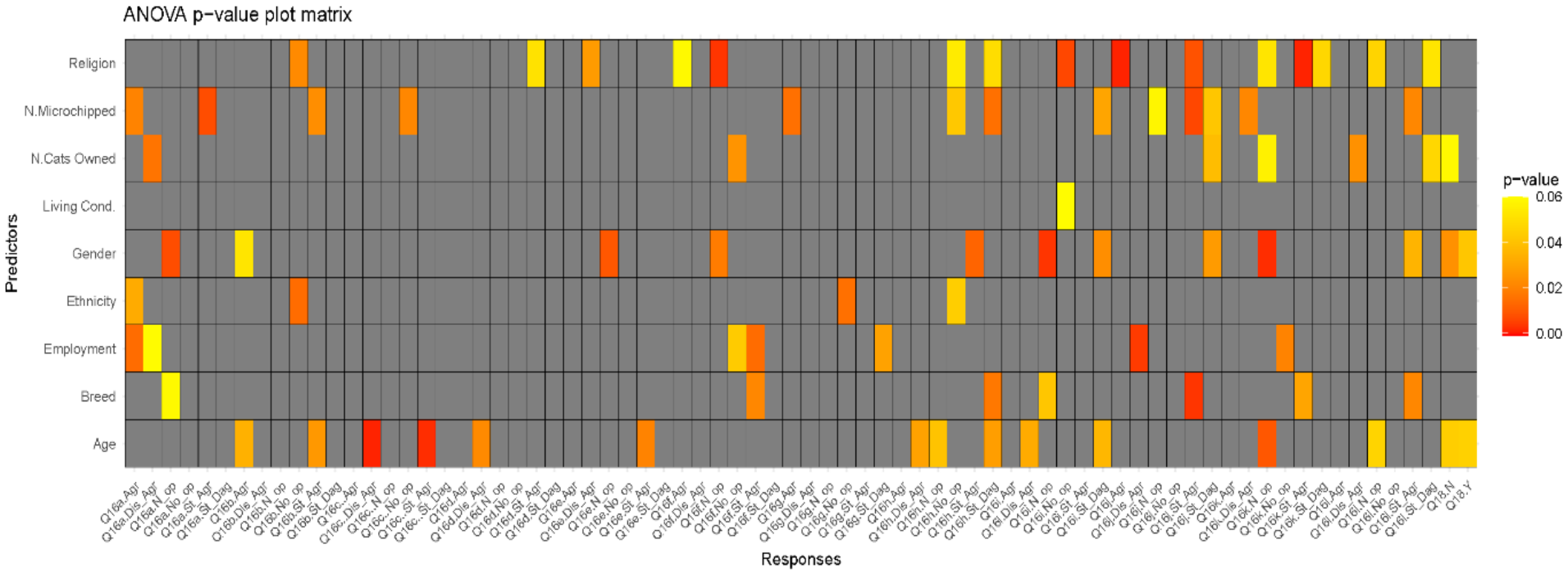

Figure 2. ANOVA p-value plot matrices for Model 1 (glm.B) binomial(link = “cloglog). Each response value with a p-value colour is a significant result in the model where p<0.05. Yellow indicates p-values at the 0.05 threshold, orange stronger ca. <0.03 and red a certain p-value <0.01

