HUMAN TRIGGERS OF DOG AGGRESSION

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For all those animals who have shared their lives with me, so that I might know the joy of the human-animal bond.

ABSTRACT

This study examined the effect of human approach on dog attitude. Of particular interest were those aspects of approach behaviour likely to trigger an attack. The approach profiles were developed from canid behavioural ecology and the recommendations of sources outside the scientific literature. The profiles chosen manipulated the eye contact, body position and movement of four experimenters. Dog emotionality (or likelihood of attack) was measured on two postural scales; low scores reflected a relaxed attitude, mid scores indicated fear and high scores suggested intimidation and readiness to attack. The approach profiles were tested within a radical behaviourist framework, using a small-N, alternating treatments design. A preferred treatment phase was also given along with baseline and reversal. Another treatment phase was run to asses the effect of individual experimenters on the dogs. Results showed, that profile had a marked effect on dog attitude, whilst individual experimenters did not. Dominant or threatening profiles scored significantly higher, on both scales, than neutral or submissive profiles. To minimise dog emotionality, and thus reduce the risk of attack when approaching an unfamiliar dog, this study suggests people avoid eye contact and reduce both their body profile and degree of movement. The limited nature of this studies findings are acknowledged

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INTRODUCTION

The Dog-Human Relationship

That dogs are an integral part of many peoples lives cannot be denied. In New Zealand the dog population is currently somewhere in excess of 510,000 (Redgrave 1992), with one urban household in four estimated to have a dog. Consequently dogs have a considerable impact on society.

The dog-human bond is of significant economic value to the community with a large animal-related industry thriving as a result of our interest in keeping companion animals. The value of dogs may also be measured in terms of their ability to fulfil specific tasks of benefit to people; such as police & security work and assisting the disabled. They also have potential for improving health, particularly in lowering blood pressure and encouraging exercise. There worth is most commonly recognized for the opportunities they provide for companionship and relaxation (Serpell 1986).

Incidence Of Dog Attacks On Humans

In New Zealand there are approximately 5710 dog attacks on people requiring medical attention reported every year (Langley 1992). That translates to 175 attacks in every 100,000 people each year, a figure similar to those found internationally. Research by Szapowski, Bonnett & Martin (1989) in the Canadian city of Guelph reports 160 dog bites per 100,000 people. These figures are perhaps on the low side of the international trend, statistics found and cited by Daniels (1986) for various areas in the United States report annual bite rates varying between 396 and 737 bites per 100,000 people.

Langley (1992) reports that the number of reported dog attacks has increased over the last ten years.

Whilst death due to dog attacks is rare (Langley 1992., Borchelt et al 1983) the severity of the injuries inflicted mean dog bites are a major public health concern. Common dog-inflicted injuries are; lacerations, puncture wounds, bruising and broken bones (Podberscek & Blackshaw 1991) not to mention the fears and phobias which may develop as a result of an attack. The most common injury sites are the face (Langley 1992) and lower extremities (Szapowski et al 1989).

Not surprisingly, persons making deliveries feature regularly in the attack statistics (Szapowski et al 1989, Podberscek & Blackshaw 1991). In a four year study by Podberscek and Blackshaw (1991) 426 dog attacks were reported by Queensland's 1150 postal delivery officers. To illustrate the risk of this group compared to the general population these figures convert to 9,630 attacks per 100,000 per year (or 1 in 10). This is perhaps a factor of dog's identifying, and responding differently to, unfamiliar people (Rappolt & Thompson 1979).

The proportion of young children as victims in the attack statistics (Podberscek & Blackshaw 1991, Blackshaw 1991, Langley 1992, Wright 1991, Borchelt et al 1983) is particularly alarming. The victims age and size may be important variables effecting attack, as the number of reported attacks on children is very high, around 48% of all bite victims were under 10 years in both Langley's 1992 study, and Wrights 1991 review.

Langley(1992) suggests this may be due to their lack of discretion in approaching dogs, lack of confidence in handling the dog, their smaller size and inability to repulse attack, greater interaction with dogs than adults or simply parental concern ensuring treatment for children and reporting of the incident.

The person's gender may also be a variable in attacks, as various papers report different statistics for males and females, with males generally being the most predominant (Langley 1992, Wright 1991). A study by Lore & Eisenberg (1986) tested the reaction of dogs to unfamiliar men and women. They showed that dogs seem to be able to differentiate between the genders with dogs being less resistant to handling by females, and males eliciting more avoidance.

From Wright's (1991) review of the area and other authors (Szapowski et al 1989, Podberscek & Blackshaw 1991,Borchelt 1983, Wright & Nesselrote 1987, Daniels 1986) the following characteristics of biting dogs have emerged. Most bites will be made by dogs aged between 1 and 4 years. The dog is more likely to be of a large (> 50 pounds) working breed such as a german shepherd dog, or of mixed breeding. Sexually entire male dogs are responsible for more bites than any other group (eg: spayed female, castrated male).

Just as a generalized picture of the dog likely to attack can be formulated, as given above, so can general pictures of a likely victim be generated. Langley (1992) states that males, children and Maori are more likely to be attacked by dogs in New Zealand, however dog attack is a problem which potentially affects all people.

Difficulty With Statistics

As mentioned earlier Langley (1992) has reported an increase in the number of dog attacks over the last ten years, however during this time the number of dog registrations has increased at a higher rate than the human population (Langley 1992). This may suggest that more dog attacks are a function of a greater number of dogs per person rather than dogs becoming more aggressive over recent time, or more aggressive breeds being kept.

Understanding this kind of statistic is made even more difficult as it is unclear if there really are a greater number of dogs kept as pets or just a greater proportion of dogs now registered due to stricter enforcement of the animal control act.

Local authority registrations are often used as indicators for dog populations, breed distribution and other similar measures. In fact the demographics may be quite different, as many pets may not be registered, some may be registered incorrectly and there is no accounting for stray animals or puppies under 3 months.

Other variables to have been looked at for patterns of attack, are size and breed of dog. As larger dogs are stronger and therefore more likely to cause damage to human victims it is possible they may feature more predominantly in the statistics than smaller dogs when in fact the actual number of aggressive encounters may be quite different.

The number of dogs of each breed/type in the community may skew results, meaning care must be taken in interpreting statistics of bite incidents. Where one breed is more common in a community than others and it is responsible for more attacks, this may simply be a result of there being more of them rather than a fault in their temperament. Likewise a breed which may be particularly aggressive may not feature in the statistics as it is under represented in the population.

When looking at statistics of this type it must remembered they are based on reported dog attacks only. This introduces further inaccuracy in trying to find trends in dog attacks as some groups of victims or types of attacks may not be accurately represented. It is thought there may be a tendency to not report attacks where the dog belongs to the victim, family members or friends, or where the injuries sustained are minor. For example it cannot be said for sure that more children are attacked than adults (although it is highly likely), as there is the possibility that attacks on children are reported, or medical advice sought more often than attacks on adults.

It is also possible that errors are made in the reporting of attacks. A dog may be misidentified, the wrong breed reported or the situation in which the attack occurred not fully understood.

It is also worthwhile to remember the effect of human society on the perception of types of dog and how this may effect their presence in aggression statistics. Perhaps certain groups within society favour particular kinds of dog over others and the resultant environmental influences are responsible for the behaviour of these dogs rather than their genetic make up.

Media coverage and other such social influences may also effect how some dogs are viewed by the public and hence how they feature in reported statistics.

