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Applied Animal Behaviour Science 90 (2005) 325–336

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Intercat aggression in households following the introduction of a new cat

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Accepted 28 July 2004

Available online 10 November 2004

Abstract

A 62 question survey was mailed to 375 individuals who adopted a cat from a local animal shelter. The goals of the survey were to identify the incidence of intercat aggression when a new cat was introduced into a household, identify potential risk factors associated with intercat aggression within a household and obtain various descriptive information on methods used to introduce a new cat into a home. The response rate was 72% ($n = 252$) with 128 of the households containing multiple cats and 124 of the households containing only the adopted cat. For this survey, fighting was defined as scratching and/or biting.

Among households with multiple cats, half reported fighting between cats when the new cat was introduced. Approximately half of the people introduced the cats into the home by simply putting the cats together immediately. Neither age, sex, nor number of cats in the household was associated with current fighting (i.e. fighting that was occurring 2–12 months after the new cat was brought into the household); however, current fighting was associated with individual behaviors (i.e. scratching and biting) during the cats first meeting, outdoor access, and the owner's perception of the first meeting as unfriendly or aggressive.

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Keywords: Cats; Aggression; Adoption; Gender; Behavior

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doi:10.1016/j.applanim.2004.07.006

1. Introduction

Figures taken from the U.S. Pet Ownership Demographics source book reveal that 31.6% of all U.S. households owned cats (AVMA, 2002). Of these households, 50.1% were single cat households and 49.2% were multi-cat households. Of the multi-cat households, 26.8% had two cats, 9.9% had three cats, and 12.6% had four or more cats (AVMA, 2001). According to a survey of owners, cats are much more likely to direct aggressive behaviors toward another cat than toward humans (Borchelt et al, 1996). Of the 133 feline cases presented to the Animal Behavior Clinic at Cornell University from 1999–2001, 13.5% presented for intercat aggression within a household. Aggressive behaviors between cats can range from an occasional chase to intense fighting (Crowell-Davis et al., 1997). Aggression between male cats is often cited as one of the most common forms of intercat aggression (Landsberg et al., 1999). This particular kind of aggression is not unexpected when one considers that free ranging male cats commonly defend their territories and, in particular, defend a potentially scarce resource, the female; however, many other social, physiological, motivational, and environmental factors contribute to intercat aggression within a household. Intercat aggression raises serious welfare concerns for both the cats and the owner. Intercat aggression can cause substantial physical injury to one or both cat(s) as well as being frightening for the victim(s). The owners face the difficult situation of wanting to help the victim but not wanting to relinquish either cat.

Although several studies have characterized intercat aggression in outdoor cat colonies (review by Crowell-Davis et al., 1997), intercat aggression within a home has been understudied. The objectives of this study were to identify potential risk factors (e.g. number of cats, indoor/outdoor accessibility) associated with intercat aggression within a household after the adoption of a new cat, to quantify the incidence of intercat aggression when a new cat was introduced into a household, and to obtain descriptive information on methods used to introduce a new cat into a home.

2. Materials and methods

2.1. Surveys and participants

All cats were selected from adoption records of the Tompkins County SPCA between November 2001 and June 2002. Of the available records, 375 met the inclusion criteria of adopting only one cat into a home and having legible records so the adopters could be contacted. Those adopting more than one cat or one cat and any other animal, were not eligible. No information was available in the records to determine if the persons adopting a cat already had cats in their household. All adopted cats had been in the new home for at least 2 months and for a maximum of 1 year at the time of the study.

2.2. Data collection

The selected adopters were sent a packet in the mail consisting of a survey, a cover letter explaining the intent of the survey, and a self-addressed and stamped envelope. One week

later, reminder postcards were sent to adopters. One month following the reminder cards, all non-respondents were sent another packet with a modified cover letter. The study questionnaire had 62 questions grouped into two sections. The first section was for those who already had cat(s) in their home at the time of the new adoption. This section asked questions with regard to the original cat's behavior in the home prior to the arrival of the new cat, and the behavior of those same cat(s) after the adoption of the new cat. People were asked if any of their original cats were littermates or parents and offspring. Questions were also asked about the new cat's behaviors, the method of introduction, and the owner's perception of the first meeting. This section also contained questions regarding age, sex, neuter status, and number of cat(s) in the household prior to the adoption. The second section was for those who had no cats in their home at the time of the cat adoption. These data were not analyzed. Questions were asked in a series of multiple choice and embedded open-ended questions. Pictures of cats were used in the questionnaire to enhance return compliance. The questionnaires were pretested on 10 SPCA cat adopters.

