Behavioural Therapy Success and the Effect of Socialisation on Subsequent Behaviour in Dogs.

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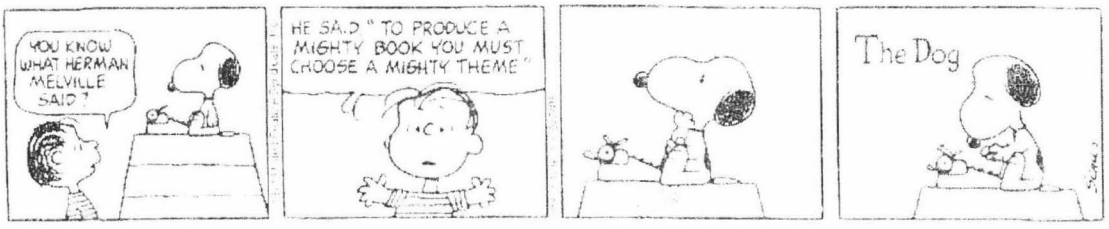
PEANUTS


YOU KNOW WHAT HERMAN MELVILLE SAID?
HE SAID "TO PRODUCE A MIGHTY BOOK YOU MUST CHOOSE A MIGHTY THEME"
The Dog

Recommended amendments

The following amendments were suggested by the examiners of the thesis and accepted as being well advised. As they were minor amendments the thesis was not modified.

In the section Aims of the Thesis (page 35-36) the word 'investigate' should be replaced by either 'assess' or 'report'.

The term 'report' should be used rather than 'assess' in the first aim of the Socialisation Study (page 35).

Mat Ward
29-9-2003

Abstract

The success of a three-week "in-clinic" behaviour modification program for the treatment of behaviour problems in dogs was investigated. This form of therapy was found to be an effective treatment for a variety of canine behaviour problems. The practicality of the consultant's recommendations for continuing therapy at home was the factor most closely associated with therapy success. Improvement in obedience was linked with therapy success for dogs that attended the clinic for problems other than obedience. The use of a remote-activated electronic collar was found to be very effective for the treatment of undesirable behaviour. There was some regression to pre-therapy behaviour once use of the collars was discontinued. Use of electronic collars did not result in any negative changes to behaviour or personality for most dogs, although negative effects were reported in some dogs. Use of electronic collars was found to be very effective in stopping inappropriate predatory behaviour towards sheep in the long term; this was not the case for predatory behaviour towards cats.

The early socialisation experience of dogs was compared with their adult behaviour. The mean level of socialisation before 12 weeks of age was found to be 3 to 4 new people a week, 1 new dog a week, and 2 to 3 new environments a week. The amount of social and environmental exposure a puppy receives was found to be positively correlated with measures of sociability, and negatively correlated with measures of fear and aggression. The amount of socialisation "in general" was the measure of early experience found to be most closely associated with desirable behaviour in adulthood. Socialisation with other species was negatively correlated with inappropriate predatory behaviour. Dogs that attended puppy socialisation class were found to be less fearful, less aggressive, and more social. No differences were found between attendees and non-attendees of socialisation classes in measures of obedience, or fear of novel stimuli, novel environments or veterinary clinics. Dogs that attended puppy socialisation classes before 10 weeks of age were less fearful of strange dogs than dogs that attended after 10 weeks. Female dogs were more aggressive and less sociable. Spayed female dogs were more likely than entire females to snap at familiar dogs. The data highlights the importance of early socialisation in the development of a well-adjusted dog.

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CHAPTER 1

A Literature Review of Canine Behavioural Therapy and the Effect of Socialisation on Subsequent Behaviour in Dogs

"Killing the dog does not cure the bite"

Abraham Lincoln

1.1 Introduction

1.1.1 Dogs and humans

Dogs can be a wonderful addition to the lives of humans. Their companionship, loyalty, playfulness, trainability, and ability to entertain provides a truly positive aspect to many human lives. The 12,000 year old bones of an Natufian woman found buried embracing a dog is testimony to the long and rewarding relationship humans have had with the domesticated wolf (Davis and Valla, 1978). However, this relationship is not always positive. A beloved pet can still destroy new shoes, bark incessantly, or bite a visiting toddler. Dog complaints are the number one issue for many city councils. The cost of injuries resulting from dog bites has been estimated at around US$30 million a year in America (Goldstein and Richwald, 1987), with $1 billion dollars a year being paid out by insurance companies as a result of dog bites (Daristotle, 1994). The toll on dogs themselves as a result of their behaviour problems is also significant. Of the 15 to 20 million dogs euthanased each year in American animal shelters (Anderson & Foster, 1995), it is estimated that 50% to 70% of them are euthanased as a result of undesirable behaviour (Sigler, 1991). For the wellbeing of humans and dogs it is important that help is available when there are problems with a dog's behaviour.

1.1.2 Thesis summary

This thesis examines some relevant aspects of this issue, i.e. the effect of early socialisation on the later behaviour of dogs, and the success of "in-clinic" behaviour therapy. The thesis is divided into four chapters. Chapter 1 contains a review of the relevant theory and literature. Chapter 2 reports on research as to the success of the author's "in-clinic" canine behaviour therapy. Chapter 3 reports on research into the effects of early socialisation on subsequent canine behaviour. Chapter 4 is a general discussion of the results of both sets of research.

In chapter 1, the reasons for the development of an applied animal behaviour science and its relevance to canine behaviour are explored. This is followed by a review of the canine behavioural consultancy process in which common etiological factors for canine behaviour problems, the process of diagnosis, and therapy are discussed. In this chapter the literature on the success of canine behavioural therapy is reviewed.

The second part of chapter 1 reviews the literature on the "sensitive period for socialisation" hypothesis. One of the common etiological factors mentioned in the canine behaviour problem literature is inadequate early socialisation. A discussion of the sensitive period hypothesis is followed by a review of research investigating when the sensitive period for socialisation occurs in dogs. The practical implications of this are then discussed, with particular reference to formal puppy socialisation classes.

There is a lack of published work on the success of canine behavioural therapy. The studies that do exist are limited in their breadth, or have poorly defined measures of success. If more behaviour consultants published follow-up studies on their behavioural cases it would provide invaluable information as to the efficacy of various treatment protocols. A study of this nature is presented in chapter 2, where the efficacy of "in-clinic" therapy is investigated. In-clinic therapy consists of the dog staying at a Behaviour Clinic facility for three weeks of behaviour modification, after which an education session is held with the owners of the dog before they take it home. This process affords various advantages over consultation alone. The aim of the study was to investigate the efficacy of various aspects of the in-clinic process. These aspects were: the success of in-clinic therapy in general, the success of therapy for different behaviour problems, investigation of which clinic-related and consultant-related factors affect success, and the role of remote-activated electronic collars in behaviour modification.

The effect of early socialisation on later dog behaviour is the focus of the study outlined in chapter 3. In this study the effect of social and environmental exposure on later dog behaviour was investigated for 96 dogs through a questionnaire-based survey. Information was obtained for dogs that had taken part in formal puppy socialisation classes and for those that had not. By comparing the level and type of early socialisation with later adult behaviour it is hoped that a better idea can be obtained of the role that various forms of early socialisation play in the development of behaviour. The efficacy of puppy socialisation classes was also investigated by comparing the adult behaviour of dogs that attended these classes and those that did not. Comparison is made between dogs that attended such classes before 10 weeks of age and those that attended after 10 weeks.

In chapter 4 the material presented in chapters 2 and 3 are summarised in a general discussion and ideas for future research are discussed.

1.2 The pet behaviour therapy field

Is euthanasia the only option for a sheep-worrying dog? Can the dog that growls at and attacks its owners be made safe? Is there any chance of improving the confidence of a dog terrified by car travel? Who should a dog owner consult about these questions? Thirty years ago it was very difficult for dog owners to get quality advice on canine behavioural matters such as these. Veterinarians, dog trainers, and breeders were responsible for providing solutions to pet behaviour problems but there was a lack of expertise in the area. Over the past three decades, however, the specialised area of canine behaviour counselling has expanded rapidly.

The expansion of the pet behaviour therapy field can be seen as an extension and utilisation of knowledge generated by research in the animal behaviour fields of experimental psychology and ethology. Much of the knowledge needed to successfully treat behaviour problems had been developed through these disciplines, and there has been sufficient demand from pet owners to warrant academic and professional interest in the area. The beginning of applied animal psychology is marked by a paper by Tuber *et al.* (1974) in which behavioural protocols were outlined for the treatment of a number of pet behavioural problems. The paper also urged those involved in animal behaviour to use their skills in the treatment of behaviour problems in pets. Since this paper was published, the applied animal behaviour field has grown steadily.

1.2.1 Impact of canine behaviour problems

The need for professional and scientifically-based guidance for pet behaviour issues is illustrated by a number of observations. First, behavioural problems are the primary reason for the euthanasia of dogs in animal shelters. Of the 15 to 20 million dogs that are euthanased each year in American animal shelters (Anderson and Foster, 1995) 50 to 70% are thought to be euthanased because of undesirable behaviour (Sigler, 1991). In addition to dogs euthanased in shelters, at least this number of pet dogs are thought to be euthanased by veterinarians due to behavioural problems (Overall, 1997a). Although behavioural problems may be used as an excuse by some to surrender or euthanase animals, causing an inflated representation of "behavioural problems" as a reason for surrender and euthanasia, it is

undeniable that behaviour problems contribute to the unnecessary deaths of large numbers of dogs worldwide. In a society concerned about the wellbeing of companion animals this provides an underlying impetus to advance the scientific study of dog behaviour.

Despite the number of dogs euthanased for behavioural reasons, a large proportion of dog owners regard surrender or euthanasia as a highly undesirable option. This is because the dog is often seen as a much loved family member rather than an expendable possession. In modern society dog owners often have a sense of affection and responsibility towards a dog that is analogous to parental feelings of caring (Askew, 1996). As a result of these feelings, owners of dogs with behavioural problems are often prepared to spend considerable time, energy, and money in order to solve a behavioural problem rather than resorting to rehoming or euthanasia. Ironically this altruistic trend may help to maintain or even increase the level of problem behaviour in dogs by maintaining genotypes that predispose dogs to behaviour problems. Voith (1981) reported that love and affection was the prime reason (55% of behavioural cases) for owners consulting a behaviour consultant rather than getting rid of a dog. The negative impact of disruptive, destructive, dangerous, or annoying behaviours mean that professional help is the only option for many dog owners. Considering that between 42% and 87% of dog owners report one or more behavioural problems in their dog (Voith, 1985; Campbell, 1986), it is not surprising that the demand for quality behavioural advice has spurred the growth of this aspect of the applied ethology.

The effect of canine behavioural problems on those who do not own dogs is also responsible for this clinical speciality. Canine behaviour problems such as aggression, barking, and inappropriate predatory behaviour affect people who do not own dogs. Social pressure can be placed on dog owners by local government authorities to solve behaviour problems, even if they do not affect the owners themselves. Inappropriate aggression in particular is of concern. Dog bites inflicted on humans are responsible for 1% of all emergency hospital visits in America, cost $30 million in health care (Goldstein and Richwald, 1987) and around $1 billion in insurance claims per annum (Daristotle, 1994). Seventeen percent of children have received dog bites serious enough to require medical attention (August, 1988). In New Zealand there were 8677 ACC claims for dog bites in 2001/2002. The prevalence of aggression as a behavioural problem in dogs, and the seriousness with which it is taken, is represented by the number of owners prepared to seek advice from a behavioural consultant. Although house-soiling seems to be the most common behavioural problem for dog owners,

(20% of all owners describe this as a problem (Campbell, 1986)), aggression cases occupy 32% to 66% of a behaviour consultant's caseload (Animal Behaviour Consultant Newsletter, 1987, cited in Overall, 1997a; Borchelt, 1983; Landsberg, 1991). Due to the potentially grave consequences of aggression problems, it is natural that behaviour consultants are frequently called on to treat aggression.

1.2.2 Pet behaviour consultants

In order to undertake successful canine behaviour consultancy, a synthesis of different disciplines is required. Knowledge of species-specific behaviour is important in order to accurately interpret the expression of behaviours considered to be a problem. This ethological understanding of the dog's natural behavioural repertoire also allows for the development of behavioural modification programs which best suit the identified problem, as does a thorough understanding of the principals of learning developed by experimental psychologists. Also, an academic background in the sciences helps foster the development of therapies and advice that is based on experimental (or at least documented anecdotal evidence), rather than myth and reliance on personal experience.

In an effort to legitimise the field of behaviour consulting a small number of organisations have been set up to certify those working in the applied animal behaviour field who meet requirements related to the qualities described above. In 1989 in the United Kingdom the Association of Pet Behaviour Counsellors (APBC) was founded to act as a certification body and as a forum for the dissemination and discussion of information. Membership to the APBC is gained by fulfilling a set of criteria requiring appropriate academic qualifications, a history of published work in the field, experience in running a behavioural consultancy practice, and a display of appropriate understanding of the etiology, diagnosis, and treatment rationale of behavioural problems.

In America the Animal Behaviour Society (ABS) has instigated a similar certification process where those involved in applied animal behaviour can submit an application to become an "Applied Animal Behaviourist" (for those with doctoral degrees) or an "Associate Applied Animal Behaviourist" (for those with Masters degrees). Such certification provides a standard for those calling themselves behaviour consultants, which is important for dog owners seeking quality advice.

1.2.3 The veterinary behavioural specialty

Physiological factors contribute to the development of many behaviour problems. An understanding of the role of physiological processes in the etiology of behaviour problems can be very beneficial when advising on behavioural issues. The veterinarian's understanding of the physiological functioning of animals means they are well placed to develop further expertise which enable them to specialise in the treatment of behaviour problems. The ability to modify the physiological and neurological state of an animal through the use of pharmacological agents is very useful when undertaking behavioural therapy.

Already veterinarians spend 20% of clinic time on the 3% to 4% of cases requiring behavioural advice (McKeown and Luesher, 1988). It has also been estimated that up to 15% of clients are lost to practices annually because of behavioural problems (Sigler, 1991). This represents a significant financial loss for veterinarians. Along with the excessive time spent on behavioural advice, this loss provides an incentive for veterinarians to take a greater interest in behavioural medicine, or at least to develop a network of specialists for referral of behavioural cases.

Up until now, however, the number of veterinarians specialising in behaviour has been limited. The lack of interest in behavioural medicine may be because the field is still in its infancy, or there may be a perception that there was not enough financial reward in the field. This seems to be changing now. In 1995 behavioural medicine was recognised as a board-certified veterinary specialty in America. Such certification will undoubtedly increase the number of veterinarians becoming involved in applied animal behaviour, resulting in a greater number of university courses and programs, more teaching staff, more university-based behaviour clinics, and more opportunities for behavioural research. This will advance our understanding of behaviour problems considerably, particularly in the field of psychopharmacology. In future the fields of the non-veterinary behaviour consultant and the veterinarian specialising in behavioural medicine will most likely co-exist cooperatively, much the same as do the fields of human clinical psychology and psychiatry.

1.3 Canine Behavioural Consultation and Therapy Techniques

The effective treatment of behaviour problems in dogs is dependent on an accurate assessment of the etiology of the problem, and a subsequent diagnosis (Askew, 1996). A comprehensive behavioural history of a dog is vital during a behavioural consultation in order to make this diagnosis as accurate as possible (Landsberg *et al.*, 1997). Aspects of a behaviour history that are particularly important for the formation of a diagnosis and subsequent therapy plan will be discussed, as will some of the main causes of behaviour problems. Treatment methods that are linked to the etiology of problems will also be discussed. A brief review of previous studies on the success rates of various behavioural treatments will be covered, and recommendations will be given on the assessment of treatment success.

1.3.1 The behaviour consultation process

The accurate diagnosis of a behavioural problem is dependent on the quality of the information obtained from the client about various aspects of their animal's life. To obtain such information, consultation periods of one to two hours are often recommended (Danneman and Chodrow, 1982; Askew, 1996; Overall, 1997a). During a consultation it is beneficial to have all members of the animal's human family present. This ensures that a balanced view of the animal's behaviour is obtained, since different members of a family will often have different viewpoints on the animal's behaviour.

Direct observation of the behaviour of the animal and of its interactions with family members is also beneficial. By directly observing the animal, reliance on the client's behavioural descriptions is reduced. The chance of totally missing behaviours that are relevant to the diagnosis is also minimised (Overall, 1997a). For example, observation of slightly submissive displays by a client's dog may not have been noticed by the client, and may indicate that the aggression problem seen in the dog derives at least in part from fear.

Another benefit of face-to-face consultations is that the behaviour of the clients towards the animal can be assessed. This is helpful in a number of ways. First, human behaviours which may be exacerbating or maintaining the problem behaviour can be observed (Askew, 1996). For example, clients are rarely aware that by patting their dominantly aggressive dog every

time it lays its head on their lap or leans against their leg they are effectively deferring to the dog. The fact that such behaviours can serve to reinforce a dominantly aggressive dog's perception of its high status, and exacerbate aggressive displays in other contexts, can then be explained to the clients. Without direct observation by the consultant of client-dog interaction, such habitual and almost unconscious behaviours may not be picked up, which can reduce the efficacy of the consultation. O'Farrel (1997) found evidence of an association between some kinds of owner attitudes and certain dog behaviour problems. This is likely to be due to the interaction between client and dog, and should be kept in mind during the consultation.

Observation of client behaviour is also useful in that it can indicate areas where the client may have difficulty in complying with the therapy plan. The client who is seen to behave in a highly anthropomorphic way towards their dog may need a lot of convincing that their dominantly-aggressive pet needs to perform a deferent behaviour such as a "down" before it receives any "love". The unconscious types of behaviours mentioned above can be clearly illustrated to the clients through the use of video footage of the client-pet relationship.

In the initial stages of history-taking it is often useful simply to let clients relate the story of their animal and its problem (Danneman and Chodrow, 1982). This can serve to reduce any awkwardness they may feel in consulting someone about their dog's problems, as they have probably come prepared to describe their animal's problem and its effect on their lives (Askew, 1996). Simply listening to clients also helps to show that the consultant is genuinely concerned about understanding - and therefore solving - the behaviour problem (Askew, 1996). Anything like this which helps to convey an impression of the consultant as being a non-judgmental and concerned specialist will encourage clients to be more honest and open during the history-taking phase of the consultation. Obviously this is very important for the compilation of a thorough history. Allowing a client to freely describe the nature of the problem also enables the consultant to form an opinion of the client's attitudes and feelings towards their dog and its behaviour. This helps the consultant to formulate the best angle with which to explain the nature of the behaviour problem and its treatment.

The broad description of the problem by clients should indicate areas to be probed more deeply by the consultant. Once clients have adequately described the problem, the process of questioning them may begin. The client should be guided through areas of importance -

although care must be taken not to suggest particular answers to the client, either consciously or unconsciously (Evans, 1993). Because there are certain questions which are useful in most consultations it is possible to use a standard questionnaire to obtain the necessary core behavioural information about the pet and the problem.

During the initial description of the problem by the client and the subsequent general questioning, a hypothesis as to the likely cause of the problem is developed. After the general information about the animal has been collected, it is often necessary to test the tentative diagnosis by asking a further set of more specific questions relating to the problem. Through these additional questions the severity of the problem is also assessed. Recently there have been attempts at a formal classification system for dog behaviour problems (Odendaal, 1997; Overall, 1997a) in order to attain some consistency in behavioural diagnosis between specialists. This is still in the early stages of development, but may eventually serve to improve the reliability and validity of abnormal behaviour diagnoses, that will in turn improve the effectiveness of therapy protocols.

1.3.2 Etiology of the behaviour problem and therapy recommendations

After confirmation or re-evaluation of the diagnosis, the likely causes and nature of the problem are then outlined to the clients. This is important for the success of later therapy, since a thorough understanding of the problem by clients should serve to improve their level of compliance with the recommended therapy plan; this is very important for therapy success (Marder, 1996; Polsky, 1994b). Factors influencing the exhibition of the problem behaviour that should be discussed can usually be grouped into three main categories (Askew, 1996). *Learning-mediated effects* include early-experience effects, inadequate or inappropriate training effects, and other environmental conditioning effects. *Physiological considerations* include genetic, hormonal, and pathophysiological factors. *Stimuli* which increase the likelihood of, initiate, exacerbate, or inhibit the problem behaviour are also important to consider.

Discussion of these etiological aspects of the problem sets up the next point for discussion, which is treatment options for the problem. These treatment recommendations are closely linked with the etiology of the problem. Specific treatment recommendations are targeted towards modifying the effect of all three kinds of behaviour-influencing factors mentioned

above. Emphasis on different areas of treatment obviously varies from animal to animal, and from problem to problem. The following paragraphs will discuss the different kinds of factors that influence behaviour, and will outline general treatment methods used to reduce the effect of these on a dog's behaviour.

1.3.3 Learning-mediated factors

When learning-mediated behaviours have a strong causal link with the problem behaviour, the recommended treatment often focuses on modifying the dog's social and physical environment. This is done in order to halt and reverse the conditioning of undesirable behaviours.

When problem behaviours are linked to the dog's early experience during its socialisation period of 3 to 12 weeks, the problem behaviour can be difficult to change (see the discussion on the effect of early socialisation below). Problems arising from anxious and fearful behaviour are commonly linked with inadequate environmental exposure during the socialisation period. Depending on the intensity of the malsocialised behaviour, treatments such as desensitisation, counterconditioning, and flooding, can be effective in reducing inappropriate behaviour. Rogerson (1997) documented successful treatment of all cases of phobic dogs that were brought to him. This was done solely by developing appropriate desensitisation and counter-conditioning programs for the clients to carry out.

Traumatic experience also seems to be able to bring about lasting change to a dog's behaviour. Traumatic experience may be most influential during the 8^{th} to 10^{th} week in puppies (Fox, 1966). Linsay (2001) reported a dog that maintained a phobia of flying insects for over 10 years after being stung once at 8½ weeks of age. As with all fears and phobias, fears resulting from traumatic experience can be effectively treated through the implementation of desensitisation and counter-conditioning protocols.

Some problem behaviours are made worse by a lack of control over the dog. Inadequate training is something that can be improved by clients once they are educated about effective training techniques. Dogs that are resistant to training by their owners may need to take part in group obedience classes or personal training by a professional dog trainer. Often improved control of a dog can significantly help the management of problem behaviours. With some

behavioural problems such as dominance aggression, the simple process of having the dog respond to requests from the owner can itself improve the problem (Reisner, 1997; Overall, 1997a). The presence of a well established "rule structure" can help to relieve problems related to anxiety, as the onus is taken from the dog to respond in anxiety-inducing situations (Overall, 1997a).

Inappropriate training of a dog by its owners can in turn exacerbate behaviour problems. For example, a client that tries to use physical punishment to stop a dog from growling and snapping may not realise that this is in fact worsening a fear-based aggression (Landsberg, 1994). By educating the client about the counterproductive nature of such punishment, one factor contributing to the problem is eliminated. In a similar vein, education about the *inadvertent* conditioning of certain behaviours can improve the chances that these problem behaviours can be treated successfully. For example, through explaining to a client that they are inadvertently reinforcing their dog's solicitous barking by giving it attention (even if it is a non-effective "be quiet" command), the rest of the therapy for inappropriate barking will most likely have a greater chance of success (Juarbe-Diaz, 1997).

The successful implementation of behaviour modification techniques by clients in cases where learning-mediated factors are influencing the problem behaviour depends on the correct application of the appropriate technique. For this reason it is very beneficial if clients can be shown the technique by the consultant (Overall, 1997a; Landsberg *et al.*, 1997; Askew, 1996). This involves the consultant giving an example of the technique, as well as observing (and correcting if necessary), the client's use of the technique. For this reason, face-to-face consultations have an advantage over telephone consultations where techniques cannot be taught so effectively.

"In-clinic" therapy where the problem dog is taken in by the consultant and worked with over a period of time is very useful in situations where it is difficult or dangerous for the client to carry out the appropriate behaviour modification themselves. If the expense of in-clinic therapy can be justified, the chances of the dog owner successfully implementing behaviour modification techniques is maximised because the owner does not need to carry out the initial (and often challenging part) of the behaviour modification. Once appropriate behaviour has been established by the consultant, however, it is imperative that the owner is taught how to

maintain it. If this is not done properly the dog will often fall back into previous behaviour patterns and the exercise will have been in vain.

1.3.4 Physiological factors

Behaviour problems are often influenced by physiological factors. The extent to which these factors influence behaviour relative to other factors varies from case to case. One of the main physiological influences on problem behaviour is genetic predisposition. The innate tendency of an individual to perform problem behaviour can be very difficult to treat (Landsberg, 1994). The urge to chase cars in some Border Collies (probably related to their inbred tendency to herd moving objects) can persist even after being hit by a car. As with the long-term behavioural effects of inadequate environmental stimulation during early development, the severity of such genetically influenced maladaptive behaviours dictates the likelihood of treatment success. In certain cases the problem may be something that needs to be managed rather than eliminated. Unfortunately a dog with an intense predatory drive may need to be securely contained at home, and kept on a lead during walks, to ensure that risk to the dog and potential prey items are minimised.

The effect of male hormones on the display of certain behaviours is well-documented (Hopkins et al., 1976; Overall, 1997a). For problem behaviours related to male hormones (such as dominance aggression, inter-male aggression, inappropriate marking and roaming) castration can often be a useful adjunct to other aspects of a therapy plan. However, there is evidence to suggest that neutered females are implicated in more cases of aggression than intact females (Borchelt, 1983; O'Farrel and Peachey, 1990; Wright and Nesselrote, 1987). Because of this, ovariohysterectomy is not recommended as an adjunct to behavioural therapy in aggressive bitches.

When treating a behavioural problem it is very important to eliminate the possibility that the inappropriate behaviour is in fact a manifestation of an underlying pathophysiological disorder. If this is the case there is little point in trying to treat the overt problem behaviour being exhibited while leaving untreated the underlying reason for the behaviour. Stereotypic behaviour by a dog may be a result of a neurological abnormality such as psychomotor epilepsy, or an infectious disease contracted through tick-borne pathogens (Dodman, 1996; Overall, 1992). In a situation such as this, the behaviour is most likely to be treatable through

medical relief of the health problem itself. The importance of ensuring that problem behaviour does not have a pathophysiological basis is not lost on non-veterinary behavioural consultants. For example some organisations such as the UK-based Association of Pet Behaviour Councilors only consult on veterinarian referrals.

Increasingly, the beneficial effects of pharmacology in the treatment of behavioural problems is being recognised (Overall, 1997a, 2001; Seksel, 2001). The benefit of drug therapy is that the effect of a dog's physiology on its behavioural responses can be mediated. Pharmacological intervention in the treatment of behaviour problems can range from being unnecessary to being essential. However, drug therapy should always be considered as an adjunct to other therapy plans such as behaviour modification, since drug treatment by itself is almost always inappropriate (Overall, 1997a; Landsberg, 2001). Combined with behavioural modification, appropriate drug therapy can improve the ease with which the therapy is carried out, or even enable treatments that would have otherwise not been possible.

Anxiety disorders are one class of canine behaviour problems which respond particularly well to the concomitant use of behavioural and pharmacological therapy (Hart and Cooper, 1996). In dogs with anxiety disorders, such as separation anxiety, generalized anxiety or phobias, the intense physiological response that the dog experiences when exposed to an anxiety-inducing situation renders the dog incapable of learning that such a behavioural response is inappropriate. By using drugs that reduce anxiety without sedating the dog to the point that it cannot learn, facilitation of behavioural modification treatments (such as systematic desensitisation and counterconditioning towards the anxiety or fear-inducing stimulus) can be undertaken (Walker *et al.*, 1997). Without pharmacological intervention, such desensitisation programs may prove difficult or ineffective due to the poor learning state of the dog when in an easily induced and intense anxious state. In recent years the efficacy of modern tricyclic antidepressants (TCAs) and selective serotonin reuptake inhibitors (SSRIs) for the treatment of canine anxiety disorders has been well documented (Overall, 2001; King *et al.*, 2000; Hewson, 1998).

1.3.5 Stimulus factors

The third main category to be investigated when treating behavioural problems is the *stimuli* which precipitate certain problem behaviours. It can be possible to treat a problem behaviour

successfully simply by removing or altering the stimuli that induce the problem behaviour. Either restricting the dog's access to the stimulus, or removing the stimulus itself, can do this. In many cases the role such stimuli play in the problem is readily obvious to the client, but manipulation of the stimulus is not practical or desirable. The barking and chasing behaviour of a dog towards people walking along its fence-line may be eliminated simply by altering the height and material of the fence (Juarbe-Diaz, 1997). This however may not be economically practical or aesthetically desirable for the clients, and other treatment options have to be discussed. In some situations, however, the clients are not aware of the influence that certain stimuli may have on the problem behaviour. Simply by alerting them to the effect of such stimuli can contribute to the success of the overall therapy. Awareness of the effects of environmental stimuli is therefore important when devising a treatment plan for problem behaviour.

1.3.6 Therapy success

The general outline of a behavioural consultation has been summarised above, as have the etiology of problems, and treatments that target the various etiological factors. The existing literature on therapy success in the field of applied animal behaviour therapy is reviewed below.

Therapy success is most commonly investigated through retrospective studies by behaviour consultants. In one such study on the effectiveness of face-to-face consultations in reducing dominance aggression, Cameron (1997) was able to improve the behaviour of 88% of the dogs as assessed in subjective rating by owners. This was accomplished after one face-to-face consultation and a telephone follow-up consultation. Of the dogs that showed improvement, 12% showed excellent improvement, 44% showed good improvement, and 32% showed fair improvement. It seems that in the investigation of subjective therapy success, often a large proportion of dogs are seen to improve. For example, in a review of home-visit consultation success, Askew (1996) also found that 88% of owners reported some degree of treatment success. In an investigation of therapy success for elimination problems 84% were found to improve (Yeon *et al.*, 1999). For this reason, it is the measures of the *extent* of improvement, as in Cameron's (1997) study, which should be of interest.

The high improvement rates seen in such treatment success studies suggest that therapy is often successful to some extent. However, studies in which the extent of improvement is *not* investigated are not very helpful since what constitutes therapy "success" is not elucidated. Reference to poorly-defined success rates is common. For example in a retrospective study carried out by Galac and Knol (1997) a broad figure of 75% improvement for their treatment of fear-motivated aggression was given. Blackshaw (1991) gives figures ranging from 75% to 94% for treatment success rates for various behaviour problems.

In an investigation of therapy success for inter-dog aggression, Sherman *et al.* (1996) used two measures. One was the standard owner opinion of *behaviour improvement*, with a "problem eliminated" category and "problem improved" category. Such a limited improvement rating scale, with only two groupings, is less desirable than a more extensive scale. The second measure was a more functional rating of treatment success, where the level of *required management* of the dog was evaluated. The treatments recommended in this study were most commonly systematic desensitisation and improved control through obedience training. Other recommendations included (in order of frequency): neutering, reduction in privileges, avoidance of triggers of aggression, use of head halters and muzzles, temporary separation, diet change, and drug therapy. Consultations were held either over the telephone (47%), in the behaviour clinic, or at the client's home (Sherman *et al.*, 1996).

In the owner rating of treatment success for within-household aggression (aggression towards dogs that were part of the household), 14% of problems were completely resolved, 45% were improved to some extent, 29% remained the same, while 12% became worse. For the management ratings, 36% of dogs could be left together unsupervised, 20% could be together if supervised, 18% were separated permanently, 18% were given to new homes, and 8% were euthanased. The last three categories seem to be more an indication of clients' management of unsuccessfully treated dogs, rather than any measure of treatment effectiveness (Sherman *et al.*, 1996).

None of the cases involving non-household aggression (i.e. aggression towards dogs that were not part of the household), either became worse or were completely resolved. Some improvement was shown in 52% of cases, while the rest continued to exhibit the same level of aggression. The management rating indicated that 33% could be around other dogs without owner control, 43% had to be leashed, 10% were not permitted any contact, 9% were given

away, and 5% were euthanased. Again this method of evaluation does not give a clear impression of any decrease in aggression. A highly aggressive dog may have improved to a large extent, but it may still be necessary to have it "leashed".

The figures for treatment success reported by Sherman *et al.* (1996) are somewhat lower than that reported by Beaver (1983) and Houpt (1983) for inter-dog aggression therapy. This may be a result of the high proportion of consultations that were carried out by Sherman over the telephone.

This overview of the consultation and therapy process, and therapy success has sought to give a broad overview of pet behaviour consultancy. Unfortunately there is little in the literature on the success of behaviour consultantancy. The studies that do exist often poorly define success or are limited in their investigation of success.

1.3.7 Remote-activated electronic collars

Remote-activated electronic training collars are widely used training devices. They are capable of delivering non-injurious electrical stimulation to the neck of a dog at the instant the button on a hand-held remote is pressed. The level of stimulation can be adjusted to the pain sensitivity and arousal of each dog. Most electronic collars can give either a momentary electrical shock of a split second, or a continuous shock for as long as the button on the remote is pressed. Although the shock is aversive, it is totally non-injurious due to the low current of less than 2 milliamps (Holliday, 1999). Electronic collars were designed initially for the training of hunting dogs, but are now used by a wider selection of trainers for a variety of objectives. Their primary use is as a positive punisher for undesirable behaviour, although they are used to facilitate behaviour through negative reinforcement.

Any training technique which inflicts pain should be carefully considered in order to ensure that the interests of the dog are best served by application of an aversive stimulus. Use of an electronic collar to *facilitate* some behaviour is justifiable when the welfare of the dog is significantly improved through such training. For example, dogs which have persistent recall problems that consistently put the dog at risk, and are resistant to other training techniques, can be trained with an electronic collar to have a consistent off-lead recall.

However the use of electronic collars to train non-essential obedience behaviour is questionable. "Tri-tronics" (Tuscan, Arizona, USA), a large manufacturer of electronic collars in America, includes a video with its collars that demonstrates how to use negative reinforcement for obedience training. These methods are also covered in a book published by Tri-tronics (Tortora, 1982). On the instructional video, it is recommended that a collar be placed around the lower back of the dog in order to train a sit. Once the trainer gives the sit command a continuous shock is applied to the dog's lower back until it sits. While the dogs displayed on the video are very responsive, they appear to be anxious while being worked. The use of electronic collars to teach or improve such behaviours is unjustifiable because the anxiety experienced by the dog is unnecessary. First, the behaviour could be taught just as effectively without the application of an aversive stimulus, and second, the behaviour is non-essential for the wellbeing of the dog or the owner.

As with other forms of positive punishment and negative reinforcement, the potential for misuse or abuse of electronic collars is ever-present. In the hands of an inexperienced trainer, incorrect timing, intensity and duration can be disastrous. If an electronic collar is used in such a way, dogs can become confused about what objects or behaviours are causing the shocks, resulting in a dog that is fearful of certain environments, people, or life in general (Polsky, 1994). This is particularly the case with dogs that are of sensitive or fearful dispositions. When using electronic collars for behavioural therapy it is therefore important to make it as clear as possible to the dog what behaviour is causing the shock. The ability to be very specific about which behaviour is suppressed with an electronic training collar was demonstrated by Linhart *et al.*, (1976) who conditioned coyotes to avoid chasing black rabbits while they still preyed on white rabbits. If this is done properly, and the dog is given an opportunity to respond appropriately to a well-defined rule or command, the delivery of shock is essentially controlled by the dog, reducing the potential for generalised anxiety. It is also important that the dog is positively reinforced for an alternate desirable behaviour. If punishment is used exclusively, the autonomic stress response induced by the noxious stimulus can interfere with learning of an alternate desirable behaviour (Overall, 1999). A contrast between a negative outcome (for performing the undesired behaviour), versus a positive outcome, (for not performing the undesirable behaviour), is therefore far more effective at stopping an undesirable behaviour than relying solely on punishment.