The purpose of this section has been to encourage the reader not to blindly accept what reported statistics may suggest regarding dog aggression. While the information they report is often very useful caution must be exercised when
generalisations about groups of any kind are considered.

What Constitutes Aggression ?

Aggression has been defined as a complex of behaviours or behaviour patterns which intimidate, or inflict damage on, another organism (Rasa 1987). A definition such as this does not include just physical attack but such diverse behaviours as threat displays, scent marking and even predation (Ridley 1986, Rasa 1987). By convention predation is not treated as aggression however (Rasa 1987), unless in the case of dogs, it is inappropriately directed at human beings.

The broader term 'agonism' is used to classify all the behaviours employed in conflict. Aggression is a subset of this behaviour classification which covers all behaviours related to threat, appeasement, avoidance and escape (McFarland 1987, Holmes 1988).

Aggressive behaviours are thought to be favoured by natural selection, in response to competition for limited resources (such as food, a place to live & the right to mate), thus ensuring the most 'fit' individuals receive the best the environment has available. The weaker or less 'fit' animals are weeded out, as they are either killed or unable to obtain a mate or territory (Rasa 1987, Ridley 1986, Krebs & Davies 1987).

In dogs, as in other species, aggressive behaviour is often highly ritualized, thus ensuring that many social

interactions do not result in a physical encounter and incur a high evolutionary cost such as death (Rasa 1987, Ridley 1986).

For this reason aggressive behaviour may be observed not just as a physical attack whereby the victim is badly bitten, but as a growl, barking or a series of postures. The dog is primarily a postural communicator, it is therefore not surprising that aggressive attitude often manifests itself in these ways.

The types of behaviours observed in an aggressive encounter between two dogs typically contain components of both dominance and submission. Various dog behaviours typical of aggression are outlined in table one below. Table two resents the behaviours commonly shown by a subordinate dog in response to an aggressive encounter.

TABLE ONE : Behaviours associated with aggression in the dog
(from Fox 1970, Scott & Fuller 1965, Vollmer 1978, Lorenz 1966, Tortora 1981)

NON-FACIAL COMPONENTS

VOCAL	TAIL	MOVEMENT	POSTURE	OTHER
Snarling	Wagging	Chasing	Sitting	Biting
Growling	Between legs	Running away	Standing over	Nipping
Yelping	Erect	Stiff legs	Crouching	Pawing
	Down		Head high	Herding
			Neck arched	Hair raising
			Paws on others back	

FACIAL COMPONENTS

Horizontal contraction of lips
Vertical contraction of lips (baring teeth)
Snapping of teeth
Ears erect & forward, or flattened & turned back
Direct stare
Eyes large

TABLE TWO : Behaviours associated with submission in the dog
(sources as for table four above)

NON-FACIAL COMPONENTS

VOCAL	TAIL	POSTURE	OTHER
Whining	Erect	Crouched	Nibbling
Whimpering	Down	Head lowered	Urinating
	Between legs	Neck extended horizontally	Jaw wrestling
		On back, legs extended	

FACIAL COMPONENTS

Ears flattened & turned down to sides
Horizontal retraction of lips
Licking
Looking away

In a typical encounter between two dogs the dominant will approach the subordinate forming a 'T' position (relative to the subordinates shoulder region), with the dominant dogs ears and tail erect (see Appendix 1). To prevent an attack a subordinate dog will show appeasement behaviours, such as turning his/her head avoiding direct eye contact with the dominant dog, who will be staring directly at the subordinate. The tail and ears of the submissive dog are typically lowered and the subordinate will often remain still. Where the dog wishes to show further submission the body position is lowered, perhaps to the stage of rolling over and exposing the inguinal region. In extreme cases the subordinate may even urinate (Schenkel 1967, Fox 1969, Scott & Fuller 1965, Kleiman 1967).

Appeasement behaviours are ritualized and symbolic of pup behaviour, and a means by which an inferior attempts to attain social integration in a friendly manner (Schenkel 1967). However showing submission does not always elicit a back down from the other animal, or guarantee to inhibit aggression (Schenkel 1967).

A variety of other behaviours are of course possible during an agonistic encounter, including riding and biting the subordinate, low throaty growls (Vollmer 1978) and various facial expressions (Fox 1970, Tortora 1981, Lorenz 1966 cited in Goddard & Beilharz 1985). A dog who is classified as a fear biter aggression, will exhibit more of the submissive behaviours than the dominant

behaviours, but is still liable to attack & thus cause injury (Young 1982).

In appendix one, pictures are presented which show many of the aforementioned postures, and facial expressions. Figure four of appendix one demonstrates how the body of the dog relates to aggression and highlights aggressive/submissive communications.

Understanding Aggression In Terms Of Dog Social Behaviour

The dog is a highly social, group living animal, as such they have advanced communication patterns. Communication of course being the key to truly social behaviour and necessary to maintain cohesion and equilibrium within the group (Ridley 1986, Wood-Gush 1983).

The dog is member of the Family Canidae, and therefore shares much of its anatomy and behaviour with other members of this taxonomic group. Similarities in many aspects, especially social behaviour (which includes the agonistic behaviours so relevant to this study) places the domestic dog in a group with the wolf and the coyote (Kleiman 1967).

The situations in which the wolf displays agonistic behaviours are usually (Scott & Fuller 1965):

- Possession of food (or other resource)
- Intrusion of strangers into the territory near the den
- Where there is disruption to the social rank order (dominance / submission)

Whilst the domestic dogs life is generally limited by the constraints of human intervention, they exhibit the same basic living patterns as their wild ancestors. Research to prepare an ethogram for the domestic dog by Scott & Fuller (1965) made these parallels with the wolf apparent.

The dogs natural social group is a pack. A pack may contain up to 30 individuals but is normally much smaller (Scott & Fuller 1965). The pack is normally of mixed age and sex and the adult members will guard a den and the surrounding area (the territory). They are predominantly meat eaters and as such are adept hunters.

The most important developmental period for social behaviour for pups is from three to twelve weeks. This critical period is when the pup must gain experience in the different social situations and groups it will encounter during its life if it is to have a full repertoire of appropriate behaviours.

In dogs, agonistic behaviour (patterns associated with conflict) is minimised by a social rank order system, or dominance hierarchy (Scott & Fuller 1965, Fox 1969), with the dominant (alpha) dog, usually a male, at the top. The other dogs show submission and soliciting behaviours toward this dominant animal. The remainder of the pack is also made up of dominant and subordinate relationships. In a study of free ranging dogs by Daniels (1983) aggression was found to be rare suggesting these patterns of behaviour are effective at minimising aggressive encounters within the pack.

The dog is a territorial animal, thus it will show aggression to defend part of it's home range from others of its kind. There may be individual variation in the size and type of area a dog defends, and how vigorously it will be defended (Scott & Fuller 1965).

Dog communication takes several forms, vocal, chemical and postural communications being very important. Vocal communication is apparent in the wide variety of whines,growls and barks they produce. Chemical communication, whilst not so easily observed, is important for maintaining territory, individual identification and indicating sexual status and receptivity. Postural communication plays a large part in all canine social behaviour. As previously indicated (see tables 1 & 2) postural signals may be facial, or involving many parts of the body at once. Interpretation of postural communication often requires fine discrimination.

In communicating aggression (particularly dominance related) the dogs' threat or attack is aimed at modifying the behaviour of the other animal and as such assumes understanding on the part of the other party (O'Farrell 1990). When the receiver of a communication does not understand or respond appropriately the dog will assume s/he is being challenged and an attack may result. Predatory type aggression of course does not assume understanding of communications as this is primarily an interspecific situation with the aim of killing the other animal for food (O'Farrell 1990).