For the purpose of this study, aggression was defined solely as scratching and biting. There were several questions for which new variables were created. Due to the small number of homes with four or more original cats ($n = 8$), the categories for number of cats in a household were collapsed into the following three categories: households with one, two, or three or more original cat(s). For associations of potential risk factors with fights, the frequency of fighting per week was collapsed into the categories "cats did fight" and "cats did not fight" both at initial and current meetings. Initial fighting was defined as fighting that occurred during the first several weeks the adopted cat was in the home. Current fighting was defined if fighting between cats was occurring at the time the owners were filling out the survey (2–12 months after adopting a cat). Answer choices for the question asking how owners perceived the first meeting between their original cat(s) and the adopted cat were as follows: (a) approached with curiosity followed by a friendly meeting, (b) approached with curiosity followed by an unfriendly meeting, (c) kept at a safe distance and observed each other with no signs of aggression, (d) kept at a safe distance and showed signs of aggression, (e) stayed apart from each other, and (f) did not witness the first interaction. Answer choices a and c were collapsed into non-aggressive/friendly meeting and b and d were collapsed into aggressive/unfriendly meetings. Answer options e and f were excluded from analysis. For the question concerning method of introduction, the answer choices were as follows: (a) didn't change anything, simply put the new cat in the house, (b) separated the new cat from the resident cat(s) for a period of time, then put the cats together, (c) separated the new cat from the resident cat(s) for a period of time, then gradually introduced them over time (the person then had to define gradual by circling hours, days, weeks, months or other), and (d) other. For the question asking about size of the home, apartments were compared to one and two story homes, town homes/condos. Cats living in mobile homes were excluded from analysis due to variability in size.

To analyze the effect of sex of the original cats, households were divided into all male households, all female households, and mixed households. All original cats in the homes were neutered. All adopted cats were neutered with the exception of two cats under the age of 6 weeks. To analyze age of original cats the following three statistical comparisons were analyzed separately: Analysis 1 included households containing any resident cat(s) less than 1 year of age compared to households containing any resident cats greater than 1 year

of age. Analysis 2 compared households containing any resident cat(s) ≤ 2 years compared to households with no cats ≤ 2 years. Analysis 3 compared households containing any resident cat(s) ≥ 6 years compared to households with no cats ≥ 6 years of age. To analyze age of adopted cats, the following three analyses were done separately: Analysis 1 included households that contained adopted cats up to 6 months of age compared to households with adopted cats greater than 6 months of age. Category 2 had three data subsets that were analyzed. The subsets included the following age groups: households containing adopted cats ≤ 3 months–2 years of age, households containing adopted cats between the ages of >3 months–2 years, and households containing adopted cats $>$ than 2 years. Analysis 3 had six data subsets that were analyzed. These subsets included: households containing adopted cats <6 weeks, households containing adopted cats between 6 weeks–3 months, households containing adopted cats >3 months–6 months, households containing adopted cats >6 months–2 years, households containing adopted cats >2 years–5 years, and households containing adopted cats >5 years.

2.3. Data analysis

The data were entered into an access database and transferred into the statistical programs Statistics 7, Stat Exact and Egret for analysis.

Chi-square tests of association were used to determine if significant associations existed between pairs of categorical variables. For example, they were used to assess the association between the presence or absence of behaviors (e.g. fights) and potential risk factors for those behaviors (e.g. sex), for associations between various behaviors (e.g. hissing) and other behaviors (e.g. fighting), and between other categorical outcomes. When the overall chi-square test was statistically significant, then all possible pairs of comparisons were examined and the p value was adjusted for multiple comparisons using a Bonferroni error correction. When the number in individual cells was less than five, exact Chi-square methods were used. Similarly, when many comparisons were made (e.g., between resident and adopted cat) a Bonferroni correction was made to account for the multiple comparisons. The uncorrected p -value is presented as well as the p -value that has been corrected for multiple comparisons. Associations between current (and initial) fighting (yes/no) and potential risk factors were first examined with each risk factor alone (univariate analysis). Factors that were significant ($p < 0.20$) in the univariate analysis were then evaluated in unconditional multivariable logistic regression models to assess the joint and confounding effects of several risk factors simultaneously. The model parameters were obtained by maximum likelihood estimation using the computer package, Egret. Significance of the potential risk factors was determined by comparing likelihood ratio chi square statistics in each step of the fitting process and significant terms were retained in the model. For all analyses (except where noted), a value of $p \leq 0.05$ was considered significant.