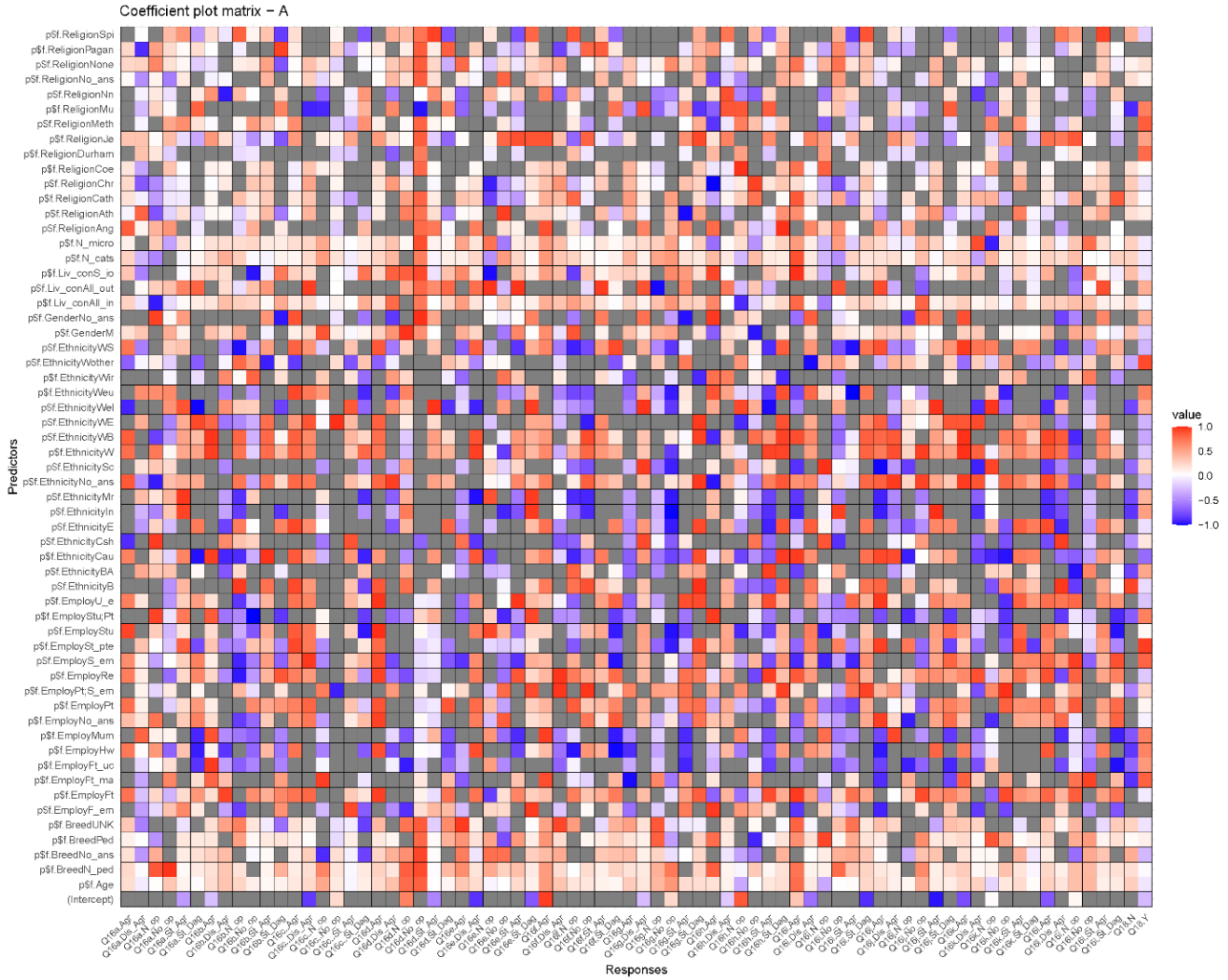

Figure 3a. Coefficient plot matrices for Model 1 (glm.B) binomial(link = “cloglog). Range coefficients -1 to +1

Figure 3b. Coefficient plot matrices for Model 1 (glm.B) binomial(link = “cloglog): Highest range coefficients from -4 to +6

Plots of fits (Figures 1a/b) show an appreciable model fit for both binomial families but the best fit was achieved on binomial family with cloglog link (glm.B – df -0.16, AIC 286.23; glm.B2 df -0.33, AIC 288.52). Both models presented very strong quantile plots and negligible fanning in residual-fits.

ANOVA p-value plot matrices for Model 1 (glm.B) binomial(link = “cloglog”) were successfully completed (Figure 2). A single graph was produced. Each response value with a p-value colour is a significant result in the model with a $p<0.05$. The range 0.001-0.06 is given as p-values ca. 0.06 often break below the 0.05 threshold with higher resampling. Resampling at 999 was sufficient for the purposes of eliciting ANOVA hypotheses driven inference and took 8.5 hours to cycle.

Coefficient plot matrices for Model 1 (glm.B) binomial(link = “cloglog”) were successfully completed (Figures 3a/b). Two graphs were produced (a and b) so as not to blind the visual interpretation of each response. Coefficients were scaled around zero prior to plotting to prevent very high values (e.g., a value up to +10) blinding out the signal from lower coefficients (e.g., between 0-3). All response coefficients are presented regardless of them being significant. Therefore, the relevant significant value from Figure 2 would need to be identified first and then searched for on the coefficient matrix plot to reveal the positive (red) or negative (blue) relationship each predictor has with the significant result. Results in grey on Figures 3a are very high values and therefore are treated in a separate adjusted scaled plot (Figure 3b).

The following detail summarises key predictors from Figure 2 and the significant plots from Figures 3a and 3b.

Significant Predictors

Age - The older the participant the more likely to agree or strongly agree that advice about microchipping is available and microchipping compromises welfare. The older the participant the more likely participants were to disagree that microchipping is a painless procedure, that they know where to take a cat to be ID scanned, that microchipping is expensive, that microchipping is time consuming and that microchipping is more important for dogs. The older the participant the more likely they are to not express an opinion about supporting a petition for compulsory microchipping.