For the average household dog the human family they live with becomes their pack and the house their den. The dog usually develops and guards a territory in the surrounding area. While there is no need to find food for most dogs they will still investigate their territory, scent mark, cache bones or excess food and of course scavenge much as their ancestors did and their free ranging relatives still do.

The tendency for dogs to identify humans as pack members is apparent when the type of interactions between humans

and dogs are looked at closely. Some pet dogs will challenge people, typically members of their human family (Line & Voith 1986), for social position much as they would members of their pack. This type of dominance aggression is responsible for around a third of all behaviour problems seen by animal behaviour consultants (Blackshaw 1991, Baxter 1989, Szapowski et al 1989).

The tendency for dogs to show the same territorial behaviours toward people as they would to other dogs is reflected in the high number of dog attacks on people who are required to enter the property of others in the course of their work (Rubin & Beck 1982 cited in Blackshaw et al 1990). Just as all animals will defend their territory most at its centre, loose pets have also been found to be more aggressive to strangers the closer they are to their homes (Blackshaw et al 1990).

Intraspecific (dog-dog) communication during conflict often has parallels with dog-human communication. Fox (1970) reports that when eye to eye contact (a dominance threat) is made between wolves, even at distances in excess of twenty metres, the subordinate will look away. He continues by saying that similar behaviour is observed in dogs during handling by a familiar person. By a direct stare he claims to have evoked lateral recumbency and urination in young submissive dogs, and direct attack or threat displays in dominant adult dogs on their home territory.

Causes And Triggers

Szapowski et al (1989) state that some 41% of dog bite victims considered the attack to be totally unprovoked, however the authors of that article (and others; Baxter 1989, Borchelt 1983) argue that nearly all attacks arise as a reaction to some stimuli, and suggest it is more likely that the victims were simply unaware of what the triggers for the attack were. Similar statistics are apparent in Podberscek & Blackshaws' 1991 study where no reason or provocation to attack was given for a third of the attacks.

A problem in identifying what provoked an attack is the ability for victims to unconsciously trigger the attack, but not necessarily cause it. For example: 1) The presence of an unfamiliar male may trigger an attack, but the cause is likely to be that the dog is inexperienced in social situations, particularly those involving males. 2) A dog who spends most of its time on a fixed point tether (chained up) and has been teased by passers by bites the first person who gets close enough, even though that person may

be friendly. The person triggered the attack by approaching the dog, but it was displaced aggression from previous events that caused the attack.

3) Making direct eye contact may trigger an attack, however the cause is perceived threat to the dogs dominance.

Dog attacks in the study by Szapowski et al (1989) have been classified from information in records of the attacks. Protective behaviour was thought to be responsible for the majority of attacks, dominance, fear, pain, accentuated play and predatory aggression or some combination of the above were identified as other causes.

Malsocialisation is commonly blamed for causing aggression in dogs. This is when the dog is not exposed to the social situations during the first three months of its life that it is required to deal with during the course of its lifetime. A dog may interact inappropriately with children if it was not introduced to them during this critical period for socialization, and an attack may result when the first child it meets at age ten pulls his/her tail.

In Podberscek & Blackshaw (1991) unintentional provocation by children during playing and patting accounted for a third of attacks, with the balance made up of fear or pain related attacks and defense of resources.

A review article by J Wright (1991) highlights many points thought to be associated with dog aggression. He believes that tendency to bite will be affected by heredity, early experience, training and socialization received, medical & behavioral health and of course victim behaviour.

In Borchelt et al (1983) four attack scenarios are reviewed. The general discussion highlights similar issues to those cited above but also identifies the number of dogs in a group (pack behaviour), presence of an oestrus bitch and nutritional status as possible factors involved in attacks.

In order to better understand causes of dog aggression researchers have attempted to develop a classification scheme for aggression problems in the domestic dog. A widely accepted scheme is that of Borchelt (1983). In preparation of his scheme Borchelt points out that the types of aggression differ with respect to; the components of the behaviour sequence, the eliciting stimuli and effects of sexual/reproductive hormones. He also indicates there may be a genetic influence on such behaviour.

Borchelt (1983) recognizes the following types of aggression (which also indicate for this study reasons why a dog may bite or otherwise exhibit aggressive behaviour).

- Fear
- Pain
- Punishment
- Dominance
- Possessive
- Protective
- Intra - specific (usually intermale or interfemale)
- Predatory

Other classification schemes include:

- Instrumental (or learned)
- Maternal
- Idiopathic (unexplainable)
- or some different form of classifying the above either by different names or grouping

The majority of dog attack injuries are found on the lower extremities, the hands and arms or the face (Szapowski 1989, Daniels 1986, Borchelt et al 1983). This is possibly because these are the most accessible parts of the victim which suggests that the attack was triggered by the victims handling of the dog (particularly near the head and mouth in threat zones), that their face (and perhaps direct eye contact) was close to the dogs head or that the victim was running which may have caused the dog to chase and nip.

Some 60% of attacks are said to occur on the dogs home territory (Szapowski et al 1989). It is therefore not uncommon that attacks are triggered by the victim entering, leaving or passing the dogs home territory, the area which s/he protects, and why posties, meter readers and similar people are so often attacked.

Threatening an animals dominance is a common cause of dog attack. The following behaviours (which have been found to precede some attacks) may be construed as threats by a dog and provoke aggression towards humans; Bending/standing over the dog, hugging, pushing or play fighting, shouting or staring at the dog, removing food or other desirable item from dog and continuing to approach the dog whilst he/she is displaying threat signals. These situations may arise due to human misinterpretation of the dogs intentions or dogs misinterpreting human actions (Daniels 1986).

Nervous or fearful dogs will often be triggered by quite different stimuli to other dogs. These dogs may attack when you turn your back on them and as you leave the property.

From the work of Borchelt (1983), and attempts to collect data from victims of dog attacks (Podberseck & Blackshaw 1987, Szapowski et al 1989, Wright 1991) it would seem that dogs bite or attack in the following situations.

- when fearful (of punishment or through malsocialisation)
- when dominance is threatened
- if they are in pain
- when they are protective (or possessive) of some resource be it person or property
- where prior learning has shown the dog that aggressive responses are rewarded (this may be deliberate such as with attack trained dogs)
- as a result of breeding favouring aggressive traits (again this may or may not be deliberate)
- where predatory responses are triggered
- where there is some biological or medical reason.

Following is a summary list of human behaviours thought to have triggered dog attacks (prepared from various sources including; O'Farrell 1990, Daniels 1986, Line & Voith 1986, Borchelt et al 1983, Voith 1981).

- Picking the dog up
- Running away (either in escape or play)
- Riding bikes around the dog
- Trying to break up a dog fight
- Interfering in mating attempts
- Interrupting a dog whilst herding
- Releasing a paw caught in a trap or removing a bone stuck in throat
- Leaning over a fence into dogs property
- Approaching/handling a nursing bitch and her pups
- Falling on the dog
- Touching the dog on specific body areas (hindquarters, back of head or neck)
- Disturbing the dog when asleep or in a habitual resting place
- Cleaning the dogs feet
- Putting leash on the dog
- Giving a command which requires a submissive response such as lying down or giving something up

It is obvious from lists such as those above that an attack can be caused by many things and that many seemingly neutral behaviours (and even some behaviours which directly benefit the dog) may in fact trigger an attack.

