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#### Abstract

Rates of adoption for adult cats in animal shelters have always been very low, thus these animals are often subjected to euthanasia and/or long periods of confinement. Furthermore, housing of shelter cats has traditionally focused on disease prevention; this has led to the use of barren, individual cages with only basic items necessary for self-maintenance. To improve the welfare of shelter cats it is necessary to increase the rate of adoption, reduce the time spent in shelter, and improve the living conditions while in the shelter. This study explored factors that influence the rate of adoption of shelter cats and the length of time they spend awaiting adoption, as well as the animals' health and psychological well-being during their stay at the shelter. In addition, factors that influence people's selection of shelter cats were examined.

Two factors - the complexity of the environment and consistency of handling were varied to create four treatments. The "Standard Treatment" represented conditions typical of North American shelters. Housing consisted of individual stainless-steel cages measuring (length by width by height) $70 \times 70 \times 55 \mathrm{~cm}$, equipped with a food and water bowl, a litter box and a towel. Daily care of the cats was carried out by a number of staff and volunteers using a variety of handling techniques. The "Enriched Single Treatment" provided similar cage type and furnishings plus a shelf and a hiding area; consistent handling and opportunity for familiarization with one caretaker was provided. The "Basic Communal Treatment" accommodated up to 8 cats in a cage measuring $2.30 \times 1.60 \times 2.40 \mathrm{~m}$ and equipped with 10 square shelves measuring $33 \times 33 \mathrm{~cm}$ placed at varying heights and several semi-hiding areas sized to accommodate only one cat at a time. This treatment also included consistent handling and opportunity for familiarization with one caretaker plus some opportunity for socialization with other cats while providing cats with lots of personal space. The "Enriched Communal Treatment" included a group cage of similar size designed to reduce the amount of personal space available to each cat; handling and familiarization were the same as the previous treatment. The fate of 165 cats was monitored until they were either "Adopted" "Euthanised due to illness", "Sent to isolation due to illness" or "Time up" after 21 days on display without being adopted. Stress level was monitored using the "Cat-Stress-Score" (Kessler \& 'Turner, 1997), a non-invasive behavioural stress measure.

Treatment affected the fate of cats. The Standard Treatment yielded the lowest adoption rate ( $45 \%$ ), highest euthanasia rate ( $16 \%$ ), and longest median wait time before being adopted ( 12.5 days); while adoption rate was between 68 and $76 \%$, euthanasia rate between 2 and $6 \%$ and median length of stay approximately 5 days for the three alternative treatments

Treatment also affected stress scores. Least squares analysis showed a significant effect of treatment $\left(\mathrm{F}_{3}, 113=5.67, \mathrm{P}<0.001\right)$ and a significant regression of scores on days ( $\mathrm{F}_{1,349}=38.5, \mathrm{P}<0.001$ ), but no interaction of treatment and days $(\mathrm{F}=0.24)$. Stress scores declined gradually over days with a slope of -0.065 ( $\pm$ S.E of 0.016). The Duncan's Multiple Range Test showed that the Standard Treatment was significantly higher ( $\mathrm{P}<0.05$ ) than all other treatments, whereas the other treatments did not differ from each other. The non-parametric Kruskall-Wallis test confirmed the result ( $\mathrm{P}<0.0084$ ). A similar analysis showed a significant difference between cats classified according to the four


outcomes (Adopted, Euthanised, Sent to Isolation, Time-up) $\left(\mathrm{F}_{3,104}=3.77, \mathrm{P}<0.05\right)$. The Duncan's Multiple Range Test showed that the cats that were "euthanised" had significantly higher scores ( $\mathrm{P}<0.05$ ) than the other three outcome categories, whereas the other outcome categories did not differ from each other (Adopted, Sent to Isolation, Time-up). The nonparametric Kruskall-Wallis test confirmed the significance of the difference ( $\mathrm{P}<0.05$

Seventy-three percent of adopters responded to a questionnaire at time of adoption. Factors reported by adopters as most influential in the selection of individual cats were "Friendliness towards adopter" ( $100 \%$ of respondents), "Playfulness" ( $86 \%$ ), "Happy disposition" ( $73 \%$ ), "Friendliness towards other cats" ( $69 \%$ ), "Neutered" ( $70 \%$ ), "Coat length" $(69 \%)$ and "Being able to enter the cage with the cats" $(74 \%)$.

Based on these findings and previous research, it seems possible to improve the welfare of shelter cats with the use of more complex environments designed to meet the needs of cats and consistent handling routines that involve familiarization with one caretaker.

## Table of Content

Abstract ..... ii
List of Tables ..... vi
List of Figures ..... vii
Acknowledgements ..... viii

1. Literature Review
Introduction ..... 1
Factors affecting the welfare of shelter cats ..... 2
Anxiety ..... 3
Fear. ..... 3
Boredom ..... 4
Stress ..... 4
Disease ..... 5
Handling ..... 6
Adoption ..... 6
Assessment of cat welfare ..... 7
Enrichment ..... 8
Aims of the present research ..... 9
2. Methods
Introduction ..... 11
Treatments ..... 11
Housing ..... 11
Handling ..... 12
Cats ..... 21
Adopters ..... 25
Statistical analysis ..... 25
3. Results
Outcome ..... 27
Stress ..... 27
Selection criteria ..... 33
4. Discussion. ..... 35
5. List of References ..... 38
6. Appendices
A. Cat Information Record ..... 45
B. Stress Log ..... 46
C. The Cat-Stress-Score.................................................................................. 47
D. Adoption Questionnaire....................................................................... 48

## List of Tables

Table Page
Table 2.1. Summary of environmental and social conditions per treatment ..... 20
Table 2.2. Distribution of cats in each treatment per origin. ..... 23
Table 2.3. Number of cats assessed for stress per day per treatment ..... 24
Table 3.1. Percentage and number of cats in each outcome category ..... 28

Table 3.2. Number and percentage of cats scoring level 1, 2, 3 or higher on the day of departure from the study32

Table 3.3. Percentage of 71 respondents citing the various physical, behavioural and environmental criteria as "important", listed in descending order.34

## List of Figures

Figures
Figure 2.1. The Standard Treatment cage ..... 14
Figure 2.2. The Enriched Single Treatment cage without hiding area. ..... 15
Figure 2.2 a The Enriched Single Treatment cage with hiding area ..... 16
Figure 2.3.The Basic Communal Treatment cage ..... 17
Figure 2.4. A plastic bin $30 \times 30 \times 19 \mathrm{~cm}$ with one open side. ..... 18
Figure 2.5. The Enriched Communal Treatment cage ..... 19
Figure 3.1. Median length of stay for cats awaiting adoption in the four treatments. ..... 29
Figure 3.2. Mean stress scores in the four treatments for days 1 to 10 ..... 30
Figure 3.3. Mean stress scores in the four outcome categories for days 1 to 7 ..... 31

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## Literature Review

## Introduction

Historically, animal shelters in North America have placed a great deal of emphasis on preventing infectious disease. This has led to the use of rather barren, individual, stainless-steel cages with only the basic items necessary for self-maintenance. More recently, trends in sheltering have focused on reducing the rate of euthanasia of adoptable cats. While adherence to this trend by many shelters has successfully reduced the number of cats euthanized, the adoption rates of adult and elderly cats have not increased proportionally; the time they remain in the shelter awaiting adoption has steadily increased and living conditions remain focused on disease prevention.

The attainment of good welfare for animals living in captivity requires provision both for their physical and psychological well-being. Owing to the public outcry associated with Ruth Harrison's book on intensive farming practices "Animal Machines" (1964), the British government established a committee (Brambell, 1965) to address issues of intensive husbandry methods of farm animals. In considering pain and discomfort as well as stress, the committee recommended that farm animals should at least have the freedom "to turn around, to groom themselves, to get up, to lie down and to stretch their limbs" (Brambell, 1965). This recommendation was later revised by the Farm Animal Welfare Council (1992), and has since been embraced and adopted by organizations interested in promoting the welfare of other species living under a variety of environmental conditions. The "Five Freedoms" principle (FAWC, 1992) asserts that animals should have:

1. Freedom from thirst, hunger and malnutrition - by ready access to fresh, clean water and a diet to maintain full health and vigour.
2. Freedom from discomfort - by providing an appropriate environment, including shelter and a comfortable resting area.
3. Freedom from pain, injury and disease - by prevention, rapid diagnosis and treatment.
4. Freedom to express normal behaviour - by providing sufficient space, proper facilities and company of the animal's own kind.
5. Freedom from fear and distress - by ensuring conditions and treatment which avoid mental suffering.