In the past there have been concerns about malfunctions with electronic collars which cause them to discharge at inappropriate times (Vollmer, 1979; Polsky, 1994). Often this is due to a radio signal extraneous to the hand-held transmitter. The effect of such random shocks would have an even worse effect on the dog than incorrect timing, as the shocks would be completely unrelated to its environment or behaviour. This would inevitably increase the general anxiety of the dog, inhibit desirable behaviours, or cause inappropriate avoidance responses towards neutral or positive aspects of the dog's environment. Personal experience with electronic collars has shown that random discharge is not an issue with modern collars manufactured by "Tri-tronics". But the serious implications of any malfunction from an electronic collar should be sufficient to ensure that use of a malfunctioning collar is discontinued immediately.

Another potential problem with electronic collar use is that it is possible for the dog to learn that the collar is a discriminative stimulus for punishment. If this happens, the dog may engage in the previously punished misbehaviour when the collar is off because it knows that there is no chance of punishment. To avoid this situation it is important that the dog wears the collar for a number of days before the training commences, and that the collar is worn during non-training periods. This continual presence of the collar does however raise another problem. Long periods of wearing an electronic collar can cause lesions on the neck due to rubbing of the collar electrodes against the skin. Daily checking of the area, and slight loosening of the collar when it is not in use, prevents this problem.

Despite the potential for misuse of electronic collars, their use can be justified when treating some behavioural problems. With persistent strongly motivated behaviours which are potentially injurious to other individuals or to the dog, including behaviours that may indirectly result in euthanasia, the effective punishment of the behaviour through the application of a remote shock can be justified. Inappropriate predatory behaviour, car and bicycle chasing, persistent recall problems, and some forms of aggression, are examples of problem behaviours that can be very difficult to treat with common training methods, but respond well to the appropriate use of a remote-activated electronic collar (Tortora, 1982; Andelt *et al.*, 1999; Christiansen *et al.*, 2001b; Polsky, 1994; Linsay, 2000).

The efficacy of the electronic collar as a punisher is due to several advantages that remote-activated shock has over other forms of punishment. This provides the justification for

treating some behaviour problems with an electronic collar, rather than other forms of punishment. First, electronic stimulation is capable of rapidly suppressing even highly motivated behaviour. This has been demonstrated innumerable times by experimental psychologists. Secondly, the timing of the shock can be delivered at the moment an undesirable behaviour is performed, which increases the effectiveness of the punishment. This was demonstrated by Baron *et al.* (1969) who delivered electric shocks to rats that were delivered between 0 and 60 seconds after the target behaviour. The results from this experiment showed an orderly relationship between punishment delay and the target behaviour response rate, with the more immediate punishment regimes giving the greatest decrease in responding of the undesired behaviour. Thirdly, the shock can be adjusted to an appropriate level for the dog's pain tolerance and level of arousal, and is non-injurious. This ensures that the correction is sufficient to stop the undesired behaviour, but is not excessive. The remote aspect of the training collar means that if the misbehaviour is witnessed it can always be punished; this means the dog cannot avoid punishment for an undesired behaviour. This continuous schedule of punishment is the most effective way to eliminate behaviour. The remote form of punishment also means that the dog does not associate the trainer with punishment; this preserves a positive relationship between trainer and dog, and ensures that undesirable behaviour is suppressed in the absence of the trainer (Tortora, 1982; Polsky, 1994).

An example of a problem behaviour that is effectively dealt with through the use of electronic collars is inappropriate predatory behaviour. In a recent study Christiansen and colleagues (2001b) found that the effects of aversive conditioning with electronic collars was effective in inhibiting sheep chasing in most dogs one year after the initial training phase. Owners of the dogs also did not report any negative effect on their dog's behaviour during the year following avoidance conditioning with electronic collars. One dog was reported as becoming more fearful of people, however, two dogs that had not received shocks for chasing sheep were also reported as developing greater fear of people. This is presumably due to the specific and controllable nature of the trained avoidance response to sheep, which means that when they were away from sheep there was no anxiety experienced by the dogs. By significantly reducing the probability that the dogs would be euthanased because of sheep-worrying, and by reducing the chance that the dogs would stress, injure, or kill sheep, it can be seen that the welfare of both dogs and sheep can be improved through the appropriate use of remote activated electronic collars.

If used by an experienced and knowledgeable trainer, electronic collar use for the modification of persistent and unsafe behaviour is defensible because it can subsequently improve the wellbeing of the dog, owner, or other animals (Polsky, 1994). But every effort should be made to ensure that electronic collar use, as with other punishment techniques, is definitely in the best interests of welfare, and not just a behavioural quick fix that could be accomplished with other, more positive, behavioural modification techniques. As part of my investigation of therapy success, the effectiveness of remote-activate electronic collars will be explored. Issues relating to collar use that will be investigated include owner attitudes to collar use, effectiveness of collar use, regression of behaviour on discontinuance of collar use, and the undesirable effects of collar use on behaviour and personality.

1.4 Early Socialisation of the Dog and its Effect on the Development of Behaviour

The effect of early socialisation on later behaviour of the dog is pertinent to the discussion of canine behaviour problems and their therapy. It has been shown that if a dog is isolated from 3 days of age to 20 weeks of age, it will most likely be disturbed for life (Aragwal, *et al.*, 1967). The detrimental effects of isolation on the later behaviour of dogs have been shown to include such problems as abnormal fear responses, social inadequacies, hyperactivity, increased aggression, and decreased learning ability (Melzak and Thompson, 1956; Pfaffenberger, *et al.*, 1962; Fox and Stelzner, 1967; Fisher, 1955; Hetts, *et al.*, 1992; Hubrecht, 1995; O'Farrel, 1992; Wright, 1983). Intensive socialisation later in life often does little to remedy the maladjusted behaviour of such a dog (Scott and Fuller, 1965, Fuller, 1964; Freedman, *et al.*, 1961). The negative effect of inadequate socialisation during puppyhood is an important factor in the development of behaviour problems in some dogs. It is therefore important to understand when the domestic dog's most sensitive period for socialisation occurs, so that suitable recommendations can be made for appropriate socialisation. Research into the timing of this important socialisation period will be reviewed below, as will recommendations for suitable socialisation of a young dog during this period. The objectives of formal puppy socialisation classes will be also be reviewed, as will research investigating the effectiveness of such programs.

Research on the social development of dogs was most notably carried out by J. P. Scott and colleagues at the Jackson Laboratory at Bar Harbour in the 1950s. In order to systematically study the developmental stages of specific behaviours, a colony of dogs was established. Over a period of 13 years more than 500 puppies were born into the colony. One main purpose of this colony was to test the hypothesis that a "critical socialisation period" existed for dogs, as well as to investigate the puppies' responses to various stimuli during that period.

Before describing the findings of investigations into the dog's critical socialisation period, it would be helpful to define the term "critical period". Scott and Fuller (1965) defined the "critical period" as being "a special time in life when a small amount of experience will produce a great effect on later behaviour". They considered this period to be "critical" because of this long-term influence on the rest of the individual's life. A few years later, Fox (1971) differentiated between "critical" and "sensitive periods". Unlike Scott and Fuller, he defined "critical periods" as being those where an animal is developmentally dependent on certain stimuli which are normally present in the environment. These periods were distinct from "sensitive periods" where the organism is highly vulnerable to the effects of environmental change, the effects of which are long lasting. Such efforts to distinguish between various terms for subtle differences in these important developmental periods has, however, not resulted in the widespread adoption of particular meanings for particular phrases (Bateson, 1979). In general, the concept of such periods always comes back to the idea that an individual's characteristics can be more strongly affected by certain stimuli at one stage of development than at other stages (Bateson, 1979). For the purposes of this essay, the term "sensitive period for socialisation" will be used to describe the optimum period in a dog's life for the formation of positive attachments to conspecifics and non-conspecifics, as well as familiarisation to other stimuli from its environmental milieu.

1.4.1 The timing of socialisation

With a young dog, the period from birth to 2 weeks of age is generally considered to be devoid of social behaviours. This period is termed the 'neonatal' period, and the puppy's behaviours are restricted to care-seeking and ingestive behaviours. In fact, over 30% of a puppy's day is spent in feeding activity, with sleep taking up much of the remaining time (Grant, 1986). It has been shown that dogs at this age are capable of stable learning (Stanley *et al.*, 1963; Stanley *et al.*, 1970; Stanley *et al.*, 1974; Fox, 1971), although their

responsiveness to reinforcement seems to be limited to such primary behaviours as the acquisition of milk and thermoregulation. The lack of social influence on neonate dogs was supported by Frederickson *et al.* (1956) who found that distress vocalisations emitted by puppies at this age when separated from their littermates was a result of temperature changes rather than social isolation.

A large number of changes take place in a short period coinciding with the opening of the eyes at around 13 to 20 days, in what is termed the "transitional" period. The maturation and myelination of the spinal cord contributes to an improvement in coordination and mobility, and social signals like tail wagging and playful raising of the paw start to be exhibited. These behaviours, as well as events such as the opening of the ears, all serve to increase the capacity of the pup to form social relationships. At around 20 to 24 days puppies separated from their littermates will choose bedding infused with the odor of their littermates over that of non-littermates (Mekosh-Rosenbaum *et al.*, 1994). This suggests the beginnings of social relationship formation. The emergence of the startle response to sound at this age is also correlated with the ability to differentiate between individuals, and indicates that the dog is starting to make an association between outside events and unpleasant feelings (Scott and Fuller, 1965). Scott (1958) found the average age when a pup startled to sound was about 20 days. This startle response, more so than the other emerging behaviours, indicates that the puppy is beginning to develop the capacity to form social relationships, and has therefore been used as a starting point for the sensitive period for primary socialisation (Scott and Fuller, 1965).

It should be noted that although puppies younger than this 3-week stage are capable of only limited interaction with their environment, they may be receptive to the positive effects of some external stimulation. Morton (1968) found that handling of neonatal puppies for brief periods (3 minutes a day) and exposure to mild environmental stressors like temperature changes and movement, may improve a puppy's resistance to disease, reduce emotional reactivity, and improve learning and problem solving ability. Similar results have been observed in rats, with neonatal stimulation resulting in adults that were less emotionally reactive and more adaptive in their adrenocortical response to stressors (Levine, 1960; Levine *et al.*, 1967). Fox and Stelzner (1967) found that puppies isolated from con-specifics after 3 ½ weeks with their litter showed a greater level of sociability than puppies that had not spent any time with their litter. This suggests that some degree of social learning takes place before

3 ½ weeks of age. The findings above indicate that in order to take advantage of the potential for positive physiological and behavioural effects of early stimulation, handling of neonates should form part of a breeder's normal rearing practice.

Due to the obvious physiological changes which take place during the transitional period, the start of the sensitive period for socialisation is fairly easy to define. The end of this period is however not so easily defined. A number of studies have been performed in order to establish when the maximal effects of socialisation occur and diminish.

One of the best-known studies was the "wild dog" experiment carried out at the Bar Harbor research laboratory by Freedman, King and Elliot (1961). In this study six groups of puppies were raised in large outdoor fields isolated from humans. At weeks 2, 3, 5, 7, and 9, one of the experimental groups was brought in to the laboratory for a week of socialisation, after which they were placed back out into their isolation field. This socialisation involved being played with, cared for, and subjected to standardised temperament tests.

From these temperament tests it was found that approach behaviours towards humans peaked at around five weeks of age. During the socialisation and temperament testing periods it was also found that avoidance responses towards the experimenters was minimal until after 5 weeks of age. When the first human socialisation experience occurred at 7 weeks of age, avoidance of the experimenters was markedly higher than the puppies socialised at 5 weeks of age or younger, and those brought in from isolation at 9 weeks of age were in turn markedly more fearful of the experimenters than the 7 week-old cohort. Despite the progressive avoidance that was displayed by puppies over 5 weeks of age, by the end of each of the socialisation weeks the puppies of all age groups were equally attracted to the handlers. This increase in avoidance relative to age is interesting, and indeed is applicable to the effective socialisation of puppies. However it is the results from the second part of the study which give us an insight into the long-term effects of socialisation at these young ages.

At fourteen weeks of age all six groups of dogs, including the control group that had not received any socialisation, were brought in for two weeks of testing. It was found that the group first socialised at 7 weeks of age performed best overall in the measures of confidence (there were six different types of tests), with the 5 and 9 week groups also performing well. The control group, however, performed very poorly in the confidence tests, even after two

weeks of interaction with the researchers. One randomly selected dog in the control group was even kept on and handled for three months in order to see if its confidence could be improved, however after this time it showed only minimal improvement in a handling test.

From this research it seems likely that at around 7 weeks of age, a young dog is most susceptible to the positive effects of socialisation. This is probably a result of the high level of social attraction that is displayed by puppies at this age, in conjunction with their minimal fear of novel stimuli. The development of adult-like neurological, physiological, and emotional functioning at around 7 weeks may also contribute to the potentiation of socialisation effects at this age (Lindsay, 2000). Adult-like capabilities in the 7 week-old may explain why the long-term effects of socialisation at seven weeks are more pronounced than those seen at 5 weeks, despite the fact that 5 week-old puppies are more likely to approach novel social stimuli and have less fear of novel stimuli. The importance of social attachment at around 7 weeks of age is also supported by a study by Elliot and Scott (1961), who showed that the strongest vocal reaction to isolation occurs with dogs of 6-7 weeks of age, indicating that it may be at this time that young dogs are most acutely socially dependent.

It can also be seen from this experiment that by fourteen weeks of age the dog's susceptibility to socialisation has dropped off to the point that it is effectively too late to socialise a dog. This was shown by the control group's poor results (which were found to be long lasting) in the confidence tests, as well as the mounting avoidance behaviour towards novel stimuli that was displayed as the period of isolation was increased before socialisation. In fact it has been proposed that it is this development of fear responses towards novel animals which effectively terminates the sensitive period for socialisation (Scott, 1962).

The approximate conclusion to the sensitive period at 12 weeks has also been observed through the success rates of guide dogs. Ninety percent of the puppies that left their kennels at or before 12 weeks of age successfully graduated as guide dogs. However those that stayed until 15 weeks of age only had a 30% success rate (Appleby, 1993).

Fox and Spencer (1969) exposed puppies aged 5, 8, 12, and 16 weeks to novel stimuli and found that the puppies exposed at 12 and 16 weeks displayed the worst behavioural deficits. This also supports the 12-week mark as the approximate end to the sensitive period for socialisation. Members of an additional group in this study, who were exposed to novel

stimuli at all four of these periods were the most confident and tolerant of novel stimuli among the experimental groups. This indicates that repeated exposure to novelty during the sensitive period is beneficial.

The window between 3 weeks of age to around 12 weeks of age is still accepted as being the most important time for effective socialisation of a dog, and is recommended in three of the more recent canine behaviour textbooks (Overall, 1997a; Landsberg *et al.*, 1997; Lindsay, 2000).

It is important to note that in the "wild dog" experiment there was some variation between groups' rankings for the various behavioural tests. This indicates that certain stages of the observed sensitive period may be more or less susceptible to influence from certain stimuli, and the subsequent effect of exposure to these stimuli on specific behaviours (Scott and Fuller, 1965). Nottenbohm (1980) suggested that this difference in socialisation sensitivity to stimuli at different ages might be a result of the state of development of the nervous system in an animal at the time. It has also been shown that the effects of inadequate socialisation can vary between breeds. For example, isolation from 3 weeks to 20 weeks caused beagles to become overly fearful of unknown humans, while Scottish Terriers became hyperactive and insensitive to pain (Freedman, 1958; Melzack and Scott, 1957).

Although the period of 3 to 12 weeks is clearly that in which puppies are most sensitive to socialisation, it should not be considered to be rigidly fixed, with socialisation deficiencies always resulting in permanent behavioural deficits (Markwell and Thorne, 1987). The timing of all developmental periods, including the socialisation period, is something that varies between individuals and across breeds, and is even related to the experience given to the dog during the period (Seksel, 1997; Markwell and Thorne, 1987). Socialisation later in life is possible, if somewhat more difficult. For example, Fox (1971) found that puppies that were raised with cats resocialised with their own species when introduced after the socialisation period, while Niebuhr (1977) documented success in socialising an incompletely socialised dog. The 3 to 12 week period should therefore be viewed as a period in which the risk of developing problems associated with inadequate socialisation can be reduced most easily (Overall, 1997a).

1.4.2 The process of socialisation

The research discussed so far has primarily dealt with the effects of complete isolation from certain kinds of stimuli. The amount of socialisation needed over this period to adequately socialise a dog has, however, not been discussed. It has been shown that the amount of socialisation does not need to be substantial. Fuller (1967) found that only two 20-minute periods of socialisation a week with humans over the sensitive period was enough to effectively "socialise" a dog to humans. Wolfle (1990) reported that beagles in a laboratory setting needed only 5 minutes of social contact a week to become "adequately socialised".

It is probable that even though minimal socialisation may serve to produce an adequately adjusted dog, more intensive socialisation may produce additional benefits. For example, Fox and Stelzner (1966) found that pups given a rigorous environmental socialisation program between 4 and 5 weeks of age displayed more mature EEG patterns and superior problem-solving abilities than those in a control group not exposed to the program. The more intense socialisation program involved exposure to a wider variety of situations and stimuli, as well as longer periods of human-puppy interaction. This indicates that exposure to a wide variety of stimuli may not only serve to desensitise the dog to these stimuli in the future, but may produce other positive effects that enable the dog to interact more successfully with its environment. This has been shown to be the case with rats, where early environmental stimulation increases adaptability to stressors (Levine, 1960; Levine *et al.*, 1967).

So far the effects of socialisation have been discussed, whereas the process by which an animal is socialised to certain stimuli has not been raised. Originally there was some debate as to whether or not this process was a conditioned response, where the pleasure of feeding was permanently linked with those supplying the food. This "acquired drives" hypothesis was first tested in dogs by Brodbeck (1954), who raised two groups of puppies through their early weeks of development. One group of puppies was hand-fed, while the other group was fed in a way that prevented them from seeing who was feeding them. At the conclusion of this experiment Brodbeck found that both sets of puppies were just as attracted to him. This indicated that feeding is not necessarily part of the development of the social bond. This result was repeated by Stanley and co-workers (1962) in a similar experiment, with the only difference being that the hand-fed puppies were more vocal at the sight of the experimenter. In an experiment by Elliot and King (1960) it was shown that hand feeding, without much

other handling, produced puppies that were more timid than those that were handled regularly but not hand fed. The experiment also showed that the group of puppies that was underfed became more rapidly attached to the handlers than an overfed group. This indicates that while food may not be necessary for the process of socialisation, hunger may speed it up.

In a similar vein, it has been found that the anxiety produced by separating young puppies from their litter serves to increase the rate with which puppies are socialised to humans (Scott, Deshaies and Morris, 1961). In this experiment 5 to 7 week old puppies were isolated from littermates overnight, and then allowed to interact with humans for 3 hours during the day. It was found that the puppies that were isolated formed stronger social attachments to human handlers than did controls. This provides evidence to suggest that the distress elicited by isolation may serve to intensify the effects of socialisation. In fact it has been proposed that any kind of strong emotion can serve to speed up the socialisation process (Scott, 1962). This concept is supported by experiments on imprinting in birds, where various stressors have been shown to speed up and strengthen social bonds during the imprinting period (Hess, 1961; Guiton, 1961; Pitz and Ross, 1961).

From the experiments mentioned above, it can be seen that food is not a highly important part of the socialisation process. In order to find out whether the *treatment* of puppies by humans affects subsequent attraction and dependency behaviours, Fisher (1955) investigated the effects of early treatment on three groups of puppies. One of the groups was always treated with kindness, another was randomly rewarded and punished, while a third group was punished for all positive approaches to the experimenter. Fisher found that the group that was both rewarded and punished showed more attraction and dependency towards the experimenter than the group that was only rewarded! The results of this experiment indicate that the process of socialisation is not necessarily improved or retarded by the actions of the individual the young animal is exposed to.

After considering these experiments, it seems that although emotional arousal may serve to speed up the socialisation process, the effects of such external influences as food, or reward and punishment, seem to have little effect on the process. The formation of emotional bonds towards a stimulus during the sensitive period simply seems to be contingent on the presence of the stimulus in the puppy's environment (Scott and Fuller, 1965). Overall, it seems that the

prime requisite for socialisation to a stimulus is simply contact with it during the sensitive period.

1.4.3 Socialising a young dog

With a young dog it is obviously important to take advantage of the 3 to 12 week sensitive period for socialisation. By definition it is a time in the life of the dog where maximal behavioural benefit can be obtained through relatively little effort. Due to the fact that the dog is highly receptive to socialisation towards novel stimuli, it is not surprising that a significant effect can result from relatively little exposure. This should not be used as an excuse however to expose the puppy to only a minimal amount of stimulation. The opportunity to bring any benefits to the dog, with a small amount of effort, should not be wasted. Due to the speed with which a dog can be socialised to a stimulus, it is probably more important to expose the puppy to a wide variety of different stimuli, rather than spending long periods of time socialising the puppy with a small number of stimuli. Although a comprehensive socialisation program may not guarantee a perfectly behaved dog, such programs will reduce the chances that the dog will develop behaviour problems associated with inadequate socialisation, as well as improve the likelihood that it will react well to any unusual situations to which it is exposed.

1.4.4 Socialisation and puppy health

A common reason why puppy owners delay early socialisation is because they have been warned against exposing their puppy to infectious disease. From birth, levels of maternal antibodies in puppies decline at a steady rate, with a half-life of about 10 days (Greene, 1990). This can put a puppy at risk of disease if exposed to other animals and environments before a vaccination schedule has been established. In an effort to reduce this risk of early socialisation, guide dog puppies have been vaccinated early at 6 weeks, and then every 3 weeks after that until aged 12 to 16 weeks. Of the 24,000 dogs vaccinated in this way, less than half a dozen that were healthy at the time of vaccination became unwell despite being exposed to a variety of environments from 6 weeks of age (Appleby, 1993). In fact there is even evidence to suggest that as long as the puppy is involved in a vaccination program, some exposure to "street" virus can result in a boosting of the dog's immunity (Overall, 1997a).

Despite the apparent safety of early socialisation indicated by these studies, the safety of a puppy at a young age cannot be totally guaranteed even with early implementation of a vaccination program. The difficulty that arises when trying to assure the safety of a vaccinated puppy is related to maternal antibody levels. Maternal antibodies can overwhelm the modified pathogens in vaccinations before a puppy has a chance to develop antibodies of its own (Smith-Carr *et al.*, 1997). The level at which maternal antibodies neutralise vaccine antigens is always lower than the level at which they protect the puppy from disease (Pollock *et al.*, 1982). This means that puppies are susceptible to infection from the time maternal antibodies drop to a level where they no longer protect, to the time they cease to inhibit development of immunity. This can leave a puppy vulnerable for over 2 weeks to diseases like parvovirus (Pollock *et al.*, 1993). Once maternal antibodies drop below the level at which they interfere with vaccines it may still be up to 3 weeks before the puppy receives the next booster in its vaccination program. This is because it is impractical to assess the level of maternal antibodies in a puppy to determine when a vaccination will be effective; as a result vaccination timing is imprecise. For these two reasons a puppy may be susceptible to infection for over 5 weeks despite a 3-weekly vaccination program.

With modern low passage, high titer, modified-live virus vaccines the sheer number of modified virus introduced to, and replicated by the puppy can overwhelm maternal antibodies and result in the development of some immunity. An experiment by O'Brien (1994) demonstrated that the modern parvovirus vaccination "Vanguard Plus" (Pfizer Animal Health, Auckland, New Zealand) could initiate an immunoresponse in puppies despite the presence of maternal antibodies. Promotional material for Pfizer reports a seroconversion rate of 52% in 6-week-old puppies, 88% in 9-week-olds, and 100% in 12-weeks-olds after administration of Vanguard Plus. This suggests there is some advantage in early vaccination, although it should be noted that the safety of puppies from parvovirus cannot be assured until 12 weeks of age.

Due to the uncertain nature of puppy vaccination before the age of 12 weeks, and the prevalence of parvovirus in some areas of New Zealand, it would be irresponsible to recommend, as part of a puppy's socialisation program, exposure to environments that may have been frequented by unvaccinated dogs. However it is important to balance the risk of disease with the risks of inadequate socialisation. Recommending that a puppy is totally isolated from the world until 12 weeks of age is also irresponsible. In conjunction with an early start to the vaccination program a young puppy should be introduced to novel

environments that have been, and presently are, free from unvaccinated dogs. By doing this it is possible to develop a socialisation program that caters for both the health and behavioural needs of a puppy. All too often, however, dog owners are told by their veterinarian that their puppy should be kept at home until it is 12-weeks old, in order to ensure the safety of the puppy, with little mention of the behavioural deficits that can result from a sheltered upbringing during the 3 to 12 week period. Simple advice about the importance of safe exposure to novel stimuli during this time would often make a significant difference to the overall wellbeing of both dog and owner.

1.4.5 Rehoming the puppy

Over and above the long-term familiarising and bonding effect of socialisation during the sensitive period, social interactions can serve to teach a dog about various aspects of its social environment. Through social interactions, particularly play, with people, dogs, and probably even other species, a puppy can learn about what is socially acceptable. Communication skills, such as learning the subtleties of body language, can be honed through such interactions (O'Farrel, 1986). This is particularly the case in interactions with other dogs. It has also been shown that interactions with littermates and the mother can result in the development of behaviours like bite inhibition and improved subsequent maternal behaviour in females (Seksel, 1997; O'Farrel, 1986). Due to the importance of primary socialisation with dogs, as well as the benefits gained through social interactions between dogs, it is important that a puppy be permitted to spend a proportion of its sensitive period for socialisation in the company of its littermates and mother. If a puppy does not receive this interaction, it can mature into a dog that is incapable of forming positive relationships with other dogs (Scott and Fuller, 1965).

For this reason it is advisable to leave a puppy with its litter until around 7 weeks of age before rehoming it. This allows the puppy to socialise sufficiently with other dogs, while still ensuring that the new owners receive the dog at approximately the optimal time for socialisation. Overall (1997a) states that this is too early to separate a puppy from its litter, due to the fact that the behavioural response to separation at this age is profound, and "causes recidivistic changes in the puppy's behavioural development". However the only source she quotes for this statement is that of Elliot and Scott (1961), who simply found that the 6 to 7 week period was when the loudest distress vocalisations were made by pups separated from

their litters. Possibly such separation does negatively affect a puppy's development, but it is not clear what part of the literature Overall is using to support this statement. In view of the study by Scott, Deshaies and Morris (1961) it is possible that this separation distress may in fact serve to speed up the socialisation process with the new owners.

It is of course acceptable to leave a puppy with the breeder or original owners longer than this 7 week period, *if* they are aware of the importance of adequate socialisation during the sensitive period, and are willing to make the effort to socialise the puppy. This however is not always practical. The new owner should have the puppy during this important developmental stage because there is no guarantee for the owner that the breeder will make the same kind of effort as the owner, who will have to live with the dog for the next 10 or 15 years! For the 3 weeks of age to 7 weeks of age period spent with the breeder, it is still important for the dog to receive as much social and environmental interaction as is practical, with participation in a human household being ideal (O'Farrel, 1986). Some puppy farms, backyard breeders, and large show kennels, are particularly guilty of not providing this important socialisation (Vollmer, 1980).

1.4.6 Puppy socialisation classes

Once a puppy has started a vaccination program and is able to fully interact with other individuals and environments, attendance at formal puppy socialisation classes is often recommended as part of a socialisation program. These "puppy parties" were popularised over 20 years ago by Ian Dunbar in the United States, and are now run all over the world (Seksel, 1997). In New Zealand, puppy socialisation classes seem to be growing in popularity, with guidelines for the classes being distributed by the New Zealand Veterinary Association (MacPherson, 1998).

Puppy socialisation classes are intended to serve a number of functions. Primarily they aim to socialise the puppy to strange people, dogs, other animals, and environments (including veterinary clinics). They initiate learning of the basic commands through positive reinforcement, and educate the owner as to the normal behaviour of dogs, as well as to potential behaviour problems (Seksel, 1997). Overall they are considered to reduce the incidence of behaviour problems in dogs which attend such classes, and to increase the likelihood that the puppy will grow into a well adjusted, social, and obedient dog. In an effort

to investigate whether puppy socialisation classes in fact do this, Seksel (1999a) undertook an investigation into the success of a socialisation program at a Sydney veterinary hospital.

For Seksel's study, 60 puppies ranging in age from 6 to 16 weeks were selected and randomly assigned to one of five groups. The five different types of puppy classes included: a socialisation and training group (S & T); a training-only group; a socialisation-only group; a feeding group; and a control group. Over the course of four 1-hour sessions the S & T group received both operant training for basic commands and socialisation with other puppies, people, and various stimuli (tape recordings of thunder, a hairdryer etc). The training-only and socialisation-only groups received only the command or socialisation aspect of the program. The feeding group was given the same amount of food as the first three groups, but was not exposed to any other aspect of the program. The control group attended the veterinary hospital for four 15-minute sessions, and was not exposed to any of the program components.

A set of standardised rating scales was used to assess each puppy's response to novel, social, handling, and commands stimuli. These assessments were made before the program, after the second and fourth sessions, and around 6 months after program completion. It was found that the groups which took part in the S & T and training-only programs, showed significantly better responses to command after the 2-week and 4-week testing periods. This however was the only significant group effect on responses to any of the novel, social, handling, and command assessments. This indicated that while the training section of the puppy socialisation classes was effective in improving the basic obedience of the puppies in the short term, the socialisation aspect did not lead to significant changes in responses to novel, social, or handling stimuli.

The idea that puppy socialisation classes are an effective tool in the socialisation of puppies is challenged by the results of this research. There are, however, some possible reasons for the lack of any significant effect of the socialisation aspects of the programs on subsequent behaviour. For one, the responses to the novel, social, and handling stimuli were generally positive at the first baseline assessment. This indicates that the puppies attending the classes were initially fairly well adjusted (and probably adequately socialised) before the start of the classes. It has been mentioned earlier that it does not take a great deal of exposure to a stimulus during the sensitive period to socialise a dog adequately to the stimulus. It is

possible that normal levels of socialisation were sufficient for the dogs in this study, and the additional socialisation at the puppy classes was not enough to produce significantly better assessment scores.

Another possible reason why the socialisation programs did not produce any significant effects is that the age of the puppies at the start of socialisation was fairly high. The S & T group had a mean age of 12.8 weeks, while the socialisation-only group had a mean age of 10.7 weeks. From the studies at Bar Harbor (Scott and Fuller, 1965), and others, it is clear that a puppy is most sensitive to socialisation at around 7 weeks, with the approximate end of the sensitive period falling around the 12^{th} week. Due to the relatively late start to the classes, and bearing in mind that the course was run over a further four weeks, it is unsurprising that the effects of the socialisation aspects were not significant. There are reasons for the relatively late starts to the socialisation class, including the health concerns mentioned previously. It is possible that if these were overcome the effectiveness of the socialisation aspect of puppy socialisation classes could be increased.

Seksel (1999a) found that the baseline score of the dogs was the best predictor of later behaviour towards the novel, handling, and social stimuli. This supports the idea that the effects of socialisation had stabilised, because either the socialisation received from the owners was sufficient, or the sensitive period for socialisation had passed.

From Seksel's study (1999a) it can be seen that attendance at a puppy socialisation class may not serve to improve a puppy's response to novel, handling, or social stimuli. It is possible that normal levels of socialisation by an owner are sufficient to socialise a dog adequately, without the need to attend professionally-run classes. The effect of age of attending puppies may also be an important factor in the success of socialisation at puppy socialisation classes, and should be kept in mind by class co-ordinators. If the socialisation received at puppy socialisation classes is in fact superfluous to requirements, this does not necessarily invalidate the value of such classes. Puppy socialisation classes are a good chance to get obedience work started successfully; this can be an important boost to human-dog relations. They also serve to educate owners about normal dog behaviour, as well as possible behaviour problems which may be encountered and/or avoided. The value of this is not to be underestimated.

A study on the effect of puppy socialisation classes on the long-term success of dogs in the household would serve to validate the usefulness of puppy socialisation classes in general. This is the subject of research outlined in a subsequent chapter. However, the basis on which puppy socialisation classes are promoted is that they are valuable for the effective socialisation of the puppy. Seksel's study suggests this may not be the case. If a puppy owner is aware of the value of exposing puppies to a wide variety of different stimuli during the sensitive period, I suggest that there may well be no reason why puppy socialisation classes need to be incorporated into a puppy's socialisation program.

1.5 Aims of Thesis

Therapy success study (Chapter 2):

- To investigate how successful in-clinic therapy is, and to investigate facets of success and failure.
- To investigate which client-related and consultant-related factors have the greatest impact on therapy success.
- To investigate which behaviour problems are most or least suited to in-clinic therapy.
- To investigate the success of electronic collars for the treatment of specific behaviour problems.
- To investigate the extent of any undesirable effects of electronic collar use.
- To investigate the extent to which undesirable behaviour resurfaces once electronic collar use is discontinued.

Socialisation study (Chapter 3):

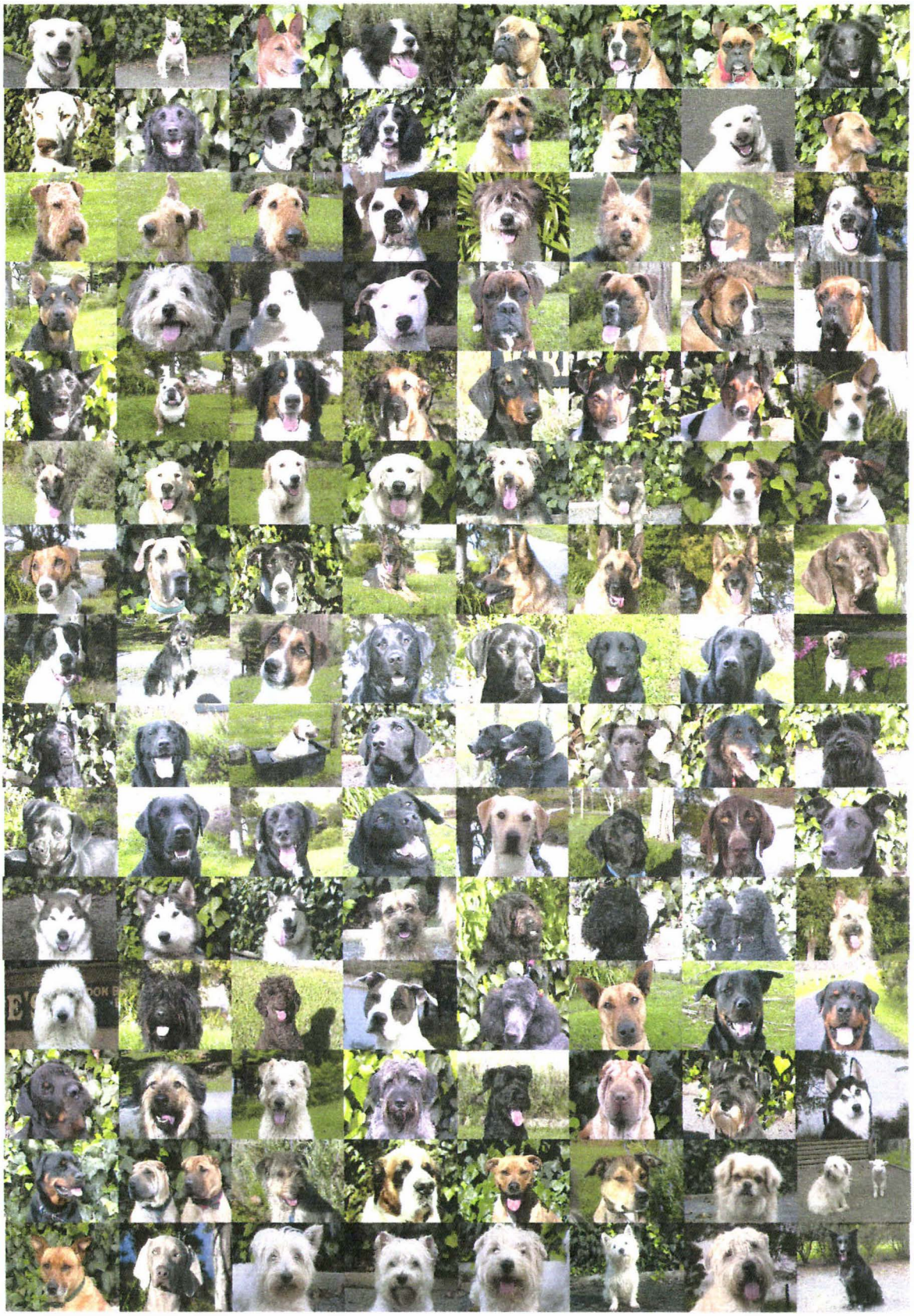
- To assess the mean level of socialisation that puppies in New Zealand receive before 12 weeks of age.
- To investigate how the *level* of exposure to novel stimuli during the sensitive period for socialisation affects subsequent behaviour.
- To investigate how the *type* of socialisation during the sensitive period affects subsequent behaviour.