3. Results

Of the 375 questionnaires mailed, 22 were returned because of incorrect address information and 5 were returned but excluded from analysis because they did not meet the

inclusion criteria. Of the remaining 348 surveys, 252 (72%) were returned and included in the data analysis. Of these 252 households, 128 were multi-cat households and 124 were single-cat (adopted animal only) households. The sex and ages of the cats adopted into one-cat households and those adopted into multi-cat households did not significantly differ from one another (Table 1). Of the households which already had a cat prior to adopting a new cat, most had only one or two resident cats (Table 1).

Of the multi-cat households, 49.6% (61/123) reported initial fighting between the new cat and the original cat(s). Of this 50%, 59% (36/61) of the households reported that the initial fighting occurred ≥ 1 /week and 41% (25/61) reported the fighting occurred < 1 /week (Fig. 1). Thirty-five percent of multi-cat households reported fighting (current fighting) 2–12 months later, with 39% of these (17/44) reported that the fighting occurred ≥ 1 /week and 61% (27/44) reported that the fighting occurred < 1 /week after introduction.

Initial fighting: The factor associated with initial fighting in the weeks immediately following introduction of the new cat into the household was: owner observed unfriendly or aggressive behaviors at the first meeting. First meetings described as unfriendly or aggressive by the owner were significantly more likely to be associated with initial fighting than first meetings described as friendly or non-aggressive ($p < 0.001$). Not surprisingly then, bites and scratches by either a resident or the adopted cat during the first meeting were also strongly associated with owner reports of initial fighting ($p < 0.004$). Number of cats in the household, age or sex of the adopted cat, age or gender of the original cats, outdoor access, or size of residence were not significantly associated with initial fighting. In the multivariable models, the addition of other variables did not change the significance or magnitude of the association between initial fighting and the signs (biting, scratching) or perception of the initial meeting.

Table 1
Descriptive characteristics of cats from a shelter adopted into households with or without other resident cats

Characteristics	Households with other cats		Households without other cats	
	No.	%	No.	%
Gender				
Male	52	40.6	44	38.8
Female	76	59.4	79	64.2
Age				
≤ 3 months	50	39.7	37	29.8
> 3 months–6 months	22	17.5	26	21.0
> 6 months–2 years	38	30.2	42	33.9
> 2 years	16	12.7	19	15.3
Number original cats				
None			124	100
1	83	65.4	–	–
2	27	21.3	–	–
3 or more	17	13.4	–	–
Outdoor access for original cats				
Yes	58	46.4	–	–
No	67	53.6	–	–

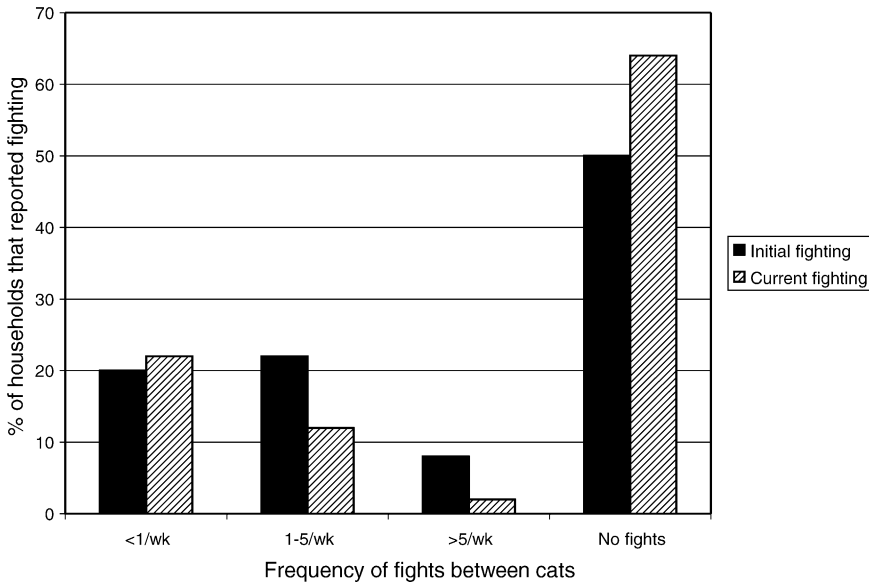


Fig. 1. Frequency of initial and current fighting among household cats after the adoption of a new cat.