Religion - Spiritual, Anglican and “none” are more likely to strongly agree that they know where to take a cat to be scanned. Anglican, Pagan, none, no answer, Church of England are more likely to strongly agree that microchipping is time consuming. Atheist are more likely to strongly agree that compulsory microchipping should be a legal requirement. Methodist and Atheist are more likely to strongly agree that financial help should be available. Christian and “no answer” are more likely to agree that financial help should be available. Jewish and Anglican are more likely to agree that compulsory microchipping should be a legal requirement. Catholic, Christian and Church of England are more likely to strongly disagree to supporting a petition. Methodist, Church of England, Catholic and Anglican are more likely to not express an opinion about financial help being available. Pagan, Muslim, and no answer are more likely to not express an opinion about accessibility of seeking advice. Spiritual and Catholic are more likely to not express an opinion about microchipping improving welfare. Christian and Catholic are more likely to not express an opinion about microchipping being time consuming. Jewish, Spiritual and none are more likely to not express an opinion about supporting a petition. Pagan, none, and no answer are more likely to not express an opinion about microchipping being more important for use in dogs.

Number of microchipped cats / owner - The more cats microchipped the more likely participants were to agree or strongly agree that; microchipping is beneficial for cats, that advice about microchipping is accessible, that microchipping is expensive, that microchipping should be compulsory, and that they would support a petition for compulsory microchipping. The more cats microchipped the more likely participants were to disagree there should be financial help available. The more cats microchipped the more likely participants were to not express an opinion about if microchipping is painless and time consuming. The fewer cats microchipped the more likely participants were to not express an opinion about if microchipping should be compulsory.

Gender - Males are more likely to agree that seeking advice about microchipping is accessible. Males are more likely to strongly disagree that microchipping is more important for dogs. Males are more likely to not express an opinion about; whether microchipping is beneficial for cats, if microchipping compromises welfare, if microchipping improves welfare, and if financial help should be available. Less males knew about dog legislation than females.

Number of cats owned - The more cats owned the more likely participants were to disagree or strongly disagree to supporting a petition for compulsory microchipping. The

more cats owned the more likely participants were to not express an opinion about if there should be financial help available. The more cats owned the more likely to know about dog legislation.

Cat breed - Pedigree owners were more likely to strongly agree they would support a petition for compulsory microchipping. Non-pedigree owners were more likely to strongly agree that financial help should be available. Pedigree owners were more likely to not express an opinion about if microchipping is more important for dogs. Non-pedigree owners or unknown breed were more likely to not express an opinion about if microchipping is beneficial to cats.

Employment - Employed students, self-employed, retired, part-time employed, full-time employed, and housewife were likely to agree or strongly agree that microchipping is beneficial for cats. Full-time Mums were likely to disagree that microchipping is beneficial for cats. Self-employed and Mother were likely to disagree that microchipping should be a legal requirement. Unemployed, students, self-employed, retired, full-time and part-time employed were likely to strongly disagree that microchipping is expensive. Retired, self-employed, part-time, and full-time were more likely to not express an opinion that financial help should be available.

Ethnicity - Caucasian, White, White British and no answer were more likely to agree that microchipping is beneficial for cats. Irish, White other, Welsh and Cornish were more likely to not express an opinion about accessibility of advice. Those who did not answer with an Ethnicity were more likely to not express an opinion about if microchipping is expensive. White British, Cornish and Black American were more likely to not express an opinion about if microchipping is time consuming.

Living conditions - Participants with cats who live outdoors only were more likely to not express an opinion about if microchipping is more important for dogs.

Qualitative Responses

Participants were given the opportunity to explain their reasons for supporting or opposing microchipping, obtained by open questions written in the comments section. The responses were categorised by identifying if the response focused on agent centred answers, or answers that focus on cat welfare and when the owner had no option (Table 5).

Table 5. Detailed categorical reasons for why participants decided "*to - or not to"* microchip their cats

Category	**Microchip Y/N**	**Reasons (number of responses)**
Welfare	Microchip	In case cat is found injured (29) In case cat is involved in road traffic incident (18)
	Not microchip	It causes cancer (3) Older cats do not need the stress (3) The cat is feral, do not want to cause stress (1) It seems cruel (1) The less vet procedures, the better (1)
Agent-centred	Microchip	Cat is lost (72) Cat is stolen (61) Offers peace of mind (48) Cat is traceable (21) It is part of responsible ownership (17) Safety (11) Increases chance of being reunited with owners (11) Proof of legal ownership (8) In case house cat escapes (4) The vet encouraged it (2) To use with microchip cat flap (2)
	Not microchip	It takes time (2) The cat does not wander (2) Indoor cats never go outside (2) Microchipping farm cats is not necessary (2) Cat does not belong to me (2) There is not one central database (1) It is too expensive (1) Never got round to it (1)
Not owner's decision	Microchip	Cat already microchipped when adopted (20) Moved to a country where it was a legal requirement (2)
	Not microchip	Covid-19 pandemic (1)

Discussion

The model analysed in this study has been able to identify some acceptance for the hypothesis that demographics influenced owners' perceptions towards microchipping, as indicated in Table 6. Open questions that allowed participants the opportunity to explain their reasons revealed detailed answers about their knowledge and perception of feline microchipping.

