

The effect of housing and handling practices on the welfare, behaviour and selection of domestic cats (*Felis sylvestris catus*) by adopters in an animal shelter

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Abstract

As adult cats can often be difficult to re-home, they may spend long periods in rescue shelters where barren housing and inconsistent handling can reduce their welfare. In this study, 165 adult cats in an animal shelter in Vancouver, Canada, were assigned to four treatments. The Basic Single treatment reflected typical conditions in that particular shelter, with cats handled in an inconsistent manner by various staff and housed singly in relatively barren cages. Three alternative treatments involved more consistent, positive handling by only the experimenter and research assistants, plus three housing conditions: Enriched Single (individual cages with opportunities to perch and hide), Basic Communal (group housing with opportunity for each cat to have personal space), and Enriched Communal (group housing enriched to encourage play and cat – cat interaction). The Basic Single treatment had the lowest percentage adopted in 21 days (45% versus 69-76% for other treatment, and higher stress scores than other treatments. The three alternative treatments did not differ significantly on any measure. Cats euthanised for poor health showed higher stress levels when alive than other cats. In a questionnaire, most adopters cited certain behavioural/emotional traits ('friendly', 'playful', 'happy') as reasons for selecting cats; these were generally associated with lower stress scores. The results suggest that consistent handling combined with a range of improved housing options can improve the chances of adoption for adult cats, perhaps by reducing fear-related behaviours that make cats less attractive to adopters.

Keywords: adoption, animal shelter, animal welfare, enrichment, handling, shelter stress.

Introduction

Adult and elderly cats are among the least likely animals to be adopted from animal shelters (Salman *et al* 1998); hence they may spend months awaiting adoption, and many are eventually euthanised because they become sick while waiting (Miller-Dowling & Stitely 1997). In North America, shelter cats are commonly housed in barren, individual, stainless-steel cages in an effort to reduce the spread of disease (Humane Society of the United States 1995). However, many welfare issues are associated with this type of management. Problems include anxiety and fear, and various stress-related changes in behaviour including aggressive and destructive behaviour, hyper-vigilance causing fatigue, pica (eating inedible things), excessive grooming and vocalising, self-mutilation, and suppression of feeding, elimination, grooming, exploration and play (McCune 1992, 1994; Carlstead *et al* 1993; Kessler & Turner 1999; O'Farrell & Neville 1994; Voith & Borchelt 1996; Rochlitz 1997). These negative indicators of welfare are also associated with apathy (Broom & Johnson 1993), anorexia and dehydration (McCune 1992; Rochlitz 1997), and reduced immune competence, thus making "disease more likely to occur and more damaging when it does"

(Sapolsky 1992). Barren housing may therefore work against the goal held by most humane organisations to control disease in their shelters.

To offset these negative effects, some shelters have used group housing as a form of social and environmental enrichment. However, group housing itself can be a source of stress for timid, very old or very young cats (McCune 1992). Ottway and Hawkins (2003) found that cats in group housing had higher mean stress scores than those in single housing. Similarly, cats that are poorly socialised to other cats typically experience stress when group housed (Kessler & Turner 1997), and all cats experience some stress when new cats are introduced to the pen (Smith *et al* 1994).

In addition to housing, handling protocols can also influence stress in animals. Stress can be reduced in farm animals by positive interactions such as petting (Hemsworth & Gonyou 1997), in laboratory animals by calm, gentle and consistent handling (Beaver 1981), in shelter dogs by the use of high-pitched voice and gentle stroking (Hennessy *et al* 1998), and in shelter cats by consistent and positive interactions (Rochlitz *et al* 1998a). In many shelters, however, staff are not trained to use handling techniques that reduce stress.

Despite the above work on how housing and handling influence the welfare of cats while at the shelter, remarkably little research has examined their effect on adoption. Yet, high rates of euthanasia of shelter cats are reported worldwide (Casey 2003; Patronek *et al* 1996). Humane organisations report higher rates of adoption in cats with increased activity and playfulness (Humane Society of the United States 1995). The tendency to sit at the front of the cage (Wells & Hepper 1992), along with increased dog-dog interaction of dogs housed in groups (Mertens & Unshelm 1996) have been associated with increased rates of adoption for shelter dogs.