Current fighting: Four factors were significantly associated with current fighting in the home when evaluated one at a time. Households in which any of the cats had outdoor access had significantly more fighting than households in which the cats remained strictly indoors ($p = 0.03$). Owner's perceptions of the cats' behavior during the first meeting was strongly associated with the likelihood of current fighting. Households where the initial meeting was perceived to be unfriendly/aggressive were more likely to have current fighting ($p = 0.003$). Certain individual behaviors of the cats during their first meeting were also associated with the occurrence of current fights. If the adopted cat bit at least one of the original cats when first introduced, it was more likely that there was current fighting in the home compared to homes where the adopted cat did not bite ($p = 0.02$). This association remained significant ($p = 0.005$) when analyzed in homes in which the adopted cat was brought into a home that contained only one original cat. In addition, if at least one of the original cats scratched the new cat when first introduced, current fighting was more likely to be present than if this did not happen ($p < 0.001$). This association was also analyzed in homes limited to two cats (one original and one adopted) and remained significant ($p = 0.01$). Initial fighting was strongly associated with current fighting ($p < 0.001$). Factors not associated with current fighting included number of cats in the home, age or sex of the adopted cat, age or sex of the original cat households, size of residence, and method of introduction.

Since biting or scratching during the first meeting, owner's perception of the first meeting, and presence or absence of initial fighting during the first weeks after adoption were strongly associated with each other, this reinforced our confidence in the validity of reports of initial fighting, (particularly that those fights involved physical contact). Therefore, initial fighting was evaluated in the multivariable models in lieu of the signs,

Table 2

Logistic regression model of risk factors associated with fighting 2–12 months following the introduction of a new cat adopted from a shelter into multi-cat households

Variable	Odds ratio	95% C.I. ^a	<i>p</i> value ^b
Initial fighting (yes/no)	38.5	9.8–150.5	<0.001
Outdoor access (yes/no)	3.4	1.1–10.2	0.03

^a C.I. = confidence interval.

^b Based on Wald's test.

biting and scratching, and the owners' impression of the first meeting. Initial fighting and outdoor access were significant independent risk factors for current fighting in a multivariable model (Table 2). Households with initial fighting were 38.5 times more likely to have current fighting than those with no initial fighting and households with cats with outdoor access were 3.4 times more likely to have current fighting than those with strictly indoor cats. The variables not associated with current fighting in the univariate analysis remained non significant, and their inclusion did not significantly change the associations with outdoor access or signs of initial aggression in the multivariable model.

The owners were asked to answer yes or no to the occurrence in their households of various behaviors (Figs. 2 and 3) that the new cat and any of their original cats engaged in during the cat(s) first meeting. There was a significant difference between behaviors of the new cat and of the original cat when they were meeting for the first time. The original cat(s) was more likely to hiss ($p < 0.0005$), scratch ($p = 0.027$), flee/hide ($p < 0.0036$), ignore ($p < 0.0005$), and stare ($p = 0.04$) at the new cat; whereas, the new cat was more likely to try to play with the original cat ($p < .0005$). The p value signifying statistical significance corrected for multiple comparisons is $p < 0.004$.