- To investigate the effect that attendance at puppy socialisation classes has on later behaviour.
- To investigate if there are any differences in adult behaviour between those dogs that attended puppy socialisation classes before 10 weeks of age and those that attended after 10 weeks of age.
- To investigate if there are any differences in behaviour between male and female dogs

CHAPTER 2

The Success of In-Clinic Canine Behavioural Therapy

"Do not make the mistake of treating your dogs
like humans or they will treat you like dogs."
Martha Scott



Attendees of the in-clinic behaviour modification program

2.1 Introduction

It is easy for an animal behaviour consultant to assume that if they do not hear from a client, all is well with the treated animal. However in order to assess properly the effectiveness of behavioural advice or behaviour modification, it is important to obtain feedback from clients on therapy success and failure. The client-feedback obtained on therapy success and published by behaviour consultants is limited (Cameron, 1997; Askew, 1996; Yeon, 1999; Galac and Knol, 1997; Blackshaw, 1991; Sherman *et al.*, 1996; Beaver, 1983; Houpt, 1983). It is the aim of this chapter to explore in more depth the success of behavioural therapy for dogs. In particular it will examine the success of "in-clinic" behavioural modification.

2.1.1 Quantifying success

Behaviour consultants normally evaluate the success of a behaviour consultation by means of a follow-up telephone conversation with the client. This informal evaluation is not conducive to formal documentation of success, and may explain why there is little in the literature which deals comprehensively with the success of behavioural therapy. Retrospective evaluation of success rates for specific treatment protocols are common enough in the literature, but these investigations are often limited in their breadth (Askew, 1996; Cameron, 1997; Galac and Knol, 1997; Blackshaw, 1991; Beaver, 1983; Houpt, 1983; Yeon *et al.*, 1999).

Typically success or failure is assessed in the literature by finding out whether or not the problem has "improved". The trouble with this is that often a large proportion of cases are found to improve to some extent. For example Cameron (1997) found that 88% of dominance aggression problems improved after a consultation, Askew (1996) reported an 88% improvement rate for a cross-section of behaviour problems, while Yeon (1999) reported an 84% improvement rate for elimination problem cases. Due to the large proportion of behaviour problem cases which are seen to improve to some degree, it is uninformative to describe behavioural therapy as being successful if the dog simply "improves". For this reason assessments based on the *extent* of improvement are most useful because they provide a more detailed (and therefore more insightful) evaluation of the success of therapy.

In the present study a number of different aspects of in-clinic therapy success are investigated. This is achieved through the use of a questionnaire presented to clients of our behaviour consultation practice. A number of different facets of success are investigated, and each question asked of clients is rated on a scale with ten graduations. It is hoped that a comprehensive analysis of behavioural therapy success will be possible by assessing success using a large number of different questions, each with a ten-point scale.

2.1.2 In-clinic behavioural therapy

When advising on therapy for behaviour problems it is often apparent that the initial phases of therapy would be best undertaken personally by the consultant. This may be due to a number of factors. These will be outlined and discussed below. Before doing so, however, it is necessary briefly to describe the in-clinic process.

In our behavioural practice we take in dogs for a period of about three weeks in order to carry out therapy ourselves. We allow this period for therapy so we have enough time to ensure that training sessions are short and enjoyable for the dog, and so that any modified behaviour can become well established before the dog returns to the client. On average fifteen 20-minute sessions are completed at our facility during the three-week period. During the dog's stay specific treatment protocols relating to the behaviour problem are implemented, and their success is evaluated. Basic obedience commands are also taught. This is due to the positive impact which improved client control over the dog can have on many forms of problem behaviour. Telephone contact with clients is maintained during in-clinic therapy since additional questions often arise during therapy which need answering in order to assist the behaviour modification process.

Once suitable treatment protocols have been established, and the dog is responding well to them, a "transfer-training" session is held with the clients. This involves reiterating to the clients the rationale behind the techniques used, and providing them with practical instruction in the appropriate behaviour modification techniques. This session is the most important aspect of the whole therapy process. It is imperative to ensure that the clients leave the session with a full understanding of how to maintain and improve the new desirable behaviour displayed by the dog during the transfer-training session.

2.1.3 Reasons for recommending in-clinic therapy

There are a number of reasons for recommending in-clinic therapy. The potential risk to owners of aggressive dogs is one good reason to have behavioural therapy started by the consultant. An example is when considering therapy for a dominantly aggressive dog. If the consultant establishes consistent response to commands, and dependence on people for everything desired by the dog, the risk to clients during the initial phases of training is eliminated.

Another situation where in-clinic therapy is useful is when the clients do not have adequate access to important components of the therapy plan. For a dog displaying aggression towards other dogs as a result of fear, it is advantageous to bring the dog into an environment where it can meet large numbers of new dogs in a controlled manner. This is achieved in our in-clinic therapy by undertaking desensitisation and counter-conditioning programs which utilise the rotating population of dogs staying at our kennels. Muzzles are always worn during such interactions to ensure the safety of all participants.

A third factor influencing the decision to bring a dog into our clinic for therapy is the difficulty of therapy. Some behaviour modification requires the expertise of a behaviour specialist in the initial stages to ensure that it is implemented effectively. For example, it can be very hard for client to start behaviour modification with a hyperkinetic, anxious, or distractible dog. By having an expert work through the difficult initial stages of behaviour modification, the client is able to see real change in their dog's behaviour, which gives the client the confidence and motivation to continue with the behaviour modification at home, rather than becoming despondent and giving up on the consultant's recommendations.

If a positive punishment technique is needed as part of the behaviour modification program it is very important that this is implemented appropriately. The use of remote-activated electronic collars is one technique requiring an experienced person during the early stages. If the timing and intensity of correction from the collar is inappropriate, or if it is not clear to the dog what behaviour is causing the punishment, not only will the therapy fail but also it may cause the dog to become fearful of specific environments or individuals, or to become generally anxious. The use of remote-activated electronic collars can only be justified if they are used initially in the clinic setting, and if clients are then fully instructed in the appropriate

use of the collar so that they can successfully maintain the dog's modified behavioural responses.

In-clinic therapy also affords other benefits in addition to the main factors mentioned above. While a dog is in-clinic, the consultant can more extensively monitor it, and a greater understanding of the etiology and nature of its problems can be obtained. This ultimately increases the likelihood of successful treatment. During in-clinic therapy it is also possible for the consultant to fine-tune the behaviour modification program for the individual dog's temperament, and for the subtleties of the problem. It is not possible to anticipate these intricacies during a face-to-face consultation.

After the period of in-clinic therapy it is normally possible to present the clients with a greatly improved dog. Since the main concern with in-clinic therapy is regression to pre-clinic behaviour, the fact that clients can see a better-behaved dog provides the necessary impetus and confidence for them to continue with the training. Once the dog has returned home with the clients, follow-up telephone sessions are more effective because the consultant has personal experience of the dog and the problem in question. The chance that inappropriate or ineffective advice will be given at this stage is therefore reduced.

2.1.4 Disadvantages of in-clinic therapy

The drawbacks of undertaking in-clinic therapy include the cost of both boarding the dog and the training time provided by the consultant. This expense can outweigh benefits brought about by in-clinic therapy in cases where the problem is not particularly conducive to in-clinic therapy, or if the problem is not very disruptive or dangerous. Obviously the client's financial status affects the extent to which in-clinic cost impinges on the value of therapy. A welfare beneficiary may not be able to justify the expense of in-clinic therapy, even for a highly aggressive dog, whereas a wealthy client may be happy to pay for in-clinic therapy for basic control issues.

In our modern consumer society some clients can regard in-clinic therapy in much the same way as when they send their car to the mechanic - i.e. they may expect a "fixed" dog at the end of the in-clinic period. These clients can be less motivated to instigate ongoing therapy recommendations at home, thus diminishing or eliminating the favourable behaviour taught

in-clinic. As always, the willingness of clients to take an active and conscientious part in their dog's therapy significantly affects the success of treatment (Polsky, 1994b; Overall, 1993).

The fact that clients are not involved during in-clinic training can mean that they do not have the practical experience necessary to deal effectively with any recurrence of their dog's problem. This is mainly an issue when the problem has been largely resolved in-clinic, and techniques used to modify undesirable behaviour cannot be demonstrated to the client as fully as the consultant would like. For this reason it is very important during the transfer-training session to discuss fully both the techniques used and the rationale for them. Anticipation of potential problems which may be encountered once home, and suggestions for effective resolution of these problems, is vital. The importance of thorough education of clients in both the rationale and the practical skills of the behaviour modification used cannot be emphasised enough. The possibility of regression to pre-clinic behaviour once home is the greatest potential drawback of in-clinic therapy. It has even been suggested that the risk of regression to pre-clinic behaviour invalidates in-clinic therapy as an option for the treatment of many canine behavioural problems (Overall, 1997a).

2.1.5 Remote-activated electronic collars

Remote-activated electronic collars are used in-clinic as part of the behaviour modification program for some problems. Con-specific aggression, inappropriate predatory behaviour, and persistent recall problems are the most common reasons for use of this effective but potentially detrimental training tool. There is much concern about the negative impact that these collars may have on dogs undergoing behaviour modification (Overall, 1999; Frank, 1999; Seksel, 1999b). However, little has been published on the effects and benefits of electronic collars when used by qualified behaviour consultants.

The concern expressed by behaviour specialists about the risks involving electronic collar use is justified, but opinion on the appropriate use of these collars is coloured strongly by the general social stigma attached to the use of electric shock for behaviour modification. In a recent study on electronic collar use for inappropriate predatory behaviour, it was found that the suppression of predatory behaviour was long lasting, and more importantly the owners of dogs experiencing electronic collars did not describe any undesirable effects on their dog's behaviour (Christiansen *et al.*, 2001b).

An objective study of electronic collar use for the treatment of suitable behaviour problems would provide a much-needed evaluation of the suitability of these collars as a professional tool for behaviour modification.

2.1.6 Aims

This study was undertaken to investigate various issues relating to in-clinic therapy success. A range of questions relating to therapy success were presented to clients to investigate these issues. The main aims of this study are as follows:

- To investigate how successful in-clinic therapy is, and to investigate facets of success and failure.
- To investigate which client-related and consultant-related factors have the greatest impact on therapy success.
- To investigate which behaviour problems are most/least suited to in-clinic therapy.
- To investigate the success of electronic collars for the treatment of specific behaviour problems.
- To investigate the extent of any undesirable effects of electronic collar use.
- To investigate the extent to which undesirable behaviour resurfaces once electronic collar use is discontinued.

2.2 Materials and Methods

Assessment of therapy success was carried out by a retrospective survey of clients who had used the in-clinic service at Mark Vette's Behaviour Clinic in Auckland, New Zealand, during the period between February 1999 and May 2002. The author treated all the dogs in the study. Questionnaires were sent to 115 clients to assess 125 dogs. Included with the questionnaire was a self-addressed stamped envelope to make return of the questionnaire more convenient. Clients received the questionnaire between 3 to 34 months after their dog was in-clinic.

2.2.1 The questionnaire

The questionnaire developed for this study (appendix 1) consisted of a cover page and three sections. The cover page explained why the survey was being carried out, and explained how to answer the questions in the questionnaire. The first section of the questionnaire consisted of 28 questions relating to various aspects of therapy success. Clients were asked to grade their responses to the questions on a scale of 1 to 10. For example:

How would you rate the overall success of the therapy?
No success 1 2 3 4 5 6 7 8 9 10 Extremely successful

Ten gradations were used in order to obtain a detailed but quantifiable impression of the client's evaluation of success. With ten gradations (rather than 9 or 11) there is no middle value. This was done so that clients could not select a middle value for questions, but rather would be forced to indicate their choice in one direction or the other. Such "sitting on the fence" is only an issue when the two extremes for the question are opposites, providing a neutral point halfway along the grading spectrum. This was not the case for many of the questions, which ranged from "no success" to "extreme success". For these questions the midpoint is not neutral, but simply halfway along the spectrum.

Clients were asked to answer as many questions as possible, but if questions were not applicable they were asked to mark an X next to the question.

The second section of the questionnaire investigated the dog's response to obedience commands (a) before in-clinic therapy, (b) immediately after that therapy, and (c) at the time of filling out the questionnaire. This was done by asking the client to evaluate their dog's response to basic obedience commands (*"sit," "down," "stay," "come," "heel," " leave it," and "no!"*) on a scale of one to ten. To guide this evaluation the descriptions "never", "sometimes", "usually", and "always" are spaced along the ten graduations. Three sets of evaluations were presented for "before clinic", "after clinic" and "now". Clients were also asked to evaluate their dog's response to any new commands introduced during in-clinic therapy.

Section three of the questionnaire assessed the success of therapy for individual problems. Clients were asked to evaluate the extent to which specific behaviour problems had decreased in both frequency and intensity. Specific problems were listed on the questionnaire according to the notes kept on the case by the consultant. Space was left for clients to include problems that were not included in the questionnaire by the consultant.

To ensure a good return rate for the questionnaire it was designed to be completed in as little time as possible. As a result there was no explicit requirement to give qualitative descriptions of therapy success. Clients were advised that comments on any of the questions would be of great interest, and a space was provided for general comments. The only question clients were asked to explain was question 28, which asked if there were any undesirable effects of electronic collar use on dog behaviour or personality.

2.2.2 Statistical analysis

Minitab version 13.30 was used for all statistical analyses. Two-sample t-tests (assuming unequal variances) were used to investigate the significance of differences between means. A regression analysis was used to investigate if improvement in obedience improved overall success for dogs with problems other than disobedience, and for aggression specifically. A stepwise regression analysis was employed to investigate which aspects of the in-clinic process affected success. Individual regression analyses were used to explore further the effect of specific aspects of therapy on success. A one-way ANOVA was used to investigate the differences in reduction of frequency and reduction in intensity for the four most common behaviour problem types. Significance was set at the 5% level for all analyses.

2.3 Results

2.3.1 General results

Of the 125 questionnaires sent out to clients, 66 (53%) were returned. Of the questionnaires returned, five dogs had received in-clinic therapy within 3 months of filling in the questionnaire (2002 clients), 35 had received in-clinic therapy between 3 and 15 months

previous to filling in the questionnaire (2001 clients), 12 had received in-clinic therapy between 15 and 27 months previous to filling in the questionnaire (2000 clients), 14 had received in-clinic therapy between 27 and 34 months previous to filling in the questionnaire (1999 clients)(Table 2-1).

The primary problem of 26 of the dogs was disobedience/control issues, for 17 dogs it was aggression towards other dogs, for 3 it was dominance aggression, for 2 it was territorial aggression, for 10 it was inappropriate predatory behaviour, for 3 it was anxiety towards people, 1 exhibited separation anxiety, inappropriate elimination, undesirable jumping up, or barking (Table 2-1). Most dogs had a range of behaviour problems, and these are shown in table 2-1. The complete raw data from all questionnaires is included in appendix 3.

Table 2-1 Summary results for each dog including type of presenting behavioural problems and answers to core questions of the survey.

Name	P1*	F**	I***	P2	F	I	P3	F	I	Q1	Q12	Q18	Q22	Q23	Q25	Q26	Q27	Q28
2002																		
Aussie	D									9	9	10	10	10	4	9		
Buddy	D	8	8	Hy	8	7				10	8	7	10	8	10	10	7	1
Strauss	PG	9	10							9				10	1	10	2	1
Tuck	AgD	4	5	AgPF	8	8				7	7	7	9	6	6	8		5
Zara	AgD	5	5	Hy	8	9	D	9	9	8	9	10	10	7	5	5	2	1
2001																		
Amber	AnP	6	6	AnG	6	6	PS	9	4	5	6	7	6	5	5	5	5	1
Bella	AgD	9	8							10	9	9	10	10	3	10	4	7
Benji	AgD	3	3	PC	1	1	D	1	1	2	1	1	6	4	1	1	9	8
Boss	AgD			PS	9	10	D	8	9	8	5	8	10	9	9	9	3	1
Bronnie	AgD	3	5	PC	1	1				4	7	3	5	2	9	1	10	10
Charlie	AgT	8	7	D	7	8	AgD	7	7	7	7	9	10	10	2	10	7	1
Charlie	AgD	5	5							7	5	5	10	10		9	1	1
Charlie	D	8	2							8	6	8	10	8	2	9	7	2
Claude	D	7	8							5	6	6	10	5	2	8	5	1
Gin	PS	10	10	D	8	1				7	8	7	9	7	2.5	10	8	1
Gracie	D	6	7							8	5	8	10	9	9	9	3	1
Griff	AgD	4	7							5	5	5	7	3	5	8		2
Hazard	SA	1	1	D	4	6				6	7	6	2	1	5	5	9	3
Honor	D	8	7							7	8	4.5	8	6	4	7	6	1
Jaspa	E	10	10	D	8	2				7	7	7	10	9	4	8	6	6
Kronfeld	D	7	7	PC	1	1				6	7	4	9	8	1	10	7	1
Lady	AgD									9	9	8	10	10	8	10	3	10
Lewis	AgD	10	10							10	9	9	10	10	6	10	2	1
Lucy	D	8	1							8	5	8	10	10	9	10	6	1
Lucy	D	3								10	2	4	10	10	5	10	9	1
Maddie	D	6	4							6	7.5	5	6.5	4	3	8	7	2
Max	AnP	3	3	D	5	8				8	7	4	10	8		10	10	1
Milly	AgPD	8	1							8	7	5	10	10	1	10	8	1
Moose	D	8	10	E	1	1	Des	8	8	8	5	8	9	7	2	9		
Nancy	AgD	3	7							4.5	5	7	7	3	5	8		2
Odysseus	D	7	7	PC	1	1				8	9	7	10	10	3	10	4	1
Rose	D			J						7	9	8	10	8	6	9	8	5
Scooby	AgD	5	6	PC/PS	9	9				8	8	8	10	9	6	6	3	3
Sledge	PC	3	8							8	7	5	10	9	4	8	8	2

Name	P1*	F**	I***	P2	F	I	P3	F	I	Q1	Q12	Q18	Q22	Q23	Q25	Q26	Q27	Q28
Storm	PC	9	1							7	8	9	10	10	1	9	1	1
Strauss	AgD	8	7							8	9	9	10	7	6	8	3	2
Tessa	PC			PS						6	8	5	8	4	2	8	8	2
Titus	AgD	3	4	PS			PC	7	5	3	7	3	9	7	4	4	8	9
Veela	J	8	8	D	8	4	E	8	7	10	8	5	10	9	4	10	8	1
Zac	D	5	8	J	7	7				7	7	3	10	10	1	10	10	1
2000																		
Beau	D									4	10	1		2	8	2		10
Geordie	VC	1	1	Des	10	10	PC	1	1	2	5.5	8.5	9	7	7	6.5	9.5	7
Hey Boy	AgPD	3	3							3	5	4	6	7	5.5	5.5	8	5.5
Jess	AnP	10	10	AnD	1	1	AgD	1	1	6	4	8	10	7	7	8	8	
Jill	D	6	3							5		6	10	6				
Jimmy	AgD	7	6							8	7	9	10	10	4	8	4	1
Kaiser	D	6	6							10	8	8	10	7	5	9	8	1
Poppy	AgT	9	8							6	6	8	10	8	3	9	6	2
Sassy	AgD	6	8	AgPF	9	9				7	7	8	10	3	6	6	3	1
Tanner	PC	4	4							7	8	7	7	6	4	7	3	1
Tosh	D	9	9	J	6	5	Des	8	9	9	8	8	10	8	1	10	9	1
Toshka	D	8	5	J	10	1				8	8	9	10	8	3	9	7	2
1999																		
Ben	PC	1	5	PCh	7	8	D	6	7	7	7	6						
Boo	D	5	5							7	6	8	10	10	5	10	7	1
Chloe	B	4	4	VC	3	3				6	7	5	2	1	2	10	10	2
Daisy	D	8	9							3	7	5	5		5		5	10
Felix	PC	1	1	D						4		3	10		1	10	10	1
Jake	PC	4	1	J	3	5				9	6	6	9	9	3	9	7	4
Jess (euth)	D			B			AnP			1	7	1	5	2	4	4	10	1
Milly	D	6	8							7	8	7	9	8	4	8		1
Porsche	D	9	9							10	9	9	9	8	2	9	1	1
Shumba	AgPD	9	9	PC	10					7	4	7	8	8	7	8	2	1
Tess	PS	9	9							5		9	5	7				
Thor	D	7	5	J	7	7	AgT	6	5	7	8	6	8	8	6	8	7	7
Troy	AgD	9	9	AgPD	8	9	D	8	9	8	8	6	10	10	5	10	2	1
Ubu	D	8	8							8	7	7.5	9.5	6.5	6.5	9	7	5.5

* P1 = Primary problem (problem classifications are listed on the next page)

** F = Reduction in frequency of problem

*** I = Reduction in intensity of problem

Problem classifications:

D=Disobedience/control issues

AgD=Aggression towards other dogs

AgPF=Aggression toward people due to fear

AgPD=Aggression toward people due to dominance

AgT=Territorial Aggression

PS=Inappropriate predatory behaviour towards sheep

PC=Inappropriate predatory behaviour towards cats

PG=Inappropriate predatory behaviour towards goats

PCh=Inappropriate predatory behaviour towards chickens

VC=Vehicle chasing (cars, trucks, bicycles)

AnP=Anxiety towards people

AnD=Anxiety towards other dogs

AnG=Generalised anxiety

Hy=Hyperactivity

SA=Separation anxiety

E=Inappropriate elimination

Des=Destructive

J=Undesirable jumping up

B=Barking

2.3.2 Responses to survey questions

More than 75% of respondents rated the overall success of the therapy above 6/10 with 18% rating it 9 or 10/10 (Table 2-2). 35% of the respondents were very satisfied (9-10/10) with the behaviour modification programme (Table 2-2) and a similar number (32%) thought that there was a huge improvement in their dog's behaviour after treatment (Table 2-2). A small number of clients reported no change in the dog's behaviour (6%). A similar number rated the therapy as not successful (5%), while a very small proportion (2%) were not satisfied with the behaviour modification program itself (Table 2-2).

Knowledge of dog behaviour and learning (Q6) was rated as greatly improved (9-10/10) by 25% of clients, with a further 55% of clients rating their improvement between 6 and 8 on the ten-point scale (Table 2-2). A similar proportion of clients reported improvement in their practical dog training skills (Q8) with 22% giving a 9 or 10 and 55% giving a 6, 7 or 8 (Table 2-2).

The majority of clients felt that the causes and treatment or their dog's behavioural problem had been explained adequately with 55% giving a 9 or 10/10 (Table 2-2). Another third (31%) rated this aspect of our therapy as 6, 7 or 8/10. 8% gave a 3, 4 or 5, 6% gave a 1 or 2 (Table 2-2).

A third of clients thought that additional transfer training sessions would have greatly improved the success of therapy by responding with a 9 or 10 to question 9 (Table 2-2). A further 38% felt that additional sessions would have improved success significantly (rating of 6, 7 or 8), 20% thought it would have helped somewhat (rating or 3, 4 or 5), while 9% did not think it would have made a difference (rating of 1 or 2) (Table 2-2).

Client confidence in the dog's behaviour was improved markedly in most cases with 84% of clients rating their improvement in confidence over 6 on the ten-point scale (Table 2-2). Enjoyment was similarly improved with 84% of clients rating the improvement of enjoyment as over 6 (Table 2-2).

Compliance with the therapy program was reported as good by most clients with 65% giving a 6, 7 or 8 rating for their implementation of the therapy plan at home. 16% of clients felt

they implemented the therapy plan perfectly (9 or 10) while 19% were less rigorous (3, 4 or 5) (Table 2-2). Our recommendations were found to be impractical for only 5% of clients, 43% found them to be practical (rating of 6, 7 or 8), while 37% found them to be extremely practical (9 or 10) (Table 2-2).

Our therapy summary notes were referred back to regularly by only 15% of clients (9 or 10 rating), although most clients used them to some extent - 33% responded with a 3, 4 or 5, and 46% responded with a 6, 7 or 8 (Table 2-2). Most clients found the notes to be useful, 49% responded with a 6, 7 or 8, while 29% responded with a 9 or 10 (Table 2-2).

Most clients found the training techniques we used and recommended to be effective: 36% of clients responded with a 6, 7 or 8, while 44% responded with a 9 or 10. Only 3% did not think our techniques were effective (Table 2-2).

It seems that the behavioural improvements achieved during the in-clinic process transferred well to interactions between clients and their treated dogs. Only 5% of clients reported that their dogs were not as well behaved with them as they were with us (rating of 1 or 2). Over a third were just as good with clients as they were with us (9 or 10), while 47% were reported as being almost as good (6, 7 or 8) (Table 2-2).

In the long term 18% of dogs retained everything they learnt in-clinic (9 or 10). 5% forgot everything (1 or 2), 28% retained something (3, 4 or 5), and 49% retained much of what they learnt in-clinic (6, 7 or 8) (Table 2-2).

At home it seemed that reward based training was most effective in maintaining desirable behaviour. 86% of clients rated the reward side of the scale for question 19 (6 to 10) (Table 2-2).

A moderate amount of time was needed by most people to maintain appropriate behaviour in their dog. Only 5% of clients reported that no time was needed (1 or 2), 40% reported some time was needed (3, 4 or 5), 37% reported a significant amount of time was needed (6, 7 or 8), while 18% spent a lot of time maintaining desirable behaviour (Table 2-2).

Most clients in this study reported that they would recommend us to others with problem pets: 73% said they would do so without hesitation (9 or 10), 17% said they were likely to recommend us (6, 7 or 8), while only 3% said they would not recommend us (1 or 2) (Table 2-2).

Many clients felt that the in-clinic therapy was value for money, with 37% giving a definite "yes" (9 or 10 rating) to question 23. Most of the remainder (43%) were satisfied with the value for money (6, 7 or 8), although 8% felt that the clinic course was not value for money (1 or 2) (Table 2-2).

For those clients who took home an electronic training collar as part of the therapy program 10% did not use it at all (1 or 2), 8% used it extensively, 38% used it somewhat, while 44% used it moderately (Table 2-2). Owner attitudes to the collars varied. 25% of owners felt they were definitely a good training tool (rating of 1 or 2), 44% were a little uncomfortable with the collars (3, 4 or 5), 23% had significant reservations with the collars, while 8% thought they were a very bad instrument (Table 2-2). Despite some clients not feeling very positively about the collars, they were found by clients to be effective. 55% of clients reported that the collars were very effective (9 or 10), 32% reported they were effective (6, 7 or 8), 8% reported they were somewhat effective (3, 4 or 5), while 5% found them to be ineffective for their problem (Table 2-2).

Once the collars were sent back to us it was found that most dogs reverted back to their previous behaviour to some extent. 20% of clients reported that their dog's behaviour reverted back greatly (9 or 10), 43% regressed significantly, 23% regressed somewhat, while 14% of dogs' behaviour remained the same after discontinuation of the collar. Use of the electronic collars resulted in undesirable effects on personality and behaviour in some dogs. 8% of clients gave a definite "yes" to question 28 "Did you notice any undesirable effects of collar use on your dog's behaviour or personality?" The majority of dogs who underwent behaviour modification with a collar did not show any negative effects on behaviour or personality.

Table 2-2 Summary of client responses to questions 1 to 28

			1 to 2		3 to 5		6 to 8		9 to 10	
Questions	**mean**	**SE**	**f**	**%**	**f**	**%**	**f**	**%**	**f**	**%**
1. How would you rate the overall success of the therapy? No success(1) - Extremely successful(10)	6.86	0.26	3	5%	12	18%	39	59%	12	18%
2. How satisfied do you feel with the behaviour-modification program suggested and/or implemented by us? Not satisfied - Very satisfied	7.42	0.30	1	2%	12	18%	30	45%	23	35%
3. In general, how do you now feel about your dog's behaviour after seeing us? Much the same - Huge improvement	7.17	0.17	4	6%	11	17%	30	45%	21	32%
4. Prior to therapy did your dog behave appropriately in all situations? No - Yes	2.67	0.25	30	45%	34	52%	2	3%	0	0%
5. After therapy does your dog behave appropriately in all situations? No - Yes	6.33	0.26	3	5%	18	27%	37	56%	8	12%
6. Has your knowledge of dog behaviour and learning improved? Not at all - Greatly	7.15	0.26	3	5%	10	15%	36	55%	16	25%
7. Did we adequately explain the causes and treatment of your dog's behaviour problem(s)? No - Yes	7.77	0.31	4	6%	5	8%	20	31%	35	55%
8. Have your practical dog training skills improved? Not at all - Greatly	6.75	0.27	2	3%	13	20%	35	55%	14	22%

Questions	mean	SE	1 to 2		3 to 5		6 to 8		9 to 10	
			f	%	f	%	f	%	f	%
9. Would additional transfer training sessions have improved the overall success of therapy? Not at all - Greatly	6.83	0.34	6	9%	13	20%	25	38%	21	32%
10. Has your confidence in your dog's behaviour improved? Not at all - Greatly	7.12	0.25	2	3%	9	14%	38	58%	17	26%
11. Has enjoyment of your dog improved? Not at all - Greatly	7.68	0.25	2	3%	8	12%	32	49%	23	35%
12. To what extent have you implemented the therapy program/training? Not at all - Perfectly	6.92	0.22	2	3%	10	16%	40	65%	10	16%
13. How practical are the recommendations made by us for therapy at home? Impractical - Extremely practical	7.42	0.29	3	5%	9	15%	26	43%	22	37%
14. To what extent did you refer back to the therapy summary notes? Not at all - Regularly	5.97	0.32	4	7%	20	33%	28	46%	9	15%
15. How useful were the therapy summary notes? No use - Extremely useful	7.16	0.30	2	3%	11	19%	29	49%	17	29%
16. In general, how do you feel about the effectiveness of the training techniques used? Not effective - Extremely effective	7.59	0.28	2	3%	11	17%	23	36%	28	44%

Questions	mean	SE	1 to 2		3 to 5		6 to 8		9 to 10	
			f	%	f	%	f	%	f	%
17. After going home (first few days) was your dog as good with you as it was with us? No - Yes	7.39	0.28	3	5%	8	13%	30	47%	23	36%
18. To what extent have your dog's desirable behaviours changed since it first went home? Forgotten everything - Retained everything	6.48	0.27	3	5%	18	28%	32	49%	12	18%
19. Once home, which type of training was most effective in maintaining appropriate behaviour? Punishment - Reward	7.95	0.25	1	2%	7	12%	22	37%	29	49%
20. How much time is now needed by you to maintain appropriate behaviour in your dog? None - A lot	6.19	0.30	3	5%	25	40%	23	37%	11	18%
21. How is your dog treated by its human family? Very softly - Very firmly	5.67	0.24	3	5%	30	48%	24	39%	5	8%
22. Would you recommend us to others with problem pets? Never - Without hesitation	8.76	0.25	2	3%	4	6%	11	17%	46	73%
23. Was the clinic therapy value for money? No - Yes	7.28	0.33	5	8%	8	13%	27	43%	23	37%
24. If an electronic training collar was recommended as part of the therapy program, to what extent did you use it? Not at all - Extensive use	5.57	0.30	6	10%	23	38%	27	44%	5	8%

Questions	mean	SE	1 to 2		3 to 5		6 to 8		9 to 10	
			f	%	f	%	f	%	f	%
25. How do you feel about the use of the electronic training collar as a training tool? It is a good instrument - It is a very bad instrument	4.42	0.30	15	25%	27	44%	14	23%	5	8%
26. Was the electronic collar effective in your dog's case? Not effective - Very effective	8.11	0.28	3	5%	5	8%	20	32%	34	55%
27. Once the collar was sent back to us, to what extent did undesirable behaviour resurface? Not at all - Greatly	6.08	0.37	8	14%	13	23%	24	43%	11	20%
28. Did you notice any undesirable effects of collar use on your dog's behaviour or personality? No - Yes	2.80	0.37	43	72%	5	8%	7	12%	5	8%

2.3.3 Comparison of dogs' response to obedience commands before and after in-clinic therapy

When the dogs' responsiveness to command before in-clinic therapy was compared with that at the time of questionnaire completion there was very strong evidence to suggest that there was an increase in such responsiveness as a result of the in-clinic therapy (Table 2-3)

Table 2-3 Comparison of Dog's Response to Obedience Commands Before In-Clinic Therapy to that at the Time of Questionnaire Completion

Command	Response Before In-Clinic Therapy (1-10)	Response at Time of Questionnaire Completion (1-10)	P-Value for Difference (2-Sample T-Test)
Sit	5.36	8.22	$p \leq 0.0005$
Down	3.80	7.74	$p \leq 0.0005$
Stay	3.48	7.23	$p \leq 0.0005$
Come	3.92	7.43	$p \leq 0.0005$
Heel	2.97	6.37	$p \leq 0.0005$
No	3.82	7.51	$p \leq 0.0005$

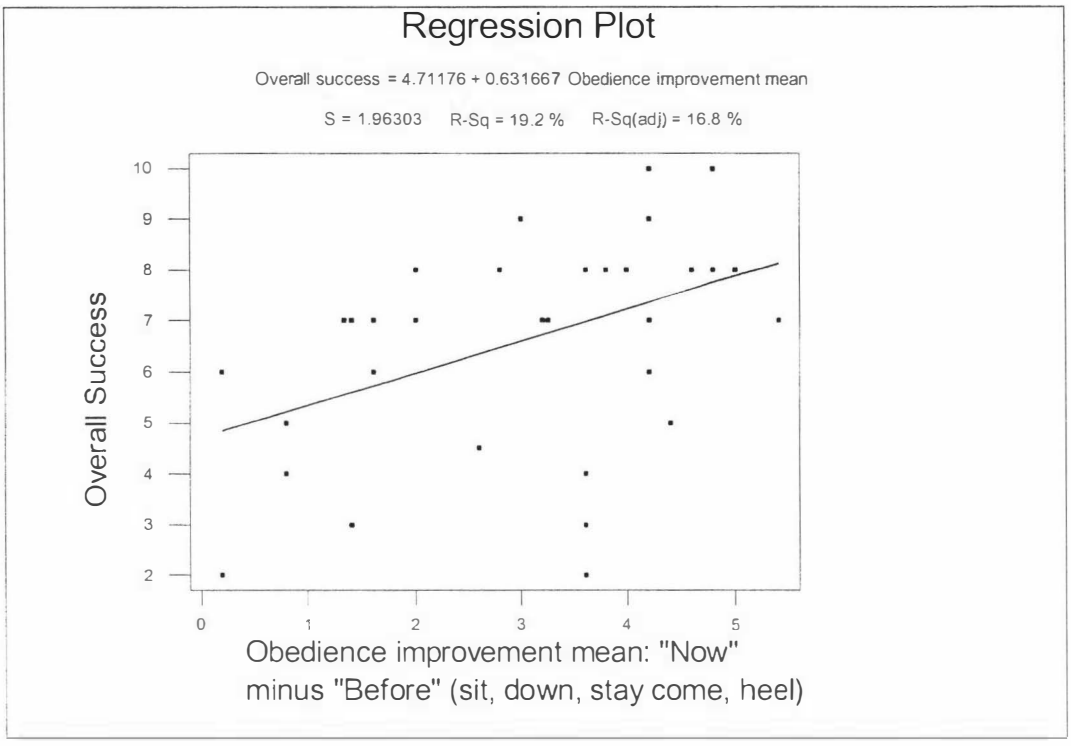
When the dogs' responsiveness to command was compared immediately after in-clinic therapy with that at the time of questionnaire completion, it was found that there was a significant decrease in responsiveness to the commands "*stay*" ($p<0.034$), "*come*" ($p<0.007$), "*heel*" ($p<0.037$), and "*no*" ($p<0.030$) (Table 2-4). There was no significant difference over time for "*sit*" ($p<0.114$) and "*down*" ($p<0.445$) (Table 2-4).