Table 6. Chronological order of how useful the predictors are for influencing attitudes

Predictor: Demographics	**Number of significant plot matrices in resampled ANOVA model**
Age	15
Religion	15
Number of microchipped cats	13
Gender	12
Number of cats owned	7
Breed of cat	7
Employment status	7
Ethnicity	4
Living conditions of cat	1

It is important to consider that 195 participants (60%) chose not to identify with a religion as this demographic question was optional. Therefore, the 15 significant plots for religion were based on only 40% of the participants, and thus the results cannot be applied generally as a reflection of religious influence towards feline microchipping due to lacking validity of significance compared to the significant plots with 100% response rate. Research regarding how religion influences perception of feline microchipping would be useful for the current study to confirm if the presence of this demographic question is relevant to the field.

Demographics

Gender - Most of the respondents were female 289 (88.7%), disproportionate to male respondents 36 (11%) (Table 3). Female participants might have been more interested in the survey, therefore influencing chance of participation. However, this does not indicate that females are more likely to be cat owners than males. It could support that females generally are more likely to participate in surveys than males (Curtin, Presser

and Singer, 2005), because their behaviour is strongly shaped by empathy for the subject of interest (Christov-Moore et al., 2014), and generally that females have more positive attitudes towards animals (Paul and Podberscek, 2000). The survey may not have reached as many males, or it might have reached them, but more males chose not to respond, suggesting that males care less, or have less, interest in the subject matter.

Age - 48.8% of participants were aged between 41 and 60, accounting for almost half of the total responses (Table 3), opposing that older people are less concerned about animals than younger generations (Driscoll, 1992). The 18 – 25 age range had the fewest respondents with just 25 participants. It could be indicative that this age range are less likely to be cat owners because they might be students living in non-appropriate accommodation for keeping cats.

Employment status - Half of the participants were in full-time employment (164) and 15% (50) were part-time employed (Table 3). Employment might be suggestive towards higher intellect and interest in the survey. Therefore, an influence on participation of the survey supports that those of higher affluence and educational level are more likely to participate in surveys than those of lower affluence and educational status (Goyder, Warriner and Miller, 2002).

Ethnicity and Religion - Ethnicity and religion were optional questions and participants were more likely to reveal their ethnicity than their religion. 60% of participants chose not to disclose their religion and 30% did not reveal their ethnicity (Table 3). Of the ethnicities revealed, they are disproportionately White British, British, or White (58%) and 29% did not answer (Table 3), reflecting that the study was conducted in the South West of England, a predominantly White British area of the Country. No answer to religion and ethnicity could be an indication that identifying to a specific religion or ethnicity is not important to the participants or not relevant to their interest in the survey.

Knowledge, Attitudes, and Legislation

Knowledge - Participants were asked to outline their current knowledge about where to take a lost/deceased cats to be scanned, overall, 90% of the participants agreed or strongly agreed that they would know where to take a lost/deceased cat to be scanned (Table 4). This is a positive indication that people are knowledgeable about the process of scanning a lost/deceased cat. This supports the success of welfare organisations educating cat owners, and the use of campaigns in promoting knowledge (Cats

Protection, 2019). Of the participants (9%) who disagreed that they would know where to take a cat to be scanned, there was an association with older age, suggesting that older generations are not aware of where to take a lost or deceased cat. This could be because some older people might not have access to, or know about, educational material such as online welfare organisations and campaigns, who regularly update the public with such information. A suggestion for campaign groups to successfully reach older people would be to hold coffee mornings within the community and encourage workshops that connect and educate attendees.

When asked if the participants knew about the compulsory UK legislation for dog microchipping introduced in April 2016, 64 participants (20%) answered ‘NO’ (Table 4). There was an association between those answering ‘NO’ and males, suggesting that men are less likely to be aware of the dog legislation, which might support that men are generally less empathetic towards animals (Martens, Hansart and Su, 2019), therefore they have less interest in researching current legislation for cats or dogs. The results also express an association for older people and answering ‘NO’, suggesting that older people are less likely to be aware of the dog legislation. This result supports that older people could be generally less concerned for animals (Driscoll, 1992). It could be considered that older participants who did not know about the dog legislation are simply not dog owners. There was a significance for higher number of cats owned by participants and not knowing about the dog legislation (Figure 3a). This may suggest that those who own more cats also do not own dogs and are subsequently less concerned.

Question 13 asked participants to outline the purpose of microchipping based on their current knowledge. Out of 326 participants, 324 (99%) responded with an open answer that presented accurate knowledge, with only 2 answering that they were not sure or did not know the purpose, supporting that feline welfare organisations and campaigns are a successful way to promote feline microchipping (Cats protection, 2019).

Question 15 asked participants to outline the current legislation regarding microchipping, 211 participants (65%) were aware that there is currently no legislation for compulsory feline microchipping, 20 participants (6%) thought that there is legislation, and 65 participants (29%) were unsure or did not know. Results are indicative that knowledge might be a significant factor that influences human perceptions of microchipping.