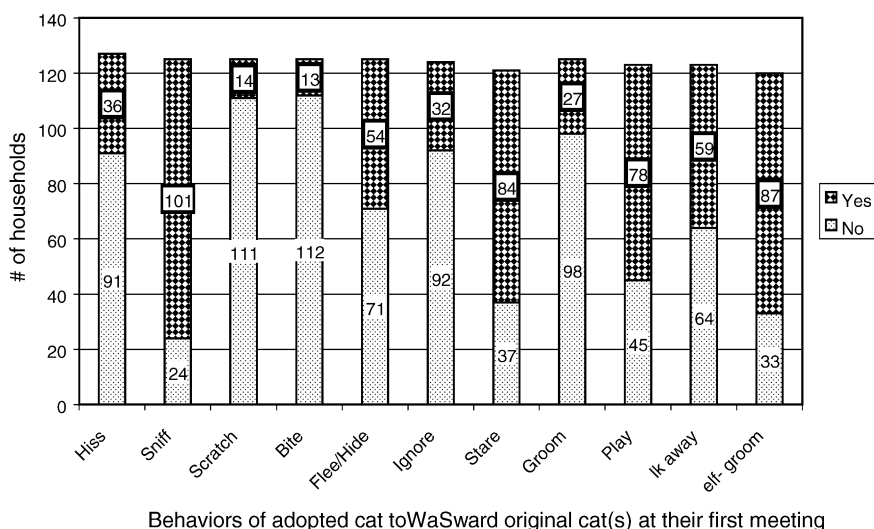


Fig. 2. Frequency of behaviors of the adopted cat directed toward the original cat(s) during their first meeting.

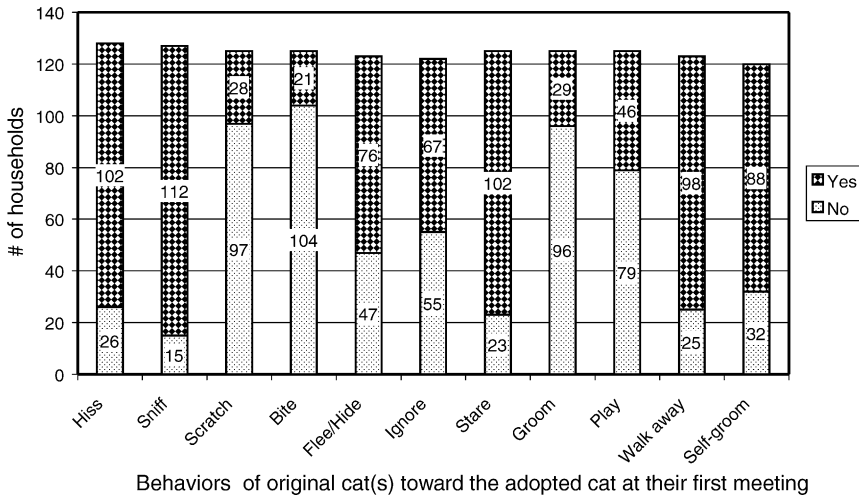


Fig. 3. Frequency of behaviors of the original cat(s) directed toward the adopted cat during their first meeting.

The owners were asked to identify the method they used to introduce the new cat to the original cat(s). Forty-four percent of people introduced the new cat to the original cat(s) by immediately putting the cats together. Twenty-two percent of people kept the cats separated for a few days and then put the cats together. Thirty-three percent of people kept the cats separated and gradually introduced the cats to each other; however, the time length of a gradual introduction varied among households from hours to weeks.

The owners were asked how long it took for the new cat to be accepted by the original cat(s) in the household. Twenty-two percent of owners reported that the original cat(s) accepted the adopted cat immediately, and 40% reported that acceptance occurred in less than 1 month. Only 9% reported that the original cat(s) had not yet accepted the adopted cat (Fig. 4).

4. Discussion

Intercat aggression within a household is the most common feline aggression problem (Houpt, 1998). Aggression can range from an occasional chase to hissing to a confrontation that results in physical wounds. In this study fighting was defined as scratching and biting for two reasons. First, the authors were concerned about fights involving physical contact. Second, the information gathered depended upon the owner's observations; therefore, the criteria needed to be easily identified by the owner. The fact that the owner's perceptions of the first meeting as unfriendly or aggressive was highly associated with scratching and biting, and the occurrence of fights in the weeks following adoption strongly suggests that owners' were defining fighting as involving physical contact. Our confidence in the validity of the reports of fighting is strengthened because when owners were asked in multiple ways about fights, the owners' responses were consistent. It is of interest that, when asked their perception as friendly/non-aggressive or unfriendly/aggressive, no criteria were available