Current guidelines for the care of animals in captivity of the Australian Royal Society for the Prevention of Cruelty to Animals (RSPCA, 2000) state that the Five Freedoms form a logical and comprehensive framework for the analysis of welfare. They add moreover, that welfare for all animals should be considered in these terms. The current "Animal Welfare, Well-Being and Ethology Policy" of the World Veterinary Association (WVA, 2000) states that provision of care in the form of the Five Freedoms is essential to animal welfare and that every practical effort should be made to achieve them. The WVA adapted the "Five Freedoms" in the following way: freedom from hunger and thirst; (2) freedom from physical discomfort and pain, (3) freedom from injury and disease, (4) freedom from fear and distress,
and (5) freedom to conform to essential behavioural patterns. The US Animal Welfare Act (U.S.D.A, 1985) requires that research facilities develop an appropriate plan to provide dogs with an opportunity to exercise and socialize both with other dogs and with humans. It also requires that primates be housed under conditions that promote their psychological wellbeing. The Nova Scotia Circus Animal Act (Department of Natural Resources, 1999) requires that big cats be provided with environmental conditions enabling the expression of behaviours that offset boredom and encourage physical activities such as running, leaping and jumping. This Act also requires that the housing of dogs in circuses provide a retreat from the public and opportunity for socialization with other dogs. Researchers have addressed the social and environmental needs of various species to improve their psychological well-being. The Canadian Council on Animal Care (1993) upholds Fraser's (1989) viewpoint that animal well-being encompasses both physical and psychological health and states that environmental enrichment should promote a full and extensive repertoire of normal behaviour, while at the same time preventing the development of abnormal behaviour. Likewise, the Canadian Federation of Humane Societies' policy statement on companion animals (CFHS, 1999) points out the importance of providing companion animals with physical and emotional care.

Control of disease remains the main concern guiding sheltering practices for companion animals in many shelters in North America. Miller-Dowling \& Stitely (1997) state that particularly in animal shelters, housing does not meet the behavioural needs of cats. In British Columbia, the Standards for Shelters and Pounds (British Columbia SPCA, 1998) recommends that cats be housed in cages measuring at least (length by width by height) 51 x $51 \times 51 \mathrm{~cm}$, to ensure that cage size is sufficient for cats to lie down, stand and turn freely. These guidelines do not address the species-specific needs of cats and appears to limit opportunity to express normal behaviour (freedom \#5). Furthermore, the steady increase in the time cats must remain in these cages prolongs their exposure to potentially stressful shelter conditions and may further impact their psychological well-being. While the welfare of cats is threatened by current sheltering practices (such as the No-Kill trend) and low adoption rates, research addressing the potential of alternative sheltering practices is sparse; hence there is a need to examine the effect of current and alternative sheltering practices on the well-being and adoption rate of cats.

## Factors affecting the welfare of shelter cats

Researchers have expressed concerns that environmental conditions in shelters evoke anxiety, fear, boredom and stress in many cats. Adjustment to new surroundings is negatively affected by these emotional states and seriously threatens the welfare of the animals.
The typical admission procedure for shelter cats in the UK is described by McCune (1994):

Cats are deposited in a metal box, smelly, cold and hard, where they are surrounded by barking dogs, bright lights, strange faces and strong smells. Add to this an altered routine and strange people, who when they finally take you out of the cage, often go and stick a needle in your tender bits! And the surprise is that any cats remain friendly and tractable under these circumstances.

Likewise, in British Columbia shelters cats are placed in open wire cages upon arrival and undergo several potentially stressing procedures before being transferred to their permanent cage (Personal communication, Director of Animal Health, B.C. Society for the Prevention of Cruelty to Animals, Vancouver Regional Branch). The latter is a stainless-steel cage containing only the necessary items for self-maintenance such as a food and water dish, a litter-box and sometimes a towel added for comfort. Each cat is typically housed singly and usually remains in the cage until it is adopted or euthanised due to untreatable sickness and/or lack of space.

## Anxiety

Holmes (1993) states that the shelter environment evokes anxiety in cats. According to Holmes, anxiety is an emotional state caused by the absence of stimuli such as a human companion or familiar objects to which the cat is attached. Gray (1988) proposes further that anxiety consists of heightened activity in the Behavioural Inhibition System, the functions of that system are located in either the septo-hippocampal system or the locus coeruleus. Internal stimuli such as the expectation of an event (e.g. the arrival of the owner at a usual time) are particularly significant for relinquished shelter cats who's bond to a human companion has just been broken (Arkow, 1991). Adult feral cats are usually included under spay/neuter release programs and are therefore not part of the adoption program.

The anxiety caused by separation from their owner has been widely studied with dogs (Hart \& Hart, 1985; Hetts, 1999; Holmes, 1993; Overall, 1997; Voith \& Borchelt, 1996), while limited research has focused on the attachment of cats to their owners and the consequences of forced separation. Behaviours that have been associated with anxiety in dogs are aggression, destruction of property, inappropriate elimination and extreme vocalization (O'Farrell, 1992; Serpell, 1995; Topál et al., 1998; Voith \& Borchelt, 1996). Two papers reported that owned cats, particularly those brought in directly from their home by the owner, are prone to anxiety (Holmes, 1993; Voith \& Borchelt, 1996). Fogle (1999) states that behavioural symptoms of anxiety in cats are excessive grooming, vocalization, or sucking on various types of inedible material. Although the increased level of attentiveness and arousal resulting from anxiety has survival value for wild animals faced with potentially dangerous novel situations, the artificially created conditions in which the animal has few opportunities for reaction may prolong the anxious state (Bradshaw, 1992).

## Fear

Holmes (1997) reports that shelter environments evoke fear in cats. He defines fear as a motivational state provoked by specific external stimuli that promote avoidance, defensiveness and escape behaviour. With regard to extreme or prolonged fear, The Oxford Companion to Animal Behaviour (Mc Farland, 1981) states that it is believed to lead to chronic anxiety, neurosis and depression. Morton (1998) in The Encylopedia of Animal Rights and Animal Welfare states that "Fear involves the perception of stressful environmental factors through an animal's senses such as smell, sight and sound" (1998: 171). Specifically for cats, conditions that are thought to evoke fear are sudden movements, unknown or loud noises, novel and unfamiliar places and objects, intrusion of others into a cat's personal space, and arrival of strangers (Holmes, 1997; Fogle, 1995; Voith \& Borchelt, 1996). As well, lack of control over the environment is a source of stress for most animals (Line, 1987).

## Boredom

Wemelsfelder (1993) reports that many animals living in captivity experience boredom (also referred to as under-stimulation). She postulates that boredom is a state resulting from impaired ability to interact with the environment. Animals housed in impoverished environments suffer from a lack of meaningful behavioural goals that may lead to listlessness and withdrawal. Impoverished zoo conditions have been associated with a decreased range of behaviours, increased passivity and apparent lack of interest in the environment. It has also been assumed by researchers that zoo animals housed under the above conditions suffer from boredom and apathy (Dantzer, 1986; Broom and Johnson, 1993; Wemelsfelder, 1993). With regard to cats, Holmes (1997) states that factors associated with boredom include youth, a genetically inherited disposition for activity, confinement, lack of opportunity to engage in hunting behaviour, absence of feline companionship for social cats, and lack of a den. In addition, the problem is considered to be more severe for intact males, and females in estrus. According to the Humane Society of the United States (1995) cats housed singly in barren environments are prone to boredom, the risk of which increases with the length of confinement. Behavioural problems associated with boredom in cats include aggression towards people, destructive behaviour, pica, excessive grooming, overeating, tail-chasing, self-mutilation (Holmes, 1997; Voith \& Borchelt, 1996) and apathy (Broom \& Johnson, 1993).

## Stress

A great deal of research on problems of animals in captivity has used the concept of "stress." The Oxford Companion to Animal Behaviour (Mc Farland, 1981) defines stress as a physiological response of the body to excessive environmental or psychological pressures. Terlouw et al. (1997) describe stress as "the animal's state when it is challenged beyond its behavioural and physiological capacity to adapt to its environment" (1997: 143). Broom \& Johnson (1993) add that stress implies poor welfare.

There are both physiological and behavioural indications of stress. One commonly used physiological measure of stress is the level of glucocorticosteroids (cortisol and corticosterone) in the blood, urine and/or saliva. Fluctuation in the level of these hormones is the result of activation of the hypothalamus-pituitary-adrenal cortex (HPA) axis. The activation of the HPA axis also affects the cats' "cardiovascular function, metabolism, muscle function, behaviour and immune system" (Terlouw: 1997, 144). Physiological measures have been used to assess stress experienced by cats and dogs in confinement (Beerda et al, 1997; Hennessy et al, 1998; Kessler \& Turner, 1997; McCune, 1992; Rochlitz, 1997; Wells \& Hepper, 1999).