Table 2-4 Comparison of Dog's Response to Obedience Commands Immediately After In-Clinic Therapy to that at the Time of Questionnaire Completion

Command	Response Immediately After In-Clinic therapy (1-10)	Response at Time of Questionnaire Completion (1-10)	P-Value for Difference (2-Sample T-Test)
Sit	8.68	8.22	p=0.114
Down	8.05	7.74	p=0.445
Stay	8.07	7.23	p=0.034
Come	8.40	7.43	p=0.007
Heel	7.32	6.37	p=0.037
No	8.25	7.21	p=0.030

Improvement in obedience was measured as the mean difference between the dogs' mean response to the basic obedience commands (sit, down, stay, come, heel) before coming into clinic, and that at the time of questionnaire completion. This "improvement in obedience" value for each dog was then subjected to a regression analysis to investigate how well it predicted overall therapy success (Q1) for dogs that had come in for behaviour problems other than disobedience. This analysis showed that improvement in obedience was a significant predictor of overall success for dogs that attended the clinic for a primary problem other than disobedience (p=0.008). Improvement in obedience accounted for 19.2% of the variance in overall success for non-disobedience dogs (Figure 2-1)

Figure 2-1 Regression Plot of "Improvement in Obedience" and Overall Success (Q1)



2.3.4 Aspects of the in-clinic process and their effect on overall success and improvement in behaviour

Aspects of therapy that had the potential to affect overall success (Q1) and the improvement in behaviour (Q3) were subjected to a stepwise regression analysis to investigate which acted as the best predictors of success. The aspects of therapy included in the analysis were the improvement in the client's knowledge of behaviour and learning (Q6), the consultant's explanation of the causes and treatment of the dog's behaviour problem(s) (Q7), the compliance of the client with the therapy recommendations (12), the practicality of the consultant's recommendations (13), and the extent to which the clients referred back to the therapy notes (Q14).

The practicality of the consultant's recommendations (Q13) was found to be the best predictor of overall success ($p \leq 0.0005$) and improvement of behaviour ($p \leq 0.0005$). Other aspects of therapy did not provide any more information than that provided by the practicality of recommendations when predicting overall success. However, improvement in knowledge of canine behaviour and learning (Q6) acted as an additional predictor of improvement in behaviour (Q3)($p=0.009$).

The practicality of recommendations was found to act as a significant positive predictor of overall success ($p \leq 0.0005$), and accounted for 44.9% of the variation of overall success (Table 2-5)(Figure 2-2).

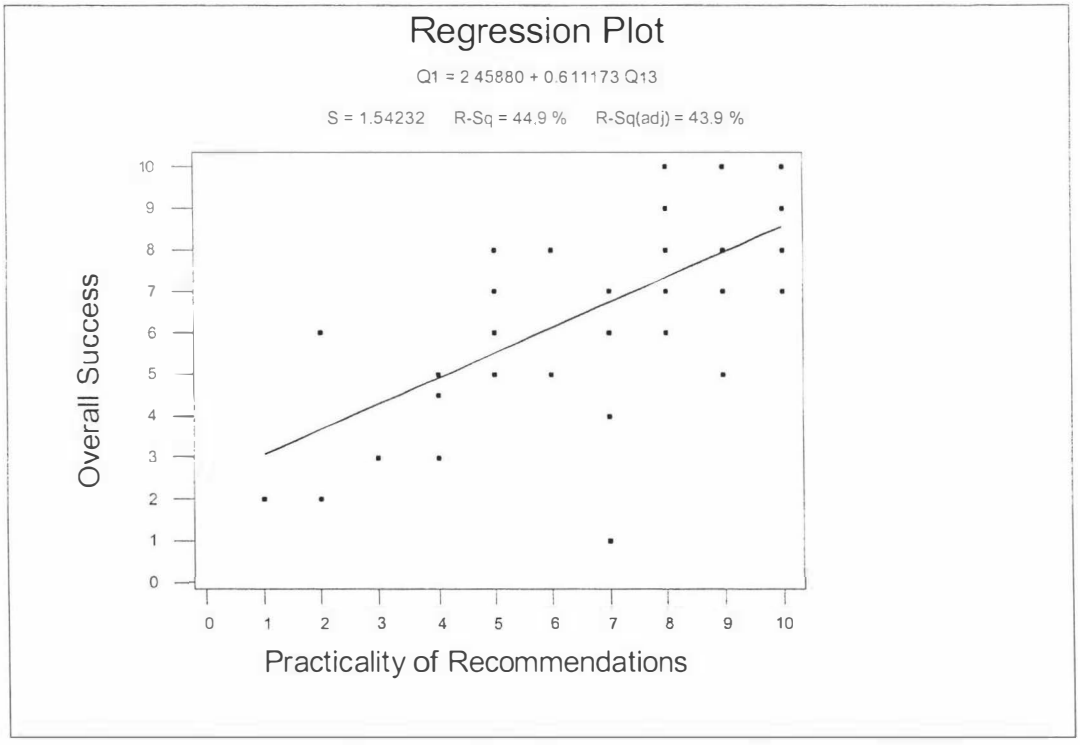
Table 2-5 Regression Analysis: Overall Success (Q1) versus Practicality of Recommendations (Q13)

The regression equation is
Q1 = 2.45880 + 0.611173 Q13

S = 1.54232 R-Sq = 44.9 %

$p \leq 0.0005$

Figure 2-2 Regression Plot of Overall Success (Q1) versus Practicality of Recommendations (Q13)



The practicality of recommendations was found to act as a significant positive predictor of improvement in behaviour (Q3)($p \leq 0.0005$), and accounted for 56.6% of the variation in improvement in behaviour (Table 2-6)(Figure 2-3).

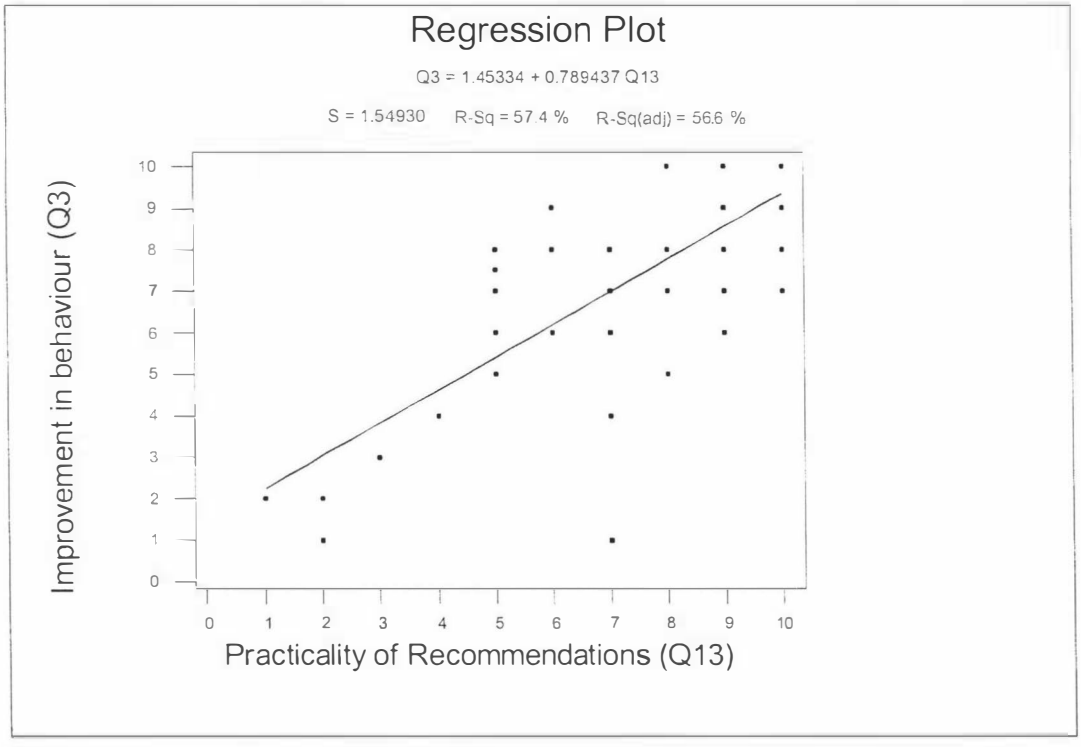
Table 2-6 Regression Analysis: Improvement in Behaviour (Q3) versus Practicality of Recommendations (Q13)

The regression equation is
Q3 = 1.45334 + 0.789437 Q13

S = 1.54930 R-Sq = 57.4 %

$p \leq 0.0005$

Figure 2-3 Regression Plot of Improvement in Behaviour (Q3) versus Practicality of Recommendations (Q13)



The owner's improvement in knowledge of dog behaviour and learning was found to act as a significant positive predictor of improvement in behaviour (Q3)($p \leq 0.0005$), and accounted for 31.3% of the variation in improvement in behaviour (Table 2-7)(Figure 2-4).

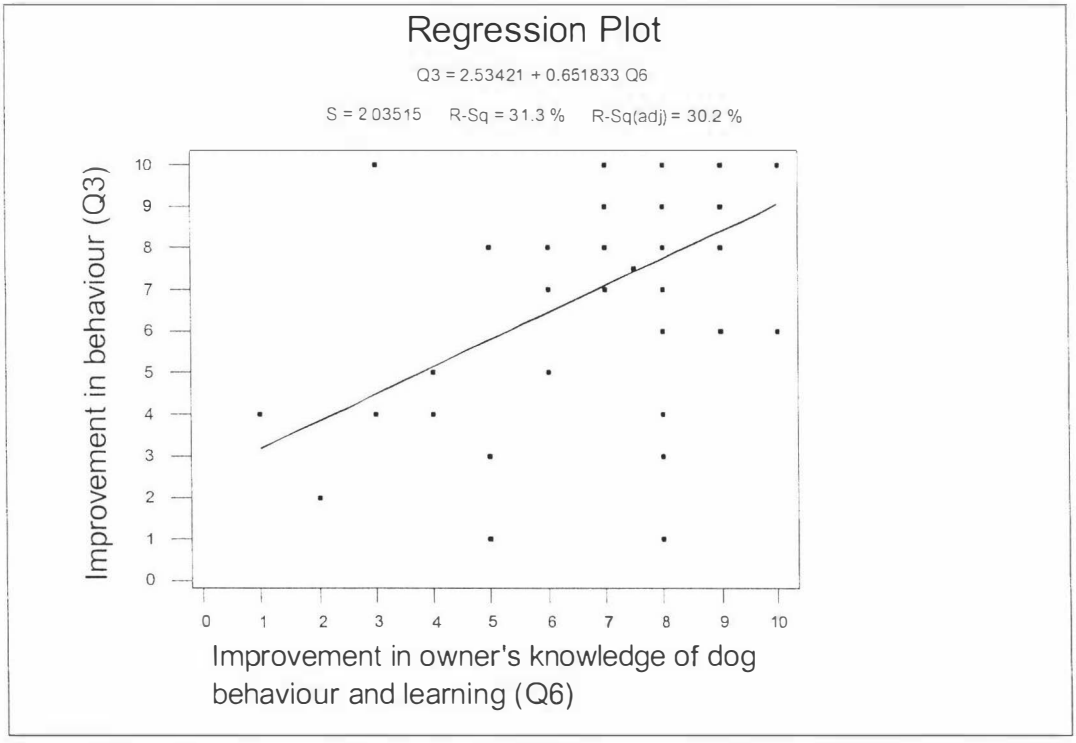
Table 2-7 Regression Analysis: Improvement in Behaviour (Q3) versus Improvement in Knowledge of Dog Behaviour and Learning (Q6)

The regression equation is
Q3 = 2.53421 + 0.651833 Q6

S = 2.03515 R-Sq = 31.3 %

$p \leq 0.0005$

Figure 2-4 Regression Plot of Improvement in Behaviour (Q3) versus Improvement in Owner Knowledge of Dog Behaviour and Learning (Q6)



Although practicality of consultant recommendations acted as the best predictor of therapy success, other factors were linked with therapy success and with one another. Client compliance was correlated with the practicality of recommendations (Q13)($p \leq 0.0005$), adequacy of explanations about the causes and treatment of the dog's behaviour problem (Q7)($p=0.0007$), and the improvement of client knowledge (Q6)($p \leq 0.0005$)(Table 2-8). Overall success was correlated with the practicality of recommendations (Q13)($p \leq 0.0005$),

adequacy of explanations about the causes and treatment of the dog's behaviour problem (Q7)(p=0.0204), and the improvement of client knowledge (Q6)(p=0.0028)(Table 2-8).

Table 2-8 Practicality of Recommendations, Adequacy of Explanation of Causes and Treatment of the Behaviour Problem, Improvement in Client Knowledge and their Correlations with Compliance, and Therapy Success

	Client Compliance (Q12)	Overall Success (Q1)
Practicality of Recommendations (Q13)	0.55459 p ≤0.0005	0.67365 p ≤0.0005
Adequacy of Explanations (Q7)	0.43233 p=0.0007	0.30377 p=0.0204
Improvement of client knowledge (Q6)	0.44188 p ≤0.0005	0.38568 p=0.0028

2.3.5 Dogs with inter-dog aggression (non-household) as their primary problem

For those dogs that underwent in-clinic therapy for inter-dog aggression towards non-household dogs (n=15) the mean assessment of overall success by owners was 6.85 on a scale from 1 (No Success) to 10 (Extremely Successful). After in-clinic therapy for inter-dog aggression, aggression towards other dogs was reduced in frequency by 50% on average (Table 2-9), while intensity of aggression when it occurred was reduced by 59% on average (Table 2-10).

It is important to note that because the design of this question followed the 1 to 10 scale of the rest of the questionnaire, 1 corresponds to 0% while 10 corresponds to 100%. This means that the score given by the respondents does not easily relate to the percentage decrease in frequency or intensity. The percentage decrease is recorded under the respondent's score for the question in the tables below. Response frequencies for reduction in frequency and intensity of aggression showed that all dogs improved to some extent, and one dog's intraspecific aggression was totally eliminated (Table 2-11).

Table 2-9 Decrease in Frequency of Aggression

Mean score (1-10)	*5.60*
This relates to a decrease of	*50%*

Table 2-10 Decrease in Intensity of Aggression

Mean score (1-10)	*6.33*
This relates to a decrease of	*59%*

Table 2-11 Response frequencies for reduction in frequency and intensity of aggression

	0%		25%		50%		75%			100%
	1	2	3	4	5	6	7	8	9	10
Frequency	0	0	4	2	3	1	1	1	2	1
Intensity	0	0	1	1	4	2	3	2	1	1

For dogs undergoing therapy for inter-dog aggression there was a significant correlation between improvement in command responsiveness with owners (sit, down, stay, come heel – "now" minus "before" clinic) and overall success (Q1)(0.6740; p<0082) and reduction in frequency of aggression (0.7132; p<0.0042). Reduction in intensity of aggression was not significant (0.3760; p<0.1672) (Table 2-12).

Table 2-12 Correlations between obedience improvement, overall success (Q1), decrease in frequency of aggression, and decrease in intensity of aggression

	Overall success (Q1)	**Decrease in frequency of aggression**	**Decrease in intensity of aggression**
Obedience improvement*	0.67401 p=0.0082	0.71317 p=0.0042	0.37600 p=0.1672

* mean improvement from "before clinic" to "now" for sit, down, stay, come and heel

2.3.6 Therapy success for sheep-chasing therapy compared with cat-chasing therapy

Dogs treated in-clinic for inappropriate sheep chasing (n=7) showed a mean decrease in chasing frequency of over 90% at the time of filling out the questionnaire (Table 2-13). Dogs treated in-clinic for inappropriate cat chasing (n=14) showed a mean decrease in chasing frequency of about 30% (Table 2-13). There was very strong evidence to suggest that these two means were different ($p \leq 0.0005$; two tailed t-test assuming unequal variances).

Table 2-13 Decrease in Frequency of Sheep and Cat Chasing

Decrease in Frequency of		
	Sheep chasing	**Cat chasing**
Mean score (1-10)	9.29	3.75
This relates to a decrease in frequency of	90%	30%

Dogs treated in-clinic for inappropriate sheep chasing showed a mean decrease in chasing intensity of about 87% at the time of filling out the questionnaire (Table 2-14). Dogs treated in-clinic for inappropriate cat chasing showed a mean decrease in chasing intensity of about 22% (Table 2-14). There was very strong evidence to suggest that these two means were different ($p \leq 0.0005$; two tailed t-test assuming unequal variances).

Table 2-14 Decrease in Intensity of Sheep and Cat Chasing

Decrease in Intensity of		
	Sheep chasing	***Cat chasing***
Mean score (1-10)	8.86	3.00
This relates to a decrease in frequency of	87%	22%

2.3.7 Dogs with control issues as their primary problem

For dogs that experienced in-clinic therapy for disobedience/control issues (n=22), the mean decrease in frequency of disobedience issues was 66% (Table 2-15). The mean decrease in intensity of disobedience issues when they arose was 61% (Table 2-16).

Table 2-15 Decrease in Frequency of Disobedience

Mean score (1-10)	6.93
This relates to a decrease in frequency of	66%

Table 2-16 Decrease in Intensity of Disobedience

Mean score (1-10)	6.45
This relates to a decrease in intensity of	61%

2.3.8 Comparison of reduction in frequency and intensity after in-clinic therapy for the four most common behaviour problem types

There was a significant difference in reduction in frequency after therapy between some of the problems types ($p \leq 0.0005$)(Table 2-17). After therapy, sheep chasing was reduced in frequency significantly more than cat chasing (Table 2-17). Sheep chasing was also significantly more reduced in frequency than aggression towards non-household dogs after therapy (Table 2-17). Disobedience was reduced in frequency significantly more for dogs undergoing therapy for this problem compared to those undergoing therapy for cat-chasing (Table 2-17).

Table 2-17 One-way ANOVA: Decrease in Frequency of Problem After In-Clinic Therapy Versus Problem Type

Analysis of Variance for Behaviour Problem Types

Source	DF	SS	MS	F	P
Problem	3	167.33	55.78	10.66	0.000
Error	54	282.55	5.23		
Total	57	449.88			

Level	N	Mean*	StDev	Individual 95% CIs For Mean Based on Pooled StDev
Ag-Dogs	15	5.600	2.444	(---*----)
Disobed	22	6.932	1.466	(---*---)
Pred-cat	14	3.750	3.424	(----*----)
Pred-sheep	7	9.286	0.488	(------*------)
				5.0 7.5 10.0

Tukey's pairwise comparisons

95% CIs for Intervals for (column level mean) - (row level mean)

	Ag-Dogs	Disobed	Pred-cat
Disobed	-3.363 0.699		
Pred-cat	-0.404 4.104	1.108 5.256	
Pred-sheep	-6.462 -0.909	-4.986 0.278	-8.344 -2.728

* On scale of 1-10.
1 = a 0% decrease in frequency of the problem
10 = a 100% decrease in frequency of the problem

It was found that at the 5% level there was also a significant difference in reduction in intensity after therapy between some of the different problem types ($p \leq 0.0005$)(Table 2-18). After therapy, cat chasing was reduced less in intensity as a result of in-clinic therapy compared to aggression towards non-household dogs, disobedience, and sheep chasing (Table 2-18).

Table 2-18 One-way ANOVA: Decrease in Intensity of Problem After In-Clinic Therapy Versus Problem Type

Analysis of Variance for Behaviour Problem Types

Source	DF	SS	MS	F	P
Problem	3	179.75	59.92	10.35	0.000
Error	52	301.14	5.79		
Total	55	480.89			

Level	N	Mean*	StDev	Individual 95% CIs For Mean Based on Pooled StDev
Ag-Dogs	15	6.333	1.915	(----*----)
Disobed	21	6.452	2.439	(---*---)
Pred-cat	13	3.000	2.915	(----*----)
Pred-sheep	7	8.857	2.193	(------*-------)

2.5 5.0 7.5 10.0

Tukey's pairwise comparisons

95% CIs for Intervals for (column level mean) - (row level mean)

	Ag-Dogs	Disobed	Pred-cat
Disobed	-2.276 2.038		
Pred-cat	0.915 5.751	1.200 5.704	
Pred-sheep	-5.445 0.397	-5.190 0.380	-8.849 -2.866

* On scale of 1-10.

1 = a 0% decrease in intensity of the problem

10 = a 100% decrease in intensity of the problem

2.4 Discussion

2.4.1 Major findings of this study

- In-clinic therapy was found to be successful on a number of owner-rated measures of therapy success
- The in-clinic process was considered by clients to provide good value for money
- In-clinic therapy was successful in reducing inter-dog aggression frequency by 50% on average, while intensity of aggression when it occurred was reduced by 59% on average
- There was some degree of regression to pre-clinic behaviour for most dogs once living back at home
- When investigating which aspects of the in-clinic process were linked with success, it was found that it was the practicality of the consultant's recommendations which was most closely linked with overall success (Q1) and improvement in behaviour (Q3)
- Improvement in obedience responsiveness was associated with overall success (Q1) for dogs that were treated in-clinic for non-obedience problems
- For dogs undergoing therapy for inter-dog aggression there was a significant correlation between improvement in command responsiveness with owners and overall success (Q1) and reduction in frequency of aggression
- Electronic collars were found to be very effective by clients
- There were reports of some negative effects of electronic collar use, but the majority of clients did not report any negative effects of using such collars
- When comparing the success of sheep-chasing therapy with cat-chasing therapy, sheep-chasing therapy was found to be significantly more successful in reducing both the frequency and intensity of the problem

2.4.2 Overall success of therapy

Retrospective success rates for behaviour therapy have been reported in the literature. Normally the success rates reported are for face-to-face consultations with clients and their dogs. Success is usually measured by mail-out postcards or questionnaires, and the questions investigating success differ between each consultant. For this reason it is difficult to compare

success between consultants. This is particularly pertinent when all that is reported is the proportion of dogs which showed some improvement. This is often not very informative because most dogs with a behaviour problem show some degree of improvement after therapy.

The present study found that after a period of in-clinic behaviour modification and a two-hour transfer and education period for clients, there was some degree of improvement in 95% of all behaviour problem cases. This compares favourably with the previous success rates for face-to-face consultations and home visits. Figures reported for behavioural consultation success are usually related to therapy for specific problems. For example, separation anxiety was reduced to some extent in 62% of dogs after behavioural consultation (Takeuchi *et al.*, 2000). Inappropriate elimination was improved in 84% of cases after consultation (Yeon *et al.*, 1999). Blackshaw (1991) reported "success rates" of 75% for dominance aggression, 94% for territorial aggression, and 93% for predatory aggression, although "restraint" was recommended as a treatment protocol for many of the dogs. Aggression towards owners was reportedly reduced to some extent in 51.2% of cases, while aggression towards strangers was reduced to some extent in 67.5% of such cases (Takeuchi *et al.*, 2001). Phobias and fear were reportedly treated with 100% success in 91 cases by Rogerson (1997). Inter-dog aggression was reduced to some extent in 52% of dogs in one study (Sherman *et al.*, 1996) and 66% of dogs in another (Houpt, 1983). In this study other questions relating to therapy success also indicated that a majority of clients received some benefit from the in-clinic process. For example: only 2% of clients were not satisfied at all with the behaviour modification program (Q2); 94% of clients reported some degree of improvement in their dog's behaviour (Q3); 97% of clients reported increased confidence in their dog's behaviour (Q10); 97% of clients reported increased enjoyment with their dog (Q11).

The higher improvement rates seen in the present study, compared to the improvement rates outlined above, are likely to be a result of the fifteen-session in-clinic training process carried out by us before the dogs returned home for continuing behaviour modification by clients. Various advantages of in-clinic therapy may have contributed to the high improvement rates. The ability to ensure that the initial stages of behaviour modification are carried out effectively is a significant advantage of such therapy. These early stages of behaviour modification can be discouraging for clients if improvements are not seen quickly; this can result in reduced compliance with the consultant's recommendations. By the end of the in-

clinic process clients can see significantly improved behaviour in their dog, which gives them the confidence and motivation to continue with the behaviour modification program. Also, by having behaviour modification techniques established skilfully in-clinic, the dog is familiarised with the new rules and routines. This makes it much easier for the client to maintain or improve the dog's behaviour. The time spent in-clinic also allows the consultant to monitor the dog extensively, and to obtain a greater understanding of the etiology and nature of the problem. This improves the chance of therapy success because the behaviour modification program can be fine-tuned for the individual dog and for the subtleties of the problem behaviour. It also enables the consultant to give effective advice during the transfer training session and during follow-up conversations.

It can be seen that the vast majority of dogs which came into the clinic for behaviour modification improved to some extent. What is more interesting and significant, however, is the *degree* of improvement seen. Unfortunately this is not regularly reported in the literature. If the extent of improvement is reported it is usually restricted to three or four gradations. For example Cameron (1997) reported that after a face-to-face consultation and a telephone follow-up for dominance aggression, 32% showed fair improvement, 44% showed good improvement, and 12% showed excellent improvement. This is far more informative than simply reporting the proportion of cases that improved to some extent, because it allows for better comparison of therapy efficacy between consultants and therapy types.

The present study asked clients to evaluate success on a scale of 1 to 10 rather than indicate descriptive outcomes such as those used by Cameron (1997). This was done in order to enable correlations to be found between questions. To make the results of these responses easier to interpret, the frequency of responses have been reported for the groupings 1-2, 3-5, 6-8, and 9-10.

Depending on the question, these groups can be considered to represent "no success/improvement/satisfaction" (1-2), "some" (3-5), "good" (6-8), and "excellent" (9-10). Over all behaviour-problem types, the in-clinic therapy was evaluated as having only some success overall in 18% of cases, good success in 59% of cases, and excellent success in 18% of cases (Q1). Behaviour was reported as improving to some extent in 17% of cases, to a good extent in 45% of cases, and to an excellent extent in 32% of cases (Q3). For the question "Would you recommend us to others with problem pets?" 73% of clients responded

with a 9 or 10 (1 = Never, 10 = Without hesitation). These results show that the majority of clients found the in-clinic process resulted in good or excellent overall success/behavioural improvement. This is further confirmation of the positive effect that in-clinic therapy has on the prognosis for behavioural problems.

When comparing dogs' responsiveness to command before in-clinic therapy with that at the time of questionnaire completion it was found that the mean response to "sit", "down", "stay", "come", "heel", and "no" was significantly higher at the time of questionnaire completion compared to before in-clinic therapy. This indicates that in-clinic therapy is effective in improving a dog's response to obedience commands in the long term.

2.4.3 Success of in-clinic therapy for dogs displaying aggression towards non-household dogs as their primary problem

The most extensive study of therapy success for intraspecific aggression in dogs is that by Sherman *et al.* (1996) at the Animal Behaviour Clinic, Cornell University (ABCCU). Of the 99 dogs treated for intraspecific aggression over the 10 years that the study encapsulated, 26 were treated for aggression towards non-household dogs as their primary problem. Treatment recommendations included: desensitisation, counterconditioning, obedience, neutering, reduction of privileges, avoidance of aggression triggers, head halters, muzzles, diet change, and drug therapy. No clients reported complete resolution of the problem, 52% felt the problem had improved, and 48% felt the problem had not changed. An earlier study into the success of treatment at the same behavioural clinic found that 33% of intraspecific cases did not improve after therapy, while 66% showed some improvement (Houpt, 1983). The sample size for this study was however small (9 cases).

When comparing these results with the present study it is clear that the in-clinic therapy carried out by us was markedly more successful. Compared to the 48% of dogs that did not show any improvement after therapy at the ABCCU, all of the dogs that came to our facility for behaviour modification showed improvement. This was indicated by our clients' evaluation of the degree to which both frequency and intensity of aggression was reduced. On a scale of 1 (0% decrease) to 10 (100% decrease), none reported a 1 or 2 for decreases in frequency or intensity. Frequency of aggression was reduced to *some* extent (evaluation of 3-5) in 60% of cases, to a *good* extent (6-9) in 33% of cases, and *totally eliminated* (10) in 7%

of cases. Intensity of aggression was reduced to *some* extent (3-5) in 40% of cases, to a *good* extent (6-9) in 53% of cases, and *totally eliminated* (10) in 7% of cases. It was also found that reduction in frequency and reduction in intensity of the presenting problem was not significantly different between dogs that attended the clinic for inter-dog aggression problems or disobedience. This similarity in success between training disobedient dogs and therapy for inter-dog aggression also suggests that our inter-dog aggression therapy is successful.

The improved rates of success at our facility for treatment of intraspecific aggression, compared to the ABCCU, may be a result of a couple of important differences between the two therapy processes. The main difference is that the cases outlined in the present study were trained for approximately fifteen 20-minute sessions at our facility before the owners took the dogs home to continue the behaviour modification themselves. This probably increases the chances of long-term success by ensuring that experienced trainers implement the initial stages of behaviour modification correctly.

It also means that clients do not become discouraged trying to deal with the problem in its most intense state. The fact that the dog is handed back to its owners at a stage where its behaviour is much improved may encourage the owner to continue the behaviour modification program. Clients who receive only a consultation and then have to complete the behaviour modification themselves may not be able to see the light at the end of the tunnel, and may give up on the consultant's recommendations. By establishing the behaviour modification program ourselves, it is also clear to the dog what behaviour is desired. Thus potential confusion once it is back with the owner is reduced, increasing the success of the owner's continuation of the behaviour modification.

Treatment of aggression at our facility is also effective because we have access to a large number of different dog breeds and behaviour types. This maximises the efficacy of desensitisation, counterconditioning, and positive punishment techniques. Clients who carry out behaviour modification themselves often struggle to find new dogs with which they can interact, due to the safety concerns of other owners. Treatment in-clinic also allows for a far more thorough observation of the etiology and nature of the aggression. This allows for fine-tuning of the behaviour modification program during the time the dog spends in-clinic, and improves the quality of the advice to the client at the transfer training and during any follow up conversations.

The therapy procedures used at our facility and recommended to clients include many of those used at the ABCCU. Desensitisation, counterconditioning, obedience, electronic collars, reduction of privileges, neutering (for males) and head halters are the main behaviour modification techniques used by us to treat intraspecific aggression. This is similar to the techniques used by the ABCCU except that electronic collars are used at our facility for intraspecific aggression that is non-anxiety based. As a non-veterinarian behaviour practice we do not recommend pharmacological intervention. The use of electronic collars for the treatment of aggression may also increase the success of our therapy over that of the ABCCU, although it is impossible to differentiate this from other therapy differences between the two practices. Use of such collars in conjunction with other behaviour modification techniques may improve success rates for inter-dog aggression simply because they add an effective positive punishment technique to the overall therapy program. It has also been found that desensitisation and counterconditioning recommendations have a low level of client compliance, possibly because they are difficult and time-consuming to apply (Sherman *et al.*, 1996). For this reason the relatively straightforward nature of electronic collar use may increase the success of our therapy over that of the ABCCU for inter-dog aggression.

2.4.4 Was in-clinic therapy value for money?

The data from this study shows that in-clinic therapy is successful. However, during therapy the client has to pay for both the board and training of their dog. Over the three-week period this expense can be considerable. At our facility board presently ranges from $NZ13 to $NZ19 per day, and the current cost for fifteen training sessions is SNZ525. For this reason the client's opinion on whether the clinic was value for money is a good measure of the overall worth of the in-clinic process. Given that it is successful, is it worth all the money?

Clients were asked "Was the clinic value for money?" (Q23). The mean response was 7.28 (1 = No, 10 = Yes). 43% of clients responded with a 6, 7, or 8. These clients could be considered to be satisfied with the clinic's value for money. 37% responded with a 9 or 10. These clients could be considered to be very satisfied with the clinic's value for money. These results indicate that despite the significant amount of money required for in-clinic therapy, it is considered by clients to be money well spent. The results from this question are perhaps the best indication of the success of in-clinic therapy.

The apparent client satisfaction with the cost of in-clinic therapy is comparable to that described by Askew (1996) for home-visit behaviour consultations despite the significantly greater cost of in-clinic therapy. Askew found that 73% of clients found the cost of his home consultations "reasonable", 21% found the cost "a little too high", while 4% found the cost "much too high".

2.4.5 Aspects of therapy which contributed to success

Bringing dogs to our facility for behaviour modification is successful. But there is always room for improvement. It was expected that client compliance with our recommendations would most influence the long-term success of the in-clinic process. The importance of compliance is mentioned in many discussions of behaviour therapy protocols and therapy efficacy (Takeuchi *et al.*, 2000; Overall, 1993; Overall, 1997a, Askew, 1996). In a study of canine aggression it was found that client compliance and extent of client effort was the biggest single determinant of therapy success (Takeuchi *et al.*, 2001).

The influence of the client on the maintenance of desirable behaviour learnt while in-clinic is illustrated by the decrease in responsiveness to obedience commands from when the client first took the dog home to when the questionnaires were sent out. When comparing responsiveness to command immediately after in-clinic therapy with that at the time of questionnaire completion, it was found that there was a significant decrease in responsiveness to the commands "*stay*" ($p<0.034$), "*come*" ($p<0.007$), "*heel*" ($p<0.037$), and "*no*" ($p<0.030$). There was no significant difference over time for "*sit*" ($p<0.114$) and "*down*" ($p<0.445$). The maintenance of consistency in response to the latter two commands is presumably due to the ease with which these commands can be reinforced. This is relevant for a discussion of client compliance because it shows that behaviours which are more difficult to reinforce, or which take more effort to reinforce, are more prone to regress to pre-behaviour modification levels.

These results may also indicate that clients were not able to maintain the same level of responsiveness to some commands because they did not carry out the initial training. This is one criticism of in-clinic therapy, which applies not only to obedience commands but to other aspects of the behaviour modification program. Although every effort is made to educate clients about the behaviour modification techniques used, often this cannot be done in a

practical sense because when the transfer training session is held immediately after in-clinic therapy, the dog is behaving appropriately.

The influence of the client on the maintenance of desirable behaviour is also illustrated by client responses to question 18: "To what extent have your dog's behaviours changed since it first went home?" (1 = Forgotten everything, 10 = Retained everything). The mean response was 6.48. 82% of clients reported some degree of behavioural regression. Behavioural regression obviously affects the overall success rates of in-clinic therapy reported here, highlighting the need to ensure that clients are able and willing to comply with therapy recommendations.