Techniques & Suggestions For Handling/Approaching Unfamiliar Dogs

There is a lack of practical information in the scientific literature for those interacting with potentially aggressive dogs. It was therefore appropriate to look beyond the strict confines of the scientific literature to the popular literature, and the opinions and techniques of people who interact with dogs. While some of the ideas expressed may not be backed up with scientific explanation, their practical application and success has meant they are repeated and offered as advice to others.

Presented in Table 3 (over page) are various techniques suggested by significant people working in the areas of animal control, dog training and welfare, for approaching unfamiliar dogs and avoiding a dog attack. Table 4 provides a key and explanatory note to Table 3.

The majority of methods which have been recommended deal with aggression as a response to threats to the dogs territory or dominance.

The specific techniques which those working in the area (and cited in table 3) are recommending the most seem to be:

- Standing still or otherwise reducing movement
- Avoiding direct eye contact (staring)
- Reducing visual impact by adopting a lower posture
- Not approaching or touching the dog
- Backing away calmly and quietly

It would appear from these popular or industry sources, that in order to avoid an attack situation arising (or escalating), when confronted with a potentially difficult dog we are best to adopt neutral (or perhaps submissive) behaviours, avoid overtly dominant threat signals and not react as a potential prey item.

Whilst some people suggested more aggressive actions on the victim's part, this was often done with a caution. The general trend however seems to be toward a less confrontational approach.

TABLE THREE : Techniques recommended for use when encountering an unfamiliar dog

Source	Source Background	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Wilson & Wilson 1991	Dog trainers	Y	Y	Y	Y		Y	Y	Y	Y		Y			Y							
Ward 1993	Dog control officer	Y	Y		Y		Y	Y	Y	Y		Y			Y							
NZ Institute of Hydatid & Dog Control	Officers training manual		Y										Y									
Payne 1993	Dog control officer	Y		Y				Y				Y		Y	Y	Y						Y
Harrison 1993	Dog control officer	Y	Y	Y				Y			Y	Y				Y		Y	Y	Y		
Ruapehu District Council 1992	Animal control division	Y	Y	Y				Y			Y	Y				Y			Y	Y		
Sheard 1993	Dog control officer					Y																
Millen 1993	Dog control officer				Y	N		Y			Y							Y				
Newport 1993	Dog control officer										Y	Y		Y	Y			Y	Y		Y	Y
Didovich 1992	Dog control officer	Y	Y	Y				Y			Y	Y	Y		Y	Y			Y	Y		
SPCA (Auckland) 1992	welfare group	Y	Y					Y			Y	Y				Y			Y	Y		
Vette in Stirling 1990	Animal behaviour consultant	Y		Y				Y				Y		Y	Y	Y						
Hunt 1993	Dog control officer			Y		Y		Y	Y		Y					Y			Y			
Taupo District Dog Control 1992	Animal control division	Y	Y	Y				Y			Y	Y	Y			Y		Y		Y		
Massie in Rife 1989	Reviewer of training video		N		N										Y		Y	Y				
Hutton 1993	Dog trainer				Y			Y		Y						N	Y					
Fetko 1993	Animal behaviour consultant	Y			Y		Y	Y						Y	Y	Y			Y		Y	Y
Cox 1993	Manager Guide Dog Services				Y							Y					Y					
No. of sources recommending use of this technique (Y)		10	8	11	9	2	3	13	3	3	8	11	3	4	8	9	3	5	7	3	2	3
No. of sources recommending against this technique (N)		0	1	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0

TABLE FOUR : Description of techniques recommended in table three

Code	Technique/s
A	Do not touch the dog, or if it solicits attention avoid the head, back of neck and shoulder region
B	Avoid any aggressive action or rough handling
C	Avoid direct eye contact (ie: staring), but remain watchful
D	Freeze all action, remain still
E	Use of a dog repellant (either electronic or shrill whistle)
F	If knocked over, feign death or curl up into foetal position
G	Do not approach the dog or try to obtain friendly interactions, largely ignore it and let it approach you
H	Offer a treat (usually food)
I	Carry a clipboard or briefcase for protection
J	Quiet coercion, take it slowly
K	Back out of situation quietly and slowly
L	Maintain a friendly, confident attitude, do not show fear
M	Do not allow dog to get behind you or turn your back on it
N	Do not run, scream, wave arms or otherwise exhibit panic
O	Reduce visual impact by; keeping low (crouching), making a quarter turn rather than full frontal approach or similar
P	Overpower the dog physically, enforce submission
Q	Shout forcefully and angrily
R	Do not surpise or startle the dog, no sudden movements
S	Call the dog by name
T	Hands & arms folded across chest or in pockets
U	Other

Findings

From the material presented in this introduction it is suggested that simple human behaviours have the potential to trigger dog attacks and that this information can be used to either eliminate or prevent escalation of an aggressive encounter between human and dog. In order to do this though it must first be shown that human behaviour has some bearing on dog attitude.

As previously presented the dog is predominantly a postural communicator (Fox 1969, Scott & Fuller 1965) and will often accept humans as members of their pack (Line & Voith 1986, Blackshaw et al 1990). It follows then that there is an exchange of information between the two species and the behaviour of one will affect the other.

Lore & Eisenberg (1986) have already shown that dogs will distinguish between gender and familiarity of people. This study aims to investigate whether a dog will behave differently in response to the postural information presented by humans in a greeting situation.

Three human behaviours thought to affect the likelihood of dog attacks will be manipulated to posturally communicate one of three messages to an unfamiliar dog. The dogs will then be assessed for any variation in attitude. The three target behaviours are presented below along with a summary justification for their selection.

TARGET BEHAVIOUR ONE

Trigger: Standing over or otherwise presenting a large, domineering figure to the dog.

Remedy: Reduce body profile, such as by crouching down.

Rationale: In canine social behaviour standing over, presenting a bigger profile (piloerection of hair) are signals of dominance and hence may be perceived as threats by the dog to his/her place in the social rank order or to the resources he/she defends (Fox 1969, Scott & Fuller 1965). This is an example of a respondent behaviour. Reduced body profile is more typical of the passive submission rituals shown by subordinates to dominant pack members and hence may reduce the likelihood of an aggressive response or attitude from the dog (Schenkel 1967, Fox 1969, Kleiman 1967).

The majority of attacks on people are by 1-4 year old sexually intact male dogs (Wright 1991). These are the dogs most likely to require treatment for dominance related behaviour problems (Wright & Neselrote 1987), suggesting that threats of this nature may be a trigger for many attacks.

Reducing body profile when encountering a dog is recommended specifically by many of the people working in this field (see Table 3). Two people recommended against it for safety reasons, as crouching down may put the face closer to the dogs mouth and therefore making it more vulnerable if to attack.

TARGET BEHAVIOUR TWO

Trigger: Making prolonged direct eye contact by staring at the dog.

Remedy: Avert eyes (such as by looking at the ear) so that while you are able to still see the dog direct eye contact is avoided.

Rationale: Direct eye contact is another behaviour which may be interpreted as a dominance display, and hence may elicit an aggressive response or cause an already dangerous situation to escalate. Averting eye contact is again a behaviour more typical of the subordinate dog. These respondent type rituals for dealing with agonism function to minimise potentially harmful situations in the social group (Fox 1969, 1970; Scott & Fuller 1965).

Avoiding eye contact is recommended by nearly all the people questioned in Table 3. It was also mentioned as a behaviour preceding some of the reported attacks, and it is thought to contribute to the large number of children attacked, as their height makes them at eye level with many large dogs (Line & Voith 1986, Wright 1991).