Attitudes and beliefs - Participants were asked to what extent they agreed that microchipping was beneficial to cats; results revealed that 297 participants (91%) either agreed or strongly agreed compared to 25 participants (8%) who disagreed or strongly disagreed, and 4 participants (1%) who did not express an opinion (Table 4). Cat owners with a higher number of microchipped cats were more likely to agree or strongly agree that microchipping is beneficial for cats (Figure 3a), suggesting that multiple-cat owners are strongly of the opinion that it is beneficial to cats, and are therefore likely to microchip. Males were more likely to answer no opinion when asked if microchipping is beneficial to cats (Figure 3b), but it is not possible to know whether the male respondents truly had no opinion or if they simply were avoiding cognitive effort due to lack of interest (Martens, Hansart and Su, 2019). Employed students, self-employed, retired, part-time employed and full-time employed were more likely to agree that microchipping is beneficial for cats, supporting that employment might indicate higher affluence and intellect. This suggests a greater knowledge about microchipping and the ability to conclude the potential benefits of microchipping. Those that did not answer, or identified as Caucasian, White or White British were more likely to agree that microchipping is beneficial for cats. These results are reflective of the study being conducted in the South West of England.

When asked to what extent participants believe that seeking advice about microchipping is accessible, 279 participants (86%) agreed or strongly agreed, compared to 9% who disagreed or strongly disagreed, and 5% who offered no opinion (Table 4), suggesting that organisations and veterinary professionals are successful in promoting feline microchipping (Cats Protection, 2020). Those who have more cats that are microchipped, are more likely to strongly agree that advice is accessible (Table 4), which could suggest that the more cats you own that are microchipped, the more contact you might have with professional advice about feline microchipping. For example, increased veterinary visits results in an increased opportunity for vets to encourage the owner.

Males were more likely to agree that seeking advice is accessible. However, it is not possible to know if participants did actually seek advice and a suggestion for future studies could investigate gender differences in advice seeking generally. There was an association between participants of older age and being more likely to agree or strongly agree that advice about microchipping is accessible (Figure a), supporting that emotional empathy drives the seeking of advice (Cornish et al., 2018). Older participants are more likely to be retired and therefore might have more time to seek advice.

Cat owners were asked to what extent they agree that the microchipping procedure is painless, 207 participants (62%) agreed or strongly agreed compared to 100 participants (30%) who disagreed or strongly disagreed, and 25 (8%) who did not express an opinion (Table 4). Those with more cats that are microchipped were more likely to not have an opinion about if the procedure is painless (Figure 3a), indicating a lack of welfare consideration, supporting agent-centred reasons for microchipping (Table 5). Of the participants who disagreed that microchipping is a painless procedure, there was an association with older age, suggesting that the older participants believe that the procedure might cause pain. This supports that older people are more concerned with emotional empathy towards animals and possess stronger beliefs about animal sentience (Cornish et al., 2018). Microchipping might be a novel procedure that older generations are not accustomed to or even aware of until recently, therefore older people may have less knowledge or understanding about microchipping.

When asked if microchipping improves feline welfare, overall, 247 participants (76%) agree or strongly agree that microchipping improves cat welfare compared to 42 participants (13%) who disagree or strongly disagree and 34 (11%) who expressed no opinion (Table 4). Of those with no opinion, there was a strong association between having no opinion and Spiritual and Catholic religions. Little is known about how different religions perceive microchipping, therefore this topic could make for a useful further study. In total 9% of all participants believed that microchipping compromises cat welfare (Table 4; Figure 4). Of these there was an association between older people strongly agreeing that microchipping compromises welfare, supporting knowledge from this survey that older people are associated with believing that microchipping causes pain, which further supports that older people have stronger beliefs about animal sentience (Cornish et al., 2018). There was a strong association between men having no opinion about whether microchipping compromises welfare (Figure 3b) and men having no opinion about whether microchipping improves welfare (Figure 3a). This result supports that men generally have less empathetic interest and less positive attitudes towards animals in general (Martens, Hansart and Su, 2019: Paul and Podberscek, 2000), therefore they are less likely to formulate opinions.

Participants were asked if they believe that microchipping is time consuming, 299 participants (92%) disagreed or strongly disagreed that microchipping is time consuming (Table 4), suggesting that the procedure is not generally considered as time consuming. This notion is supported in literature and states that the procedure is fast (BVA, BVNA,

BSAVA & SPVS, 2019). There was an association for older people disagreeing or strongly disagreeing that microchipping is time consuming, 65% of participants were over 40 and 20% were over 60, indicating that a proportion of the participants might be retired and therefore have more time. Of the 59% participants that strongly disagreed that microchipping is time consuming, those with Anglican religion were strongly associated (Figure 3a). Christian and Catholic religion and White British ethnicity were most associated with having no opinion about microchipping being time consuming.