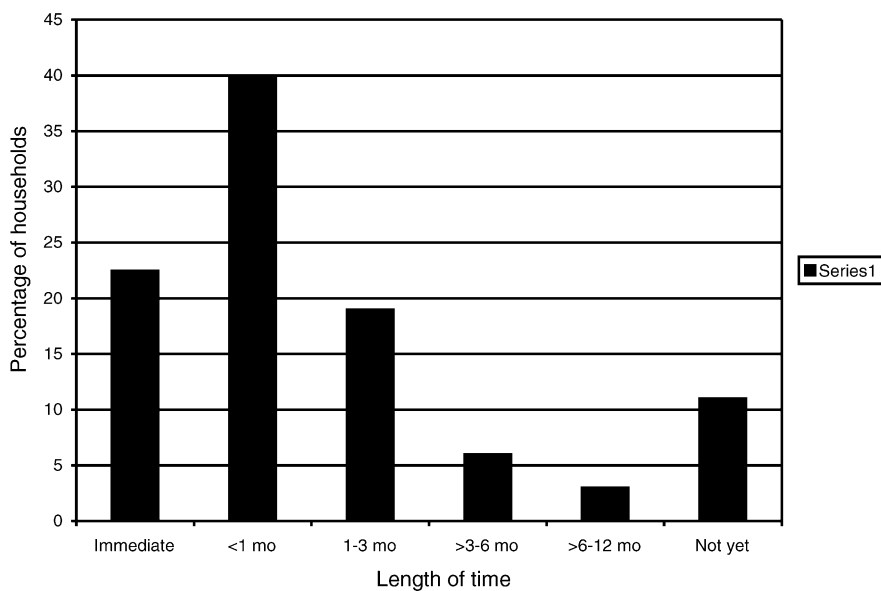


Fig. 4. The length of time it took for the original cat(s) to accept the adopted cat as reported by the owner(s).

to guide them so the question was eliciting a subjective response from the owner. This is important to realize as there is often doubt if owners can interpret feline aggression, but it appears for the purposes of this study, they can.

Thirty-five percent of households surveyed in this study reported that there were fights between their cats currently. Borchelt and Voith (1996) found that 44.5% ($n = 544$) of multi-cat homes reported that fighting occurred once a month or more among their household cats. There was no definition of fighting in the previously mentioned study, which allowed them to collect data pertaining to a wider range of aggressive behaviors. When fighting between household cats was defined as those causing bleeding, only 5% (48/969) of households reported that fighting occurred (Spain, 2003). The difference among estimates of the incidence of fighting is likely due to the different “definitions” of a fight and different time frames. The more limited the definition (scratch, bite, bleeding) the lower the overall incidence. The incidence of 44.5% of fighting in multi-cat homes may be a more accurate representation of overall aggression in multi-cat homes.

Inter-male aggression is reported as one of the most common forms of intercat aggression. Several studies of free-ranging cats have reported that aggression occurs between males, between females, and between females and males (reviewed by Crowell Davis, 1997). Studies examining intercat aggression within a household have found different results with regard to sex as a risk factor for aggression. One study found males were more likely to be the aggressor with an equal possibility of the victim being male or female (Lindell et al., 1997). Hart and Cooper (1984) found males were more likely to aggress to female housemates than male housemates, while Barry and Crowell-Davis (1999) found no association with sex and aggression. No association between sex and aggression was found in the present study. These varying results may reflect differences in

sampling methods or in other study methodologies. Some of the studies depended upon owner observations (Hart and Cooper, 1984, present study) whereas another study had trained individuals assessing the behaviors directly (Barry and Crowell-Davis, 1999). In addition, the definition of aggression varied among studies.

A young kitten (of the opposite sex) has been suggested to help decrease the possibility of aggression (Landsberg et al., 1999); however, it has been reported that some older cats act very aggressively to young kittens, a condition known as Feline Asocial Aggression (Beaver, 2003). The present study found that the adopted cat was not associated with occurrence of aggression. It is possible that the younger group of cats (>6 weeks–3 months) in this study did not get adopted into homes with significantly older cats; thereby avoiding feline asocial aggression. The age of the original cat was not a significant factor either, but that may have been a factor of the way the variables were defined (e.g. any home containing a cat of a certain age).

Intercat aggression was not influenced by the size of the house in which cats were living, similar to the findings of a study (Barry and Crowell-Davis, 1999) in which floor area was measured and agonistic interactions were recorded. It is possible that specific types of aggression may be associated with space. Further studies are needed to evaluate this association.