TARGET BEHAVIOUR THREE

Trigger: Running or otherwise moving in an erratic fashion.

Remedy: Remain completely still.

Rationale: Running and associated panic behaviours (such as flailing arms and screaming) are typical of a dogs prey and may therefore elicit predatory responses (respondent behaviour) from the dog, such as chasing and biting to bring the prey down. These behaviours also cause a general increase in excitement and arousal which may lead to an attack.

In a number of reported attacks running away has often been reported, in a case where one victim ran and the other lay still the latter was ignored and the former attacked (Borchelt et al 1983). Remaining still is the technique recommended most often in Table 3.

Hypotheses

1) How a dog responds to a person will be affected by the posture and approach behaviour of that person.

2) Presenting a reduced profile, avoiding direct eye contact and remaining still when encountering a dog will elicit a less emotional response in the dog (less threat of attack) than presenting a high profile, making direct eye contact and moving.

The Behavioural View

Central to the behaviour analysis perspective is the interaction between organism and environment (Skinner 1938). It is therefore appropriate to consider aggressive behaviour in dogs in this manner.

The environment acts on the behaviour of the individual in three ways (Catania 1984). Firstly through phylogenetic means, this refers to those hereditary aspects which have been acquired through the development of that group of organisms (phylum). The evolutionary process determines the type of behaviours which can occur, what environmental factors can affect the organism and the capacity to learn.

With respect to the current study, phylogenetic selection will determine the basic form of aggressive behaviours and the type of situation which may bring about aggression, both will however be effected by the actual environment the individual encounters. The evolutionary process is evident in the similarities in the form of aggressive behaviour amongst all the canids (Fox 1970, Scott & Fuller 1965).

Ontogenetic selection is the second factor. This refers to the learning the environment causes during the life of the individual organism. Two basic forms are recognized, respondent conditioning (Pavlov 1927) and operant conditioning (Skinner 1938).

Respondent behaviour is behaviour which is elicited by a preceding stimulus. Respondent conditioning refers to the association of a neutral stimulus (NS) with an unconditioned stimulus (UCS) so that it also begins to elicit the unconditioned response (UCR). The previously neutral stimulus thereby becomes a conditioned stimulus (CS) and the unconditioned response a conditioned response (CR). The initial relationship on which conditioning acts is typically a reflex, that is where the stimulus and response are genetically determined not the result of learning (Pavlov 1927, Catania 1984).

EXAMPLE ONE:

In the dog, pain will elicit a defense response, typically growling or attempting to bite who/what is inflicting the pain (Borchelt 1983).

UCS = Pain UCR = Bite

A veterinarian in white coat who has no prior association with the dog will probably not elicit any response from the dog.

NS = Person in a white coat

If the vet is repeatedly associated with pain in the course of treatment, it is possible the dog may bite the vet in the future regardless of the presence of pain.

CS = Person in white coat CR = Bite

EXAMPLE TWO:

A predatory response may be elicited in the presence of a prey item. The prey will typically be running and perhaps exhibiting panic. The dog will chase and attempt to bring the prey down and kill it.

UCS = Running prey item UCR = Chase and attack

A child who is unaware of the dog and behaving casually is not likely to elicit any response from the dog.

NS = Child

If the child begins to panic, starts running and screaming in a similar manner to a prey item, the dog may begin to chase it and attack.

CS = Child CR = Chase and attack

Operant behaviour is not elicited by a preceding stimulus as above; the behaviour (R) is emitted, and changed by its consequences (S^C). Simplistically, where the consequences are favourable (reinforcement) the behaviour is likely to increase and where they are unfavourable (punishment) the behaviour will decrease. Operant conditioning is changing the relationship between behaviour and the environment by the consequential operation (Skinner 1938, Catania 1984).

The chance of a behaviour being emitted in a particular situation may be altered by bringing it under stimulus control. Simplistically again, this functions by a preceding stimulus (S^D) cueing the organism of the likely

consequences of the behaviour (Skinner 1938, Catania 1984).

EXAMPLE THREE:

A dog displays threat behaviour

R

Victim drops food she is eating

S^C

Dog finds the food pleasant, and threatening people increases.

EXAMPLE FOUR:

Situation A	Situation B
Owner enters property	Stranger enters property

S^D

Dog barks and threatens person entering property

R

Dog praised	Dog ignored or punished

S^C

In situation A, threatening behaviour in the presence of owner is likely to decrease.
In situation B, threatening behaviour in the presence of a stranger is likely to increase.

The situation is not however as simple as it may appear. Some behaviours are the result of a respondent-operant interaction (Catania 1984) or some other combination of processes.

EXAMPLE FIVE:

A dog which is normally very good with children (reinforced by play and attention- Operant) may suddenly bite if hurt (unconditioned response to pain- Respondent).

EXAMPLE SIX:

A bitch with pups may show maternal aggression (protect pups from potential harm- Respondent) and territorial aggression (which may combine aspects of both Operant and

Respondent processes), to someone entering her den area.

EXAMPLE SEVEN:

A dog growling and nipping at owner who is attempting to move it off a bed, may be responding to a threat to its dominance from the owner (Respondent) and because previous displays of aggression have meant the owner has backed down and the dog has been allowed to sleep with owner instead of being put outside (Operant).

The third way the environment alters behaviour is cultural selection (Catania 1984). This a non genetic transmission of behaviour common amongst a number of organisms. It is facilitated by the same processes as ontogenetic selection, however the individuals within the culture will be affected in a similar (but possibly not the same) manner (Catania 1984).

EXAMPLE EIGHT:

Social behaviour is maintained by a series of rituals common to most canids. Differences occur in the precise form of the behaviours across individuals due to ontogenetic selection, however aggressive encounters are minimal as the basic forms are common to all members of the group.

It has been explained that all behaviour is the result of interaction between the organism and environment, and that the environment alters behaviour through genetic transmission from ancestors, learning during the individuals own lifetime and the shared behaviour of groups of individuals. From the examples given, it is clear that this view is appropriate for a systematic investigation into the stimuli and consequences which have given rise to dog attacks on humans.

The behavioural view also encourages the scientific study of behaviour using single subject or 'small-N' designs. The principle of the single subject design is that each subject acts as his/her own control, by a process of repeated measurement of behaviour (Cooper, Heron & Heward 1987). The results obtained, for each subject, in each condition, are compared for the effects of the different treatments they were exposed to (Cooper et al 1987).

Steven Hayes discussed the use of single case experimental design in his thorough paper published in 1981. He presents a good case for the validity of this type of research, and design guidelines for those using a single (or small number of) subject/s.

This study then will consider the postures adopted by human experimenters, in a dog greeting situation, as discriminative stimuli(S^D) for the dog's behaviour or

attitude. Individual dogs will be exposed to these stimuli in a manner appropriate to small-N design to allow treatment comparison. This design type is particularly appropriate given that each dog will have an individual conditioning history. This could mean unique triggers for aggressive behaviour are observed in a subject, as well as those triggers/behaviour patterns considered to be species specific.

METHOD

Subjects

Four dogs were used in this study. They were selected from the Massey University Animal Health Service Centre. Dogs were chosen that could be handled without too much difficulty and who were not known to have attacked or inflicted injury on a human in the past.

The dogs were selected from medium sized mixed working breeds, and were aged between two and three and a half years. Two dogs were female, one desexed the other entire. Two dogs were male, one sexually entire and the other a natural castrate.