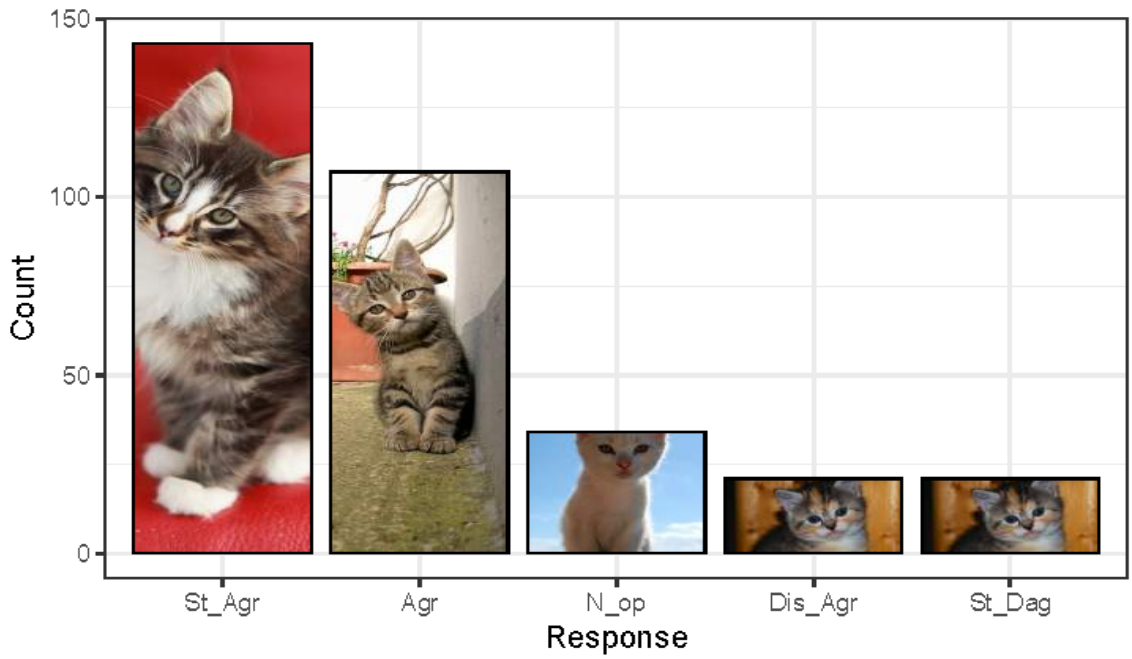

Figure 4. Responses to the statement “Microchipping improves feline welfare”

Participants were asked if they believed that microchipping was more important for dogs than it is for cats. Overall, 278 participants (85%) disagreed or strongly disagreed that feline microchipping is more important for dogs (Table 4), suggesting a strong opinion that microchipping legislation should not be prioritised by species.

Overall, 37 participants (11%) of the total participants agreed or strongly agreed that microchipping is more important for dogs than cats (Table 4). Older participants were more likely to strongly disagree, suggesting that they believe cat microchipping to be just as important, supporting that older generations have more concern with emotional empathy towards animals (Cornish et al., 2018). There was an association between male gender and strongly disagreeing that microchipping is more important for dogs, however the disproportional gender response rate within the survey suggests that this does not directly mean that men believe that microchipping is more important for cats.

Owners of pedigree cats are less likely to have an opinion about microchipping being more important for dogs, suggesting that pedigree owners focus more on cat subjects than dog related subjects. When the cat owners were asked to what extent they agree that microchipping is expensive, 36 participants (11%) agreed (Table 4), supporting that microchipping is relatively inexpensive (BVA, BVNA, BSAVA & SPVS, 2019). The more cats the participant have that are microchipped, the more likely they are to agree that microchipping is expensive (Figure 3a), which evidences that the more procedures an owner engages with, the greater the expense overall. Those who did not disclose an ethnicity were more likely to answer no opinion about whether they believed microchipping was expensive suggesting that ethnicity and financial status were not considered relevant to survey participation.

When asked if participants believed that there should be financial help available for compulsory feline microchipping, 194 participants (60%) believed there should be financial help available, 88 (27%) disagreed and 44 (13%) had no opinion (Table 4), suggesting that financial help would influence a decision to microchip. This supports an agent-centred reason for participant perception towards microchipping (Table 5). Of the 79 participants (24%) that strongly agreed that there should be financial help, those of Methodist and Atheist religion were most associated, and those that strongly disagreed (10%) were mostly associated with Christian, Catholic and Church of England religions (Figure 3a). Participants who owned more cats were more likely to answer no opinion about whether there should be financial help available (Figure 3a), this might be because it is not regarded as relevant or they might not want to identify as being influenced financially. Those with greater numbers of microchipped cats were more likely to disagree that there should be financial help available (Figure 3a), suggesting that those with the most cats regard financial commitments as part of a responsible ownership. There was an association between males and not expressing an opinion about potential financial help, suggesting a lack of interest for the subject, and supporting that females in general formulate more positive attitudes towards animals (Paul and Podberscek, 2000).