Broom \& Johnson (1993) propose that although physiological measures are good indicators of short-term stress, behavioural measures may provide a better indication of long term stress. Fraser (1985) states that many clinical conditions in animals first become apparent to observers through a set of behavioural indicators. Mench \& Mason (1997) further noted that behaviour is one of the most easily observed indicators of welfare. They state that: "behaviour, after all, is what animals do to change and control their environment, and thus provides information about their needs, preferences and internal states (1997:128). Several researchers have stated that a cat's posture and behavioural expression correlate with
its emotional state and provide good indications of how well it is coping with stressors (Hart, 1978; McCune, 1994; Rochlitz, 1997; Kessler \& Turner, 1999; Voith \& Borchelt, 1996). In The Encyclopedia of Animal Rights and Animal Welfare, Broom (1998) refers to coping as a process involving behavioural and physiological adjustment in an attempt to control environmental effects. Observed behaviours and postures of cats exposed to known environmental stressors include the suppression of active exploratory and play behaviour (Carlstead et al., 1993, McCune, 1994; Rochlitz, 1997), feigned sleep also described as "passive defense behaviour" (Pfleiderer, 1990), fear aggression as demonstrated by "scratching, hissing, growling, biting while holding defensive posture indicated by ears back, body hunched, or combination of attack and defensive postures with ears back, back arched and piloerection" (Voith \& Borchelt, 1996: 224), and hiding or attempting to hide (McCune, 1992; Carltsead et al., 1993; Rochlitz, 1997; Kessler \& Turner, 1999). Hiding is a common behaviour for cats; those in free-living conditions (females in particular) usually establish a home-base around a nest or den area such as a hole in a tree, or a deserted rabbit burrow. Shelter cats sometimes create hiding places by shredding newspaper and turning over items during the night, but these are routinely destroyed as part of daily cleaning procedures.

In her study of shelter cats, McCune (1992) observed and classified behaviours associated with stress in three ways: inhibited behaviour, defensive behaviour, and disruptive behaviour. In comparison to uncaged cats, shelter cats exhibited (1) greater inhibition of self maintenance behaviour such as eating, eliminating and grooming, (2) greater intensity of aggressive behaviour and (3) higher incidence of destructive behaviour, such as shredding the contents of the cage. O'Farrell \& Neville (1994) found that behavioural responses to environmental stressors differ based on the cat's temperament. These researchers state that extroverted cats tend to engage in aggressive and disruptive behaviours, while introverted cats tend to become withdrawn and immobile. They add that cats living in impoverished conditions will attempt to reduce stress and anxiety with excessive use of displacement activities such as excessive grooming or vocalization.

## Disease

Sustained stress in response to on-going or repeated exposure to perceived threats can suppress the immune system response (Sapolsky, 1992). Sapolsky states that chronic stress can "make disease more likely to occur and more damaging when it does" (1992:311). Two studies have found stress to be associated with impaired immune system function in shelter dogs (Beerda et al, 1998; Hennessy et al, 1998). Studies to specifically examine the suppression of immune system function in shelter cats have yet to be conducted. However, suppression of normal behaviour such as self-maintenance behaviour is reported by McCune (1992) and by Rochlitz (1997) as a cause of anorexia and dehydration. Anorexia depletes cats of energy to fight disease and it exacerbates immunosuppression, thereby increasing the risk of complications when afflicted with upper respiratory tract infection, a condition affecting many cats in animal shelters (Feline Advisory Bureau, 2000).

## Handling

Many shelters have volunteer programs designed to promote human/animal interactions through activities such as grooming and petting, in the belief that this will lead to increased welfare of cats. Most shelter workers in North America receive formal training in
handling of dangerous animals using tools such as the catch pole or net but few receive training in handling strategies to minimize stress. In relation to tactile interaction, Hemsworth \& Gonyou (1997) note that interaction between caretakers and animals can be positive, negative or neutral. In their evaluation of the effects of human interaction on the welfare of farm animals, these researchers conclude that more positive (compared to neutral or negative) interactions improve animal welfare. In the context of psychological well-being, the U.S. Animal Welfare Act has defined positive interaction as "petting, stroking, or other touching which is beneficial to the well-being of the animal" (USDA, 1996).

Mertens \& Turner (1988) found that personality and previous experience with humans influence the effect that human interaction has on cats. Hoskins (1995) suggests that increased contact with a familiar caretaker contributes to an increased willingness by the cat to be held by strangers. Rochlitz et al. (1998a) report that increased contact with humans, using appropriate handling decreases stress among cats in shelters. However, they do not describe what constitutes "appropriate handling" or any of the potential effects of inappropriate handling on stress. Regarding the time of day for interaction and the gender of the handler, Bradshaw \& Cook (1996) state that cats are more receptive to interactions with humans immediately before feeding. Unfortunately, in many shelters feeding and cleaning are done simultaneously leaving little time for such things as petting and vocal interactions between staff members and the cats. To date, no studies have investigated whether the gender of the handler affects the stress level of shelter cats. However, Hennessy et al. (1998) evaluated the effects of a 20 -minute petting session on the stress level of puppies and adult dogs using both male and female petters. Stress was assessed both with plasma cortisol levels and the dogs' use of displacement behaviours. Results showed that dogs petted by women had a greater reduction in stress than those petted by men. However, when men were instructed to use the same vocalization type (softer, higher pitch) and petting type (gentler) as that used by women, the difference became non-significant. These researchers concluded that for shelter dogs, gentle petting and soft, high pitch speech results in more positive interaction and general reduction in stress. Other researchers state that animal caretaker styles can affect the behaviour of animals and that calm, gentle, consistent handling can reduce stress (Beaver, 1981; Fox, 1989; Hurni \& Rossbach, 1989).

## Adoption

Adult and elderly cats are described as the least likely to be adopted from animal shelters. Salman et al. (1998) report that only fourteen percent of owned cats are acquired from animal shelters and many of them as kittens. Miller-Dowling \& Stitely (1997) report that adult cats are also the most likely to be euthanised due to disease, and, as a result of policies that eliminate or minimize euthanasia, the most likely to spend periods lasting up to several months in shelters awaiting adoption. Up to a decade ago, adult cats that were not adopted after seven days were routinely euthanised in BC (Personal communication, Director of Field Operations, B.C. Society for the Prevention of Cruelty to Animals, Vancouver Regional Branch). More recently, societal pressure and changing shelter culture have led to a shift in shelter practices from providing humane death to preventing death at all cost. The popularity of this practice is evidenced by the growing list of organizations declaring themselves to be "no-kill" facilities. The U.S.A. directory of shelters listed sixty "no-kill" shelters in 1991, two hundred in 1995 and close to seven hundred in 1998 in which "indefinite confinement" is practiced over euthanasia (Miller-Dowling \& Stitely, 1997).

Studies and anecdotal reports on factors that influence rate of adoption and length of time waiting for adoption are diverse. According to the Humane Society of the United States (1995), increased levels of activity and playfulness of grouped cats and the length of time visitors spend watching the animals, are factors that increase adoption rates. Some researchers have reported colour of the coat, size (Karsh \& Turner, 1988), personality (Podberscek and Blackshaw, 1988), age and sex (Rochlitz et al., 1996) of cats to be factors affecting adoption. Indications as to the most preferred age, sex, colour and personality were not provided by these researchers. Rochlitz et al. (1996) and Endenburg et al. (1994) found that desire for feline companionship is the primary reason for acquiring a cat and that many people adopt a cat to provide another cat with companionship. Thus, the opportunity to appraise a cat's potential for good companionship may influence adoption. Albert (1998) reports that demographic conditions of adopters greatly influence the selection criteria. Single people, more so than other groups, are likely to adopt a pet as company for another pet, while married people with children often select a pet to entertain the children. Thus, environmental conditions that help visitors assess a cat's temperament may influence adoption.

Influential factors in the selection of shelter dogs by adopters reported by Wells \& Hepper (1992) may provide further information about factors that influence general animal selection. Behaviours exhibited by dogs while in their pen were found to be the most influential factors in the selection of a dog by an adopter. These researchers report that sitting at the front of the cage increased a dog's chance to be selected. Contrary to Wells \& Hepper (1998), Posage et al. (1998) found that physical characteristics of dogs such as size, colour and history of indoor residence were most influential in selection, while behaviours exhibited in the pen played a small part in the decision. Mertens and Unshelm (1996) found that dogs in group housing had an increased adoption rate and concluded that people prefer to adopt dogs from group housing conditions because they can watch dog-dog interactions. They also found a higher level of satisfaction, fewer complaints about behavioural problems and a lower return rate amongst owners of dogs from group housing.