The extent to which clients comply with treatment recommendations is often influenced by the effort needed to implement them. For example, Sherman *et al.* (1996) found that there was a low level of compliance with more time-consuming techniques such as desensitisation and counterconditioning. However, client compliance is not solely influenced by the amount of effort a client is prepared to put in. The best-intentioned and motivated client can struggle to implement a behaviour modification program if it has not been adequately explained, or it is not practical for the client to implement. Takeuchi *et al.* (2000) found that success was lower for clients with dogs experiencing separation anxiety when clients were given more than 5 discharge instructions, when compared to those who were given less than five discharge instructions. It was proposed that one of the reasons for this may have been because clients given more than 5 instructions were somewhat confused by the many facets of the behaviour modification program. This illustrates the importance of giving clear, easy to understand recommendations that the client can respond to. If a number of recommendations are made, it is even more important than usual to ensure that the rationale for each is thoroughly explained, as are any practical aspects of the behaviour modification program.

Educating clients about aspects of canine behaviour and learning theory relevant to their dog's behavioural problem is likely to have two important effects. First, if a client is not exactly sure why they are supposed to undertake aspects of the therapy program they are less likely to carry out the recommendations, and if they do, they are less likely to execute them appropriately. By explaining to clients the rationale behind the therapy recommendations, thereby improving their understanding of the nature of the problem, it will be more likely that they will expend the time and effort necessary for the behaviour modification program. This

increase in compliance should in turn increase the level of therapy success. Secondly, if aspects of learning theory which are relevant to a behavioural case are explained (e.g. reinforcement schedules, timing, extinction, desensitisation, counterconditioning, and spontaneous recovery), the client will most likely undertake any behaviour modification in a more effective manner. This too should improve the success of the therapy overall.

To investigate which aspects of in-clinic therapy most influenced success, a stepwise regression analysis was performed on aspects of therapy that had the potential to affect overall success (Q1) and improvement in behaviour (Q3). It was found that the practicality of the consultant's recommendations (as assessed by clients) was the best predictor of overall success (Q1) and improvement in behaviour (Q3). The fact that the practicality of the recommendations accounted for 44.9% of the variation in overall success and 57.4% of the variation in behaviour improvement, highlights the importance of designing recommendations and techniques for clients to implement that are practical to carry out. It is very important to ensure that recommendations are practicable and appropriate for the client's ability and situation, in order to ensure maximum compliance by clients. In this study it was found that the practicality of recommendations for therapy at home (Q13) was highly correlated with the level of client compliance (Q12) ($p \leq 0.0005$). These results support the assumption that the practicality of recommendations influences whether or not a client will implement them, which in turn influences the success of therapy.

The fact that question 12 (which explored client compliance) was not a better predictor of therapy success may be because question 13 (practicality of recommendations) explores the extent of compliance at home in a more subtle and ultimately more accurate way.

Although the practicality of recommendations acted as the best predictor of overall success, other factors were significantly correlated with success. To investigate the role that client education had on compliance and therapy success, correlations were explored between questions related to client education, compliance, and success. It was found that client compliance (Q13) was strongly correlated with the client's evaluation of the adequacy of our explanations of the etiology and treatment of their dog's behaviour problem (Q7)($p<0007$). The answers to Question 7 were also directly correlated with success ($p=0.0204$). The clients' evaluation of their improvement in knowledge of dog behaviour and learning (Q6) were a significant predictor of improvement in behaviour (Q3)($p \leq 0.0005$, $R^2=31.3\%$) when subjected

to a regression analysis and was also strongly correlated with compliance (Q13)($p<0.0005$). These results support the assumption that increased owner education increases compliance and therapy success.

In order to ensure that essential aspects of the therapy recommendations are remembered, and that confusion is minimised, we provide clients with a written summary of our recommendations. In order to investigate the value of these notes we asked clients "How useful were the summary notes?" The mean response was 7.16 (1 = No use, 10 = Extremely useful), with almost a third of clients responding with a 9 or 10. This response highlights the value of such written instructions.

2.4.6 Improvement in response to owner command and overall success (Q1) for dogs that did not present with disobedience as their primary problem

Using a regression analysis it was found that improvement in response to obedience commands was linked with overall therapy success for dogs that attended the clinic for problems other than disobedience ($p=0.008$). The improvement in response to obedience commands accounted for 19.2% of the variation in overall success.

The effect of obedience training on behaviour problems is thought by some authors to improve or prevent behaviour problems in dogs. Overall (1997a) advocates a compliance program for dogs where a basic obedience behaviour is required in order to obtain anything of value to the dog. Overall (1997a) asserts that this routine is effective in treating and preventing all types of behaviour problems.

Evidence for the preventative effect of obedience on behaviour problems is, however, unclear. In a questionnaire-based survey of 711 dog owners it was found that obedience training showed no significant correlation with a range of behaviour problems (Voith *et al.* 1992). Podberscek and Serpell (1996) did not find any significant correlation between aggression in English cocker spaniels and obedience training. Gershman and colleagues (1994) also did not find any relationship between obedience training and aggressive behaviour.

A larger and more recent study, by Goodloe and Borchelt (1998), found that a history of obedience training is linked with a lower occurrence of a variety of behaviour problems.

Obedience training was linked with lower aggression for all forms of aggression analysed, except aggression towards unfamiliar dogs. It was also found that obedience training reduced the incidence of undesirable behaviour and increased the incidence of desirable behaviour.

Goodloe and Borchelt (1998) suggest that the positive effects of obedience training may result from incidental aspects of the obedience training process, such as increased time spent with the dog, added exposure and socialisation resulting from obedience class attendance, and a better understanding of dog behaviour. The confounding effect of these incidental factors is mostly avoided in the present study because *improvement* in obedience is measured rather than simply obedience training experience, and all owners and dogs surveyed underwent a similar in-clinic process. Dogs with the greatest long-term improvement in response to obedience commands may have spent more time with owners, meaning this can not be ruled out as a factor influencing success of therapy overall. However, increased socialisation and owner knowledge would not have had any influence on the link between obedience improvement and success because all dogs and owners received a similar amount of time with the consultant, and it was obedience improvement rather than obedience training experience that was found to be linked with success.

From the present study it is apparent that improving a dog's response to command can increase the overall success of behavioural therapy for problems other than disobedience. This effect may be linked to the establishment of a better-defined rule structure for the dog (Overall, 1997a), an increased level of dominance of the owner over the dog, or an improved ability by the owner to manage and modify the dog's behaviour. Conversely, the link between obedience improvement and overall success may simply be due to the fact that an owner who complies with recommendations for obedience will most likely also comply with recommendations for other aspects of the therapy; this would in turn increase therapy success. There is also the possibility that owners would see improvement in obedience as an element of overall success, further increasing the link between obedience improvement and success.

2.4.7 Improvement in response to owner command and its effect on inter-dog aggression (non-household)

For dogs undergoing therapy for inter-dog aggression there was a significant correlation between improvement in command responsiveness with owners (sit, down, stay, come heel – "now" minus "before" clinic) and overall success (Q1)(0.6740; $p<0.0082$) and reduction in frequency of aggression (0.7132; $p<0.0042$).

Obedience training or non-confrontational compliance training is usually recommended as part of a therapy program for aggression (Blackshaw, 1991; Clark and Boyer; Reisner, 1997; Line and Voith, 1986; Campbell, 1992; Overall, 1997a). The reasons for the use of obedience training for aggression vary. Clark and Boyer (1993) proposed that obedience training promotes a "feeling of security" due to the establishment of clearer lines of communication and clearer social boundaries. Overall (1997a) advocates that dogs need a rule-based social structure in order to communicate and cooperate with both dogs and humans. Those who do not believe obedience training has an inhibitory effect directly on aggression, nevertheless recommend it as a therapy protocol "because it still provides tools for owners to use in modifying pet behaviour" (Cameron, 1997).

Another rationale for the use of obedience training for inhibition of aggression towards non-household dogs is related to group-protective behaviour. It has been proposed that aspects of inter-dog aggression are analogous to territorial defense in wolves (Sherman *et al.*, 1996). Wolves may attack and even kill non-pack members (Mech, 1970; Mech 1993). The alpha pair is particularly threatening (Mech, 1970; Mech 1993). In a study of a captive colony of wolves it was reported that when strange wolves were brought near to the colony compound the alpha pair responded aggressively while subordinate and formerly alpha wolves responded submissively (Zimen, 1976; Zimen, 1982).

This is pertinent to inter-dog aggression because lack of leadership from human owners may increase the likelihood of aggressive behaviour by their dogs due to the dogs assuming an "alpha" role. This was supported by Sherman *et al.* (1996), who found that aggression towards non-household dogs was correlated with dominance aggression towards owners and out-of-control behaviour. As a result it was recommended that dogs displaying this form of aggression undergo dominance-reversing exercises such as obedience training, withholding

attention until the dog responds to a command, and reduction of privileges (Sherman *et al.*, 1996). Lack of dominance by owners has also been correlated with an increased likelihood of aggression towards human strangers (Askew, 1996).

Evidence for a positive effect of obedience training on aggression is conflicting. Podberscek and Serpell (1996) and Gershman and colleagues (1994) did not find any significant correlation between aggression and obedience training. While Goodloe and Borchelt (1998) reported a lower incidence of aggression in all categories except aggression towards unfamiliar dogs.

The present study has shown a clear link between improvement in response to obedience commands and reduction in aggression towards non-household dogs. Whether this is a result of an increased feeling of security, a better established rule-structure, an increased ability of owners to manage and modify their dog's behaviour, or through dominance reduction, it is clear from this study that improving a dog's response to command is a valuable therapy protocol to implement when attempting to reduce aggression towards non-household dogs.

2.4.8 Electronic collars: Are they effective, and does their use impact negatively on a dog's behaviour or personality

For question 26: "Was the collar found to be effective in your dog's case?" the mean response was 8.11 on a scale of 1 (Not effective) to 10 (Extremely effective). 5% of clients responded with a 1 or 2, 8% with a 3 to 5, 32% with a 6 to 8, and 55% with a 9 or 10.

The properties of electronic training collars which enable effective positive punishment of undesirable behaviours have been outlined by a number of authors (Tortora, 1982; Landsberg,1994; Polsky, 1994; Andelt *et al.*, 1999; Lindsay, 2000). The ability to deliver a well-timed punisher at an intensity that is neither too high nor too low is the key to the effectiveness of electronic training collars as positive punishment training tools. The remote nature of the punishment is also beneficial, enabling a trainer consistently to punish undesirable behaviour without the dog linking the punishment with the human trainer. Lindsay (2000) goes so far as to describe these collars as the "ideal positive punisher".

Polsky (1994) outlines a number of dog behaviour problems that can be suppressed solely through the appropriate application of an electronic training collar. These include: displays of territorial aggression; excessive barking; inappropriate predatory behaviour (including car, jogger, and skateboard chasing); stealing household items; eating inedible objects; coprophagia; aggressive lunging towards other dogs (Overall, 1997a); stereotypical behaviours such as tail-chasing (Eckstein *et al.*, 1996); and escape behaviours (digging under fences, jumping over fences, running through open gate). Christiansen *et al.* (2001b) showed that electronic training collars were effective for the suppression of sheep chasing.

The results from question 26 indicate that once implemented by us, electronic training collars were found by clients to be very effective when used to suppress undesirable behaviour in their dogs. With a mean evaluation of their effectiveness of 8.11 and with 77% of clients responding with an 8, 9 or 10 at the "very effective" end of the scale, it seems that the electronic training collar is clearly a very effective tool for the suppression of undesirable behaviour. As described above, this is due to the ability of the collars to deliver a well-timed remote correction which is sufficiently aversive to stop the performance of the target behaviour and to inhibit its occurrence in the future.

The effectiveness of the electronic training collar as a positive punisher has clearly been supported by this study. However, the ability of electronic training collars to suppress undesirable behaviour is not generally an issue of contention. The main criticism of electronic training collars is their potential to cause a dog to become fearful or anxious as a result of their use (Overall, 1999; Frank, 1999; Seksel, 1999b). The present study investigated the effect of electronic training collar use on a dog's behaviour by asking clients: "Did you notice any undesirable effects of collar use on your dog's behaviour or personality?" The mean response was 2.80 on a scale of 1 (No) to 10 (Yes). 72% responded with a 1 or 2, 8% with a 3 to5, 12% with a 6 to 8, and 8% with a 9 or 10.

The only non-anecdotal evidence in the literature relating to electronic collar effects on personality is that of Christiansen *et al.*, (2001b). In a previous study (Christiansen *et al.*, 2001a) carried out one year before the experiment outlined in Christiansen *et al.* (2001b), 17 dogs received shocks for approaching sheep. Of these, responses were obtained from 13 owners regarding any changes in behaviour in their dogs as a result of the experiment. One owner reported an increase in fear towards people. However, of the dogs that did not receive shocks in the first year, two were reported to have a subsequent increased fear of humans and

one was reported to have an increased fear of other dogs. It seems therefore that the increase in fearful behaviour in the one collar-trained dog was not necessarily a result of electronic collar use.

Measurements carried out by the researchers in the second-year experiment also showed that dogs that had received shocks for chasing sheep approached an unfamiliar human after only a short period of time, and there was no difference in recovery times to a startling noise between the group that had received shocks and the group that did not. This indicates that electric shock punishment for sheep chasing did not increase any general level of anxiety in the dogs (Christiansen *et al.*, 2001b).

The present study indicates that while the majority of dogs undergoing behaviour modification with an electronic collar showed no undesirable behaviour as a result, there were some dogs that did.

The responses of clients who circled a response higher than 2 on question 28 included: "He objected to putting it on" (8); "Became a very frightened dog when used. Just sat there very frightened instead of it changing its behaviour" (10); "Did affect Lady's personality for about a week. Very timid the first week, but fine after that." (10); "Bella avoided other dogs and cats a lot in the first two months following therapy, as I believe she associated them with the correction collar. This is not such an issue now. She does sniff and allow sniffing" (7); "Would make him more aggressive when he was in a hyped up state. To the point where he would turn on whatever was around him. Including the owner." (9); "Fearful, unhappy, nervous." (10).

The effect that electronic collar use apparently had on these dogs is cause for concern, despite the fact they make up a small proportion of the dogs undergoing behaviour modification with an electronic collar. When using an electronic collar as part of a behaviour modification program, it is very important to assess the impact of the collar correction on the dog, both at the time of the correction and in general. It is important that the correction is sufficiently aversive to stop the undesirable behaviour, but it should not be so strong as to cause the dog to become anxious.

This can be tested immediately after correction by observing the dog's response to a well-liked food treat or initiation of play. Other physiological or behavioural signs of anxiety should also be monitored. This includes breathing, heart rate, reactivity to a startling stimulus, body/tail/ear/eye position, and response to known commands. An experienced trainer does this unconsciously. However, on consideration of the comments above, in some cases it may have been clients' lack of knowledge and inexperience with canine communication, behaviour, and learning which caused them to persevere with collar use at an inappropriate intensity, frequency, or with erroneous technique.

This highlights the crucial importance of thorough client education, and shows the inherent danger of passing on a potentially detrimental training device to dog owners inexperienced in behaviour modification. Part of our verbal and written recommendations are that clients should contact us if unsure of any aspect of the therapy, in particular the electronic collars. It is also strongly emphasised to clients that positive punishment should only be used when the dog's motivation to perform the undesirable behaviour is very high, and a behaviour modification program based on positive reinforcement in progressively more challenging situations is insufficient to condition consistently desirable behaviour. It appears that in some cases this may not be sufficient to guarantee that clients do not use the collars in a way that induces generalised anxiety.

Responsibility rests with the consultant to ensure that clients use the collar appropriately. It is easy for a collar to become the focus of the behaviour modification by the client because it seems technologically advanced, it is unusual, and it can bring about rapid behavioural responses. For these reasons we insist that clients come back for a follow up session two to three weeks after the transfer training. This allows an evaluation of the client's behaviour modification techniques, (a) to ensure that they are focussing on other aspects of the behaviour modification program rather than just the collar, (b) to ensure that if the collar is used it is used appropriately, and (c) to deal with any problems encountered during this period at home.

Of the clients that were followed up in this study, surprisingly few returned for this follow-up session. If greater numbers had attended it is likely that some aspects of therapy success could have been improved. This was also reflected in clients' responses to question 9 of the

questionnaire: "Would additional transfer-training sessions have improved the overall success of therapy?" The mean was 6.83 on a scale of 1 (Not at all) to 10 (Greatly).

A focus or reliance by clients on the collar to stop problem behaviour in their dogs may have resulted in an inability to maintain appropriate behaviour using other techniques once the collar was returned to us. This is reflected in client responses to question 27: "Once the collar was sent back to us, to what extent did undesirable behaviour resurface?". The mean response to this was 6.08 on a scale of 1 (Not at all) to 10 (Greatly). The propensity of clients to focus on an electronic collar component of a behaviour modification program is one valid criticism of introducing collars as a part of the client's behaviour modification program. Part of the regression back to previous undesirable behaviour once the collar was sent back to us is probably also simply a result of the removal of a component of the behaviour modification program that is more effective than other methods in maintaining appropriate behaviour amidst distractions and undesirable-behaviour-eliciting stimuli.

Clearly the detrimental effects of electronic collar use on behaviour are not always merely a result of inexperienced clients. In some cases the dog's motivation to engage in undesirable behaviour can be so high that repeated high-level corrections are required to bring about any decrease in the frequency or intensity of the behaviour. This can bring about some level of anxiety in the dog, although this is usually related to the circumstances where the problem arises. For example, when attempting to positively punish persistent and intense attacks on other dogs, the collar can cause the dog to become anxious when in the presence of other dogs. This can happen despite positively rewarding relaxed and sociable behaviour.

At this point it is important to evaluate whether it is justifiable to persist with electronic collar use. Sometimes the negative impact of electronic collar use is outweighed by the alleviation of a serious behaviour problem. Two of the clients whose comments are outlined above fall into this category: "Did affect Lady's personality for about a week. Very timid the first week, but fine after that," and "Bella avoided other dogs and cats a lot in the first two months following therapy, as I believe she associated them with the correction collar. This is not such an issue now. She does sniff and allow sniffing".

Electronic collars have been described as inappropriate for treatment of aggression, due to the danger of collar correction causing pain-induced aggression which is redirected at nearby

individuals. In our practice we do not use a collar when the dog is in the vicinity of a person unless we are correcting for an aggressive lunge away from the handler at another dog or prey species. This is more to reduce the chance that the dog associates this correction with people than a safety measure. From personal experience, collar use only elicits an aggressive response in dogs that are very dominant in nature. This has been observed by another author (Polsky, 1994). The client comment: "Would make him more aggressive when he was in a hyped up state. To the point where he would turn on whatever was around him. Including the owner." was from an owner of a very dominant Malamute with a very high pain threshold. Normally aggressive behaviour can be quickly suppressed with an electronic collar. An understanding of the motivation for the behaviour is very important, because positive punishment for anxiety-based aggression can worsen the underlying motivation for the aggression, even if the aggressive behaviour resulting from this anxiety is reduced.

The high proportion (72%) of clients who did not observe any negative effect of electronic collar use on their dog's behaviour does indicate that these collars normally do not have any detrimental effects on dogs trained with them. This is particularly the case if it is borne in mind that in this investigation such collars were used by owners with limited experience, and the undesirable behaviour mentioned by clients was not necessarily long-lasting or severe. It is also important to note that the nature of positive punishment means that there is an inherent risk of negative behavioural effects due to the use of an aversive stimulus. Therefore any negative consequences of collar use might also be observed with other forms of positive punishment.

It is for this reason that every effort should be made to avoid the use of punishment when trying to modify behaviour. But if a problem cannot be resolved though positive methods alone, and the impact of a continuing problem is serious, the appropriate use of an electronic collar seems to be valid in suitable cases. This is especially so when it is remembered that use of such collars can be discontinued at any point, with a very good chance of any negative impact on behaviour being reversed.

Much of the criticism of electronic collars probably stems from the common social stigma associated generally with the use of electric shock for behaviour modification, and the potential for harm from pain-inducing behaviour modification techniques. However if used appropriately the electronic collar is a very effective behavioural modifier, which - though not

without its risks - are relatively safe in experienced hands. No one questions the use of electric fences to contain farm stock, despite the fact that the shock from such fences is many times the strength of the highest levels on an electronic collar. It may be the predictable and understandable way in which an electric fence works which means that they are never questioned. When electronic collars are used appropriately it should be as clear to the dog which behaviour is inappropriate, as it is to the cow when deciding whether or not to push past an electric fence in order to feed on the other side.

The use of electronic collars as a tool for behaviour modification can be justified in some situations if used appropriately. The danger is that sometimes only lip-service is paid to this by those using electronic collars, and they are either overused or resorted to without fully exploring other forms of behaviour modification. It is important to acknowledge that if their use is condoned at all then there will always be room for misuse, even by experienced and compassionate trainers.

If used correctly positive punishment can be effective in suppressing undesirable behaviour. Sometimes it is therefore tempting to use it as a quick fix for problem behaviours. This is of concern because in some cases problem behaviour can be suppressed, but the underlying reason for this suppression of behaviour is fear of the positive punisher by the dog. This is far less desirable than reducing the behaviour by removing any rewarding consequences of the behaviour, or rewarding alternate behaviours, or by altering the motivation to engage in the behaviour. For example the aggression displayed by an anxious dog towards other dogs can be suppressed with an electronic collar. However, while the overt problem is reduced the underlying problem for the dog remains or is exacerbated. This is far less desirable than desensitising and counterconditioning the same dog to other dogs so that aggression is reduced as a result of decreased anxiety.

As behavioural consultants it is our duty to design behaviour modification programs which improve the acceptability of the dog's behaviour in the owner's eyes. But we must do so in a way which is most beneficial to the dog. Indiscriminate or unwise use of electronic collars for the treatment of behaviour problems is contrary to these professional responsibilities.

2.4.9 Sheep and cat avoidance conditioning with electronic collars

Scientific investigation into the effectiveness of electronic collars as behaviour modification tools for dogs is very limited. Recently however there has been some investigation into their use for the suppression of inappropriate predatory behaviour towards sheep. Andelt *et al.* (1999) showed that electronic collars were effective in conditioning an avoidance response in coyotes towards sheep. The conditioned avoidance response lasted for over four months for the coyotes involved in the study. In Norway a relatively extensive study was undertaken to investigate predatory behaviour of dogs towards sheep (Christiansen *et al.*, 2001a & Christiansen *et al.*, 2001b). The use of electronic collars to inhibit this behaviour was a central component of the study. Of 17 dogs that received shocks for chasing sheep in the first year of the study, only one displayed enough interest in sheep to require further shocks in the second year (Christiansen *et al.*, 2001b).

The research undertaken by Andelt *et al.* (1999) and Christiansen *et al.* (2001a & 2001b) is consistent with the results of the present study into therapy success for inappropriate sheep chasing. As with the studies just cited, the conditioned avoidance response of dogs treated with electronic collars seems to have been maintained for a considerable time after the initial behaviour modification. The mean decrease in frequency of sheep chasing of 9.29 and decrease in intensity of 8.86 is impressive considering that the initial in-clinic therapy was conducted 1 to 2½ years before the questionnaires were sent out. This supports the suggestion that electronic collar use is an effective technique for stopping inappropriate predatory behaviour towards sheep over the long-term.

To my knowledge there is no literature on the efficacy of electronic collars for stopping cat-chasing. In the present study it has been found that initial avoidance conditioning towards cats at our facility was not highly successful in the long-term. The mean decrease in cat chasing frequency of 3.75, and the decrease in intensity of 3.00, was significantly less than that obtained from the sheep-aversion therapy. It is clear that the avoidance response conditioned "in-clinic" towards cats is far more prone to regression than an avoidance response conditioned towards sheep.

The maintenance of the avoidance response towards sheep, and the regression of the avoidance response towards cats, is probably due to two main factors. First, dogs with a

history of cat chasing are likely to have engaged in this behaviour far more frequently before being brought to our clinic than those that have been caught chasing sheep. This is due to the greater seriousness with which society regards sheep chasing; it is often treated as a very serious offence, thereby greatly reducing the incidence of recidivism. The fact that cat chasing dogs usually have had more positive experiences of predatory behaviour towards cats means that they are more likely to return to this behaviour once electronic collar use has been discontinued.

Lindsay (2000) outlines evidence to support the hypothesis that predatory behaviour is a hedonistically pleasurable experience. For example animals will self-stimulate areas of the brain associated with predatory behaviour (Panksepp, 1971). This rewarding nature of predatory behaviour is presumably sufficient to cause dogs to engage in behaviour that has previously been rewarding, despite experiencing a period of avoidance conditioning. The relatively limited amount of sheep-directed predatory behaviour displayed by dogs caught chasing sheep, and hence the more limited degree of positive reinforcement, may mean that they are less likely to return to predatory behaviour once the avoidance conditioning is undergone.

The second reason that therapy for sheep chasing is more successful than cat chasing therapy may be because dogs have more exposure to cats than sheep. This would result in an increased rate of desensitisation towards cats. If owners do not have access to an electronic collar when their dog again shows interest in cats, there is the potential for the dogs to quickly regress back to cat-chasing behaviour.

The findings above suggest that while electronic collars are effective for stopping sheep chasing, they are not highly effective for stopping cat chasing in the long-term. Considering this, the importance of reducing cat chasing in a dog should be evaluated before an electronic collar is used to try to stop the behaviour. If stopping the cat chasing is not highly important then it may not be justifiable to implement an avoidance-conditioning program, because of the probability of limited long-term success of such therapy. Although not highly successful in the long-term, electronic collar use to stop cat chasing is probably the most effective method. Therefore if, for the safety of the dog and neighbouring cats, electronic collar use is required to stop cat chasing, consultants should recommend owners of such dogs to purchase a collar in order to maintain the avoidance response towards cats.

2.4.10 Limitations of this study

Due to the different ways in which success was measured in this study and in other reports of canine behaviour therapy success, it is not possible rigorously to compare the differences in success between behaviour consultants. Consistency between consultants in the way feedback is obtained would enable better comparisons of therapy success.

The name of the dog and owner was on the feedback questionnaire, this meant that respondents were aware that their responses were not anonymous. This may have reduced the return rate of the questionnaires, due to owners not wanting to be identified with their questionnaires. It may have also increased the likelihood of positive responses to questions overall, because to owners with a positive experience at the clinic may have been more likely to return the questionnaires. The response to questions may also have been positive overall simply as a result of owners not wanting to be negative or to cause offence.

This study did not investigate any differences in the way individual dogs were worked with in-clinic. If information on the subtleties of the behaviour modification for each dog had been obtained during the in-clinic process, a better understanding could have been obtained of the factors/methods of in-clinic therapy that increase the likelihood of success. Also it was not feasible to withhold aspects of a therapy program, so no control groups could be compared with treatment groups in order to assess the effectiveness of in-clinic techniques.

2.5 Conclusions

Compared to other methods of behaviour consultancy reported in the literature, the in-clinic process was successful. The success of therapy for inter-dog aggression towards dogs outside the household compared very favourably to a large study from the Animal Behaviour Clinic at Comell University (Sherman *et al.*, 1996). Despite the significant cost, in-clinic therapy was considered by owners to provide good value for money. Once the dogs returned home there was some degree of regression to pre-clinic behaviour. It was found that the practicality of the consultant's recommendations for therapy at home was the factor most closely linked with therapy success. Improvement in canine obedience was associated with overall success for

dogs which attended the clinic for problems other than disobedience. For dogs that were treated for inter-dog aggression, improvement in obedience significantly reduced the frequency of their aggression. Electronic collars were found by owners to be very effective in inhibiting undesirable behaviour, although there was some regression to pre-clinic behaviour once collar use was discontinued. The majority of clients did not report any negative effects of collar use on their dog's behaviour or personality. Treatment for inappropriate sheep chasing was significantly more effective than treatment for inappropriate cat chasing.

CHAPTER 3

The Effect of Socialisation on Subsequent Behaviour in Dogs

"Scratch a dog and you'll find a permanent job."

Franklin P. Jones

3.1 Introduction

Exposure to people, dogs and different environments during early puppyhood has been shown to be important for the development of well-adjusted behaviour in the adult dog (Fisher, 1955; Melzak and Thompson, 1956; Freedman *et al.*, 1961; Pfaffenberger *et al.*,1962; Fuller, 1964; Scott and Fuller, 1965; Aragwal *et al.*, 1967; Fox and Stelzner, 1967; Hetts, *et al.*, 1992; O'Farrel, 1992; Wright, 1983; Hubrecht, 1995; Serpell and Jagoe, 1995). In particular, the period between 3 and 12 weeks of age seems to be important for the effective "socialisation" of a dog (Freedman *et al.*, 1961; Appleby, 1993; Fox & Spencer, 1969). Unfortunately the importance of early socialisation during this time is not realised by many dog owners. The result of this is that many dogs in our society are not behaviourally well-adjusted to aspects of their social and physical environment.

Nowhere is this more apparent than in a behaviour consultancy practice, where the etiology of problem behaviour often seems to be linked with inadequate socialisation (Lindsay, 2000). In particular, anxiety-based and fear-based behaviour problems appear to stem from inadequate socialisation. This includes fear-motivated aggressions (both inter-specific and intra-specific), territorial aggression, generalised anxiety, phobias and separation anxiety. However it is important to remember that inadequate socialisation is only one potential factor when considering the etiology of canine behaviour problems. Most research in this area has been carried out under experimental conditions (Melzak and Thompson, 1956; Freedman *et al.*, 1961; Scott and Fuller, 1965; Aragwal *et al.*, 1967; Hetts *et al.*, 1992; Wright, 1983; Hubrecht, 1995; Fox and Spencer, 1969) and there is very little good data to support its significance. In real life other important factors such as genetic predisposition can be just as influential as inadequate socialisation in the etiology of behaviour problems. A good example of this has been illustrated in a study comparing the behaviour of two strains of English Pointers, where even well socialised dogs were highly anxious and fearful (Murphree, 1973).

It is therefore desirable to assess the importance of socialisation as a factor influencing behaviour in dogs reared under normal home conditions. In this study the level and type of early socialisation experienced by individual dogs will be assessed, then a comparison will be made between this and aspects of their current behaviour. This will be accomplished by an

owner-rated mail-out survey. The behavioural characteristics assessed by the survey questionnaire include confidence, affection, trainability, aggression, anxiety and fear.

3.1.1 Socialisation

Environmental and social isolation of a puppy before 12 weeks of age has profound and lasting behavioural consequences (Scott and Fuller, 1965). However minimal socialisation during the sensitive period is capable of producing a dog that is "adequately" socialised (Fuller, 1967; Wolfle, 1990). It is hoped that this study will indicate the effect that the *level* of socialisation has on subsequent behaviour, and will also identify the amount of socialisation necessary in order for a puppy to develop into a dog that is well adjusted to life in modern society. This study will give an indication of the level of socialisation experienced by dogs in New Zealand.

It is possible to identify socialisation with "people", "dogs", "other animals", and "novel environments", and in this study the effect of specific *types* of socialisation on the development of behaviour will be investigated. It is expected that limited interaction with specific stimuli will result in behavioural deficits specifically related to each such stimulus. For example limited early interaction with other dogs as a puppy may result in this puppy becoming fearful, aggressive, or socially inept around other dogs.

3.1.2 Puppy socialisation classes (PSCs)

An assessment of the effects of PSCs on the development of behaviour comprises an important part of this study. PSCs have been promoted worldwide as an effective way to socialise a puppy, teach it basic obedience commands, and educate puppy owners about dog behaviour and the minimisation of behaviour problems (Seksel, 1997). However in a recent study it was found that there was no significant influence of prior PSC attendance on later responses to novel, social, and handling assessments when compared with control groups (Seksel, 1999a). This challenges the perceived socialisation advantages of attendance at these classes.

There are two possible reasons for the lack of any significant socialisation effect in Seksel's study. Most of the puppies' responses to novel, social, and handling stimuli were positive at

the first baseline assessment; this suggests that the puppies may have been adequately socialised before attending the classes. In addition, the majority of the puppies in the experimental groups attended the classes after 12 weeks of age. This is after the well-established sensitive period for socialisation in dogs, so it is not surprising that no socialisation effects were observed.

The present study aims to assess the effect of PSC attendance on subsequent behaviour. This will be done by comparing the owner-rated behaviour of dogs that have attended PSCs with those that have not. The confounding influence of adequate socialisation prior to PSC attendance will be countered in the present study by obtaining an owner's assessment of the baseline level of early socialisation of their dog. This will allow a better understanding of the effects of PSC attendance, compared to the effects of at-home socialisation. For example it may be found that attendance at PSCs has a significant effect only if at-home socialisation is poor.

The investigation into PSC effects will also compare the behaviour of dogs that attended puppy socialisation prior to 10 weeks of age with those that attended after 10 weeks of age. By doing this it will be possible to investigate whether there is indeed an advantage of starting PSCs during the sensitive period for socialisation. If it is found that there is a significant behavioural difference in dogs that started puppy paries during the sensitive period for socialisation compared to those that started after this period, the lack of socialisation effect observed by Seksel (1999a) could be attributed to the late start of the puppies in her experimental groups. It would also indicate that a greater emphasis should be placed on early attendance at socialisation classes in order to maximise any behavioural benefits.

It should be noted that attendance at PSCs at an early age (8 weeks) is resisted by some PSC coordinators due to the risk of parvovirus infection at this age. This is reasonable. However, on consultation with PSC coordinators who accept pre-10 week old puppies into their classes, it is apparent that classes can be run with young puppies for years without incident if common sense disease management procedures such as vaccination requirements, disinfection of the class area, and exclusion of unwell dogs, are undertaken (Pat Woolerston, PSC coordinator, Howick Veterinary Clinic, Auckland; Tania Colquhoun, PSC coordinator, Dog Power, Auckland: personal communication). This is especially the case in affluent areas with high

vaccination rates, where the incidence of parvovirus is low. This study hopes to find out whether it is worth the risk to hold PSCs for dogs under 10 weeks of age.

3.1.3 Aims

- To assess the mean level of socialisation that puppies in New Zealand receive before 12 weeks of age.
- To investigate how the *level* of exposure to novel stimuli during the sensitive period for socialisation affects subsequent behaviour.
- To investigate how the *type* of socialisation during the sensitive period affects subsequent behaviour.
- To investigate the effect that attendance at PSCs has on later behaviour.
- To investigate if there are any differences in adult behaviour between those dogs that attended PSCs before 10 weeks of age and those that attended after 10 weeks of age.
- To investigate if there are any differences in behaviour between male and female dogs

3.2 Materials and Methods

In order to collect data on the socialisation of individual dogs and their subsequent behaviour, a questionnaire-based survey of dog owners was undertaken.

Questionnaires for this study were completed by clients of the Massey University Veterinary Clinic in Palmerston North, New Zealand, and Howick Veterinary Clinic in Auckland, New Zealand. Clients previously involved in PSCs with their dogs were telephoned and asked if they would be prepared to participate in the study. Questionnaires were posted to those clients willing to take part.

In addition to clients that had previously attended PSCs, socialisation and behavioural data was sought from members of the general dog-owning public who had not attended PSCs but were aware of their dog's early socialisation and experiences. This was accomplished by telephoning current clients of the Massey University Veterinary Clinic and requesting permission to mail out a survey questionnaire.

3.2.1 The questionnaire

The questionnaire used for this survey is included in appendix 2. This consists of a number of sections. A cover page describes the aims of the study and outlines the nature of the questions. Then the details of the respondent's dog is requested (age, breed, sex, neuter status).

Measures of early socialisation

The body of the questionnaire starts with Section 1, which is designed to evaluate the level of socialisation experienced by the dog before 12 weeks of age. The dog's early exposure to environments, people, dogs, and other species are assessed in this section. In order to obtain consistent evaluations for an individual dog's exposure to environments, people, and dogs, respondents were asked to rate the dog's level of exposure by indicating which of 10 sentences best described their dog's early experience. By obtaining information on socialisation in this manner it is hoped that it will be possible to quantify the levels of socialisation which inhibit or facilitate the development of appropriate adult behaviour.