Question 8 offered participants the opportunity to give detailed responses that explain their reason for microchipping or not microchipping their cat, the responses were grouped into 3 general categories: welfare, agent-centred and not owners' decision. There was a 100% response rate to this question, revealing that 93% of the participants did microchip their cats compared to 7% who did not (Table 5). Of the 93% who did microchip, the reasons were mostly agent-centred, which assumes that the decision to

microchip was more beneficial to the participant than the welfare of their cat. Of the 93% there were only 2 reasons that directly related to cat welfare: ‘in case the cat is found injured and in case the cat is involved in an RTA’. This is suggestive that cat welfare is compromised and therefore being able to identify the cat via microchip could improve cat welfare (Table 5).

Of the 7% of participants who did not microchip their cats, there were a number of reasons (5) (Table 5) not to microchip that related to cat welfare: ‘it causes cancer, older cats do not need the stress, cat is feral do not want to cause stress, it seems cruel and the less vet procedures the better’, suggesting that cat welfare is significant in influencing the decision not to microchip. However, there were more agent-centred responses (8) for not microchipping. Therefore, these qualitative results suggest that whether participants microchipped or did not microchip, their reasons were mostly agent-centred, and less concerned with cat welfare. It can therefore be suggested that potential human benefits influence perceptions towards feline microchipping.

Legislation

When asked if feline microchipping should be a legal requirement in the UK, 250 participants (77%) agreed or strongly agreed, compared to 48 (15%) who disagreed or strongly disagreed, and 28 (8%) who did not express an opinion (Table 4). Interestingly there were more participants who strongly disagreed (29) than disagreed (19), indicating a strong negative opinion for compulsory feline microchipping amongst those opposing. Those of Jewish and Anglican religion were most likely to agree, and those of Atheist belief were most likely to strongly agree that microchipping should be legally enforced in the UK (Figure 3a). Self-employed participants were more likely to disagree to legislation. The lower the number of cats microchipped per owner, the more likely that the participant had no opinion about whether feline microchipping should be compulsory in the UK, this might be because it is not relevant to them because they chose to microchip regardless. The higher the number of cats microchipped per owner, the more likely they were to agree or strongly agree that microchipping should be compulsory in the UK (Figure 3a), suggesting that owning more cats might increase stronger cat owner opinions about legislation being brought in for compulsory microchipping, supporting that cat companion value influences cat owners’ perceptions towards feline microchipping.

Participants were asked if they would support a petition for compulsory feline microchipping in the UK, 244 (75%) of the 326 participants agreed or strongly agreed

that they would support a petition, 45 (14%) disagreed or strongly disagreed, and 37 (11%) did not express an opinion (Table 4). Of the participants who strongly agreed, there was an association with pedigree breed, suggesting that owners with a pedigree cat are more likely to support a petition for compulsory microchipping. This might be because pedigree cat owners hold financial value of their pedigree cats and that microchipping is therefore paramount. Of the participants, those who did not disclose a religion were most likely to have no opinion about supporting a petition and those of Catholic religion were more likely to strongly disagree that they would support a petition (Figure 3a). Of the participants that disagreed or strongly disagreed that they would support a petition (45), there was an association with the higher number of cats owned, this might indicate that just because an owner has multiple cats, it does not mean that they feel the need to support compulsory microchipping, or that they have more empathy for cats in general. Cat owners with higher numbers of microchipped cats were more likely to strongly agree they would support a petition for compulsory microchipping (Figure 3a), this might indicate that multiple-cat owners show more empathy towards compulsory microchipping if they believed legislation would protect cats.

Question 17 offered the opportunity to explain why participants would or would not support a petition for compulsory microchipping in the UK, 75% of participants agreed or strongly agreed, the most common responses mentioned that compulsory microchipping will improve feline welfare, and reduce the number of strays or promote responsible ownership of cats. Of the 14% of participants who disagreed, the most common answer was that it should be the owners' choice, suggesting that these participants might be more concerned that their choice is being removed rather than their actual feelings about supporting compulsory microchipping, further supporting agent-centred reasoning toward perceptions of feline microchipping.

Other reasons for not supporting compulsory microchipping included that microchipping causes unnecessary stress and cancer, compulsory microchipping does not include compulsory scanning, and lack of one central database. Compulsory scanning and use of multiple database systems appear to be an ongoing concern for current microchipping validity (BVA, 2019), influencing cat owners' perceptions towards microchipping.