This study examined how different housing and handling conditions affected the welfare, behaviour, adoption rate and selection of individual cats by adopters. Three different treatments with consistent handling and various forms of enrichment were compared to each other and to a control group exposed to more typical conditions in that shelter. To help describe different classes of behaviour, we used a non-invasive behaviour score; The Cat-Stress-Score developed by Kessler and Turner (1997). A questionnaire was used to gain insight into the factors that influenced the selection of individual cats by adopters.

Materials and methods

The study involved 165 adult cats at the Vancouver Shelter of British Columbia Society for the Prevention of Cruelty to Animals (BC SPCA) between July and October 1999. The normal intake procedure included a physical health exam. Cats classed as physically healthy by the Animal Health Technologist were categorised as adoptable. These cats were included in the study if they were judged to be between one and seven years old, had already been sterilised and were of mixed breed. Cats had either been relinquished by owners or captured as strays; feral cats were not included in the study.

Housing and handling

The 165 cats were randomly assigned to one of the following four treatments and adjustments were made to ensure as equal a distribution of colour, sex and age across treatments as possible:

1) Cats in the Basic Single treatment were housed singly in stainless-steel cages measuring 70 × 70 × 55 cm (length × breadth × height), furnished with a food dish, water dish and litter box. The floor of each cage was lined with newspaper, and a towel was provided for bedding. 2) Cats in the Enriched Single treatment were singly housed. Cages were of similar dimensions but oriented vertically to be 70 × 55 × 70 cm (length × breadth × height). Cage furnishings were similar but with the addition of one horizontal shelf, 30 × 22 cm hooked on the cage door 33 cm above the floor of the cage. A towel was draped over the shelf. Cats could perch on the shelf or hide beneath it, behind the towel. The shelf also offered more separation between feeding, eliminating and sleeping areas, and it was used by cats for face rubbing. A rolling toy and a batting toy were also provided in the cage. 3) The Basic Communal

treatment consisted of a converted dog kennel, 230 × 160 × 240 cm (length × breadth × height), housing a maximum of eight cats at a time. The Basic Communal treatment aimed to provide each cat with personal space and to minimise contact between cats. Ten shelves, each measuring 33 × 33 cm and sized for a single cat, were provided plus steps giving access to the shelves. Eight shelves were attached to the walls at various heights and two were placed high in corners to give full view of the cage and any approaching cats. All shelves had a towel for bedding. Five vegetable baskets placed on the single shelves also served as hiding areas. Two large litter-boxes and several food and water dishes were placed along opposite walls away from resting areas. A small plastic patio chair was placed in the centre to facilitate contact with shelter visitors. 4) The Enriched Communal treatment was a similar converted dog kennel but was furnished to promote contact between cats and to increase the level of activity. It was equipped with a plastic cat playhouse (The Cat Tower, Dskocil manufacturing) featuring several carpeted walkways and large hiding areas. The playhouse gave access to shelves on either side, sized to accommodate several cats. One shelf measuring 75 × 48 cm was placed 1 m above the floor. The other measured 2 m in length and served as a walkway between the playhouse and the front of the cage where a third shelf measuring 60 × 35 cm was mounted on the cage door at 1.20 m above the floor. Food and water dishes were located on the long shelves, and the two litter-boxes were placed beside each other along the back wall. Hanging and rolling toys and a scratching post were placed at the centre of the cage. A small patio chair was placed in the centre to encourage people to sit while visiting the cats.

The Basic Single and Enriched Single treatments were located in the cat adoption room, a self-contained room with natural light and equipped with 24 single stainless-steel cages placed in a double row along each wall. The communal pens were located beside each other, adjacent to the cat adoption room. This area was exposed to more noise and shelter activities because it was closer to nearby dog kennels and a kitchen.