## Assessment of cat welfare

Duncan \& Fraser (1997) state that "The welfare of an animal refers to its quality of life" (1997:20). These researchers describe three main approaches to the assessment of animal welfare. The "feeling based" approach proposes that the affective states of an animal are the key elements of its quality of life. Measures include preferences and motivations of the animal as well as behavioural and physiological indicators of affect. The "functioning based" approach proposes that normal biological functioning of the animal are indicative of good welfare. Measures are based on health, longevity, fitness and disturbance to behaviour and physiology. The "natural living" approach emphasizes the importance of providing an environment in which animals can engage in species-specific behaviour. The measures include observation of behavioural repertoire. Duncan \& Fraser (1997) add that although the assessment of animal welfare is embedded in values, objective measures of welfare are possible. Broom \& Johnson (1993) also state that welfare measurements should be objective and that welfare must be evaluated in terms of levels indicative of the animal's ability and/or failure to cope with its environment.

Assessment of cat welfare has typically involved physiological and behavioural measures of stress. The physiological measures described above have been used by Rochlitz
(1997) for cats and by Beerda et al. $(1997,1998)$ and Hennessy et al. (1998) for dogs. Behavioural measures have included the comparison of confined cats in various types of facilities (Kessler \& Turner, 1997, 1999; McCune, 1992, 1994; Rochlitz, 1997; Smith et al., 1994; Roy, 1992) with free-living cats (UK Cat Behaviour Working Group, 1995) and with house cats (Bernstein \& Stack, 1996). Rochlitz (1997) assessed the welfare of cats in rescue shelters, quarantine kennels and boarding catteries by evaluating their biological functioning and behavioural expressions. She also reports on the capacity of various environmental conditions to provide the cats with the "Five Freedoms" and cautions against a simplistic application of these guidelines. For example, she states that "freedom from hunger and thirst" may not be met with the mere presence of fresh food and water in the cat's cage. Cats may fail to eat if elimination and eating areas are close together or if food and water are located in areas where cats may be intimidated by other cats.
McCune (1994) states that assessing the cat's body language in conjunction with its behavioural expressions provides an accurate indicator of stress. The McCune Welfare Index for Cats (McCune, 1992) and its updated version the Cat-Assessment-Score (McCune, 1994), describe body postures originally correlated with other measures such as physiological response to stress, rates of habituation and basal (normal) behaviour. Kessler \& Turner (1997) adapted the Cat-Assessment-Score (McCune, 1994) following the observation of about 300 cats under single, pair and group housing conditions in animal shelters and catteries. These researchers modified behavioural and postural elements outlined in the Cat-Assessment-Score to facilitate differentiation between the various levels, and to include certain elements of active behaviour and a tense sleeping posture. The resulting work, the Cat-Stress-Score (Kessler \& Turner, 1997), is a non-invasive behavioural assessment tool to evaluate stress in cats based on posture, facial expression including pupil dilation, vocalization and level of activity. The instrument describes seven levels of stress from (1) fully relaxed to (7) terrorized. In this study, the Cat-Stress-Score was used to assess the stress of cats in the four treatments.

## Enrichment

Research to date suggests that the provision of social and environmental enrichment that encourages species-appropriate activities, positive interactions with humans and other cats, and bonding with one caretaker speeds up the cat's adjustment to its surroundings and promotes its psychological well-being.

McCune (1994) states that it is unreasonable to expect cats to cope psychologically as well as physically with new surroundings and routines, novel smells and sounds, inconsistent handling by different people, exposure to pathogens and the loss of familiar people and objects while being housed in impoverished environments. Rochlitz (1997) states that while single housing can provide some social enrichment through olfactory, visual and auditory contact with cats in neighbouring cages, staff and visitors, it does not provide the means to exert control over the amount and timing of contact. Furthermore, the size of single type housing typically renders the separation between eating and elimination areas difficult and most cats are repelled by having to eat next to their own fæces (Hart \& Hart, 1985).

To offset the negative effects of the previously mentioned conditions some shelters have begun to place more emphasis on social enrichment, typically in the form of group housing. However, group housing is not considered beneficial for all cats; McCune (1992) found that it can be a source of stress for cats with timid temperament, very old or very
young cats, and/or cats with restricted prior experience with other cats. Kessler and Turner (1999) supported McCune's findings, but related the level of stress to previous socialization with other cats, particularly during kittenhood. Smith et al. (1994) supported the finding that some cats experience more stress in group conditions particularly when new cats are introduced. However, they concluded that once adaptation is complete, communal housing provides a more humane alternative for the cats.

Roy (1992) reports that the complexity of the space in the pen greatly influences adaptation to shelter conditions. He states that to facilitate adaptation cages must include elevated resting shelves of various sizes located at various heights in order to provide the cats with the opportunity to have a full view of their environment and to control the amount of interaction with other cats. With regard to the substrate, Roy (1992) found that insulating materials such as straw, shredded paper, shavings, sack, cloth or wood are preferable because of the cats' sensitivity to temperature fluctuations. Beaver (1981) states that cats need toys, scratch posts, climbing apparatus, and hide-outs for privacy. She also suggests that cats need either hanging objects that can be swatted or watched, or objects that roll when batted, in order to facilitate play and activity.

Smith et al. (1994) conducted a three-year study of cats that had been living in confinement for short and long time periods. Their study provides detailed information on the use of, and preference for, objects and substrates in single and group conditions. In addition, these researchers report on the interactions between cats at the time of introduction and over time under grouped conditions. Three types of enrichment structures were introduced: a large, four compartment cube with a multi-surface top, some simpler structures with single angular or curved wall compartments, and a variety of wooden shelves. These structures were used in various types of enclosures with long-term and short-term resident cats. These researchers report high usage of these structures, particularly the tops of the structures and the elevated shelves. They note that cats use the structures as vantage points to observe other cats, thus increasing the amount of time they spend watching each other. Smith et al. (1994) also report that excessive vocalization, escape behaviour, hiding and time spent under objects is significantly reduced after four days, with some additional changes taking place over the next month, when environmental enrichment is provided. With regard to social enrichment, the researchers found that upon introduction into a pen, both new and established cats display increased stress. However, evidence of bonding, structured relationships and preference for one partner were observed among long-term residents. They concluded that social enrichment seemingly improves the welfare of cats despite some difficulties upon introduction of new cats.

Some studies of environmental conditions for cats report that separating space into functional areas for food, litter, scratch posts, toys, bedding and viewing points, while leaving space for communal play objects, encourages cats to interact with the environment and with one another (Loveridge, 1994; Roy, 1992). Other studies report that facilitating hiding or semi-hiding behaviour increases the opportunity for exertion of control over the environment and is believed to improve cat welfare (Smith et al., 1994; McCune, 1994; Rochlitz, 1997).

## Aims of the current research

Research to date indicates that factors influencing the welfare of cats in animal shelters are numerous. Conditions that provide cats with some control over the environment
contribute to welfare. Examples include the ability to withdraw from shelter activities at will by hiding, or to survey the whole environment from a high vantage point without the possibility of being approached from behind by people and/or other cats. Conditions that facilitate the prediction of routine events and provide opportunity to become familiar with at least one caretaker, as well as ensuring a short, disease-free and minimally stressing stay that ends in adoption, are important contributors to the welfare of shelter cats.

To address some of the above issues, this study explored factors that influence the rate of adoption of shelter cats and the length of time they spend awaiting adoption, while monitoring clinical symptoms of disease and behavioural indications of stress during their stay at the shelter. In addition, factors that influence people's selection of shelter cats were examined.

## 2. Method

## Introduction

Between July and October 1999, a total of 165 adult cats between the ages of one and 12 years took part in a study at the Vancouver Regional Branch (VRB) of the British Columbia Society for the Prevention of Cruelty to Animals (BC SPCA). The Vancouver shelter is a three-building structure that houses a veterinary hospital, administration offices, a quarantine area for potentially contagious animals, adoption facilities for dogs and cats, a stray ward for cats, and a nursery for animals too young for adoption. The cat adoption room is a self-contained room with natural light and equipped with 24 single stainless-steel cages measuring $70 \times 70 \times 55 \mathrm{~cm}$ high and placed in a double row along each wall. Each cage houses either one adult cat or three to four kittens.