Although handled regularly by kennel staff and used by other experimenters in the past, three of the four dogs showed signs of poor socialisation with humans. The three dogs showing signs of malsocialisation were purpose bred at the research facility, the other dog was acquired at ten months from a sheep farm.

During the study the dogs remained in their normal home environment within the research centre. Except when actually involved in trials their normal exercise, feeding and handling regimes were maintained.

Setting

The trial area was a room in a 7m x 4m out-building which was exposed minimally to external stimuli so as to ensure that the experimenter's entrance impacted strongly on the dog. The room was divided in half by a wire mesh fence, which allowed two video cameras to cover the whole area the dogs were in (see Figure A). The walls were cream coloured to ensure dogs postures were easily recognised on videotapes. The walls were marked with red tape to ensure correct alignment of the video cameras for every session.

Lighting was provided by fluorescent tubes and a sky-light. The floor was concrete, this allowed the experimenter to hose the floor down easily when a dog urinated in the trial area. This was important as the urine would have distracted the next dog to be used in the trial area. The door had a wire mesh window, this allowed easy monitoring of experimenter safety.

Independent Variables

Four human experimenters were involved in the study. The

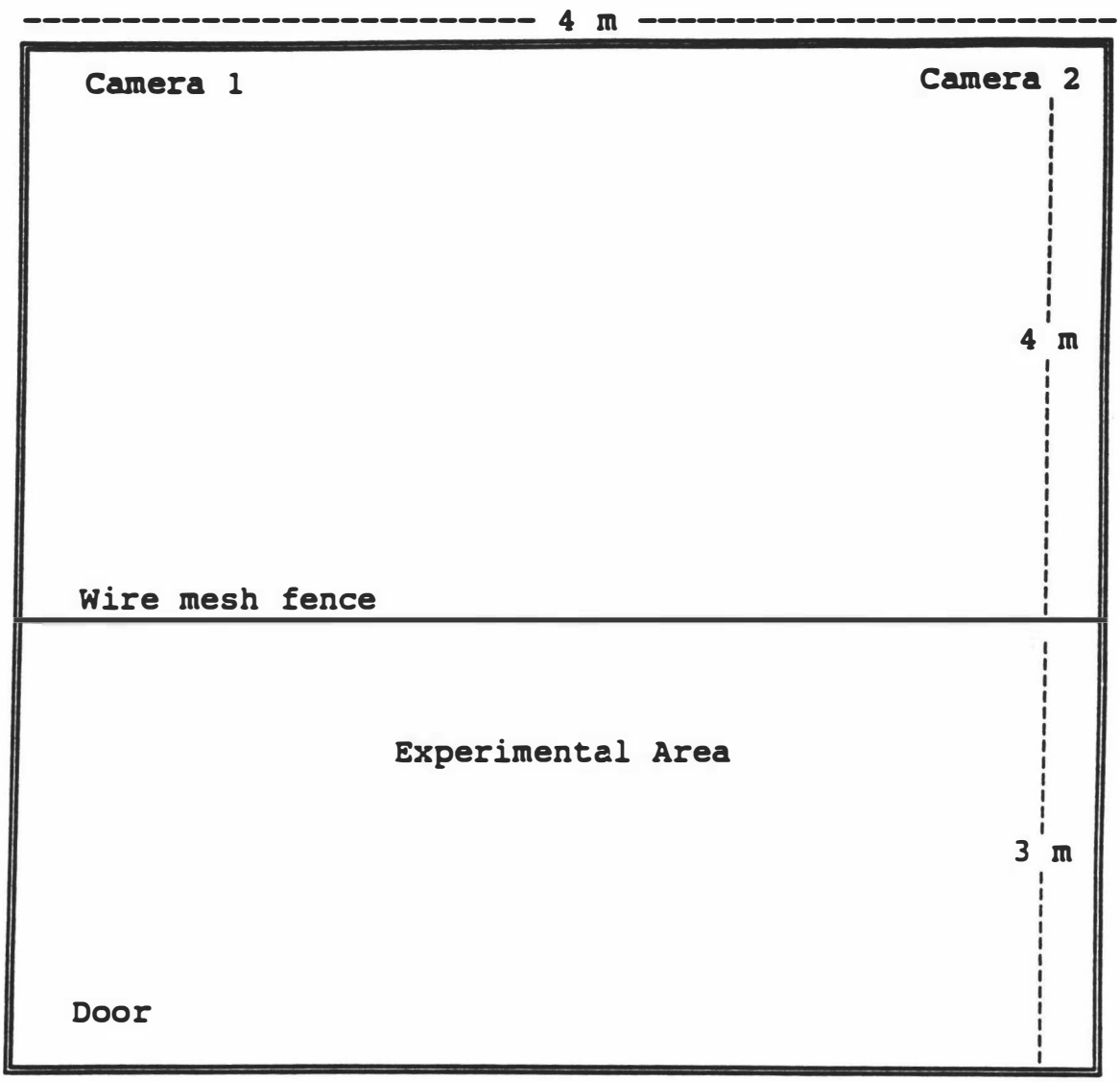


FIGURE A : Set up of experimental area

primary experimenter was a twenty-four year old female with considerable experience in handling dogs. The secondary experimenters were two adult males and one adult female. The secondary experimenters had limited experience handling dogs and one expressed fear of dogs. All experimenters were previously unknown to the dogs.

Independent variables involved the manipulation of these experimenter's approach behaviours, operationally defined as follows.

Low-profile approach: Enter the trial area, remain aware of the dog's location but avoid eye contact at all times. Lower body height by bending knees (do not go so low as to put your face in a direct line with the dog's head) and make a quarter turn away from the dog. Do not walk toward the dog, remain still throughout the trial. Do not touch or speak to the dog. Otherwise behave in a manner in which you feel comfortable. At the sound of a bell quietly leave the trial area without turning your back on the dog.

Mid-profile approach: Enter the trial area, look in the general area of the dog but avoid making direct eye contact. Do not remain at full body height or squat down, but reduce body size slightly by stooping. On entering trial area, walk towards the dog for 1-2 paces then stop all foot movement. Keep body and/or arms moving slightly throughout trial. Do not touch or speak to the dog. Otherwise behave in a manner in which you feel comfortable. At the sound of a bell quietly leave the trial area without turning your back on the dog.

High-profile approach: Enter trial the area, and make direct eye contact with the dog and maintain this throughout the trial. Approach the dog square on at full body height and continue to move feet and body at all times. Do not touch or speak to the dog. Otherwise behave in a manner in which you feel comfortable. At the sound of a bell quietly leave the trial area without turning your back on the dog.

Dependent Variable

The dependent variables were the dog's postural attitudes in the presence of the experimenter, evaluated on two scales; one for facial expression and one for tail and hindquarters position. The dog's behaviour was evaluated using a 10 second time sampling technique (Martin & Bateson 1988).

Figure B was developed from M W Foxes facial and postural ratings (1979 cited in SPCA 1992) and shows various facial expressions. At the end of every ten second period the video record of the trial was stopped and the subject's expression was rated and recorded on a check sheet (see Appendix Two). Facial expression was scored according to which of these pictures the dog most closely resembled. Pictures 1 or 2 (relaxed or attentive),

picture 3 (uncertain, indicating flight or attack are equally likely) or pictures 4,5 or 6 (aggressive).

Figure B also shows various tail and hindquarters postures. The subject's posture was rated (and recorded)

according to whether it most closely resembled pictures 4 or 5 (aggressive), pictures 1 or 2 (fearful) or picture 3 (relaxed or normal).