Handling of cats for the Basic Single treatment followed normal practice at the shelter. Every morning a handler placed cats, one at a time, in either a carrier or a neighbouring cage for approximately 3 min. The cat's own cage was then disinfected and supplied with clean food, water bowl, litter, bedding and paper lining. The cat was then returned to the cage. Handling was done by various staff on a 3-day rotation and by volunteers. As staff and volunteers had not been trained to handle cats in a specific way, animals tended to be handled in a different manner by each caretaker. In the three alternative treatments, all handling was carried out by the experimenter and/or research assistant. The cleaning procedure involved placing cats directly in the hiding area of an adjacent cage and returning them to their own cage after cleaning. For these treatments, the experimenter moved slowly and provided vocal and

tactile reassurance upon approach. Minimal restraint would also be used when transferring the cats. The experimenter then had several minutes of interaction with the cat after cleaning; this included playing, talking or stroking.

Data Collection

Each cat was classified as having one of four outcomes: 'Adopted' for cats adopted within 21 days; 'Euthanised' for cats with clinical symptoms of disease selected by the Animal Health Technologist for euthanasia because of poor prognosis; 'Isolation' for cats with clinical symptoms of disease selected by the Animal Health Technologist for medical treatment in the animal hospital and 'Time up' if the cat was not adopted within 21 days.

For 117 cats, fearfulness was assessed daily for the first 10 days that the cat was on the study, using the Cat-Stress-Score of Kessler and Turner (1997). Briefly, posture, level of activity and vocalisations were observed and classified as: Level 1 (fully relaxed), level 2 (weakly relaxed), level 3 (weakly tense), level 4 (very tense), level 5 (fearful/stiff), level 6 (very fearful), level 7 (terrorised). The experimenter or trained research assistant carried out assessments every morning before feeding and cleaning and before the arrival of staff and volunteers. Each cat was observed for 2 min. There was no vocal or physical interaction with the cats during assessment. Data collection was stopped after the first 117 cats due to time constraints and the sample being deemed sufficient. Data were not collected on days when ambient temperature fell outwith the range of 15 – 30°C, or when there was disturbance in the room. The number of Cat-Stress-Score values collected dropped from 84 on day two to 27 on day ten as cats were removed due to adoption or health grounds.

Shelter visitors who adopted a cat did not know that the cat was part of a study until they had completed the adoption contract. They were then asked to read an information letter about the study, and were asked for voluntary participation by completing a written 'Cat Adoption Questionnaire' before taking possession of the cat. The Cat Adoption Questionnaire was designed by the researchers to examine both the adopters' perceptions of the cats and the factors that influenced their selection. The questions were adapted from similar surveys (Endenburg *et al* 1994; Karsh & Turner 1988; Podberscek & Blackshaw 1988; Rochlitz *et al* 1996; Wells & Hepper 1992). Participants were asked to identify their selection criteria by rating various physical, behavioural, and environmental factors (listed in Table 2 as: 1) not at all important, 2) somewhat important, 3) very important, 4) don't know, and 5) not relevant). Additional questions inquired as to the adopters intentions prior to arriving at the shelter (eg 'to adopt a kitten versus an adult') and their reasons for wanting to adopt a cat. The questionnaire also provided space for any additional comments.

Statistical Analysis

The number of cats in each treatment and each outcome category (Adopted, Euthanised, Isolation and Time up) constituted a 4 × 4 table. These data were analysed by a chi-

squared test (Siegel & Castellan 1988) with 3 degrees of freedom after the last three outcome categories (all cats that were not adopted) were combined to give acceptably large expected values in each cell.

Differences between treatments in the length of stay before adoption were tested by the Extension to the Median Test (Siegel & Castellan 1988). Data included all cats that were adopted or had reached the maximum of 21 days without being adopted (scored as > 21 days for this analysis); cats that were removed from the study for health reasons were not included.

Cat-Stress-Scores were analysed by least squares analysis using PROC GLM of SAS (SAS Institute 1994). The model included treatment (3 df) tested against an error term based on cats within treatment (113 df), as well as the linear effect of days (1 df) tested against an error term based on the scores of all cats on all days (349 df). Data were analysed after log transformation to reduce non-normality. Differences between pairs of treatments in average scores from days 1 to 10 were tested using Duncan's Multiple Range Test (SAS Institute 1994).