The study examined the effects of usual (referred to as Standard) and alternative housing and handling practices, on cat stress scores, length of time spent waiting for adoption, and rates of adoption, sickness and euthanasia. With the usual method of housing and handling cats in shelters as a control, three alternative methods were applied. The study also examined the criteria used by adopters when selecting a shelter cat as well as the influence of housing design on selection.

## Treatments

## Housing

The Standard Single Treatment represents the sheltering practices commonly used in animal shelters. Standard housing (Fig. 2.1) consisted of four single stainless-steel cages each measuring (length by width by height) $70 \times 70 \times 55 \mathrm{~cm}$ and equipped with a plastic dish for dry and wet food, a stainless-steel water bowl and a litterbox measuring $33 \times 25 \times 9 \mathrm{~cm}$. The bottom of each cage was covered with newspaper, and a folded towel was provided for bedding. This type of housing aims to facilitate cleaning and reduce risk of contagion between cats.

The housing for cats in the Enriched Single Treatment (Fig. 2.2) consisted of four single stainless-steel cages measuring $72 \times 55 \times 70 \mathrm{~cm}$. These cages were equipped with a wooden shelf measuring 30 by 22 cm and placed 33 cm from the bottom of the cage along one side. A hiding area could be created by placing a towel over the shelf to the bottom of the cage (Fig. 2.2a), this was done when cats where assessed at level 3 or higher. The wooden structure supporting the shelf was used to elevate the food and water dish 2 cm above the bottom of the cage. The aim of this cage design was to provide cats with a perching area from which to view the whole adoption room, a place to hide when stressed, a separate sleeping area and some separation between eating and elimination areas.

The eight cages used for the Standard and Enriched Single Treatments were located in the adoption room and exposed to the same environmental conditions such as noise, odours, light and level of human activity.

Housing for cats in the Basic Communal Treatment (Fig. 2.3) was a converted dog kennel measuring $2.30 \times 1.60 \times 2.40 \mathrm{~m}$ high that could accommodate a maximum of eight cats. Interior walls were constructed of wood panels and painted with a sealant paint. The
cage was equipped with ten square wooden shelves measuring $33 \times 33 \mathrm{~cm}$; four shelves were mounted on each side in a stair design and two were placed at the back corners, 1.20 m above the cage floor. All shelves were sized to accommodate one cat at a time. Five hiding areas were created with plastic bins $30 \times 30 \times 19 \mathrm{~cm}$ with one open side (see Fig. 2.4.) Three were stacked on the floor at the front of the cage, with the openings turned towards the inside of the cage and two more were placed upside-down on the shelves closest to the floor. Towels or small blankets were placed on every shelf and in each basket and a washable carpet covered the cement floor. A small patio chair, placed in the cage to facilitate interaction between the cats and shelter visitors, was also used by the cats as a semi-hiding and perching area. Two large litter-boxes were placed lengthwise along one side wall, and several food and water dishes were placed along the opposite wall. The aim of this cage design was to provide opportunity for hiding, perching high up without the possibility of being approached from behind, and ample personal space for each cat. Although socializing was possible, it was not facilitated by cage items.

Housing for the Enriched Communal Treatment (Fig. 2.5) was the same size and adjacent to the Basic Communal cage. A plastic cat playhouse (The Cat Tower, Doskocil manufacturing) measuring 1.80 m in height with several carpeted walkways and three large hiding areas was located at the rear right-hand corner of the cage. The playhouse gave access to shelves on either side, sized to accommodate several cats. One shelf measured $75 \mathrm{~cm} \times 48$ cm and was placed 1 m above the ground. The other measured 2.00 m in length and served as a walkway between the playhouse and the front of the cage where a third shelf measuring $60 \times 35 \mathrm{~cm}$ was mounted on the cage door at 1.20 m above the ground. Three (single size) shelves, one of which was equipped with a plastic basket, were mounted close to each other underneath the long walkway shelf. The same bedding material was provided as in Basic Communal housing. Three food and water dishes were provided; one placed on the back corner shelf, one on the long shelf and one on the floor of the cage. Two litter-boxes were placed at the back of the cage beneath the corner shelf. A variety of hanging and floor toys were provided and a scratching post was placed at the center of the cage. A patio chair was also placed in this cage and was used by cats in a similar fashion as in the Basic Communal housing. The aim of this cage design was to maximize the opportunity for socialization between cats and to increase the level of activity with the use of toys and a scratching post. This treatment afforded cats little opportunity to withdraw from each other.

Both of the communal cages were located in the corridor leading to the cat adoption room. Adjacent to the cages were several dog kennels and the cleaning and food preparation area. Thus, Communal cats, more so than the singly housed cats, were exposed to a great deal of staff activity (particularly in the morning and late afternoon) and sounds of barking.

## Handling

Two handling strategies were practiced: non-consistent handling in the Standard Treatment and consistent handling in the three alternative treatments.

The non-consistent handling provided to cats in the Standard Treatment aimed to represent the practice most commonly used in shelters in British Columbia. Vancouver Regional Branch shelter staff and volunteers do not receive formal training in handling of cats and no particular staff or volunteer is consistently assigned to cat care every day of the
week. Consequently, there is little opportunity for the cats to become familiar with one person and handling techniques vary according to the caretaker's personal style, level of experience and the particular shelter. Some caretakers used scruffing with or without body support, sometimes talking to the cat, sometimes not. Others stroked the cats, enticing them to the front, then taking them out of the cage by lifting them with full body support. Some caretakers placed cats into an open wire cage on the floor, cleaned the cage and then placed the cat back. Others transferred the cat to a pre-cleaned cage. Finally, other caretakers left the cats in their cages while cleaning it. Some cats were observed staying at the back of the cage during the whole cleaning them. Some cats were observed staying at the back of the cage during the whole cleaning procedure, while others interacted with the caretaker by rubbing or playing.

The handling provided to cats in the three alternative treatments aimed to reduce stress, provide cats with the opportunity to become familiar with at least one person and increase the predictability of routine events. In the three alternative treatments, handling necessary for routine care was primarily done by the experimenter and/or one of two research assistants using a similar technique. The handler began by talking to the cat, primarily to entice him/her to come to the front of the cage. The handler then placed one hand over the cat's body then lifted the cat and secured him/her under the left arm while softly gripping the cat's front legs. For difficult cats and to prevent escape, biting or scratching the right hand could be placed under the cat's head or at the base of the neck in a soft scruff to have more control. The final step was to place the cat in an adjacent precleaned cage. Cats showing signs of fear (as indicated by stress level of 3 or more) usually could not be enticed to the front of the cage. More vocal and tactile reassurance was provided and in some cases, highly stressed cats were covered by a towel, picked up (as described above) and placed directly into the hiding area of the pre-cleaned cage. Consistent handling included an additional five to ten minutes interaction with the experimenter either playing, talking or stroking.


Figure 2.1 A Standard Treatment cage.


Figure 2.2 The Enriched Single Treatment cage without hiding area.


Figure 2.2 a The Enriched Single Treatment cage with hiding area.


Figure 2.3.
The Basic Communal Treatment cage.


Figure 2.4. A plastic bin $30 \times 30 \times 19 \mathrm{~cm}$ with one open side.


Figure 2.5 The Enriched Communal Treatment cage.

Table 2.1. A summary of environmental and social conditions of each treatment

| Treatment features <br> opportunity to: | Standard <br> perch | Enriched <br> Single | Basic <br> Communal | Enriched <br> Communal |
| :--- | :--- | :--- | :--- | :--- |
| hide or semi-hide | no | yes | yes | yes |

Cats
Cats arrived at the shelter from various sources: (1) stray cats brought in by a person other than the owner or picked up by animal control officers, (2) cats relinquished to the shelter by their owner, (3) cats from the VRB hospital that had undergone treatment for medical conditions, injury and/or neutering and (4) cats transferred from other shelters due to the lack of space. A total of 165 cats were accepted in the study.

All neutered cats over the age of one year, having received the Feline RhinotracheitisCalici Vaccine (by Felomune CVR®) and classified by SPCA staff as adoptable (brought in by the owner, or in the possession of the SPCA for 7 days) were informally tested for cat-cat aggression. The test was done by placing the cat in an open wire cage in one of the communal enclosures. Cats displaying extreme aggression (indicated by lunging while producing a deep growl and spitting from the throat while keeping the ears up and forward) were not accepted for the study. Only two of all the cats tested were not accepted in the study; they showed extreme aggression; both were males of the Siamese breed. One of the cats had been neutered 48 hours prior to the testing. Sampling of convenience was used to assign cats to treatment with the provision that the single cages were kept full. Cats meeting all sampling criteria were therefore placed in one of the four housing conditions based on availability of space with single cages being filled first. Table 2.2 shows the number of cats in each treatment from each of the four sources listed above (strays, relinquished, hospital, or other shelters).