In order to obtain a measure of dog emotionality an overall attitude rating for both the head and tail positions was calculated for each trial. Attitude can not be measured on an interval scale, but was assumed to on an ordinal scale from low levels (relaxed) to medium and high levels (uncertain & aggressive) of emotionality.

These attitude measures were obtained by multiplying the percentage of time in each face or tail position by an increasing index, 1-3 (see Appendix 3 for a worked example). Aggressive responses were multiplied by three indicating a high level of emotionality (facial ratings 4,5,6 and tail ratings 4,5). Uncertain or fearful responses were multiplied by two, indicating a lower level of emotionality (facial rating 3 and tail ratings 1 or 2). Normal attitude was multiplied through by one (facial ratings 1,2 and tail rating 3).

Experimental Design & Procedure

In order to assess and compare the effects of human postures on dog behaviour an alternating treatments design (Hayes 1981). The three postures under experimental manipulation were eye contact, body height and movement.

The study involved each dog in three trials per day. In each trial the dog was led into the room and left to familiarise him/herself for five minutes (reduced to two minutes after each dog had been exposed to 5 trials). The experimenter then entered, behaving in the manner appropriate to the experimental phase. After a further two and a half minutes a bell was sounded to terminate the trial. The experimenter then quietly left the room and the dog was removed.

The baselines for all subjects started concurrently but the alternating treatments and other phases were staggered. Phase changes occurred after a specified number of trials, or longer if the dog's behaviour was not stable or was showing a trend.

Baseline 1 (BL1)

The primary experimenter was briefed to enter the room in accordance with the behavioural definition for a mid-profile approach. This phase continued for a minimum of nine trials.

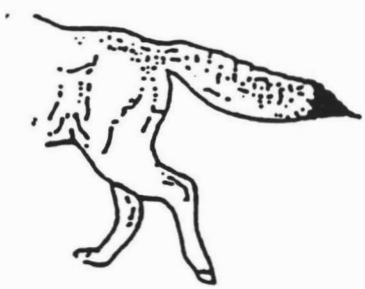
Facial Expression	Tail Position	Code
		1
		2
		3
		4
		5
		6

FIGURE B : Measures of dog attitude - Facial expression & tail position

Alternating Treatments (AT)

The alternating treatments phase followed the baseline phase and was identical to baseline except that the three approach profiles were used on different trials. Each of the three profiles was assigned to a trial in a varied but counterbalanced fashion.

The alternating treatment phase lasted for a minimum of nine trials.

It is common practise in the alternating treatments phase to provide some cues to distinguish the different components (Kazdin 1982). In this study one of three different coloured sweatshirts (bright pink, apricot, dark green) was worn by the experimenter as a discriminative stimulus for the different types of approach behaviour. The sweatshirt colour used for each approach profile was varied across the dogs.

Preferred Treatment Phase 1 (PT1)

Following the alternating treatments phase, the most effective of the three approach profiles was then used during all three daily sessions.

This phase lasted at least three trials.

Baseline 2 (BL2)

Following the best treatment phase baseline conditions (mid-profile approach) were reinstated for a minimum of three trials.

Baseline 3 (Across experimenters) (BL3)

Baseline conditions were then re-introduced for three of the four dogs, but with the three secondary experimenters each being randomly assigned 3 - 4 trials with each dog.

Preferred Treatment 2 (Replication Of Effects Across Experimenters) (PT2)

Following baseline 3 secondary experimenters were then instructed to follow the same procedure to that used in preferred treatment 1 by the primary experimenter.

Each of the secondary experimenters was assigned a minimum of 3 trials with each dog.

Reliability

Three observers were trained to evaluate the videotape data using the behavioural definitions given above, photographs and video samples.

Interobserver agreement of both the independent and dependent variables was computed by dividing the number of agreements by the sum of agreements and disagreements

and multiplying the quotient by 100. If two observers recorded experimenters behaviour (IV) in the same manner and scored the dogs postures (DV) as the same, agreements were scored; otherwise a disagreement was scored.

Prior to baseline all trials were assessed by two observers. In later phases a single observer was used with interobserver agreement checks on 25% of trials, distributed randomly across phases and subjects. Only the data from the primary observer for each trial is included in the study.

Baseline recordings began when interobserver agreement on videotaped data (experimenters approach behaviour and the dogs response to it) was consistently above 85% for both the independent and dependent variables.

Over the whole study, the interobserver agreement for dog behaviour ranged from 100% - 70% (Mean = 87.97%). The interobserver agreement for experimenter behaviour ranged from 100% - 66.7% (mean = 87.8%).

Observer Drift

To ensure that the behavioural definitions were being applied uniformly across trials a check for observer drift was carried out (Cooper et al 1987). This was particularly important as the primary observer was involved in rating a great deal of data over time.

Intra-observer agreement checks were carried out on 5% of trials rated by the primary observer. For dog behaviour the range was 100% - 83% (mean = 96%) and experimenter behaviour 100% - 93% (mean =98.4%).

Treatment Integrity

As well as rating the dogs behaviours observers also rated the experimenter's behaviour, to check for treatment integrity (Cooper et al 1987).

The treatment integrity check (Cooper, Heron & Heward 1987) on the independent variable (experimenter's approach behaviour) was done by assessing whether or not the experimenter's behaviour complied with the operational definition appropriate for each trial. In order to do this, body posture, eye position and movement were evaluated using ten second time sampling and recorded on a check sheet (see Appendix Two).

For each sample of behaviour body height was scored as being full (fully upright), reduced (knees bent) or intermediate (stooped); eye contact was scored as being direct (straight at dogs eyes), averted (clearly looking away from dog) or intermediate (looking in general direction of dog); and movement was scored as moving (feet lifted from ground), still (no movement) or intermediate (body moving but not travelling on feet).

For a trial to be considered as showing compliance the experimenter must have shown all three postural cues in at least 80% of the time samples and scored 0% for behaviours appropriate to other components. The appropriate behaviours for each component were:

Low-profile approach	-	Reduced body height, still and averted eye contact
Mid-profile approach	-	Intermediate body height, intermediate movement and intermediate or averted eye contact
High-profile approach	-	Full body height, moving and direct eye contact

The independent variable complied with the treatment integrity check in 96.6% of trials.

RESULTS

Two measures of dog attitude were obtained for each two and half minute trial, they were based firstly on the position of the dog's tail and hindquarters (tail attitude) and secondly on the facial expression, particularly the ears and mouth (face attitude).

Figures C, D, and E show these two measures during each of six experimental phases for the dogs; Tip, Alf and Blue. These measures of attitude are used to highlight the effect of the three approach profiles and four experimenters on the dogs. Figure F presents similar data, to those above, for the subject Mike. Mike however was only exposed to one experimenter and wasa used in only four experimental phases.

In the alternating treatments phase of figures C, D, E and F. a block of three trials, one for each approach profile, is shown above each point on the abscissa. Similarly during BL3 and PT2 phases on figures C, D and F, the trials for each secondary experimenter are shown in blocks.

Tables five through seven present non-parametric statistical analyses of the dog attitude scores. Table five investigates the significance of the differences in attitude due to approach profile. Table six and seven tests for an experimenter effect on the attitude scores.

A test for correlation between the two measures of the dependent variable (face attitude and tail attitude) is presented in table eight.

Presented in the following sections are analyses of the data from each experimental phase. Results in each section are presented firstly as they relate to each dog, followed by a summary and any relevant statistical information.