A similar analysis of the Cat-Stress-Scores (least squares analysis and Duncan's test) was used to compare cats classified by outcome (Adopted, Euthanised, Isolation, Time-up) instead of treatment. The analysis was done for 7 days rather than 10 because of very small sample size after day 7 in some outcome categories.

Results

Only 45% of the cats in the Basic Single treatment were adopted within the 21 days, versus 69 – 76% in the three alternative treatments (Table 1; $\chi^2 = 10.9$, 3 df, $P < 0.02$). The proportion euthanised, sent to isolation (for treatment), and not adopted after 21 days (Time up) was correspondingly higher in the Basic Single treatment. Cats in the Basic Single treatment waited a median of 12.5 days before being adopted, compared to approximately 5 days for the other treatments (Table 1; $P < 0.02$ by the Extension to the Median Test.)

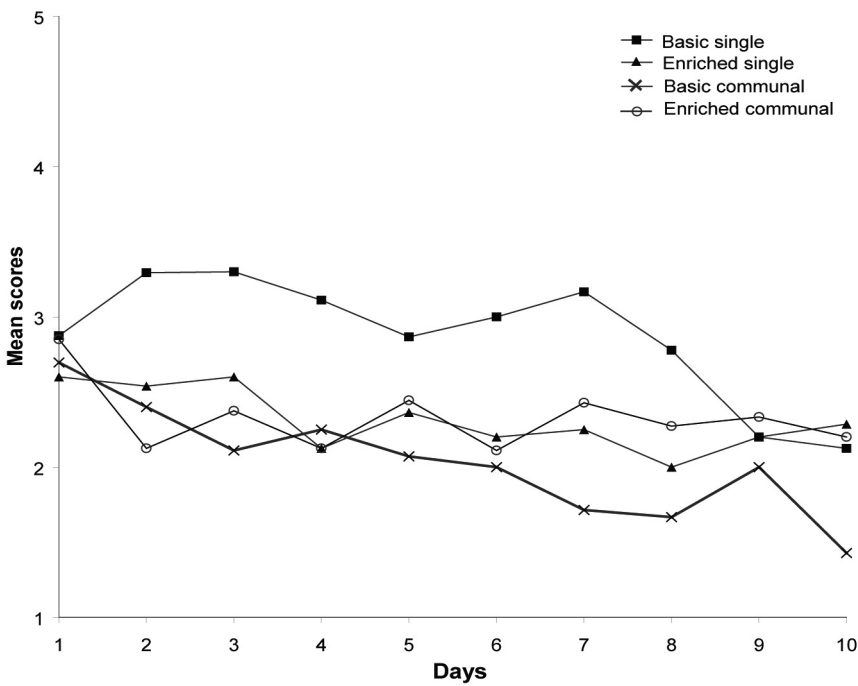
Cat-Stress-Scores were similar for all four treatments on day 1, but scores were higher on average for cats in the Basic Single treatment compared to the three alternative treatments until day 9 (Figure 1). Least Squares analysis showed a significant effect of treatment ($F_{3, 113} = 5.67$, $P < 0.001$) and a significant regression of scores on days ($F_{1, 349} = 38.5$, $P < 0.001$), but no interaction of treatment and days ($F = 0.24$). Duncan's Multiple Range Test showed that the Basic Single treatment differed significantly ($P < 0.05$) from all other treatments, whereas the other treatments did not differ from each other. After day 6 the Basic Communal treatment showed a very low average value of < 2 (Figure 1), but this was based on only 7 cats because most cats had already been adopted or removed from the study by that time.

Cat-Stress-Scores of cats that were eventually euthanised for health reasons were higher on average than for cats in the other three outcome categories (Isolation, Adopted and

Table I Number and percentage of cats in each outcome category per treatment, and median length of stay to adoption.