A "Cat Information Record" (Appendix A) was completed for every cat involved in the study. Demographic information (physical characteristics, age and spay/neuter status, origin, and medical condition) was recorded on the day of the cat's arrival and outcome information (See Appendix B) was added for each cat upon leaving the study. There were four possible outcome categories: (1) "Adopted" when a visitor took the cat home after completing the adoption process; (2) "Sent to isolation" when the Animal Health Technologist (AHT) classified the cat as sick but treatable; (3) "Euthanised" when the AHT assessed the cat as sick with complicating factors, and (4) "Time-up" when a cat had not been adopted after 21 days of exposure.

A subsample of 117 cats (see Table 2.2 for details on sample size, number of assessed cats per day per treatment) were assessed daily using the Cat-Stress-Score (Kessler \& Turner, 1997) (Appendix C). The stress assessment procedure started in the latter part of the morning following cleaning. Interruptions of the assessment procedure were frequent, often because incoming cats relinquished to the shelter were in need of immediate housing. (cages not used for the study were sometimes full). For each assessment, a cat was first observed from a distance of about one meter with no physical interaction. Levels of activity and vocalization, posture, and movement with particular attention to abdomen, legs, tail, head, ears were recorded using the Stress Log (Appendix C). The researcher then approached the cat to observe breathing rhythm, position of whiskers and eyes including pupil dilation and if eye lids were partially or fully open and relaxed or pressed together. A score based on the criteria given in the Cat-Stress-Score (level 1-7) was assigned and noted on the Cat Information Record together with the date

Assessments were done when the ambient temperature was between $15^{\circ} \mathrm{C}$ and $30^{\circ} \mathrm{C}$, visual access to a cat was adequate and when no extraordinary event was taking place that could affect scoring.

Table 2.2 Distribution of cats in each treatment per origin.

|  | Standard | Enriched <br> Single | Basic <br> Communal | Enriched <br> Communal |
| :--- | :--- | :--- | :--- | :--- |
| Relinquished | 15 | 15 | 24 | 22 |
| Stray | 11 | 11 | 17 | 16 |
| Hospital | 5 | 7 | 10 | 6 |
| Other | 0 | 1 | 3 | 2 |
| Total | 31 | 34 | 54 | 46 |

Table 2.3 Number of cats assessed for stress per day per treatment.
Stress assessments were stopped after the first 117 cats had been evaluated, as the sample was deemed large enough to obtain significant results.

|  | Day |  |  |  |  |  |  |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Treatments | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ | $\mathbf{5}$ | $\mathbf{6}$ | $\mathbf{7}$ | $\mathbf{8}$ | $\mathbf{9}$ | $\mathbf{1 0}$ |  |
| Standard | 8 | 17 | 10 | 18 | 15 | 10 | 6 | 9 | 10 | 8 |  |
| Enriched Single | 10 | 13 | 10 | 8 | 11 | 5 | 4 | 7 | 5 | 7 |  |
| Basic Communal | 23 | 30 | 18 | 20 | 13 | 12 | 7 | 9 | 7 | 7 |  |
| Enriched Communal | 20 | 24 | 16 | 16 | 18 | 9 | 7 | 11 | 6 | 5 |  |

## Adopters

The adoption process at the Vancouver shelter includes the following steps: a visitor interested in adopting a cat takes the cat's identification card (usually found on the cage door) to the reception area where they sign an adoption contract and pay an adoption fee. Once the adoption process is completed, the adopter returns to the adoption area and a volunteer places the cat in a cardboard carrier, at which time the adopter can take the cat home.

People adopting cats from the study (cats from the study had no special identification) were told about the study after they had started the adoption process. They were asked to read an information letter about the study and were asked for voluntary participation by completing an "Adoption Questionnaire" (Appendix D). Seventy-three percent of people adopting cats in the study completed the questionnaire.

The Cat Adoption Questionnaire based on previous surveys of adopters of shelter animals (Endenburg et al., 1994; Karsh \& Turner, 1988; Podberscek \& Blackshaw, 1988; Rochlitz et al., 1996; Wells \& Hepper, 1992, was developed by the researcher to examine the factors most important to adopters in their selection of a shelter cat. Respondents were asked to identify the selection criteria by rating various physical, behavioural, and environmental factors as (1) Not at all important, (2) Somewhat important, (3) Very important, (4) Don't know, and (5) Not relevant. Additional questions included the intention of the adopter before arriving at the shelter - i.e. to adopt a kitten versus an adult, reasons for wanting to adopt a cat, as well as additional comments about the selection process.

## Statistical Analysis

A $4 \times 4$ table was used to assign each cat in each treatment (Standard, Enriched Single, Basic Communal, Enriched Communal) to one of four outcomes (Adopted, Sent to Isolation, Euthanised, Time-up). For Chi-Squared analysis, the last three outcomes (cats that were not adopted) were combined to give acceptably large expected values in each cell. A Chi squared test (Siegel \& Castellan, 1988) with 3 degrees of freedom was used to compare the number of cats either adopted or not adopted in each treatment.

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.

The stress scores were analyzed 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 the treatment ( 113 df ), as well as the linear effect of days ( 1 df ) tested against an error term based on the stress scores of all cats on all days ( 349 df ). The analysis was done after $\log$ transformation to normalize the distribution. Because the data did not fully conform to the assumptions of standard parametric analysis, a non-parametric test (KruskallWallis one-way analysis of variance by ranks; Siegel and Castellan, 1988) was also used to test for differences between treatments, using the mean stress score for each cat averaged over all days on which a given cat was scored. Differences between pairs of treatments in average stress scores from days 1 to 10 were tested using the Duncan's Multiple Range Test (SAS Institute, 1994).

A similar analysis of the stress scores (least squares analysis using PROC GLM of SAS, and the Kruskall-Wallis Test) was used to compare cats classified by outcome (Adopted, Euthanised, Sent to Isolation, Time-up) instead of treatment. Differences between outcome categories in average stress scores from days 1 to 7 were tested using the Duncan's Multiple Range Test (SAS Institute, 1994). The ánalysis was done for 7 days rather than 10 because of the small sample size after that day.

## 3. Results

## Outcome

Only $45 \%$ of the cats in the Standard Treatment were adopted, whereas $76 \%, 74 \%$ and $68 \%$ were adopted in the Enriched Single, Basic Communal and Enriched Communal respectively (Table $3.1 ; \chi^{2}=10.9,3 \mathrm{df}, \mathrm{P}<0.02$ ). Euthanasia rate in the Standard Treatment was $16 \%$ while it was $6 \%, 2 \%$ and $6 \%$ for the Enriched Single, Basic Communal and Enriched Communal respectively. The rate of sickness (sent to isolation for treatment) for cats in Standard Treatment was $26 \%$ while it was $12 \%$ in the Enriched Single, $22 \%$ in the Basic Communal and $22 \%$ in the Enriched Communal. The rate of cats not adopted after 21 days (Time up) was $13 \%$ in the Standard Treatment, $6 \%$ in the Enriched Single, 2\% in the Basic Communal and 2\% in the Enriched Communal Treatments. Cats in the Standard Treatment waited a median of 12.5 days whereas those in the three alternative treatments waited a median of approximately 5 days (Fig. 3.1; P $<0.02$ by the Extension to the Median Test).

## Stress

The stress scores were similar for all four treatments on day 1, but scores were higher on average for cats in the Standard Treatment compared to the three alternative treatments until day 9 (Fig. 3.2). The Least Squares analysis showed a significant effect of treatment $\left(\mathrm{F}_{3}, 113=5.67, \mathrm{P}<.001\right)$ and a significant regression of scores on days $\left(\mathrm{F}_{1}, 349\right.$ $=38.5, \mathrm{P}<0.001$ ), but no interaction of treatment and days $(\mathrm{F}=0.24)$. The non-parametric Kruskall-Wallis test confirmed the result ( $\mathrm{P}<0.0084$ ). Duncan's Multiple Range Test showed that the Standard Treatment differed significantly ( $\mathrm{P}<0.05$ ) from all other treatments, whereas the other treatments did not differ from each other.