Limitations and Opportunities

At some point whilst the survey was live, it featured on the social media page of a cat welfare organisation. It must be considered that those who follow that cat welfare

organisation and responded to the survey, might have biased opinions regarding feline microchipping because they are arguably more knowledgeable about microchipping and concerned for cat welfare, compared to those who do not follow material from animal welfare organisations. It is not known how many participants from the survey follow or support a cat welfare organisation. In future studies to help prevent biased overall results, an additional indicator / predictor that allows declaration of participants who follow animal welfare material online would be useful to compare with participant perceptions who do not follow animal welfare social media material.

The gender of the survey respondents was disproportionate; 289 females and 36 males. Consequentially the results that highlighted a gender correlation cannot be applied to the general population. For future studies, reaching more males might be achievable by targeting the survey towards male dominant sectors such as construction.

It might be beneficial for feline welfare organisations to focus on the reasons that participants oppose microchipping of cats in Table 5. A focus on identified negative perceptions toward feline microchipping could suggest directions mould approaches to help change cat owners' attitudes to associate microchipping more positively with feline welfare.

This survey used 'no opinion' options to answer some of the attitudinal questions which require more cognitive work. If the cognitive work required exceeds the participant motivation, or ability to answer a question, then said participant may avoid the cognitive workload by just answering 'no opinion'. The survey was trialled within a small group of BSc Animal Behaviour and Welfare students to gauge appropriateness. Future studies might consider an advanced pilot survey with a broader, more diverse and larger sample, to test if the questions were appropriate for public use. Feedback from a pilot study would be useful to understand participant engagement to the questions and how they can be modified to reduce the tendency to answer no opinion.

Conclusion

This study focused on findings obtained from the public survey about cat owners' perceptions towards feline microchipping, which is currently being applied by the UK government as a legal requirement. The survey was valuable by obtaining cat owners' perceptions via quantitative and qualitative survey data, the latter providing more details.

Findings suggest that demographics can predict cat owners' perception towards feline microchipping and with the opportunity to explain, participants revealed that there are more agent-centred reasons for their perceptions, compared to reasons that relate to cat welfare. Specific demographics were more influential on perceptions. Gender results indicated that males are less likely to formulate opinions about feline welfare, supporting that females show more empathy towards animals (Martens, Hansart and Su, 2019). Age results revealed that concern for welfare increased with age, supporting that older people are more emotionally empathetic towards animals and have stronger beliefs about animal sentience (Cornish et al., 2018). Overall, 77% of participants agreed that microchipping can improve feline welfare and 75% would support compulsory microchipping. Of those who would not support microchipping, concern for welfare was highlighted.

The current study has useful insight for feline welfare organisations seeking to focus on the negative perceptions towards feline welfare. It can serve to stimulate innovate ways to promote microchipping positively alongside feline welfare. Future investigation that evaluates the influence of welfare organisations on their followers would support this study further.

Acknowledgements

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Appendix 1.0 – Questionnaire

Human perceptions towards feline microchipping

Thank you for your interest in this survey that aims to determine cat owner's perception of feline microchipping that will take approximately 10 minutes. Individual responses will not be used in any way that would allow identification of the participant. Data collected will be analysed by Kingston Maurward College and The Royal Agricultural University. Data might be shared and or published to related organisations for educational purpose.
If you have any questions please contact 99078207@kmc.ac.uk
* Required

1. What is your age? *

   Mark only one oval.

   - ◯ 18-25
   - ◯ 26-40
   - ◯ 41-60
   - ◯ >60
   - ◯ Do not wish to disclose

2. What is your gender? *

   Check all that apply.

   - ☐ Male
   - ☐ Female
   - ☐ Prefer not to say
   - Other: ☐ _____

3. What is your ethnicity? (optional)

   _____

4. What is your religion? (optional)

5. Current employment status *

Check all that apply.

- [ ] Student
- [ ] Full-time employed
- [ ] Part-time employed
- [ ] Unemployed
- [ ] Retired
- [ ] Contractual
- [ ] Do not wish to disclose
- Other: [ ] _____

6. How many cats do you own? *

7. How many of your cats are microchipped? *

8. Explain your reason for microchipping or not microchipping your cat *

9. How old are your cats? (in years) *

10. What breed are your cats? *

Mark only one oval.

- ◯ Non-pedigree
- ◯ Pedigree
- ◯ Mixed breed
- ◯ I do not know

11. State how many of your currently owned cats have been rescued *

12. Select which of the following best describes your cat's living conditions *

Mark only one oval.

- ◯ All of my cats live indoors only
- ◯ All of my cats live outdoors only
- ◯ All of my cats have the option of living indoors or outdoors
- ◯ Some of my cats have to stay indoors but others can go outdoors

13. Outline the purpose of cat microchipping based on your current belief/knowledge *

14. How much money do you believe the microchipping procedure costs? *

15. Outline the current UK legislation regarding microchipping for cats *

16.

17. Explain why you would, or would not, support a petition for compulsory microchipping of cats in the UK *

18. Did you know that in April 2016, UK legislation enforced compulsory microchipping of dogs? *

Mark only one oval.

- Yes
- No