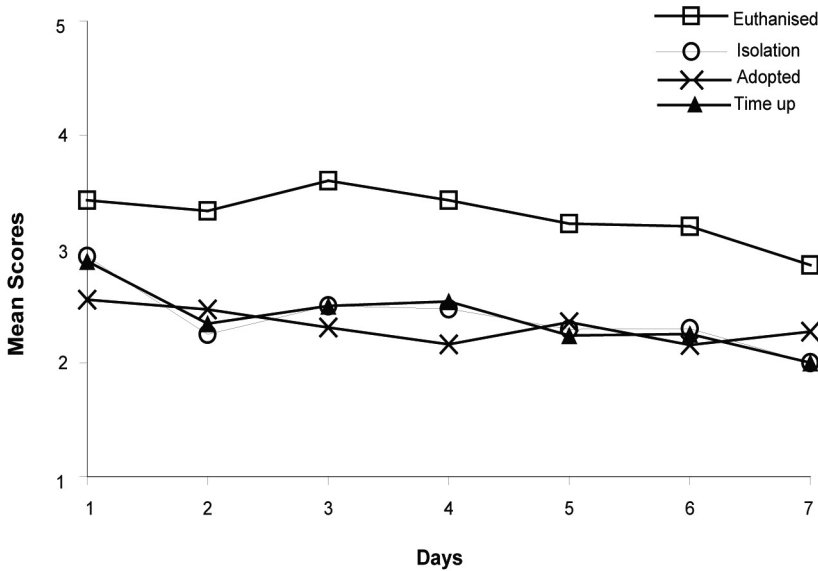
Outcome	Treatments			
	Basic single	Enriched single	Basic communal	Enriched communal
Adopted	14 (45%)	26 (76%)	40 (74%)	32 (69%)
Euthanised	5 (16%)	2 (6%)	1 (2%)	3 (6%)
Isolation	8 (26%)	4 (12%)	12 (22%)	10 (22%)
Time up	4 (13%)	2 (6%)	1 (2%)	1 (2%)
Total	31	34	54	46
Median stay (days)	12.5	5.5	4.5	5.5

Figure 1



Mean Cat-Stress-Scores in the four treatments for days 1 to 10.

Figure 2



Mean Cat-Stress-Scores in the four outcome categories (Euthanised, Isolation, Adopted, and Time-up) for days 1 to 7.

Time Up) (Figure 2). Least Squares analysis showed a difference between the four outcomes ($F_{3, 104} = 3.77$, $P < 0.05$). Duncan's Multiple Range Test showed that cats that were eventually euthanised differed significantly ($P < 0.05$) from cats in the other outcome categories whereas the other categories did not differ from each other.

Seventy-one people completed the questionnaire. Most identified several criteria that they considered important in the selection of a cat. The most common were 'friendly', 'playful', 'happy', 'relaxed', 'friendly with other cats' and 'smart', whereas fewer than half cited 'shy', 'sad' or 'fearful' as reasons (Table 2). Physical characteristics cited as important by more than 50% of adopters were spayed/neutered, coat length, and coat colour. Results indicated that being able to enter the cage and see cats with other cats were important factors in the selection, while seeing the cat alone in the cage or attempting to hide in the litter box was influential for relatively few adopters. The most common reasons for adopting a cat were listed as companionship for the owner and saving it from death.

Most of the additional written comments confirmed the preference for playfulness and friendliness as important factors in selecting a cat. Several other comments indicated that pity was a selection criterion regarding one cat in the Enriched Communal treatment ("She is an older cat, harder to adopt"), and regarding three cats in the Basic Single treatment: "Had a history of not being loved and I wanted to purchase a cat that I could make a difference with", "He had been there for a long time and looked depressed", and "Being shy and alone, he looked like he needed a home".

Discussion

To summarise the results, the Basic Single treatment when compared to the three alternative treatments yielded not only the lowest adoption rate but also the longest length of time awaiting adoption, and the most fearful behaviour as indicated by higher Cat-Stress-Scores. Moreover, the behavioural/emotional characteristics that most people reported using to select a cat ie 'happy', 'playful' were typical of behaviour associated with lower Cat-Stress-Scores. Hence, it seems likely that the alternative treatments helped encourage adoption of cats partly by leading to more relaxed and less fearful behaviour.