The 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, Time-up). The Least Squares analysis showed a difference between the four outcomes ( $\mathrm{F}_{3}$, $104=3.77, \mathrm{P}<0.05$ ) (Fig. 3.3). The Duncan's Multiple Range Test showed that the Standard Treatment differed significantly ( $\mathrm{P}<0.05$ ) from the other three categories (Adopted, Sent to Isolation, Time up), whereas the other categories did not differ from each other. The nonparametric Kruskall-Wallis test, comparing Euthanised cats with the other three groups (Adopted, Isolation, Time-up), confirmed the significance of the difference ( $\mathrm{P}<0.05$ ).

For 71 cats, stress scores were recorded at time of departure from the study. Of these, the majority of the animals that were adopted ( $69 \%$ ), or sent to isolation ( $64 \%$ ) had scores of two, while only $21 \%$ of adopted cats and $21 \%$ of cats sent to isolation scored 3 or higher. In contrast, $25 \%$ of cats euthanised, and $40 \%$ of cats removed because time was up, scored two, while $75 \%$ and $60 \%$ respectively scored three or higher (Table 3.2).

Table 3.1. Number of cats in each outcome category per housing condition.

|  | Treatments |  |  |  |
| :--- | :---: | :---: | :---: | :---: |
| Outcome | Standard | Enriched <br> Single | Basic <br> Communal | Enriched <br> Communal |
| Adopted | 14 | 26 | 40 | 32 |
| Euthanised | 5 | 2 | 1 | 3 |
| Isolation | 8 | 4 | 12 | 10 |
| Time up | 4 | 2 | 1 | 1 |
| Total | 31 | 34 | 54 | 46 |



Figure 3.1 Median length of stay (in days) for cats awaiting adoption in the four treatments. Results are based on all cats that remained in the study (e.g., were not removed for health reasons) until they were adopted or until a maximum of 21 days.


Figure 3.2. Mean stress scores in the four treatments for days 1 to 10 .


Figure 3.3 Mean stress scores in the four outcome categories (Euthanised, Sent to Isolation, Adopted, and Time-up) for days 1 to 7. (Average stress scores for the outcome categories " Isolation" and "Time-up" were very similar from days 1-7)

Table 3.2 Number and percentage of cats scoring level 1,2,3 or higher on the day of departure from the study.

|  | Stress scores on the day of departure |  |  |
| :--- | :---: | :---: | :---: |
| Outcome | Level 1 | Level 2 | Level 3 and higher |
| Adopted | $10 \%(5 / 48)$ | $69 \%(33 / 48)$ | $21 \%(10 / 48)$ |
| Isolation | $15(2 / 13)$ | $64 \%(9 / 13)$ | $21 \%(3 / 13)$ |
| Euthanised | $0 \%(0 / 4)$ | $25 \%(1 / 4)$ | $75 \%(3 / 4)$ |
| Time-up | $0 \%(0 / 5)$ | $40 \%(2 / 5)$ | $60 \%(3 / 5)$ |

## Selection criteria

As indicated in Table 3.3, the most common reasons given for adopting a cat were for feline companionship and to save it from death.

Physical characteristics cited as important by more than $50 \%$ of adopters were "being neutered", "length of coat", and "coat colour", while fewer than $50 \%$ of respondents cited "size", "eye colour", "breed type" and "sex" as important.

A large number of respondents expressed a preference for cats they perceived as friendly, playful, happy, relaxed, friendly with other cats and smart, while fewer than half the respondents cited the cat being shy, sad or fearful as reasons for adoption.

Results indicated that being able to enter the cage and to 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 fewer than $23 \%$ of adopters.

Additional comments provided by respondents identified a preference for playfulness, friendliness and affectionate disposition - "She caught my attention, was playful", "Looked relaxed and calm", "The main reason is his personality, he is affectionate", "Seems full of energy", "Active curious", "Seemed friendly and cuddly", "Very alert and affectionate", "Looks like a fun cat, very affectionate", "Very affectionate, she seems to like me", "Friendly and lovable." Some people commented on their ability to estimate the cat's sociability with other cats and wrote: "I could see him with other cats, he seemed very mellow and noncombative" and "Gets along with other cats." Comments indicating pity as a selection criteria were given regarding one cat in the Communal Enriched Treatment "She is an older cat, harder to adopt", and three cats in the Standard Treatment: "Had a history of not being loved, wanted to purchase a cat that I could make a difference with", "He had been there for a long time, looked depressed", and "Being shy and alone, he looked like he needed a home".

Table 3.3 Percentage of 71 respondents citing the various physical, behavioural and environmental criteria as "important", listed in descending order.

Selection Criteria $\%$ citing as "important"

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

Physical
Spayed/neutered 70
Coat length 68
Coat colour 56
Size 43
Sex 43
Breed type 29
Eye colour 18
Behavioural and emotional
Friendly with me 100
Playful 86
Happy 73
Relaxed 71
Friendly with other cats 69
Smart 66
Shy 45
Sad 44
Fearful 38

## Environmental

Able to enter cage 74
Viewed with other cats 52
Toys 38
Shelves 22
Alone in cage 22
Hiding in litter-box 19
Reasons for adoption
Companionship for me 88
To save from death 81
Companionship for other cat 23
Companionship for children 18
Companionship for dogs 7

## 4. Discussion

To summarize, compared to the three other treatments, the Standard Treatment yielded the lowest adoption rate, longest length of time awaiting adoption and the highest percentage of cats not adopted after 21 days. As well, while a similar number of cats became sick in all treatments, more of those in the Standard Treatment were euthanised. Finally, cats in the Standard Treatment displayed behaviour cited as desirable by adopters less often than cats in the three other treatments.

The three alternative treatments, which provided consistent handling and varying degrees of environmental complexity, did not differ greatly from each other, so the results give little guidance on exactly which aspects of the three experimental treatments led to the beneficial effect. The results are consistent, however, with a reduction in stress in the experimental treatments being involved in the higher adoption rate. Results from the Adoption Questionnaire indicated that most people preferred to adopt cats they perceived as "friendly", "playful", "happy", "relaxed" and smart". To be perceived as having these attributes a cat must display some level of activity, be somewhat interactive, show interest in the visitors, and not show signs of fear or aggression. Such behaviour would be typical of cats scoring 2 on the Cat-Stress-Score (Kessler \& Turner, 1997). In this study, $69 \%$ of cats in the Adopted category scored 2 on the day of departure, while $31 \%$ scored 1,3 or higher. Level 1 cats are usually sleeping and level 3 or higher usually engage in behaviour that makes them appear fearful and/or aggressive, or at least not interested in the visitor's attempt at interaction.

The findings indicate an effect of the treatments on stress scores, with higher scores in the Standard Treatment than the three alternatives. Although, stress scores declined at the same rate in all treatments, the average stress scores of cats in the Standard Treatment remained consistently higher. Conditions found by other researchers to be stressing for cats include unpredictable events, lack of control over amount and timing of exposure to people, proximity between feeding and elimination areas, lack of opportunity for familiarization with at least one caretaker, and (for some cats) proximity to other cats (McCune, 1994; Rochlitz, 1997; Roy, 1992; Smith et al., 1994). Cats in the Standard Treatment were not provided with a hiding area; and although some cats were found in the morning hiding under shredded newspaper, the practice of cleaning the cages every morning left them with no control over the amount and timing of exposure to visitors during the day. In addition, Standard cages did not provide separation between sleeping, feeding and elimination areas, thus cats were forced to eat and sleep in close proximity to the litter box. Finally, the lack of consistent handling and rotation of caretakers rendered routine events unpredictable and familiarization with one person unlikely. In contrast, cats in the Enriched Single Treatment had some control over the environment. They could sit on the shelf and survey the whole room and could hide at will in the hiding area under the shelf. The size of single cages meant that cats in the Enriched Single Treatment were still eating close to the litterbox (although with the feeding station elevated by 2 cm off the bottom of the cage); however, the shelf provided separation between sleeping and other areas. The small number of caretakers and consistent handling provided by these caretakers made procedures such as feeding and cleaning more predictable, and familiarization with at least one person was more likely.

Cats in the Basic and Enriched Communal cages benefited from the same conditions as those provided to cats in the Enriched Single with additional space and use of various cage
items which added complexity to the environment. However, the two Communal treatments did not make provision for each cat to acquire personal space; hence, cats in the Enriched Communal Treatment had less control over the amount and timing of contact with other cats. Several researchers have stated that for some cats proximity to other cats can be stressing (McCune, 1992; Smith et al., 1994). Caretakers reported that cats in the Enriched Communal showed more hissing and striking between cats, and more hissing directed at the caretakers during routine care, than in the Basic Communal cage. Further research is needed to identify the effect of personal space on cat-cat and cat-caretaker interactions. Specific emotional states reported to be experienced by shelter cats such as anxiety and fear (Holmes, 1993) could not to be distinguished in this study. Literature on companion animal welfare uses these terms liberally; however, the processes involved and a clear explanation of these states are not provided. It was beyond the scope of this study to attempt to differentiate among anxiety, fear and stress for the purpose of assessing welfare.