Section 2 of the questionnaire records whether the dog attended PSCs, the age during attendance at the classes, and the number of sessions attended. Attendance at obedience and agility classes is also recorded in this section. Data from sections 1 and 2 of the questionnaire will be compared with measures of adult behaviour investigated in subsequent sections.

Measures of adult behaviour

Sections 3 to 14 of the questionnaire investigate current behaviour in the respondent's dogs. For the most part this is accomplished by the respondents evaluating their dog's behaviour on a ten-point scale for various behavioural traits.

For example:

My dog is: Never confident 1 2 3 4 5 6 7 8 9 10 Always confident

If respondents circled the word on the left instead of a number their response was marked as a "1", if the word on the right was circled their response was marked as a "10". If more than one number was circled the average of the numbers circled was recorded.

Section 3 investigates the general nature of the dog. Section 4 assesses the owner's enjoyment of the dog. Sections 5 to 10 assess how the dog behaves in social interactions. This includes behaviour towards familiar people, strangers, children, familiar dogs, strange dogs, and other animals. Section 11 evaluates how the dog responds when left alone. Section 12 evaluates how the dog responds to new stimuli. Response to obedience commands is assessed in section 13. In section 14 owners are prompted to describe specific behaviour problems and to evaluate their severity.

3.2.2 Statistics

Minitab version 13.30 was used for all statistical analyses. To compare differences between dogs that attended PSCs and those that did not, two-sample t-tests were carried out. These were one-tailed as it was expected that any favourable differences would be in favour of the PSC attendees. The same tests were carried out to investigate differences between dogs that started PSCs before 10 weeks of age with those that started after 10 weeks. Significance was set at the 5% level for all analyses.

In order to investigate if any aspects of early experience measured in section 1 were associated with the specific kinds of adult behaviour measured in section 3 and sections 5 to 12, individual stepwise regression analyses were carried out on all questions relating to adult behaviour explored in section 3 and sections 5 to 12. Measures of early experience before 12 weeks of age that were included in the regression models for each of the specific behaviour types included; interaction with people outside the household (Q8), number of familiar people by 12 weeks of age (Q9), average number hours spent with people each day (Q10), interaction with new dogs (Q11), age the dog was separated from its litter (Q12), number of familiar dogs (Q14), interaction with novel environments (Q15), number of novel environments (Q16), interaction with other species (Q17), and general environmental and social interaction level (Q18). For the stepwise regression the "alpha to enter" and the "alpha to remove" values were both set at 0.15. Individual regression analyses were performed on associations between measures of early experience and adult behaviours that were found by the stepwise regression analyses to be most closely linked.

3.3 Results

3.3.1 General results

Of the 160 questionnaires posted out, 98 (61%) were returned. Two of these were excluded due to incorrect completion of the questionnaire. Of the 96 respondents, 11 had acquired their dog after 12 weeks of age so their responses to section 1 (early socialisation) were ignored. Four respondents did not complete section 2 (regarding PSC information) at all. Mean responses and standard deviations of each of the questions are presented in Table 3-1.

Of the 94 respondents who filled in section 2, 57 had attended PSCs, while 37 had not. Of the 57 respondents that had attended PSCs, 7 did not provide information on when the classes were started. Of the 50 respondents that recorded when their dog attended PSCs, 15 attended before 10 weeks of age, while 35 attended after 10 weeks of age. The Massey University Veterinary Clinic does not allow dogs younger than 10 weeks to attend their PSCs. All dogs in this study who attended PSCs after 10 weeks of age attended them at the Massey Veterinary Clinic in Palmerston North, New Zealand, while all those that attended before 10 weeks of age attended at Howick Veterinary Clinic, Auckland, New Zealand.

Of the 95 dogs whose gender was recorded, 43 were male, and 52 were female. Thirty two dogs were recorded as entire, 61 were desexed. The mean age of the dogs was 2.57 years.

Table 3-1 Means and Standard Deviations for the Respondent's Answers to the Survey Questions

Variable	Mean	St Dev
Age now (years)	2.57	1.43
Age Acquired? (weeks)	8.57	4.38
Human socialisation	6.47	2.14
How many familiar people	11.76	9.62
Hours per day with people	11.45	6.21
Canine socialisation	4.09	2.22
Age separated from litter (weeks)	7.82	1.59
Familiar dogs by 12 weeks	3.21	3.26
Environmental socialisation	5.41	2.21
How many environments	9.05	8.26
Other species socialisation	3.57	2.64
General socialisation	5.90	2.22
Start of PSC	12.14	4.21
Finish PSC	17.37	5.76
How many sessions	5.11	2.30
Confidence	7.74	1.83
Anxious	3.65	2.13
Fearful	3.77	2.11
Excitable	7.35	2.36
Distractible	6.13	2.23
Dominant	4.88	2.46
Protective of Owner	5.64	2.74
Protective of territory	6.48	2.93
Human companionship	9.14	1.22
Canine companionship	7.06	2.45
General enjoyment	9.27	1.07
Walk enjoyment	8.68	1.65
Enjoyment Around People	8.48	1.78
Enjoyment Around Dogs	8.00	2.11

Variable	Mean	St Dev
Enjoyment At Home	9.29	1.05
Friendly with familiar people?	9.76	0.71
Jumps up on familiar people?	6.05	2.85
Afraid with familiar people?	2.12	1.72
Growls at familiar people?	1.84	1.40
Snaps at familiar people?	1.31	0.85
Attacks familiar people?	1.11	0.58
Friendly with strangers?	7.18	2.97
Jumps up on strangers?	4.44	3.07
Afraid of strangers?	3.28	2.33
Growls at strangers?	3.28	2.89
Snaps at strangers?	1.60	1.66
Attacks strangers?	1.31	1.19
Friendly with children?	8.91	2.13
Afraid of children?	2.57	2.47
Growls at children?	1.77	1.74
Snaps at children?	1.51	1.21
Attacks children?	1.07	0.39
Sociable with familiar dogs?	9.32	1.24
Playful with familiar dogs?	9.29	1.30
Fearful of familiar dogs?	2.83	2.81
Dominant with familiar dogs?	4.53	2.55
Avoids familiar dogs?	1.73	1.60
Bares teeth at familiar dogs?	1.71	1.37
Growls at familiar dogs?	2.12	1.47
Snaps at familiar dogs?	1.57	0.95
Attacks familiar dogs?	1.38	0.92
Sociable with strange dogs?	7.10	2.80
Playful with strange dogs?	6.81	2.62
Fearful of strange dogs?	4.13	2.49
Avoids strange dogs?	3.61	2.59

Variable	Mean	St Dev
Dominant with strange dogs?	3.76	2.40
Bares teeth at strange dogs?	2.18	2.04
Growls at strange dogs?	2.93	2.47
Snaps at strange dogs?	2.06	1.90
Attacks strange dogs?	1.75	1.59
Aggressive with strange dogs?	2.48	2.23
Lunges at strange dogs?	2.21	2.16
Aggressive on lead?	2.65	2.63
Gender	4.92	2.07
Chases running cats?	6.47	3.23
Chases confident cats?	2.29	2.24
Chases other species	4.27	2.99
Anxious when left alone?	2.68	2.23
Barks when left alone?	2.81	2.30
Whines/howls when left alone?	2.32	2.07
Destructive when left alone?	2.88	2.14
Toilets inside?	1.67	1.38
Fearful at strange locations?	3.05	2.26
Fearful of strange stimuli?	3.73	2.13
Fearful at the vet's?	2.89	2.66
General obedience	7.39	1.76
Obedience when distracted	5.80	2.40
Satisfaction with obedience	7.01	2.26

3.3.2 Socialisation levels of dogs in the study

The mean level of socialisation with people outside the household before 12 weeks of age (Q8) was 6.46 (on a scale of 1 to 10)(Table 3-2)(Figure 3-1). From the description alongside each of the numbers in question 8, this equates to meeting 3 to 4 new people a week.

The mean level of socialisation towards new dogs (Q11) was 4.09 before 12 weeks of age. From the description alongside each of the numbers in question 11, this equates to meeting about one new dog a week (Table 3-2)(Figure 3-2).

The mean level of socialisation towards new environments (Q15) was 5.41 before 12 weeks of age (Table 3-2)(Figure 3-3). From the description alongside each of the numbers in question 15, this equates to 2 to 3 novel environments a week.

Table 3-2: Mean Level of Socialisation to People, Dogs, and Environments Before 12 Weeks of Age

	People	**Dogs**	**Environments**
Mean socialisation Score (1-10)	6.46	4.09	5.41
Description of this value	3 to 4 new people a week	1 new dog a week	2 to 3 new environments

Figure 3-1 Levels of Socialisation Towards People Before 12 Weeks of Age

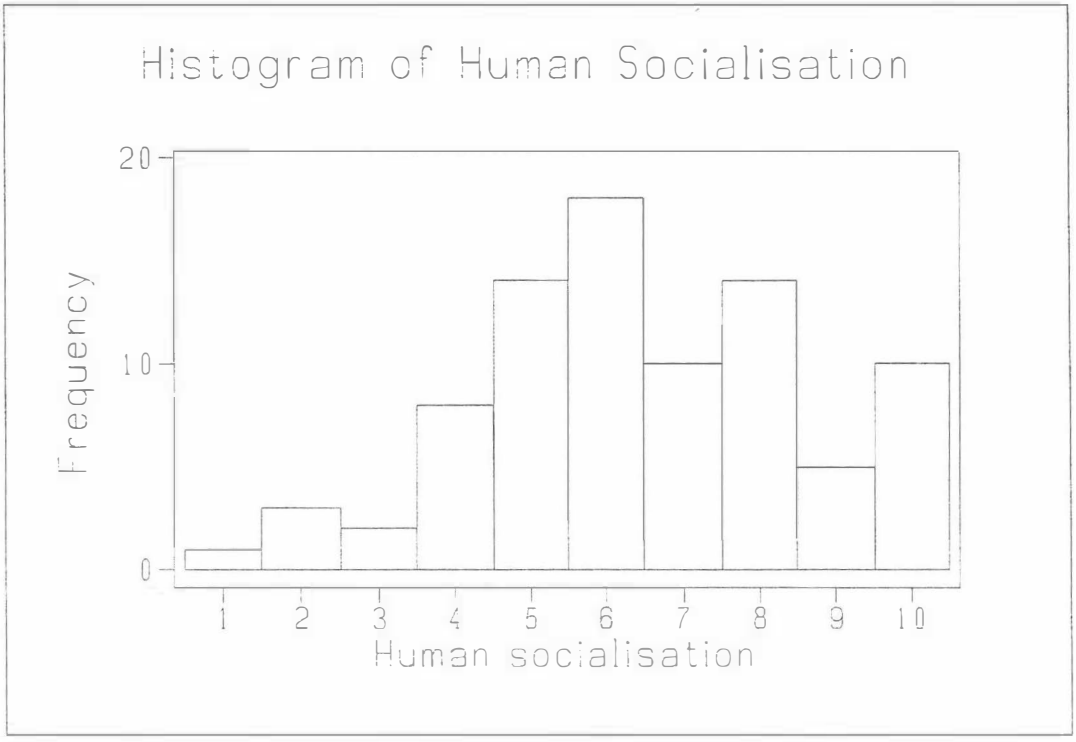


Figure 3-2 Levels of Socialisation Towards Dogs Before 12 Weeks of Age

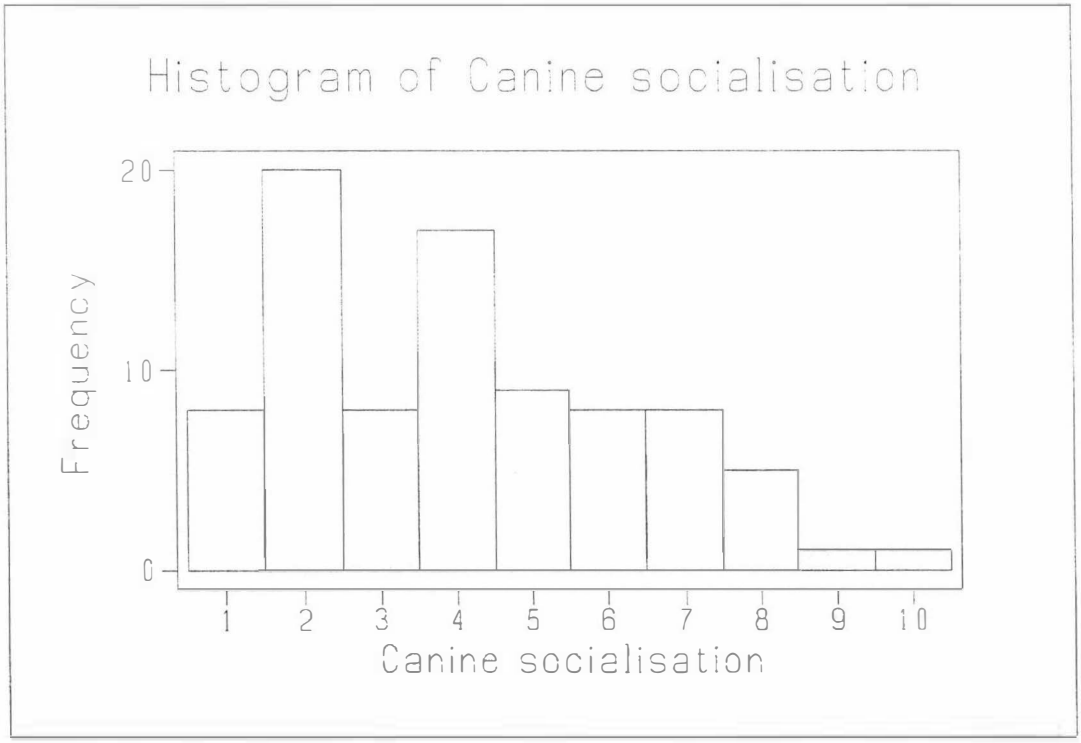
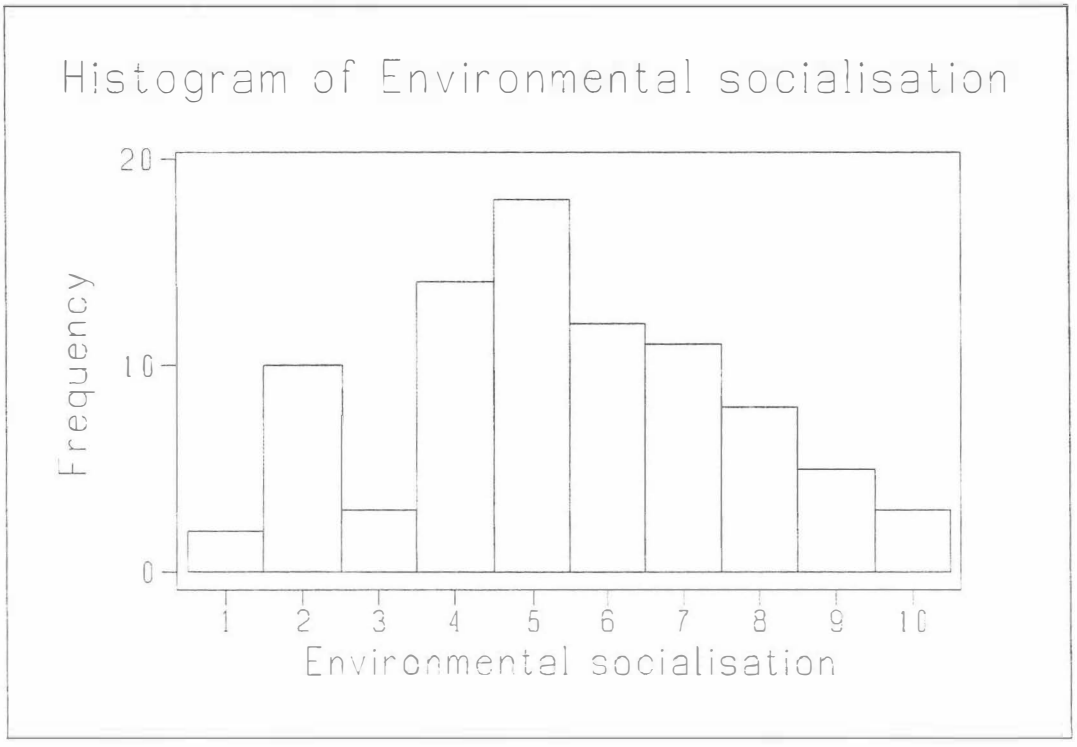


Figure 3-3 Levels of Exposure Towards Novel Environments Before 12 Weeks of Age



3.3.3 Gender differences

There were a number of significant differences in behaviour between male and female dogs (Table 3-3). Males were found to be more distractible (p=0.021). Females snapped more at familiar dogs (0.046), were more aggressive (p=0.031), were less sociable (p=0.036), less playful (p=0.050), and there was some evidence to suggest they were more likely to snap at children (p=0.051).

Table 3-3 Differences in Behaviour Between Male and Female Dogs

	Male n=43	Female n=52	P-value for difference*
Distractible (1=never 10=always)	6.72	5.65	p=0.021
Snaps at children	1.26	1.73	p=0.051
Snaps at familiar dogs	1.37	1.75	p=0.046
Sociable with strange dogs	7.77	6.58	p=0.036
Playful with strange dogs	7.42	6.38	p=0.050
Aggressive with strange dogs	1.93	2.88	p=0.031

* t-Test: Two-Sample Assuming unequal variances – two-tail.

The behaviours that were significantly different between the genders were subjected to an ANOVA analysis to investigate whether the differences were due to the neuter status of the dogs.

The only behaviour that was significantly influenced by neuter status was "snapping at familiar dogs". The ANOVA analysis of snapping at familiar dogs in relation to gender and neuter status (Table 3-4) rejected the hypothesis that the means were the same (p=0.044). The reason for this appears to be that the female-spayed mean (1.92) is greater than all the other means (female-entire mean 1.31, male-neutered 1.37, male-entire 1.38).

Table 3-4 One-Way ANOVA Analysis of Snapping at Familiar Dogs for Gender and Neuter Status

Analysis of Variance for Snapping at Familiar Dogs
p=0.044

Level	N	Mean	StDev	Individual 95% CIs For Mean Based on Pooled StDev
f entire	13	1.3077	0.4804	(-----------*----------)
f spayed	38	1.9211	1.1942	(------*-------)
m entire	19	1.3684	0.5973	(---------*---------)
m neutered	24	1.3750	0.8242	(--------*---------)

0.80 1.20 1.60 2.00

Intervals for (column level mean) - (row level mean)

	f e	f s	m e
f s	-1.3938 0.1671		
m e	-0.9350 0.8136	-0.1299 1.2351	
m n	-0.9038 0.7692	-0.0873 1.1794	-0.7525 0.7393

3.3.4 Stepwise regression analysis of early experience and adult behaviour

Individual stepwise regression analyses were carried out on all questions relating to adult behaviour (section 3 and sections 5 to 12). All measures of early experience before 12 weeks of age were included in the regression models as predictors of the different behaviours.

General socialisation (Q18) and adult behaviour

The level of environmental and social interaction (Q18) a dog received *in general* before 12 weeks of age was the measure of early experience most closely associated with the following adult behavioural characteristics; fear (p=0.006, r= -0.302)(Figure 3-4); dominance (p=0.008, r= -0.290); friendliness with strangers (p=0.001, r= 0.355)(Figure 3-5); playfulness with familiar dogs (p=0.006, r= 0.307)(Figure 3-6); sociability with familiar dogs (p=0.0005, r= 0.324)(Figure 3-7); playfulness with strange dogs (p=0.006, r= 0.298)(Figure 3-8); sociability with strange dogs (p=0.002, r=0.337)(Figure 3-9); attacks on familiar dogs (p=0.023, r= -0.249); avoidance of strange dogs (p=0.013, r= -0.274); dominance with strange dogs (p=0.020, r= -0.255); bares teeth at strange dogs (p=0.034, r= -0.232); growling at strange dogs (p=0.002, r= -0.329)(Figure 3-10); snapping at strange dogs (p=0.017, r= -0.261);

aggression towards strange dogs (p=0.051, r= -0.214); and fear at the veterinary clinic (p=0.010, r= -0.283)(Figure 3-11).

Figure 3-4 Regression Plot of General Socialisation Before 12 Weeks of Age Against Fearfulness as an Adult

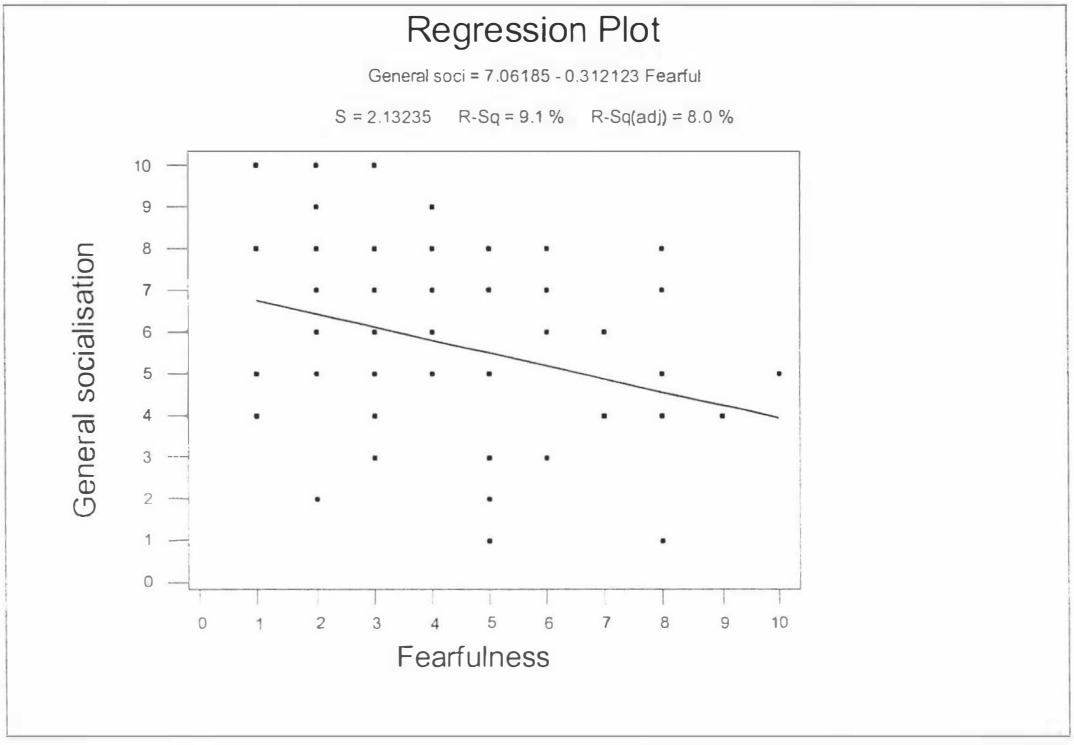


Figure 3-5 Regression Plot of General Socialisation Before 12 Weeks of Age Against Friendliness with Strangers as an Adult

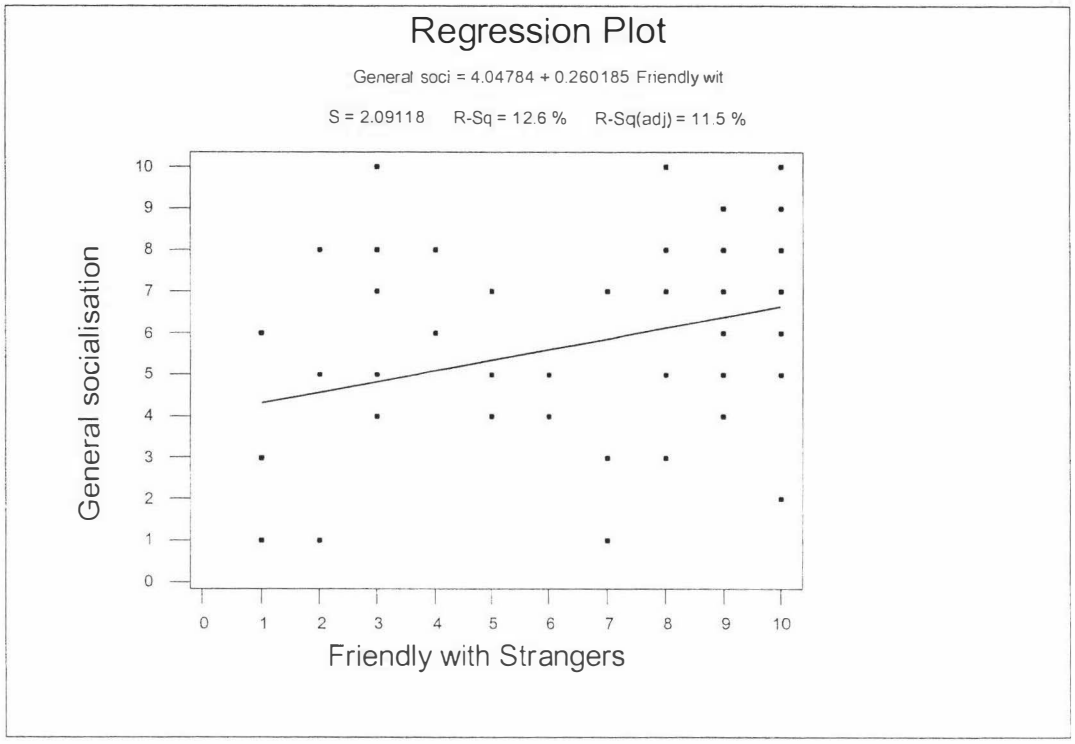


Figure 3-6 Regression Plot of General Socialisation Before 12 Weeks of Age Against Playfulness With Familiar Dogs as an Adult

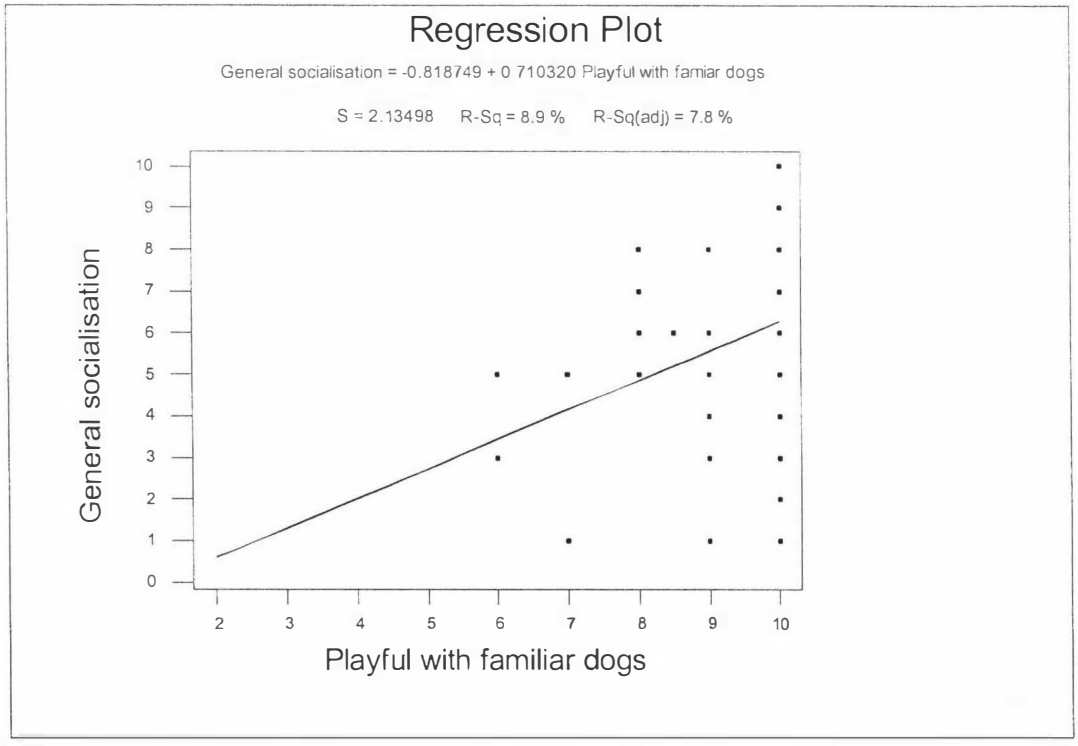


Figure 3-7 Regression Plot of General Socialisation Before 12 Weeks of Age Against Sociability with Familiar Dogs as an Adult

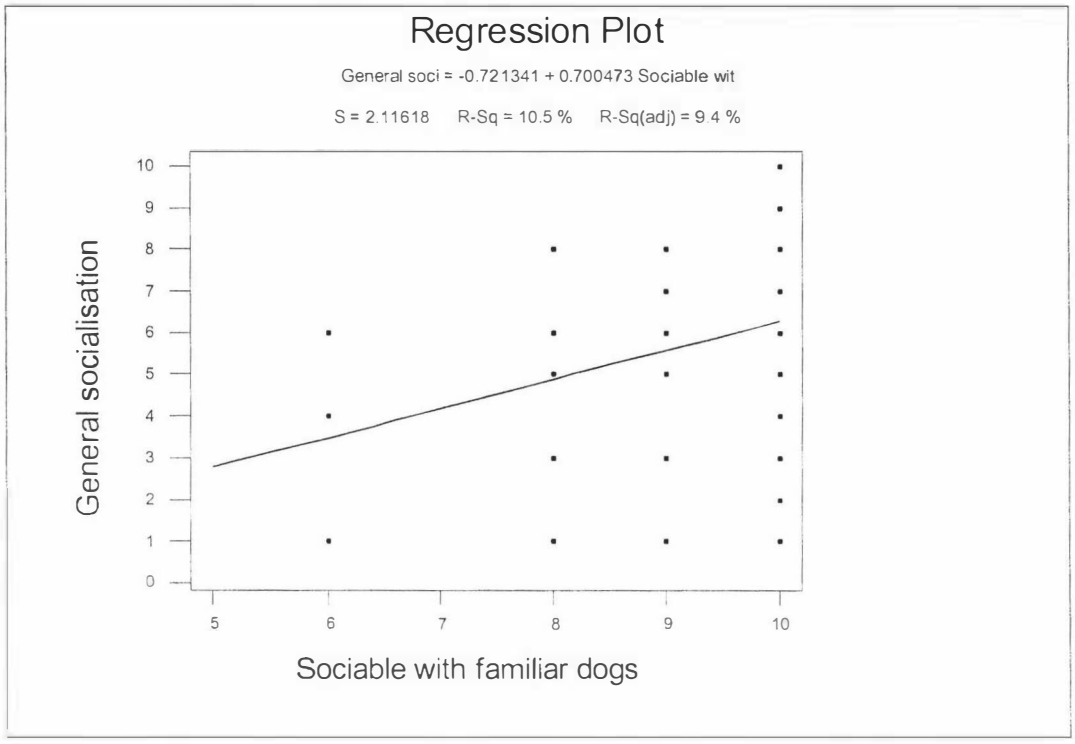


Figure 3-8 Regression Plot of General Socialisation Before 12 Weeks of Age Against Playfulness with Strange Dogs as an Adult

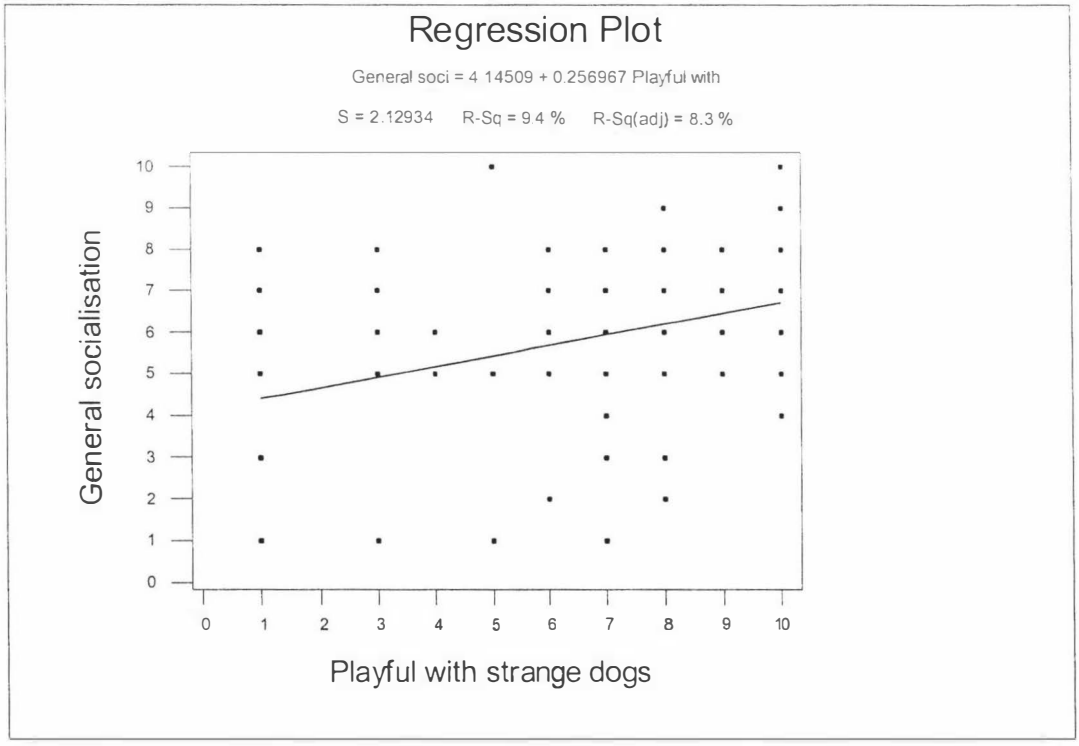


Figure 3-9 Regression Plot of General Socialisation Before 12 Weeks of Age Against Sociability with Strange Dogs as an Adult

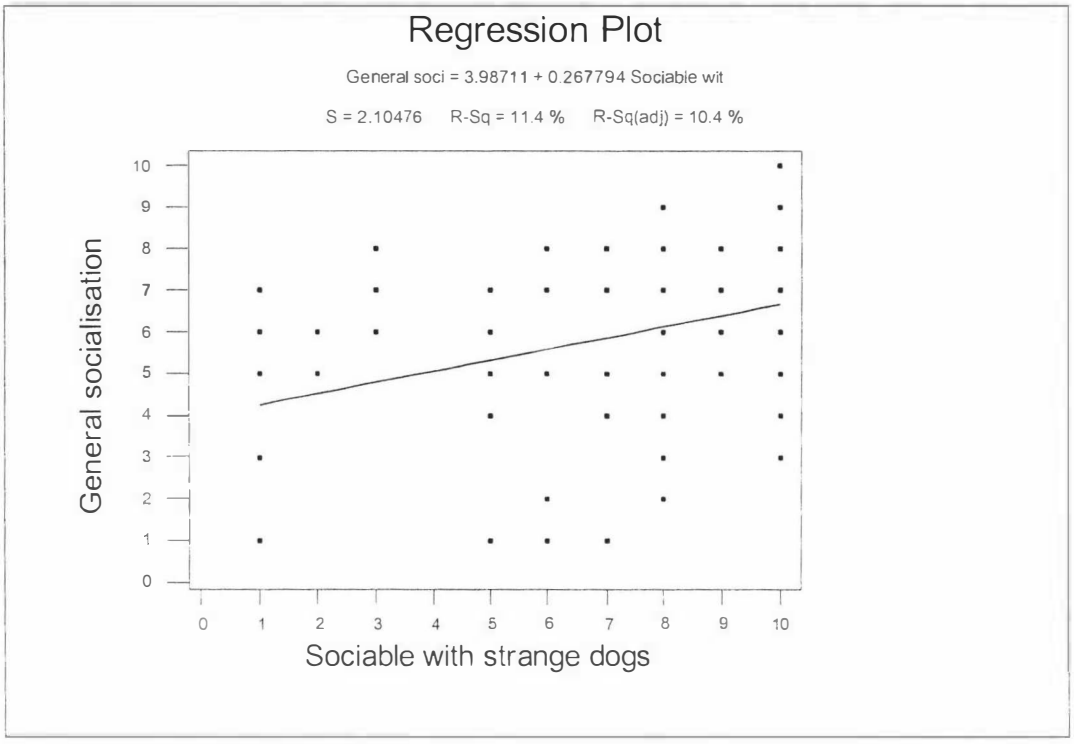


Figure 3-10 Regression Plot of General Socialisation Before 12 Weeks of Age Against Growling at Strange Dogs as an Adult