In planning the study, our strategy was to combine consistent handling with different housing options in the hope of finding at least one treatment that provides an improved adoption rate. Since all three alternatives were effective, we cannot tell which aspects of the treatments were most influential. Both handling and housing could potentially have contributed to the effect. More consistent and positive handling may have reduced fearfulness toward humans, as it has been shown to do with a wide range of species (Beaver 1981; Hemsworth & Gonyou 1997; Hennessy *et al* 1998; Rochlitz *et al* 1998a). Consistent, positive handling may have contributed to the lower Cat-Stress-Scores in the three alternative treatments partly because the cats were scored in the presence of the people that did the daily

Table 2 Percentage of 71 respondents citing various behavioural/emotional, physical, and environmental factors as important criteria for choosing the cat, and percentage citing various reasons for wanting to adopt a cat.

Selection criteria	Percent
<i>Behavioural/emotional</i>	
Friendly with me	100
Playful	86
Happy	73
Relaxed	71
Friendly with other cats	69
Smart	66
Shy	45
Sad	44
Fearful	38
<i>Physical</i>	
Spayed/neutered	70
Coat length	68
Coat colour	56
Size	43
Sex	43
Breed type	29
Eye colour	18
<i>Environmental</i>	
Able to enter cage	74
Viewed with other cats	52
Toys	38
Shelves	22
Alone in cage	22
Hiding in litter-box	19
<i>Reasons for adoption</i>	
Companionship for me	88
To save from death	81
Companionship for other cat	23
Companionship for children	18
Companionship for dogs	7

handling of the animals in those treatments. Consistent, positive handling may also have made the cats more relaxed in the presence of potential adopters. The three alternative housing treatments may have had a similar effect, because all these treatments allowed cats some opportunity to control exposure to humans by hiding or moving away. Cats in the Basic Single Treatment, which provided no hiding area, sometimes shredded newspaper and turned cage furnishings upside down during the night; this behaviour may have created some opportunity to hide, but the results were undone every morning when the cages were cleaned. The sudden, uncontrollable approach of humans experienced by cats in Basic Single cages, which may contribute to fear, would have been mitigated in all three of the alternative housing treatments. The benefit of providing cats with a hiding area has also been noted by other researchers (Carlstead *et al* 1993; McCune 1992; Rochlitz *et al* 1998b).

In other research, communal housing has sometimes given rise to more indicators of stress than individual housing at least for some animals (McCune 1992; Kessler & Turner 1999; Ottaway & Hawkins 2003). For example, Kessler & Turner (1999) found higher Cat-Stress-Scores in communal than individual housing for cats that were poorly socialised with other cats. Our study showed no evidence of higher Cat-Stress-Scores in communal housing. However, negative encounters between cats were often noted in the Enriched Communal treatment where cats had little opportunity to claim personal space for perching or hiding and were forced to cross paths in order to reach the food. Perhaps the stress reported by other researchers for cats in communal pens is due in part to the manner in which the pen is furnished, with less stress occurring in those pens where cats can avoid other cats.

As reported by other researchers (Endenburg *et al* 1994; Albert 1998), the adoption questionnaire revealed that the majority of adopters select a cat for companionship and in some cases to provide company for another cat. Physical characteristics (coat length, coat colour and size) were found to be important criteria for selecting a cat, as in other studies (Podberscek & Blackshaw 1988), but these factors were reported as important less often than the cat's behavioural and emotional traits and the fact that the cats were neutered.

Animal welfare implications

The results suggest that fearfulness in shelter cats can be significantly reduced by a combination of consistent, positive handling and environments enriched by either improved cage design or communal housing. These treatments also make the cats better candidates for early adoption, perhaps because they help to reduce fearful behaviour and promote relaxed, friendly behaviour which is attractive to many potential adopters.

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