Although it is widely believed that shelter cats need to be caged separately to prevent spread of disease, in our study similar numbers of cats from each treatment had to be removed for health reasons; however, more cats from the Standard Treatment were euthanised due to illness than in the other three treatments. The Animal Health Technologist (AHT) decided to euthanise (rather than treat) some cats because of complicating factors such as anorexia and/or non-compliance or aggressive response to handling. Results indicated that cats in the "euthanised" outcome category had a higher stress level than those in the other categories. Endocrine responses to stress are known to reduce many aspects of the body's immune responses (Sapolsky, 1992), thus the greater stress in the Standard Treatment could have rendered treatment more difficult. Further research is needed to examine the relationship between the stress measure and the severity of disease in the shelter environment.

Respondents cited cat personality based on behaviour as the most important criteria for selecting a cat; however, other factors were also found to influence selection of cats. Respondents reported "Being neutered" as an important factor in the selection. All cats from the study were neutered because intact cats cannot be housed communally; thus this criterion did not differentially affect rates of adoption between treatments. Respondents did not indicate if they would have selected their chosen cat had s/he not been neutered or whether they selected from the experiment (which were all neutered) rather than a non-experimental cat (which were not neutered) because of the neutering status. Coat length and to a lesser extent coat colour and size were identified by about half of the respondents as important factors in the selection of a cat. Previous studies had found age, coat colour and size to be important factors in the selection of cats by adopters (Rochlitz et al., 1996; Podberscek and Blackshaw, 1988).

Environmental features of the housing treatments may also have contributed to adoptions. Many people reported that being able to enter the cage, as well as seeing cats with other cats, influenced their selection of a cat. For a small number of people, pity for the cat was reported as a contributing factor to the decision to adopt. Therefore, the usual shelter housing for cats such as those provided in the Standard Treatment with no shelf, hiding place, or toys may have contributed to some adoptions.

In this study, several difficulties were encountered when scoring cats with the Cat-Stress-Score. Some cats engaged in tail twitching (a behaviour expected of level 3 or higher) when otherwise seeming to fit into level 1 (fully relaxed) based on posture. Some cats
displaying characteristics of level 1 (fully relaxed) were found to be sick; while seemingly relaxed, they were also inhibiting eating, grooming and elimination behaviour. Some conditions inherent to the shelter environment may also have influenced stress scores based on time of day or day of the week. Cats that were assessed while the cleaning and feeding of dogs was in progress may have scored higher as a result of the higher level of noise and activity than if they had been scored at quieter times.

Conditions that promote rapid adoption may have economic advantages through increased adoption revenue and reduced sheltering cost per animal. The cost of caring for one cat for one day is about four dollars (Personal communication, Director of Field Operations, B.C. Society for the Prevention of Cruelty to Animals, Vancouver Regional Branch). Therefore, based on the number of days a cat remained in the shelter waiting to be adopted, the usual cost of caring for a cat at VRB is $\$ 50.00$. In the three alternative treatments, the cost of caring for a cat was between $\$ 18.00$ and $\$ 22.00$. Furthermore, in the Communal Treatments, savings resulted from the reduced time it took to clean eight cats residing in one cage rather than eight individual cages. These figures do not factor in the potential initial cost of training staff and volunteers if such alternatives were implemented. Adoption revenues from the alternative treatments were also greater than from the Standard Treatment. During the same four month period, while 14 cats were adopted from the Standard cages, 26, 40 and 32 cats were adopted from the Enriched Single, Basic Communal and Enriched Communal respectively.

Furthermore, sheltering professionals report that donors' contributions to animal shelters are influenced by the rate of euthanasia, and that the productivity of shelter staff may be influenced by the stress experienced as a result of killing animals (HSUS, 1995). The alternative treatments resulted in a decrease in the usual euthanasia rate, thus possibly further increasing the economic advantages of such alternative sheltering practices.

## Conclusions

The results of this study suggest that the welfare and adoption rate of shelter cats can be significantly improved by increasing the complexity of housing and providing cats with consistent handling and the opportunity for familiarization with a caretaker. This study does not support the claim that disease is more likely to spread when cats are housed communally. Further research is needed to determine which aspect of the proposed sheltering practices may have the best potential to improve welfare and increase adoption rates.

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## CAT INFORMATION RECORD

_ Adopted
Time up
_ Iso
Euthanasia

SPCA Id \#: $\qquad$ Sample Id number: $\qquad$
Cage Assignment: $\qquad$ Adoption date: $\qquad$
Arrival in the system: $\qquad$ Removal date: $\qquad$
Arrival in the study: $\qquad$

| Physical characteristics | Medical / non medical procedures |  |  |
| :--- | :--- | :--- | :--- |
| Sex: <br> Age: <br> Eye colour: <br> Coat colour: <br> Breed/breed type: <br> Other: | Nasal vaccination: <br> Spay /neuter: <br> Medication: <br> Surgery for injury: <br> Shaved: <br> Other: |  |  |
| Date | Score | Date | Score |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Comments:



## Adoption Questionnaire

Cat's identification number: $\qquad$ Today's date: $\qquad$

|  | Yes | No | Not Sure |
| :--- | :--- | :--- | :--- |
| I viewed all the cats before selecting mine |  |  |  |
| I came here today with the intention of adopting an $\underline{\text { adult cat }}$ |  |  |  |
| I came here today with the intention of adopting a kitten |  |  |  |
| My cat was in a single cage with $\underline{\text { no } \text { shelf }}$ |  |  |  |
| My cat was in a single cage with a shelf |  |  |  |
| My cat was in a communal cage with $\underline{\text { no toys }}$ |  |  |  |
| My cat was in a communal cage with toys and a playhouse |  |  |  |

## Reasons that influenced my decision to adopt

|  | Very <br> important | Somewhat <br> important | Not at all <br> important | Not <br> relevant | Don't <br> know |
| :--- | :--- | :--- | :--- | :--- | :--- |
| I want this cat to keep company to my other <br> cat |  |  |  |  |  |
| I want this cat to keep me company |  |  |  |  |  |
| I want this cat to keep company to my dog |  |  |  |  |  |
| I want this cat for my kids |  |  |  |  |  |
| I want this cat to save it from death |  |  |  |  |  |
| Other: |  |  |  |  |  |

Physical characteristics that influenced my decision

|  | Very <br> important | Somewhat <br> important | Not at all <br> important | Not <br> relevant | Don't <br> know |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Coat colour |  |  |  |  |  |
| Coat length |  |  |  |  |  |
| Eye colour |  |  |  |  |  |
| Size |  |  |  |  |  |
| Spayed/neutered |  |  |  |  |  |
| Sex |  |  |  |  |  |
| Breed Type |  |  |  |  |  |
| Other |  |  |  |  |  |

Other:

The personality traits that influenced my selection

|  | Very <br> important | Somewhat <br> important | Not at all <br> important | Not <br> relevant | Don't <br> know |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Friendly (towards cats) |  |  |  |  |  |
| Friendly (towards me) |  |  |  |  |  |
| Playful |  |  |  |  |  |
| Happy |  |  |  |  |  |
| Sad |  |  |  |  |  |
| Fearful |  |  |  |  | - |
| Shy |  |  |  |  |  |
| Smart |  |  |  |  |  |
| Laid back |  |  |  |  |  |
| Other\| |  |  |  |  |  |

Other:

## Environmental factors that influenced my decision

|  | Very <br> important | Somewhat <br> important | Not at all <br> important | Not <br> relevant | Don't <br> know |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Seeing the cat with other cats |  |  |  |  |  |
| Being able to go into the cage with the cats |  |  |  |  |  |
| Watching my cat play with toys |  |  |  |  |  |
| Seeing my cat trying to hide under a shelf |  |  |  |  |  |
| Seeing my cat laying in his/her litterbox |  |  |  |  |  |
| Seeing my cat by himself/herself in a cage |  |  |  |  |  |
| Other: |  |  |  |  |  |

If needed, use the space below to provide additional information as to why you selected your cat over all the other cats you saw today.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$

Please leave the completed questionnaire with the Adoption Officer

## Thank you for participating in this study