In this study, fighting only referred to scratching and biting; therefore, the incidence of all forms of aggression (e.g. chasing, hissing) when introducing a new cat into a home is probably higher than 50%. Homes with older cats may need to take a longer period of time to introduce a new cat into the home, but some older cats will never accept a newcomer (Beaver, 2003). In the present study, the original cats immediately accepted the new cat in less than a quarter of the households and less than half were accepted within 1 month. It is not known what people considered as “accepted”. Nine percent reported that the new cat had not yet been accepted into the home. It is important to realize that some people had the new cat for only 2 months so this 9% may be higher when compared to households in which cats have lived together for a minimum of a year. Several studies have found that time living together is negatively correlated with aggression (Barry and Crowell-Davis, 1999; Beaver, 2003); therefore, most cats may eventually accept (tolerate) each other.

Introducing a new cat into households already containing cats can stimulate territorial aggression (Haupt, 1998). Others have noted that introducing a cat into a home often results in aggression (Crowell–Davis, 1997). Approximately half of households in this study reported fighting when the new cat was first introduced. Gradual introduction of the cat into the household has been suggested to help reduce aggression (Crowell–Davis, 1997, Haupt, 1998, Beaver, 2003,). Although method of introduction was not a significant factor with regard to inter-cat aggression in this study, the first author has significant reservations about this finding. From a behavioral standpoint, the concept of a gradual introduction includes desensitization (e.g. scent exchange, limited visual contact, limited physical contact) during the time-period the cats are kept separated. These details were not ascertained in this study and because the definition of “gradual” varied among households from hours to weeks, it is doubtful that the necessary behavioral methods needed to reduce aggression were done. The method(s) of introducing cats may warrant further investigation.

Fear aggression is the most commonly diagnosed aggression between cats that undergo a change in the feline household (Borchelt and Voith, 1987). The present study found that the original cat(s) were more likely to engage in hissing, scratching, fleeing/hiding behaviors than the new cat who was more likely to attempt to play with the original cat(s). The original cat was also more likely to ignore or stare at the new cat. These data suggest that the original cat may be fearful (e.g. flee, hiss, scratch) or dominant (e.g. stare, ignore) to the new cat and that individual personality differences will influence how the original cat responds to a new cat. Genetics and previous social experience with cats are likely to play a role in the original cats' behaviors (Landsberg et al., 2003). If the adopted cat bit one of the original cat(s) or if one of the original cat(s) scratched the adopted cat during the first meeting, it was likely that there would be current fights. The owners were asked to record which of the behaviors they saw during the first meeting but not the order in which the behaviors occurred. The actual order in which the behaviors occurred might have revealed important information as to why the aggression escalated into a physical confrontation. There was an association between scratches and bites both initially and currently with the owners reporting unfriendly or aggressive behavior in the first meeting. It should be considered that owners are interpreting a cat batting at another cat as a scratch. It is also possible that people misinterpret feline play behavior as aggression. The adopted cats were more likely to try to play with the original cat(s). This could be related to age, as about half of the adopted cats were ≤ 6 months of age. This may also be the reason for the predominantly fearful behaviors that the resident cat(s) exhibit, as play behavior may be perceived by the resident cat(s) as threatening.

It is often speculated that the more cats there are in a home the more fights there will be. This study did not find a correlation between number of cats and aggression; however, the number of households with a large number of cats (≥ 4) was very small ($n = 8$). This association should be re-examined with a larger sample size of homes with four or more original cats.

Allowing cats outdoors was associated with current fighting. This study did not determine if the cat that goes outdoors was the aggressor, the victim, or if the cat was involved in the actual fight. It is possible that the cat going outdoors comes inside smelling different and causes redirected aggression between other cats within the household or that the cat that goes outdoors may be the victim as he/she, smelling different, may cause the other cat(s) to act aggressively to him/her. The cat that goes outdoors may be the aggressor if he or she is very aroused immediately after coming inside and redirects to a household cat or after he/she has been patrolling (controlling) the outdoors may try to continue patrolling, (controlling) once indoors which may result in a fight. The cat that goes outside may also redirect frustration to other cats if he/she wants to go outdoors but does not have access to the outdoors at that time.

5. Conclusion

A significant number of cats will fight when a new cat is brought into the home. With the exception of having access to go outdoors, it is not clear what, if any, discrete risk factors can predict when two cats will fight; however it appears that cats that initially bite or

scratch when they first meet may be more likely to have current fighting. Over half of the adopters reported that their adopted cat was accepted by their original cat(s) in less than 1 month. With regards to fights defined as those involving physical contact, it did not appear that the number of cats in the household was a significant factor. Further research is needed to identify risk factors for intraspecific feline aggression.

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