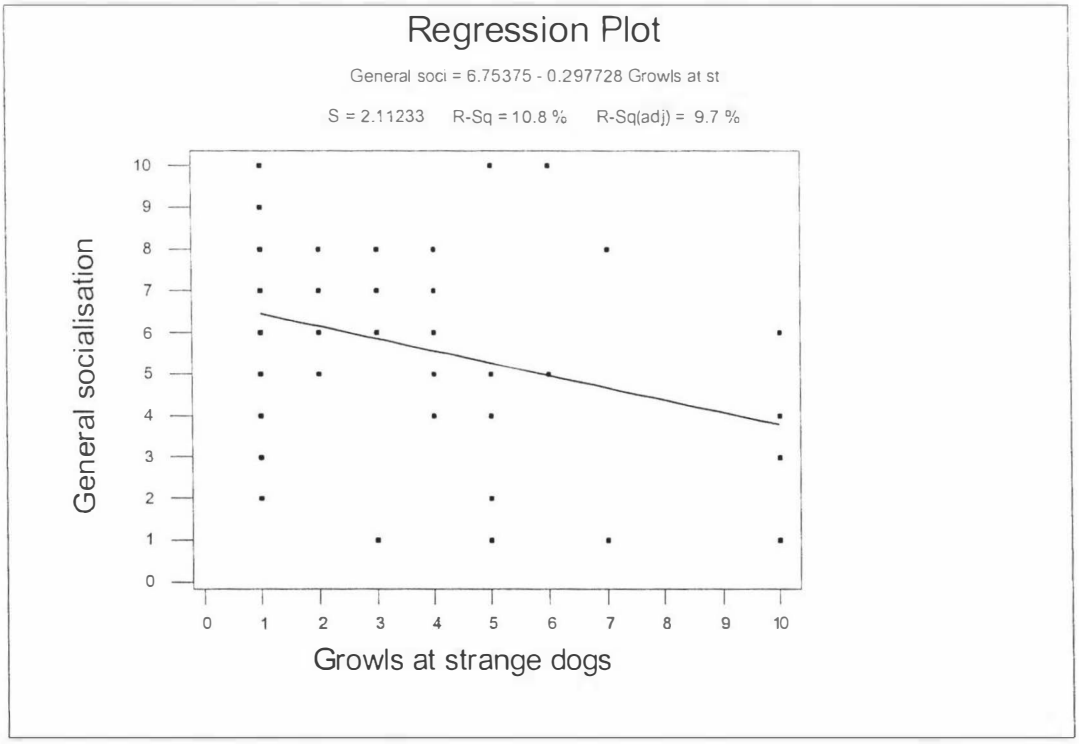
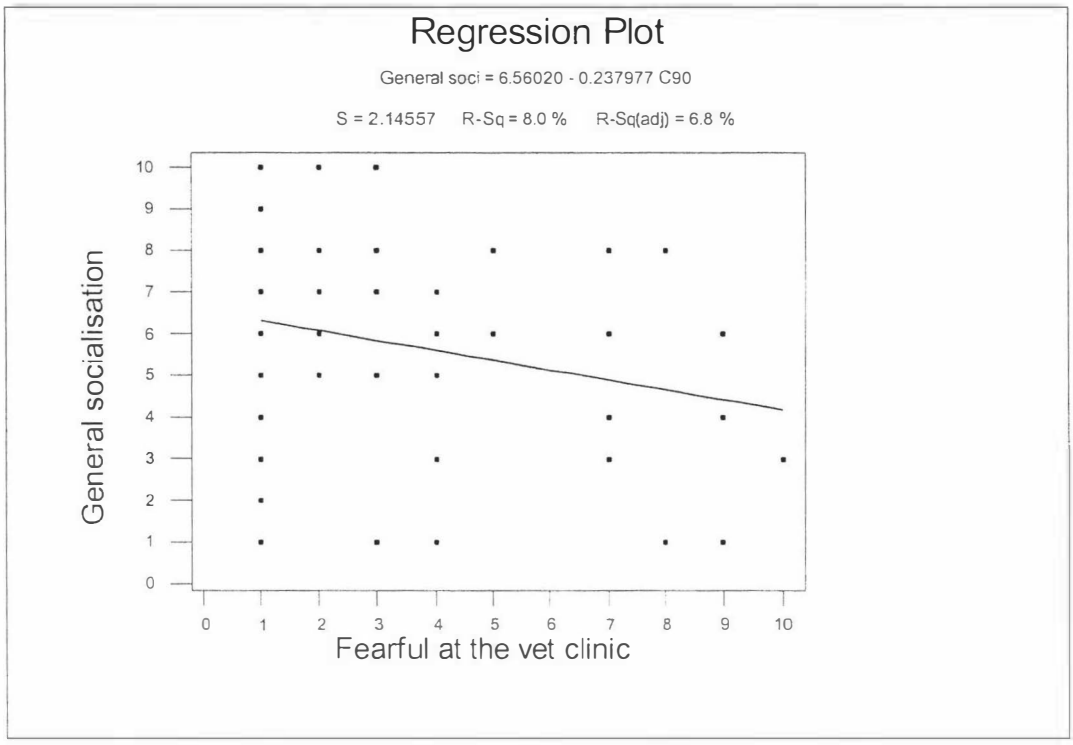


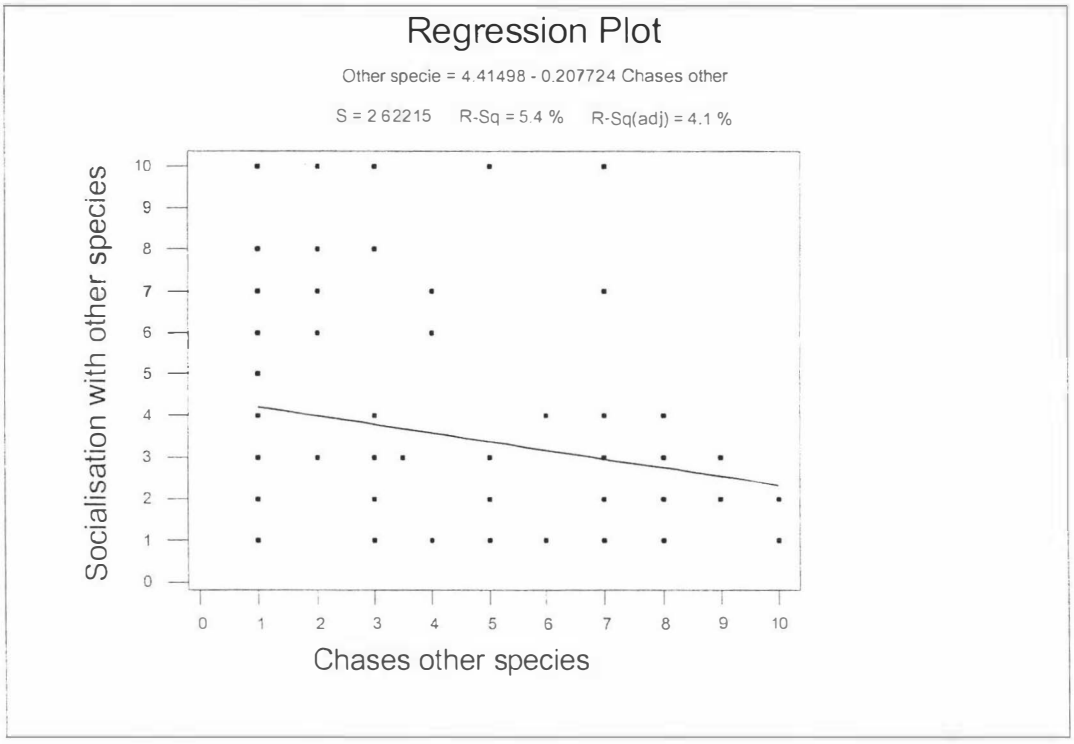
Figure 3-11 Regression Plot of General Socialisation Before 12 Weeks of Age Against Fear at the Veterinary Clinic as an Adult



Predatory behaviour and socialisation

Socialisation with other animals (Q17) was picked out by a stepwise regression as having a significant negative association with predatory behaviour toward other species (p=0.040, r= -0.232)(Figure 3-12).

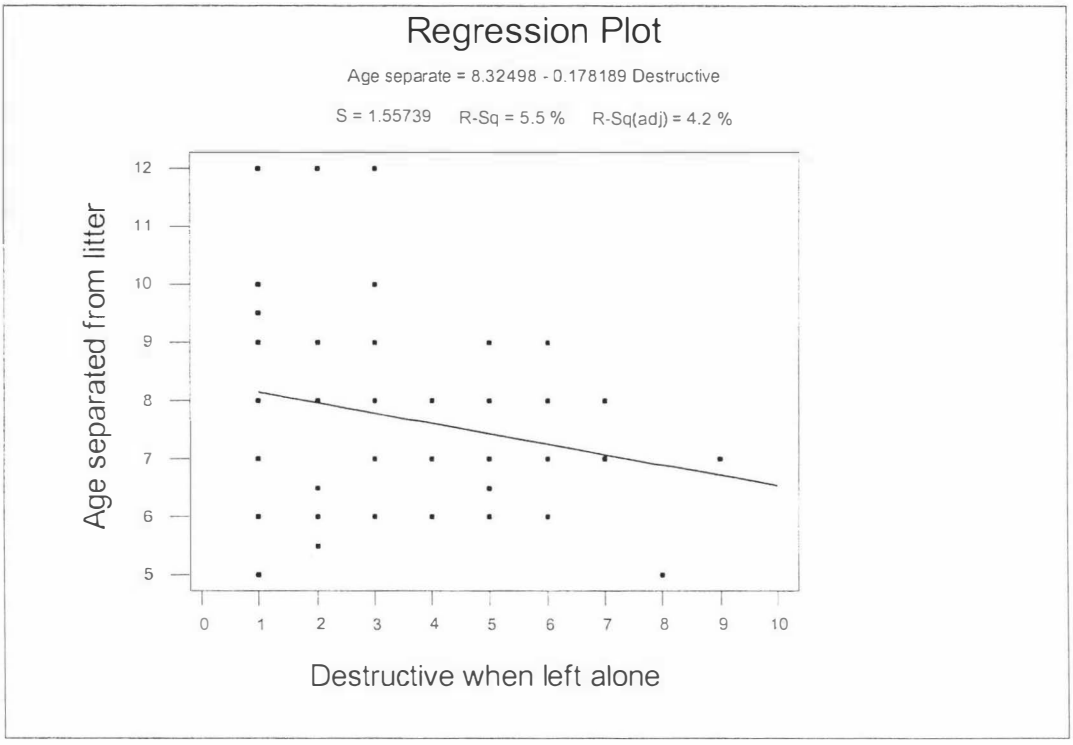
Figure 3-12 Regression Plot of Level of Socialisation With Other Species Against Propensity to Chase Other Species



Age separated from litter and separation anxiety

Age of separation from the litter was picked out by a stepwise regression as having a significant negative association with destructive behaviour when left alone ($p=0.040$, $r= -0.235$)(Figure 3-13).

Figure 3-13 Regression Plot of Age Separated From Litter Against Destructiveness When Left Alone



3.3.5 Behavioural effects of attendance and non-attendance at PSCs

There were no significant differences in the level of socialisation received between the PSC and non-PSC dogs for any of the questions relating to early experience and socialisation (Table 3-5).

Table 3-5 Measures of Socialisation Between Dogs that Attended PSCs and Those That Did Not

	Did Not Attend PSC	Attended PSC	P-value for difference*
Age acquired (weeks)	9.65	7.90	0.113
Human socialisation (1=none 10=very extensive)**	6.38	6.58	0.689
Familiar people by 12 weeks	12.70	11.45	0.539
Hours per day with people before 12 weeks of age	10.33	12.10	0.252
Canine socialisation (1=none 10=very extensive)**	3.98	4.23	0.637
Age separated from litter	7.55	7.98	0.289
Familiar dogs by 12 weeks	3.13	3.32	0.787
Environmental socialisation (1=none 10=very extensive)**	5.40	5.46	0.907
Number of environments experienced	9.30	8.98	0.884
Socialisation with other species (1=none 10=very extensive)	3.70	3.45	0.633
Socialisation in general (1=none 10=very extensive)	5.53	6.16	0.238

* t-Test: Two-Sample Assuming unequal variances – two-tail.

** See questionnaire in appendix 2 for a written description of what specific numbers (1-10) relate to in terms of early experience.

A number of significant differences were observed between dogs that had, and those that had not, attended PSCs. Dogs that had not attended PSCs were more fearful (p=0.030) and more dominant (p=0.050) than dogs that had attended PSCs (Table 3-6). They were more likely to growl at familiar people (p=0.001), and more likely to snap at familiar people (p=0.018)(Table 3-6). With familiar dogs they were more likely to be dominant (p=0.029), more likely to growl (p=0.002), more likely to avoid (p=0.035) were less sociable (p=0.029) and less playful (p=0.029)(Table 3-6). With strange dogs they were more likely to be aggressive (p=0.032), and dominant (p=0.027), and there was some evidence to suggest that

they were more likely to avoid strange dogs (p=0.056)(Table 3-6). Dogs that had not attended PSC were also more likely to be aggressive towards other dogs when separated by a fence (p=0.003)(Table 3-6). Non-PSC dogs found human companionship to be less important (p=0.016) and they were more likely to toilet inside when left alone (p=0.035)(Table 3-6).

Table 3-6 Statistically Significant Differences in Adult Behaviour Between Dogs that Attended PSCs and Those That Did Not

	Did Not Attend PSC	Attended PSC	P-value for difference*
Fearfulness in general (1=never 10=always)	4.32	3.46	p=0.030
Dominance in general	5.43	4.55	p=0.050
Frequency of growling at familiar people	2.57	1.39	p=0.001
Frequency of snapping at familiar people	1.59	1.14	p=0.018
Dominance towards familiar dogs	5.19	4.13	p=0.029
Frequency of growling at familiar dogs	2.73	1.70	p=0.002
Avoidance of familiar dogs	2.16	1.44	p=0.035
Sociability with familiar dogs	9.00	9.54	p=0.029
Playfulness with familiar dogs	8.95	9.54	p=0.029
Aggression with strange dogs	3.00	2.11	p=0.032
Dominance towards strange dogs	4.36	3.34	p=0.027
Avoidance of strange dogs	4.19	3.31	p=0.056
Aggression towards dogs when separated by a fence	3.62	2.03	p=0.003
Importance of human companionship	8.80	9.37	p=0.016
Toilets inside when alone	2.06	1.45	p=0.035

*t-Test: Two-sample assuming unequal variances – one-tail.

Although not significant at the 5% level, non-PSC attendees had noticeably higher ratings for; excitability, distractibility, fear towards familiar people, fear of strange people, fear of children, growling at children, fear of familiar dogs, fear of strange dogs, frequency of teeth baring at strange dogs, growling at strange dogs, snapping at strange dogs, lunging at strange dogs on the lead, attacking strange dogs, anxiety when left alone, whining/howling when left alone, destructive behaviour when left alone, and fear of strange locations (Table 3-7). They also had lower scores for: friendliness towards children, sociability towards familiar dogs, playfulness towards familiar dogs, sociability with strange dogs, and playfulness towards strange dogs (Table 3-7). The only behaviour trait where the mean evaluation was more desirable (more than 0.2 difference) for the non-PSC attendee dogs compared to PSC attendees was general confidence (Table 3-7).

Table 3-7 Statistically Non-Significant Differences in Adult Behaviour Between Dogs that Attended PSCs and Those That Did Not*

	Did Not Attend PSC	Attended PSC	P-value for difference**
Confident (1=never 10=always)	8.00	7.56	p=0.114
Excitable	7.51	7.32	p=0.345
Distractible	6.42	6.05	p=0.221
Protective of owner	5.81	5.55	p=0.335
Fear towards familiar people	2.45	1.91	p=0.082
Fear of strange people	3.56	3.19	p=0.231
Friendliness with children	8.43	9.22	p=0.058
Fear of children	2.81	2.46	p=0.258
Growling at children	2.08	1.57	p=0.097
Fear of familiar dogs	3.11	2.58	p=0.188
Playfulness with strange dogs	6.49	6.98	p=0.193
Fear of strange dogs	4.35	4.05	p=0.282
Frequency of teeth baring at strange dogs	2.49	1.93	p=0.114
Growling at strange dogs	3.30	2.67	p=0.127
Snapping at strange dogs	2.19	1.93	p=0.261

Lunging at strange dogs	2.49	2.02	p=0.156
Attacking strange dogs	1.89	1.60	p=0.195
Anxiety when left alone	3.11	2.45	p=0.086
Whining/howling when alone	2.68	2.07	p=0.090
Destructive when alone	3.22	2.70	p=0.135
Fear at strange locations	3.35	2.89	p=0.169

*Differences of less than 0.2 omitted.

**t-Test: Two-sample assuming unequal variances – one-tail.

There were no significant differences in measures of obedience between dogs that attended PSCs and those that did not (Table 3-8).

Table 3-8 Obedience and PSC Attendance

	Did Not Attend PSC	**Attended PSC**	**P-value for difference***
General obedience	7.26	7.44	p=0.323
Obedience when distracted	5.70	5.79	p=0.433
Satisfaction with obedience	7.35	6.71	p=0.091

*t-Test: Two-Sample Assuming unequal variances – one-tail.

There were no significant differences in fear towards strange locations, strange stimuli, or veterinary clinics between dogs that attended PSCs and those that did not (Table 3-9).

Table 3-9 Fear of Novel Stimuli and PSC Attendance

	Did Not Attend PSC	Attended PSC	P-value for difference*
Fear of strange locations	3.35	2.89	p=0.169
Fear of strange stimuli (sights, sounds)	3.81	3.71	p=0.417
Fear of the veterinary clinic	2.95	2.88	p=0.451

*t-Test: Two-sample assuming unequal variances – one-tail.

3.3.6 Attendance at PSCs before and after 10 weeks of age

The dogs which attended PSC before 10 weeks of age (9wk-) were found to have had more socialisation with other dogs compared with the dogs that attended PSCs after 10 weeks of age (10wk+)(p=0.017). They were also separated from their litters at a younger age (p=0.016)(Table 3-10). The 10wk+ group had more socialisation classes on average (5.57) than the 9wk- group (4.00).

When the 9wk- dogs were compared with the 10wk+ dogs it was found that the 9wk- group were rated by owners as being less fearful of strange dogs (p=0.040)(Table 3-11), and there was some indication of them being less afraid of strange people although this was not significant at the 5% level (p=0.067)(Table 3-11). The 9wk- dogs were also reported to be more aggressive towards dogs when separated by a fence (p=0.034)(Table 3-11). These were the only significant differences between the two groups for all questions.

Table 3-10 Significant Differences in Socialisation Between Dogs that Attended PSCs Before 10 Weeks of Age and those that Attended After 10 Weeks of Age

	9wk-	10wk+	P-value for difference*
Canine socialisation	5.33	3.90	p=0.017
Age separated from litter (weeks of age)	7.21	8.30	p=0.016

*t-Test: Two-sample assuming unequal variances – two-tail.

Table 3-11 Significant Differences in Behaviour Between Dogs that Attended PSCs Before 10 Weeks of Age and those that Attended After 10 Weeks of Age

	9wk-	10wk+	P-value for difference*
Fearful of strange dogs?	3.00	4.31	p=0.040
Fearful of strangers?	2.60	3.66	p=0.067
Aggressive towards dogs when separated by a fence?	3.00	1.46	p=0.034

*t-Test: Two-sample assuming unequal variances – one-tail.

3.4 Discussion

3.4.1 Major findings of this study

- The mean level of socialisation before 12 weeks of age was 3 to 4 new people a week, 1 new dog a week, and 2 to 3 new environments a week.
- Female dogs were more aggressive and less social than males.
- Spayed female dogs are more likely to snap at familiar dogs than entire female dogs.
- The level of environmental and social interaction that a puppy gets in general (Q18) was the measure of early experience most closely associated with a range of desirable behaviours in adulthood. It was positively associated with measures of sociability, and negatively associated with measures of fear and aggression.
- Socialisation with other species before 12 weeks of age was associated with a reduction in predatory behaviour.
- The age a puppy was separated from its litter was negatively correlated with destructive behaviour when left alone as an adult.
- Dogs that attended PSCs as puppies scored significantly higher than non-PSC dogs on some measures of sociability, and scored lower on some measures of fearful behaviour and aggressive behaviour.
- There was no difference between PSC attendees and non-attendees for fearful behaviour towards novel stimuli, novel environments, and veterinary clinics.
- Dogs that attended PSCs before 10 weeks of age were less fearful of strange dogs, and there was some evidence to suggest that they were less fearful of strange people.
- PSCs did not have any effect on the long-term obedience of dogs.

3.4.2 Level of socialisation of New Zealand dogs

There is nothing in the literature reporting the amount of socialisation puppies experience in our society. This study provides some indication of what the average puppy experiences during the sensitive period for socialisation.

The mean level of socialisation towards people outside the household before 12 weeks of age was 3 to 4 new people a week. Socialisation towards new dogs was found to be about one

new dog a week The mean level of environmental exposure was found to be 2 to 3 novel environments a week.

Fuller (1967) reported that dogs were effectively "socialised" if they experienced two 20 minute periods of contact with humans per week during the sensitive period, while Wolfle (1990) reported "adequate socialisation" of beagles if they had only 5 minutes of human interaction. From these studies it seems that the mean level of socialisation towards humans found in this study of 3 to 4 new people a week, is sufficient to "adequately" socialise a dog to people. The possibility does exist however that if the people introduced to the puppy are all very similar (for example adult European females) the dog may display malsocialised behaviour towards types of people it did not encounter during the sensitive period. Also, "adequate socialisation" as described by the cited authors refers to laboratory dogs, which presumably require a lesser degree of confidence than household pets, due to the limited environmental and social stimuli they encounter in the laboratory environment. While the average level of socialisation with people found in this study is probably adequate, further socialisation may provide additional behavioural benefits, as was found to be the case with dogs experiencing the additional socialisation of puppy socialisation classes.

The mean level of early experience with new dogs of one interaction per week seems minimal. This is most likely a result of owners keeping their dogs away from other dogs until the vaccination program has been completed. The increase in sociability and decrease in fearful behaviour that was found in dogs that experienced the extra canine socialisation experience of PSCs suggests that the normal level of socialisation towards other dogs may be insufficient. In addition to the positive effect of the extra canine socialisation experienced at PSCs, dogs that attended PSCs before 10 weeks of age displayed less fear of strange dogs as adults compared to dogs that attended PSCs after 10 weeks of age. This is most likely due to the canine socialisation experienced at PSCs being more effective in the 9wk- dogs because they experienced it before the conclusion of the accepted socialisation period. The fact that the dogs in this study seemed to be susceptible to the positive effects of further canine socialisation suggests that the normal level of canine socialisation in New Zealand is inadequate.

The mean amount of early exposure to novel environments was 2 to 3 environments a week. PSCs were not found to increase confidence towards novel locations or veterinary clinics, and

the mean level of fear to these environments was relatively low. This suggests that the mean level of environmental exposure may be sufficient to adequately socialise a dog to novel environments.

3.4.3 Gender differences

There was a tendency for female dogs in this study to be less social and more aggressive than males, especially towards other dogs. This is in contrast to Wright and Nesselrote (1987), Bradshaw *et al.* (1996) and Lund *et al.* (1996), all of whom reported that males exhibit aggressive behaviour more frequently.

Female dogs were found to be more likely to snap at familiar dogs. This was a result of spayed females being more likely to snap than entire females, neutered males, or entire males. Increased aggression in spayed female dogs compared to entire females has been noted before. Voith and Borchelt (1982) reported increased dominance-related aggression in some female dogs after spaying, and speculated that this was a result of foetal androgenization causing male-like behavioural characteristics which were increased after spaying. O'Farrel and Peachey (1990) compared 150 spayed female dogs with 150 unspayed females. The groups were matched for age and breed. As with Voith and Borchelt (1982) they found that dominance-related aggression increased in female dogs after spaying. Finally, Serpell (1996) reported increased aggression towards children after spaying even though the dogs had not exhibited aggression towards children before surgery. These findings indicate that spaying should not form part of a treatment protocol for aggression in female dogs, and that it may in fact exacerbate any existing aggression problem.

No significant difference was found between the sexes in measures of obedience. This is in contrast to Hart and Hart (1985) who carried out a cluster analysis of behaviour profiles for breed and gender, and found that females were reported as being easier to train. Bradshaw *et al.* (1996) also found that females were considered by veterinarians and dog care professionals to be easier to obedience train.

3.4.4 Early socialisation and adult behaviour

Socialisation "in general" and adult behaviour

In this study the level of environmental and social interaction that a dog gets *in general* (Q18)(general socialisation) was significantly associated with a number of adult behavioural characteristics. General socialisation was positively correlated with desirable social characteristics such as friendliness with strangers, and both sociability and playfulness with familiar and strange dogs. Conversely, general socialisation was negatively associated with fear and anxiety-based behaviours and aggressive behaviour. This included attacks on familiar dogs, avoidance of strange dogs, dominant behaviour towards strange dogs, teeth-baring at strange dogs, growling at strange dogs, snapping at strange dogs, aggression towards strange dogs, dominant behaviour in general, fear at the veterinary clinic, and fearful behaviour in general. General socialisation acted as a better predictor of these behavioural characteristics than any other measures of early experience.

The correlations between early socialisation and adult behaviour were significant, but not highly so. This is to be expected, considering that there are many other factors which influence the development and maintenance of behaviour in a dog. The fact that so many significant correlations were found - despite the confounding influence of other factors on behaviour - reflects the important role that early socialisation plays in the development of adult dog behaviour. It is also important to note that the information on early socialisation was obtained from owners who were mostly unaware of the level of socialisation their puppy experienced before it was acquired. The mean age of puppy acquisition was 8 ½ weeks. Therefore early socialisation information was obtained for only 3 ½ weeks of the puppies' lives on average (i.e. 8 ½ weeks to 12 weeks). The fact that this period was both short and past the 7-week optimum socialisation age also highlights the significance of the correlations.

Lack of exposure to novel environments and social interactions as a young puppy have been shown to result in problems such as abnormal fear responses, social inadequacies, and increased aggression (Melzak and Thompson, 1956; Pfaffenberger *et al.*, 1962; Fox, 1969; Fox and Stelzner, 1967; Fisher, 1955; Hetts *et al.*, 1992; Hubrecht, 1995). These behavioural deficits are long-term, with later socialisation often being ineffective in adequately improving such maladjusted behaviour (Scott and Fuller, 1965; Fuller, 1964; Freedman *et al.*, 1961).

The period in a puppy's life in which it is most sensitive to the developmental benefits of socialisation seems to be before 12 weeks of age (Freedman *et al.*, 1961, Fox and Spencer, 1969; Appleby, 1993).

The positive correlation found in the present study between general socialisation and desirable adult behaviour, and the negative correlation with undesirable behaviour, further highlights the importance of environmental and social interaction before 12 weeks of age in dogs.

Reduced socialisation before 12 weeks of age was associated with an increase in fearful behaviour as an adult. Lower levels of general socialisation were linked with increased fearful behaviour in general, increased fear of strangers, increased avoidance of strange dogs, and more fear at the veterinary clinic.

General socialisation was positively correlated with social behaviour. Poor general socialisation was associated with reduced friendliness with strangers, reduced sociability and playfulness with both familiar and strange dogs, and less playfulness in general. This is in accordance with studies by Fuller (1964), who reported a reduction in intensity of social contacts as a result of poor socialisation, Fox (1969), who found that puppies reared with cats between 3 and 16 weeks were inhibited in their reactions with other dogs, and Hubrecht (1995), who reported a small increase in approachability of dogs as a result of slightly increased human socialisation before 14 weeks of age. Fox and Stelzner (1967) also found a link between socialisation and sociability by comparing three groups of puppies that were isolated from their peers at 3 days old, 3 ½ weeks old, and 8 weeks old. It was found that puppies that had had the least social contact with con-specifics were the least social. The puppies isolated at 3 days old "tended to wander off alone and engage in self-play or to manipulate inanimate objects" and "rarely engaged in group play". This was in contrast to the puppies isolated at 8 weeks old who "grouped together and showed strong interaction due to mutually compatible behaviour patterns". As suggested by Fox and Stelzner, it may be the development of social interaction skills, rather than reduced fear, that increases the sociability and playfulness of well-socialised dogs.

Fox and Stelzner (1967) noted that the poorly socialised dogs "rapidly became aggressive towards their peers". This link between socialisation and aggression has also been reported by Roll and Unshelm (1997), who found that half of the dogs involved in aggressive conflicts

were described as having minimal interaction with con-specifics between the ages of 5 weeks to 5 months. This negative relationship between socialisation and aggression was also observed in this study, with general socialisation being negatively correlated with snapping at strange people, growling at children, attacks on familiar dogs, teeth-baring at strange dogs, growling at strange dogs, snapping at strange dogs, and aggression towards strange dogs. Increased fear as a result of inadequate socialisation probably plays an important role in increasing aggressive behaviour in poorly socialised dogs. The retardation of social skills in poorly socialised dogs may also increase a dog's propensity to resort to aggression, rather than more appropriate communication systems, in order to prevent or terminate a fear-inducing social interaction. If this kind of aggressive behaviour is successful in terminating an undesirable social interaction the experience can act as a strong negative reinforcement for aggression, increasing the probability of aggressive behaviour in the future.

It is interesting that general socialisation was found to be the factor most closely associated with the behaviour characteristics above. It was expected that the level of socialisation with specific stimuli would be associated with behaviour towards those stimuli as an adult. For example, it was expected that socialisation with novel dogs before 12 weeks of age would be more closely associated with con-specific interactions than any other measure of early experience. The positive effect that general socialisation had on dog behaviour in this study highlights the broad long-term behavioural benefits which can be achieved by exposing a young puppy to many different stimuli.

Predatory behaviour and socialisation with other species

Interaction with other species before 12 weeks of age was negatively correlated with chasing other species in adulthood ($p=0.034$, $r= -0.232$).

It has been demonstrated that socialisation with natural prey species during the sensitive period for socialisation can result in highly social behaviour towards these species. Fox (1969; 1971) found that dogs raised with kittens during 2 ½ to 13 weeks of age preferred to interact with cats rather than dogs. Cairns and Werboff (1967) found that dogs raised with rabbits showed distress when separated from their rabbit partner as puppies, but that this did not preclude injurious behaviour towards the rabbits by some puppies as they grew older.

The negative correlation found in the present study between socialisation with other species and chasing behaviour in adulthood suggests that early socialisation may increase the probability that dogs regard the species they were socialised with as a social peer rather than as prey. The reduction in predatory behaviour found in this study as a result of socialisation with other animals suggests that such socialisation is an effective preventive measure for owners, to reduce the likelihood of inappropriate predatory behaviour in the future.

Age of separation from the litter and its link with destructive behaviour

There was some evidence to suggest that age of separation from the litter is negatively correlated with destructive behaviour when left alone as an adult ($p=0.040$, $r= -0.235$).

One of the main reasons for destructive behaviour by dogs when left alone is separation anxiety (Landsberg *et al.*, 1997). The link found in this study between destructive behaviour when left alone and the age the dog was separated from its litter, is most likely due to a higher level of separation distress in dogs that were separated from their litter at an earlier age.

Puppies seem to be most socially dependent around 7 weeks of age (Elliot and Scott, 1961). So it is likely that at this age the greatest emotional distress will be experienced by puppies when separated from their litter. Emotional distress has been shown to speed up and strengthen social bonds during the imprinting period in birds (Hess, 1961; Guiton, 1961; Pitz and Ross, 1961). Scott (1962) has proposed that any kind of strong emotion can serve to speed up the socialisation process in animals. Scott *et al.* (1961) reported evidence for this in dogs, finding that puppies separated from their littermates formed stronger social attachments to human handlers than did puppies that were not separated from their litter.

These studies suggest that the association found in this study between early separation from the litter and destructive behaviour when left alone is due to the fact that at younger ages a puppy experiences a greater level of emotional distress when separated from its litter. This in turn has the potential to strengthen the social bond with the new owner, which may result in an increased likelihood of separation anxiety and behaviour linked with this anxiety when the dog is left alone. While a close bond with their dog is important to many owners, in light of this finding it may be advisable to ensure that puppies that are placed early are exposed to a

number of different social stimuli, as well as being left for periods by themselves, in order to avoid over-dependence on a new owner.

3.4.5 Behavioural effects of attendance and non-attendance at PSCs

Dogs that had attended PSCs were less fearful in general as adult dogs than dogs that had not attended such classes (p=0.030). Other measures of fearfulness and anxiety were also greater in the non-PSC dogs. Increased snapping at familiar people (p=0.018) avoidance of familiar dogs (p=0.035), and avoidance of strange dogs (p=0.056) are likely to be a result of fear or anxiety. Other differences between the PSC dogs and non-PSC dogs, such as greater frequency of growling at familiar people by non-PSC dogs (p=0.001), greater frequency of growling at familiar dogs (p=0.002), less sociability with familiar dogs (p=0.029), less playfulness with familiar dogs (0.029), and more aggression with strange dogs (0.032) are all behaviour types which would be affected in these directions by fear and anxiety.
The lack of any significant difference in socialisation experience between the two groups indicates that attendance at PSCs rather than overall socialisation by owners was the factor influencing the differences in adult behaviour.

Non-PSC dogs were also found to be more dominant than PSC dogs. Non-PSC dogs were more dominant in general (p=0.050), and more dominant towards both familiar (p=0.029) and strange dogs (p=0.027). This difference in "dominant" behaviour between the two groups may have been a result of anxiety-based aggressive behaviour being interpreted as dominant behaviour by owners rather than actual status-related dominant behaviour. Consider the following: an owner observes another dog approach their dog which now raises its hackles, growls, and bares its teeth to communicate that it feels threatened by the initial direct approach by the other dog; this causes the approaching dog to stop interacting and to move away. This could easily be interpreted as "bossy" or dominant behaviour despite the fact that when the dog has time to interact in a less threatening manner it becomes more confident, less aggressive, and may well not adopt a dominant social role in the relationship. All that is noticed by the owner however is the initial "dominant" behaviour by their dog.

The greater reported level of aggressive behaviour for non-PSC dogs towards familiar people and dogs is somewhat surprising. It was expected that the most pronounced differences would occur in the dog's interactions with strange people and dogs. This did not prove to be

the case, with a similar number of significant differences occurring in relation to both familiar and strange individuals. This may be a result of dogs displaying such behaviour towards familiar people before they are fully recognised. Another explanation is that dogs which are more anxious (as the non-PSC dogs seem to be) may be more likely to try aggressive behaviour with familiar individuals in order to obtain information about what is expected of them (Overall, 1997a). It has been hypothesised that dogs that are socially inept or anxious resort to aggression to "define their social and behavioural boundaries by using the response to their aggression" Overall (1997a).

This hypothesised anxiety-induced explanation for the significantly greater level of dominant behaviour by the non-PSC dogs is supported by some of the non-significant differences in reported behaviour between the two groups. Although not significant at the 5% level, non-PSC attendees had noticeably higher ratings for: fear towards familiar people, fear of strange people, fear of children, growling at children, fear of familiar dogs, fear of strange dogs, frequency of teeth baring at strange dogs, growling at strange dogs, snapping at strange dogs, lunging at strange dogs on the lead, attacking strange dogs, anxiety when left alone, whining/howling when left alone, destructive behaviour when left alone, and fear of strange locations. They also had lower scores for: friendliness towards children, sociability towards familiar dogs, playfulness towards familiar dogs, sociability with strange dogs, and playfulness towards strange dogs. Although these differences are not statistically significant, it is of interest that all measures of fear and anxiety which were noticeably different between the two groups (apart from "confidence in general"), were less desirable for the non-PSC dogs. This pattern of greater anxiety-related behaviour shown by non-PSC dogs adds weight to the statistically significant findings outlined above.

The level of aggression displayed towards other dogs when separated by a fence was found to be higher in dogs that did not attend PSCs ($p=0.003$). As with the other behavioural differences outlined above, it can be hypothesised that the greater propensity for non-PSC dogs to display this form of aggression is linked with the greater level of anxiety that such dogs experience. It may seem counter-intuitive that a more fearful dog will be more aggressive. However fear is one of the primary motivators of aggressive behaviour (Overall, 1997a; Landsberg *et al.*, 1997; Lindsay, 2000). In the author's opinion a dog that feels threatened is more likely to become aggressive if 1) it can not move away from the threat, or 2) it knows that it can try to displace the threat with aggressive behaviour with minimal risk,

or 3) the threat is in the vicinity of its territory. The last two of these scenarios are consistent with "fence fighting" between two dogs, and may explain why this form of aggression was found to be significantly different between the two groups when other measures of aggression were not.

The only study in the literature that investigates the effect of PSCs on later behaviour is that of Seksel (1999a). In Seksel's study no behavioural differences were observed between groups of dogs that attended PSCs and those that did not. This led Seksel to conclude that the level of exposure to novel, social, and handling stimuli in the home environment was sufficient, and that PSCs did not significantly improve on it.

The results of the present study contrast with those of Seksel (1999a). It seems from the behavioural differences outlined above that the PSC experience decreases the propensity for fear and fear-related behaviour in adulthood. That effect was observed in this study despite the fact that many of the PSC attendees started the classes after 12 weeks of age, which is considered to be the end of the sensitive period for socialisation (Freedman *et al.* 1961; Appleby, 1993; Fox and Spencer, 1969; Overall, 1997a; Landsberg *et al.*, 1997; Lindsay, 2000). This suggests that education of owners may be an important factor in the development of more desirable behaviour in PSC dogs, rather than just increased socialisation. For example, educating owners about interactions with other dogs may have a number of positive long-term effects on their dog's later behaviour with other dogs. First, if an owner is educated on some of the basics of canine communication they may feel more confident in interpreting their dog's behaviour during canine interactions, and as a result will feel more confident in allowing their dog to interact with other dogs. This may increase the amount of time their dog spends with other dogs, and a likely result is that the dog will interact with other dogs in a more positive way. Secondly, educating owners during PSCs on how to reinforce sociable behaviour and to inhibit unsociable behaviour in their dog, would introduce an improved learning-mediated effect on their dog's long-term behaviour with other dogs. Thirdly, owners who take their dogs to PSCs may be better able to maintain a dominant role with their dog, which has been hypothesised to reduce aggression (Askew, 1996; Sherman *et al.*, 1996) and anxiety (Overall, 1997a).

PSCs and obedience

There was no difference in measures of obedience between dogs that attended PSCs and those that did not. Owners' evaluations of general obedience, obedience when distracted, and satisfaction with obedience were not significantly different for attendees and non-attendees.

Seksel (1999a) investigated the effect of PSCs on obedience. Seksel's experiment compared the behaviour of five groups of dogs. The five groups included one which took part in both socialisation and obedience training education (S & T), one which took part in the socialisation component only (S), another in the training aspect only (T), one which was just fed at the PSC venue (F), and a control group which visited the venue only (C). On comparison of the groups' responsiveness to obedience commands it was found that the socialisation and training, and training only groups were more responsive than the other groups to command at 2 and 4 weeks after the classes. However this effect was not long-lasting with no difference being evident six months after the classes.

The results from the present study suggest that the obedience education the puppies and owners receive at PSCs does not result in dogs that are any more obedient in the long term than dogs that did not attend PSCs. This is consistent with the findings of Seksel (1999a).

Educating dog owners about successful command training is one of the aims of PSCs. The fact that there was no difference between dogs that attended these classes and those that did not suggests that the obedience aspect of PSCs is not effective in increasing the long-term obedience of attendees. This may be because the information given at classes is insufficient to improve significantly the level of obedience that the dog would otherwise have displayed. Or (as seemed to be the case in Seksel's (1999a) study), dogs that do not attend PSCs catch up with the obedience improvements made by PSC attendees. Whatever the reason for the lack of any difference in obedience command responsiveness, the results from the present study should encourage coordinators of PSCs to ensure that the training program they implement is as effective as possible. Improving aspects of owner education found to be important for therapy success (see chapter 2), may serve to increase the chances that the PSC helps to improve the long-term obedience of attendees.

PSCs and fear of new stimuli

There was no difference between PSC and non-PSC dogs for fear towards new locations, new stimuli, or veterinary clinics.

Seksel (1999a) found that the level of fear towards novel stimuli (thunder tape, opening umbrella, squeaky toy, hairdryer, vacuum cleaner, and tennis ball) was not significantly different between PSC attendees and non-attendees. Seksel's study did not investigate the effect of PSCs on behaviour at novel locations or at the veterinary clinic.

The results from both the present study and that of Seksel (1999a) suggest that PSCs do not significantly affect a dog's response to novel stimuli. This suggests that the normal level of environmental interaction that a puppy receives with owners is sufficient to socialise a dog adequately to novel stimuli. This assumption is supported by the relatively low levels of fear towards novel stimuli found in the present study.

One of the aims of PSCs is to teach a puppy to cope with novel stimuli, and to ensure that visits to the veterinary clinic are an enjoyable experience for the dog (Seksel, 1997). The lack of any demonstrable effect of PSC attendance on fear of novel stimuli or locations suggests that PSCs do not fulfil these aims. However the social benefits resulting from PSC attendance found in this study highlight the value of these classes as part of a puppy's early experience.

3.4.6 Comparison of behavioural effects of attendance at PSCs before and after 10 weeks of age

There is no published research investigating the effect that the age of puppies attending PSCs has on subsequent behaviour. Seksel (1999a) reports the ages of puppies taking part in an investigation of PSC effects, but no comparison was made between the behaviour of dogs that attended at different ages. From research investigating the timing of the sensitive period of socialisation, it seems that the positive effects of socialisation start to wane at around 10 to 12 weeks (Freedman *et al.* 1961; Appleby, 1993; Fox and Spencer, 1969; Overall, 1997a; Landsberg *et al.*, 1997; Lindsay, 2000). It was therefore expected that exposure to

environmental and social stimuli would have the greatest effect if carried out before 10 weeks of age.

In this study dogs that attended their first PSC before 10 weeks of age were found to be less fearful of strange dogs as adults when compared with those that attended after 10 weeks. This is most likely due to the fact that they experienced exposure to other dogs in PSCs at an age where they were more sensitive to the effects of socialisation than those that attended after 10 weeks of age. The social exposure to various breeds and temperaments of dogs at this age would presumably have resulted in dogs which were less fearful of unknown dogs, despite the fact that they experienced a similar amount of social contact with dogs at PSCs to that of the post 10-week attendees.

Although not statistically significant at the 5% level there was some evidence to suggest that dogs starting PSCs before 10 weeks of age show less fear towards unfamiliar people. This also is most likely due to the fact that as puppies these dogs experienced exposure to a variety of different types of people at a time that they were more sensitive to socialisation.

Only two of the behavioural measures were statistically significant between the groups, but the mean behavioural scores for pre-10-week attendees were more positive for almost all of the behavioural measures when compared with post-10-week attendees. These results indicate that there is some benefit to be gained by starting PSCs before 10 weeks of age. Considering that early socialisation is only one of the factors influencing adult behaviour, and that most of the dogs investigated in this study were not seriously under-socialised, it is significant that some behavioural differences were found between pre- and post-10-week starters.

Socialisation levels for the 9wk- and 10wk+ groups

Two significant differences in early socialisation were found between the 9wk- group and the 10wk+ group. The level of canine socialisation was found to be higher for the 9wk- group ($p=0.017$) and the 9wk- dogs were separated from their litter at an earlier age ($p=0.016$).

The greater level of canine socialisation that the 9wk- group experienced before 12 weeks of age probably accounts for the difference between the groups for fear towards strange dogs.

However, it is not possible to determine whether the higher socialisation level was a result of their experience at PSCs, or whether as a group they experienced more canine socialisation outside the classes. It is therefore not possible to say for certain that it was attendance at PSCs at an earlier age that decreased the 9wk- dogs' fear of strange dogs.

The fact that the 9wk- dogs were separated from their litters at an earlier age than the 10wk+ dogs also reduces the certainty of any conclusions that can be drawn from the behavioural differences found between the 9wk- and 10wk+ dogs. As a result of this difference in separation from the litter, it is possible that the behavioural differences may be due to the 9wk- dog owners acquiring their puppies at an age that is nearer the 7-week optimum age for socialisation.

Although the behavioural differences observed between 9wk- and 10wk+ dogs are not as clear as those between the PSC and non PSC dogs, they do suggest that there may be some benefits from earlier PSC attendance. To some extent these results provide a counterbalance to the health risks of early PSC attendance.

Anecdotal evidence suggests that as long as early PSC attendees have received their first vaccination, and the venue is either never frequented by unvaccinated dogs, or is thoroughly disinfected, the risk of contracting a serious disease is very small (Pat Woolerston, PSC coordinator, Howick Veterinary Clinic, Auckland; Tania Colquhoun, PSC coordinator, Dog Power, Auckland: personal communication). Providing a disease-free environment for PSCs is of course more difficult for veterinary clinics. However one veterinary practice in Auckland has run classes in its clinic for pre-10-week puppies for more than 5 years without incident (Pat Woolerston, PSC coordinator, Howick Veterinary Clinic, Auckland: personal communication). As long as the owners of puppies are made aware of the risks involved with early PSC attendance, and the venue fulfils the requirements outlined above, it is the opinion of the author that the probable behavioural benefits of early PSC attendance outweigh the health risks.

3.4.7 Limitations of this study

Information on the early experience of dogs involved in the present study was obtained a few years after they were young puppies. This would have reduced the accuracy of the owners'

reporting of their dog's early experience. It may have also increased the potential for a dog's later behaviour to influence how the owner assessed their early experience. Possibly owners may remember a well-behaved dog's early experience as being more comprehensive than it actually was, or conversely an owner of an antisocial fearful dog may remember the dog's early experience as being poorer than it actually was. Obtaining socialisation information for a longitudinal study immediately after the sensitive period would avoid this issue.

Another shortcoming of the socialisation information was that it was mostly obtained for the later part of the sensitive period because owners were unaware of their puppy's socialisation before adoption. Thus in many cases socialisation information was obtained only for the last few weeks of the sensitive period. This may have resulted in a misrepresentation of the socialisation experience of dogs. Probably this would have been an issue for dogs that received little socialisation by the adopting owners but substantial earlier socialisation by the owner of the dam. This would result in a dog that was reported as having little socialisation but which displayed the behaviour of an adequately socialised dog, due to the fact that small amounts of socialisation can produce significant changes in behaviour. It would have been ideal to obtain accurate socialisation information from 3 weeks of age to 12 weeks of age for all dogs.

Evaluations of adult behaviour were obtained from people who did not necessarily know anything about canine behaviour. That may reduce the validity of the adult behavioural assessments. This is not so much of an issue when investigating the frequency of behaviours which are discrete in nature, such as "snapping". Other behaviours that are subtler in expression, such as "dominant" or "fearful", are open to a much broader range of interpretations by owners, and would therefore be reported by them with a varying degree of competency. This limitation could be avoided if someone knowledgeable in canine behaviour assessed the behaviour of all the dogs in the study. This would, however, create its own limitations because the amount of time and number of situations that the assessor could be present with the dogs would be minimal.

The design of the questionnaire attempted to minimise the complexity of the behavioural assessments in order to avoid the issue of misinterpretation of behaviour by owners. It was therefore not possible to assess the motivations for the behaviour displayed by dogs. For instance, where a dog was reported as frequently baring its teeth, it was not possible to assess

whether this was a result of dominant behaviour, fearful behaviour, play, or a range of other possible motivations. This is an intrinsic limitation of any owner-rated survey, and limits the conclusions which can be made from the data.

Another limitation of the study is that the questionnaire respondents took part in the PSCs with their dogs. This means that their evaluation of their dog's behaviour is influenced by their own experience at the classes, thus reducing the independence of their behavioural assessment from the treatment effect. For example, attendance at the classes may increase an owner's expectations about acceptable behaviour. This may increase the negativity of their subsequent assessment of their dog's behaviour. Also it was not possible to assess the extent to which socialisation of the puppy or education of the owner influenced the differences in behaviour observed between PSC attendees and non-attendees.

The Massey University Veterinary Clinic does not accept puppies under 10 weeks of age into its PSCs. Thus in order to obtain research information on the behaviour of dogs which attended PSCs before they were 10 weeks old it was necessary to seek information from another organisation which operates PSCs. It was discovered on enquiry that the Howick Veterinary Clinic in Auckland accepts puppies younger than 10 weeks into its PSCs. Data was therefore gathered on dogs which had attended the Howick PSCs earlier than 10 weeks of age. This raises the possibility that the observed differences between dogs attending PSCs before and after 10 weeks of age may (partly or wholly) be a result of differences between the PSC programs of the two clinics, or to the different instructors, rather than being due to the age of attendees. So far as was possible to ascertain, however, it seems that the two programs are very similar in essence. Thus the author considers it likely that if there was any influence from any such differences that influence is likely is likely to have been only partial, and not crucially determinative.

3.5 Conclusions

The mean level of socialisation dogs received before 12 weeks of age was 3 to 4 new people a week, 1 new dog a week, and 2 to 3 new environments a week. Female dogs were less social and more aggressive than males, and spayed females were more likely than entire females to

snap at familiar dogs. The measure of early experience most closely associated with desirable behaviour in adulthood was environmental and social exposure "in general". The amount of socialisation that a puppy experienced "in general" before 12 weeks of age was positively associated with measures of sociability, and negatively associated with measures of aggression and fear. Socialisation with other species was linked with a decrease in predatory behaviour as an adult. Age of separation from the litter was negatively correlated with destructive behaviour when left alone as an adult. Dogs that had attended PSCs as puppies displayed lower levels of fear and aggression as adults, and were more social. PSCs did not reduce fear towards novel stimuli, novel environments, or veterinary clinics. Attendance at PSCs did not increase the long-term obedience of dogs. Dogs that attended PSCs before 10 weeks of age were less fearful of strange dogs as adults, and there was some evidence to suggest they were less fearful of strange people.

CHAPTER 4

General Discussion

"Rambunctious, rumbustious, delinquent dogs become angelic when sitting."

Dr. Ian Dunbar

General Discussion

In-Clinic Therapy

Between 42% and 87% of dog owners report one or more behavioural problems with their pet (Voith, 1985; Campbell, 1986). The negative consequences of these behaviour problems are significant. Of the millions of dogs that are euthanised in animal shelters and veterinary practices each year it is estimated that 50% to 70% are euthanised because of undesirable behaviour (Sigler, 1991). This is not only a tragedy for the dogs involved, but can also be a highly undesirable outcome for many owners. If owners do put up with their dog's behaviour problem it can seriously compromise their quality of life and the quality of their relationship with their dog. Behaviour problems such as aggression, barking, and inappropriate predatory behaviour can also seriously affect the lives of the rest of the community.

The impact of canine behavioural problems has spurred the development of the pet behaviour counselling field over the past 30 years. Utilising knowledge gained in the animal behaviour fields of experimental psychology and ethology, protocols for the treatment of canine behaviour problems have been developed and disseminated. There is no shortage of published recommendations for the treatment such problems, but there is little published on the efficacy of various forms of treatment for behaviour problems.

The efficacy of the "in-clinic" behaviour modification program at a pet behaviour clinic in Auckland, New Zealand, was investigated in the first study of this thesis. The in-clinic process involves the problem dog staying at the facility for about three weeks, while it undergoes a behaviour modification program coordinated by the consultant. This affords a number of benefits as a therapy process. It reduces the risk to owners of aggressive dogs, it ensures that the initial (and more difficult) period of behaviour modification is carried out by an expert, it enables the consultant to fine-tune the therapy program for the individual dog, and it is based at a large boarding kennel so as to enable effective treatment of inter-dog aggression. The main disadvantages of the in-clinic process are that it is more costly than other forms of consultation, and clients are not involved in the initial stages of behaviour modification, which can mean that they do not have the practical experience to deal with any recurrence of their dog's behavioural problem.

Remote-activated collars are used for some behaviour problems during the in-clinic process. Much concern is expressed about the negative effects of these collars (Overall, 1999; Frank, 1999; Seksel, 1999b). This is warranted, however, little has been published on their efficacy and benefits.

The first study of this thesis aimed to determine the following:

- The success of in-clinic therapy
- Which client-related and consultant-related factors were associated with the success of therapy
- The efficacy of in-clinic therapy for different behaviour problems
- The risks and benefits of electronic collar use in therapy and the extent to which undesirable behaviour resurfaced once collar use was discontinued

Conclusions

The in-clinic process was found to be very successful. There was some degree of success after in-clinic therapy in 95% of cases. However, other studies have also reported that a high proportion of cases improve to some extent, so this measure of success is limited in its value. More interesting was the *degree* to which dogs improved. Most owners rated success of therapy and improvement in behaviour as good or excellent. In-clinic therapy for inter-dog aggression was more successful than that reported by the Animal Behaviour Clinic at Cornell University (Sherman *et al.*, 1996). Three quarters of owners said they would recommend in-clinic therapy to other pet owners without hesitation, and most clients were satisfied with the value for money provided by the clinic, despite the $800-$900 cost. These results suggest that the benefits of in-clinic therapy outweigh any disadvantages in most cases, and confirm the efficacy of the in-clinic process.

The practicality of implementing the consultant's recommendations to clients was found to be the factor most closely associated with success. This finding emphasises the importance of clear, practical recommendations when advising clients on behavioural issues.

Improvement in a dog's responsiveness to command was linked with treatment success in dogs with problems other than disobedience. This highlights the value of command training as one aspect of therapy for behaviour problems in dogs.

Clients considered electronic collars to be extremely effective for the treatment of behaviour problems. Most clients did not notice any negative effects of collar use on their dog's behaviour or personality, but there were some reports of negative effects of collar use. This is of concern, and highlights the importance of thorough client education, as well as the inherent danger of recommending a positive punisher as a treatment tool for behaviour problems. Clients reported that undesirable behaviour resurfaced once collar use was discontinued. This suggests that either clients were too reliant on the collars to inhibit undesirable behaviour and as a result were not as capable of maintaining desirable behaviour with other behaviour modification methods. Or it may simply be a result of the removal of a component of the behaviour modification program that is more effective than other methods for inhibiting undesirable behaviour.

The utilisation of electronic collars to inhibit inappropriate predatory behaviour towards sheep was highly successful in the long term. This was not the case for such behaviour towards cats. This is probably due to the greater number of positively reinforcing cat-chasing experiences that a dog is likely to have had, compared to a dog attending the clinic for sheep-worrying. Also exposure to cats is normally much greater after therapy, giving a greater opportunity for desensitisation to the avoidance conditioning. These findings confirm the efficacy of in-clinic use of electronic collars for stopping sheep-chasing in the long term, but suggest that if it is important for the initial in-clinic cat-chasing therapy to be maintained effectively in the long term, such a collar may need to be purchased by the client.

On comparison with published success rates of therapy for canine behaviour problems, it is seems that in-clinic therapy is very successful. Due to the different measures of success that are used, however, it is not possible to evaluate accurately the efficacy of in-clinic therapy over other methods. In the future it would be interesting to compare the success of in-clinic therapy with the success of face-to-face consultations and/or telephone consultations using the same feedback questionnaire. This would enable a better evaluation of the merits and disadvantages of in-clinic therapy. It would also be of interest to compare the efficacy of electronic collar use with that of other behaviour modification methods for the treatment of

behaviour problems. This would allow a better evaluation of any advantages or disadvantages of collar use.

In the future it would also be useful to obtain data from a larger sample of dogs. This would allow a better evaluation of the relative success rates for the different problems. In this study it was not practical to compare the efficacy of therapy for problems such dominance aggression because the sample size was small.

Socialisation and Adult Behaviour

Social and environmental isolation of a puppy before 12 weeks of age can cause profound and lasting behavioural deficits. This is not realised by many dog owners, resulting in many dogs that are not behaviourally adjusted to aspects of their social milieu and environment. Nowhere is this more apparent than in a behaviour consultancy practice, where the etiology of problem behaviour often seems to be linked with inadequate socialisation. However it is important to note that inadequate socialisation is just one potential factor when considering the etiology of problem behaviour, and there is little good data to support its significance.

It was therefore of value to investigate the effect of early socialisation on later adult behaviour. This was accomplished by comparing owners' evaluations of their dog's social and environmental interaction with the behaviour of the dog as an adult. The effect of formal puppy socialisation classes on later behaviour was also of interest. Therefore the behaviour of dogs that had attended these classes was compared with those that had not.

The specific aims of the study were to determine:

- The mean level of socialisation that puppies in New Zealand receive before 12 weeks of age.
- How the *level* and *type* of exposure to stimuli during the sensitive period for socialisation affects subsequent behaviour.
- The effect that attendance at puppy socialisation classes has on later behaviour.

- If there are any differences in adult behaviour between those dogs that attended puppy socialisation classes before 10 weeks of age and those that attended after 10 weeks of age.

Conclusions

The level of general social and environmental interaction in which a puppy is involved was positively associated with measures of sociability, and negatively associated with measures of fear and aggression. It was the measure of early experience found to be most closely associated with desirable behaviours in adulthood. The fact that significant correlations were found between general socialisation and a large number of adult behaviours suggests that exposure to a wide variety of different stimuli during the sensitive period for socialisation does play an important role in the development of well adjusted behaviour in the dog. The importance of the correlations between general socialisation and adult behaviour is further emphasised when considering that there are many other factors which influence the behaviour of a dog. Also, information from owners on the early experience of their dog was obtained for a period of 3 ½ weeks on average. The fact that this period was short, and was past the 7-week optimum socialisation age, also highlights the significance of the correlations.

Socialisation with other species before 12 weeks of age was negatively correlated with chasing other species in adulthood. This confirms that socialisation with prey species during the sensitive period for socialisation is an effective preventative measure for owners who wish to reduce the likelihood of inappropriate predatory behaviour in the future.

Dogs that attended puppy socialisation classes were found on a number of owner-rated measures to be less fearful, less aggressive, and more social. The level of socialisation experienced by the dogs in each group was similar. This suggests that attendance at puppy socialisation classes, rather than general socialisation by owners, was the main factor influencing these behavioural traits. The differences in behaviour between the dogs that attended puppy socialisation classes, and those that did not, suggest that these classes do indeed increase the sociability of dogs. No differences were observed between attendees and non-attendees for fear towards new locations, new stimuli, or veterinary clinics. This suggests that puppy socialisation classes may not be effective in reducing fear of non-social stimuli. Also, no difference was observed in measures of obedience for attendees and non-

attendees of puppy socialisation classes. This indicates that some of the main aims of puppy socialisation classes are not being achieved.

Dogs that attended puppy socialisation classes before 10 weeks of age were found to be less fearful of strange dogs when compared with dogs that had attended classes after 10 weeks of age. There was also some evidence to suggest that they were less fearful of strange people. This suggests that there may be some behavioural benefit in attending puppy socialisation classes at an earlier age while a dog is more susceptible to the positive effects of early socialisation.

The mean weekly level of socialisation before 12 weeks of age was found to be 3 to 4 new people, 1 new dog, and 2 to 3 new environments. The mean level of socialisation to people and environments seems to be adequate, although additional socialisation may provide additional behavioural benefits. The mean level of socialisation towards other dogs may be insufficient; this is reflected by the noticeable improvements in con-specific behaviour observed in dogs which experienced the additional canine socialisation of puppy socialisation classes.

When comparing gender behavioural differences it was found that female dogs were more aggressive and less sociable as a group. This conflicts with two other studies which found that males are more likely to behave aggressively. Spayed female dogs were more likely to snap at familiar dogs. Increased aggression in spayed female dogs has been reported previously. The results from this study indicate that spaying is not an effective technique when trying to inhibit aggressive behaviour in a bitch.

The conclusions of this study could be tested more comprehensively in future by making a few changes to the design of the study. Information about pre-12 week socialisation could be obtained by veterinarians during the final vaccination of puppies, which would ensure that the information required was within recent memory of clients. This would result in greater accuracy in the reporting of socialisation levels than that obtained in this study. Behavioural assessments of the dogs as adults could be carried out by a canine behaviour specialist to ensure that assessment of the behaviour of the subjects was accurate and consistent. Increasing the number of respondents in future studies would increase the sensitivity of the statistical analysis.

It would be interesting to compare the behaviour of dogs that attended puppy socialisation classes with owners, with those that attended classes without owners. This would enable an investigation of whether it is the socialisation experience experienced by dogs, or an increase in owner knowledge that improves the behaviour of puppy socialisation class attendees.

The behaviour problems reported by owners in this study were diverse and comparatively minor. This meant that it was not possible to link socialisation levels with serious behaviour problems. If socialisation experience was investigated in dogs that were brought to a behaviour consultancy practice it would be possible to assess the role that socialisation has in the etiology of serious behaviour problems.

Investigations of socialisation levels in different parts of the country, and amongst different social groups, would provide an idea of how aware dog-owning populations are regarding early socialisation. If socialisation levels were found to be very low in some areas it would provide an impetus for veterinarians to increase client education about safe methods of early socialisation. Future studies on socialisation levels in New Zealand would indicate whether the general level of socialisation in New Zealand is increasing.

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Appendix 1

Section 1:

Your name:

Dog's name:

1. How would you rate the overall success of the therapy?
   No success 1 2 3 4 5 6 7 8 9 10 Extremely successful

2. How satisfied do you feel with the behaviour-modification program suggested and/or implemented by us?
   Not satisfied 1 2 3 4 5 6 7 8 9 10 Very satisfied

3. In general, how do you now feel about your dog's behaviour after seeing us?
   Much the same 1 2 3 4 5 6 7 8 9 10 Huge improvement

4. Prior to therapy did your dog behave appropriately in all situations?
   No 1 2 3 4 5 6 7 8 9 10 Yes

5. After therapy does your dog behave appropriately in all situations?
   No 1 2 3 4 5 6 7 8 9 10 Yes

6. Has your knowledge of dog behaviour and learning improved?
   Not at all 1 2 3 4 5 6 7 8 9 10 Greatly

7. Did we adequately explain the causes and treatment of your dog's behaviour problem(s)?
   No 1 2 3 4 5 6 7 8 9 10 Yes

8. Have your practical dog training skills improved?
   Not at all 1 2 3 4 5 6 7 8 9 10 Greatly

9. Would additional transfer training sessions have improved the overall success of therapy?
   Not at all 1 2 3 4 5 6 7 8 9 10 Greatly

10. Has your confidence in your dog's behaviour improved?
    Not at all 1 2 3 4 5 6 7 8 9 10 Greatly

23. Was the clinic therapy value for money?
No 1 2 3 4 5 6 7 8 9 10 Yes

24. If an electronic training collar was recommended as part of the therapy program, to what extent did you use it?
Not at all 1 2 3 4 5 6 7 8 9 10 Extensive use

25. How do you feel about the use of the electronic training collar as a training tool?
It is a good instrument 1 2 3 4 5 6 7 8 9 10 It is a very bad instrument

26. Was the electronic collar effective in your dog's case?
Not effective 1 2 3 4 5 6 7 8 9 10 Very effective

27. Once the collar was sent back to us, to what extent did undesirable behaviour resurface?
Not at all 1 2 3 4 5 6 7 8 9 10 Greatly

28. Did you notice any undesirable effects of collar use on your dog's behaviour or personality?
No 1 2 3 4 5 6 7 8 9 10 Yes (if so please describe)

If you have any further comments on our service generally, our recommendations, electronic training collars, or any other issues, we would be very interested:

Section 3:

Below are two tables designed to assess the success of therapy for individual problems. The tables measure **decrease** in *frequency*, and *intensity*.

We have listed the individual problems we have on record for your dog; if there were additional problems please rate them using the spaces available.

Decrease in **Frequency** of Problem(s)

(A 100% decrease in frequency of the problem indicates the behaviour problem has been eliminated, while a 0% decrease indicates that the problem occurs just as frequently)

Problem description:	0%		25%		50%		75%			100%
1:	1	2	3	4	5	6	7	8	9	10
2:	1	2	3	4	5	6	7	8	9	10
3:	1	2	3	4	5	6	7	8	9	10
4:	1	2	3	4	5	6	7	8	9	10

Decrease in **Intensity** of Problem(s)

(Intensity relates to the seriousness of the problem when occurring. A 0% decrease in intensity would mean that the problem is just as intense when it does occur)

Problem description:	0%		25%		50%		75%			100%
1:	1	2	3	4	5	6	7	8	9	10
2:	1	2	3	4	5	6	7	8	9	10
3:	1	2	3	4	5	6	7	8	9	10
4:	1	2	3	4	5	6	7	8	9	10

Thank you for completing this questionnaire. Remember that dogs which have been in our clinic during the past year qualify for a 10% discount on boarding at Mark Vette's Clevedon Kennels.

Appendix 2

DOG SOCIALISATION QUESTIONNAIRE

This questionnaire has been designed to take up as little of your time as possible, however if you would like to make any additional comments, or explain your responses to questions, **we would be very interested**.

Your dog's details:

1. **Dog's name:** .....

2. **Breed:** .....

3. **Age of dog at Present:** .....

4. **Sex:** Male / Female

5. **Desexed: Yes / No**

6. **At what age was your puppy acquired?** (.....) weeks

7. **Where did you get your puppy?** SPCA / Friend / Registered Breeder .....

12. **At what age was your dog separated from its litter?** .....

13. **Did your dog live with or interact frequently with other dogs after being separated from its litter up to 12 weeks?** Yes / No

14. **How many dogs was your dog familiar with by 12 weeks of age?** .....

15. **How much interaction did your puppy have with novel environments? (e.g. beach, car, vet clinic, friend's house, bush, park...)**

Exposure to more than 1 new environment a day	10
Exposure to 1 new environment a day	9
Exposure to 5 new environments a week	8
Exposure to 4 new environments a week	7
Exposure to 3 new environments a week	6
Exposure to 2 new environments a week	5
Exposure to 1 new environment a week	4
Exposure to 1 new environment a fortnight	3
Exposure to less than 1 new environment a fortnight	2
No exposure with new environments	1

16. **How many environments had your dog experienced by 12 weeks of age?** .....

17. **How much interaction did your puppy have with other species?**

None 1 2 3 4 5 6 7 8 9 10 A lot of interaction with many **different** animals

18. **How much environmental and social interaction did your puppy have in general?**

None 1 2 3 4 5 6 7 8 9 10 Very extensive exposure to many **different** stimuli

19. **What, if any, were your vet's recommendations for socialisation of your puppy before 12 weeks of age?**

.....

Section 4:

Personal enjoyment of your dog:

In General I get No enjoyment	1 2 3 4 5 6 7 8 9 10	Great enjoyment from my dog
During walks I get No enjoyment	1 2 3 4 5 6 7 8 9 10	Great enjoyment from my dog
With other people present I get No enjoyment	1 2 3 4 5 6 7 8 9 10	Great enjoyment from my dog
With other dogs present I get No enjoyment	1 2 3 4 5 6 7 8 9 10	Great enjoyment from my dog
At home I get No enjoyment	1 2 3 4 5 6 7 8 9 10	Great enjoyment from my dog

Section 5:

Interactions with:

Owners/human family/familiar people

My dog is: Never friendly	1 2 3 4 5 6 7 8 9 10	Always friendly with me and familiar people
My dog: Never jumps up	1 2 3 4 5 6 7 8 9 10	Always jumps up on me and familiar people
My dog is: Never afraid	1 2 3 4 5 6 7 8 9 10	Always afraid of me and familiar people
My dog: Never growls	1 2 3 4 5 6 7 8 9 10	Always growls at me and familiar people
My dog Never snaps	1 2 3 4 5 6 7 8 9 10	Always snaps at me and familiar people
My dog Never attacks	1 2 3 4 5 6 7 8 9 10	Always attacks me and familiar people

Section 8:

Within-household dogs or familiar dogs

My dog is: Never sociable	1 2 3 4 5 6 7 8 9 10	Always sociable with familiar fogs
My dog is: Never playful	1 2 3 4 5 6 7 8 9 10	Always playful with familiar dogs
My dog is: Never fearful	1 2 3 4 5 6 7 8 9 10	Always fearful of familiar dogs
My dog is: Never dominant	1 2 3 4 5 6 7 8 9 10	Always dominant with familiar dogs
My dog: Never avoids	1 2 3 4 5 6 7 8 9 10	Always avoids familiar dogs
My dog: Never bares teeth	1 2 3 4 5 6 7 8 9 10	Always bares teeth at familiar dogs
My dog: Never growls	1 2 3 4 5 6 7 8 9 10	Always growls at familiar dogs
My dog: Never snaps	1 2 3 4 5 6 7 8 9 10	Always snaps at familiar dogs
My dog: Never attacks	1 2 3 4 5 6 7 8 9 10	Always attacks familiar dogs

Section 9:

Strange dogs

My dog is: Never sociable	1 2 3 4 5 6 7 8 9 10	Always sociable with strange dogs
My dog is: Never playful	1 2 3 4 5 6 7 8 9 10	Always playful with strange dogs
My dog is: Never fearful	1 2 3 4 5 6 7 8 9 10	Always fearful of strange dogs
My dog: Never avoids	1 2 3 4 5 6 7 8 9 10	Always avoids strange dogs
My dog is: Never dominant	1 2 3 4 5 6 7 8 9 10	Always dominant with strange dogs

Section 11: Separation anxiety

When left alone (at home, in car...)

My dog is: Never anxious	1 2 3 4 5 6 7 8 9 10	Always anxious when left alone
My dog: Never barks	1 2 3 4 5 6 7 8 9 10	Always barks when left alone
My dog: Never whines/howls	1 2 3 4 5 6 7 8 9 10	Always whines/howls when left alone
My dog is: Never destructive	1 2 3 4 5 6 7 8 9 10	Always destructive when left alone
My dog: Never toilets inside	1 2 3 4 5 6 7 8 9 10	Always toilets inside when left alone

Section 12: New stimuli

Strange location

My dog is: Never fearful	1 2 3 4 5 6 7 8 9 10	Always fearful in a strange location

Strange stimulus (sound, sight...)

My dog is: Never fearful	1 2 3 4 5 6 7 8 9 10	Always fearful when exposed to a strange stimulus

Veterinary clinic

My dog is: Never fearful	1 2 3 4 5 6 7 8 9 10	Always fearful when visiting the vet clinic

Section 14: Behaviour problems:

Does your dog display any behavioural problems? If so please describe the nature of the problem and evaluate its severity:

Problem 1:

Not serious 1 2 3 4 5 6 7 8 9 10 Extremely serious

Problem 2:

Not serious 1 2 3 4 5 6 7 8 9 10 Extremely serious

Problem 3:

Not serious 1 2 3 4 5 6 7 8 9 10 Extremely serious

Problem 4:

Not serious 1 2 3 4 5 6 7 8 9 10 Extremely serious

Please check that you have answered all the questions you can.
Thank you. Your participation in this study is greatly appreciated.

If you have any questions regarding this questionnaire, please contact:
Kevin Stafford (06) 3505329 ext 7437

Appendix 3