The next section then addresses each dogs behaviour over all trials. Finally a brief look at the adequacy of the two measures is presented based on the information in table 8.

Behaviour of dogs in each experimental phase

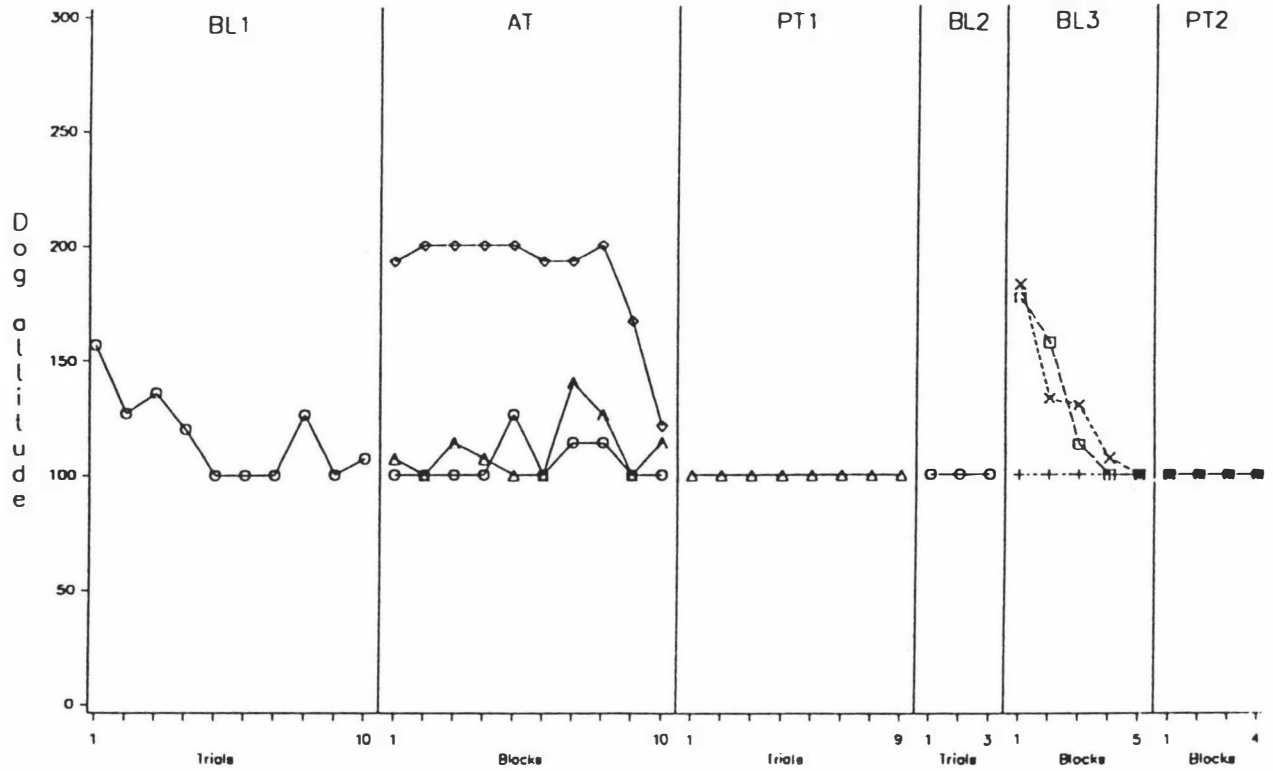
Baseline 1 (BL1)

Ten trials were required to stabilise attitude scores for the subject Tip. Attitude scores, as measured by tail position, varied between 100 and 155, mode being 100. Tips reactivity to the experimenter obviously decreased over the trials, however attitude still showed some

FIGURE C : **Tip's attitude score as rated by both tail position and facial expression for each of three experimenter approach profiles (low, mid, high) and four experimenters, during baseline 1 (BL1), alternating treatments (AT), preferred treatment 1 (PT1), baselines 2 & 3 (BL2, BL3) and preferred treatment 2 (PT2).**

Tail Roling

Tip



Face Roling

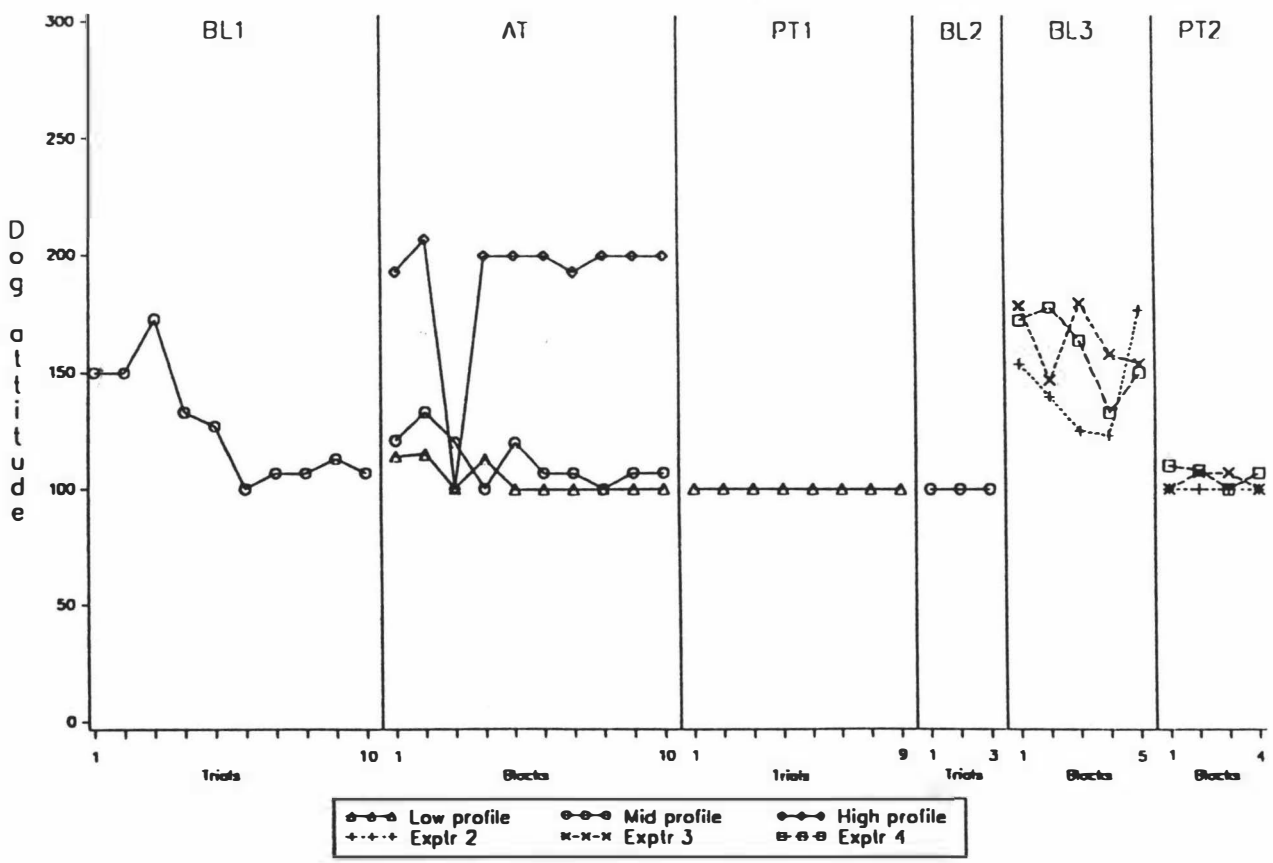
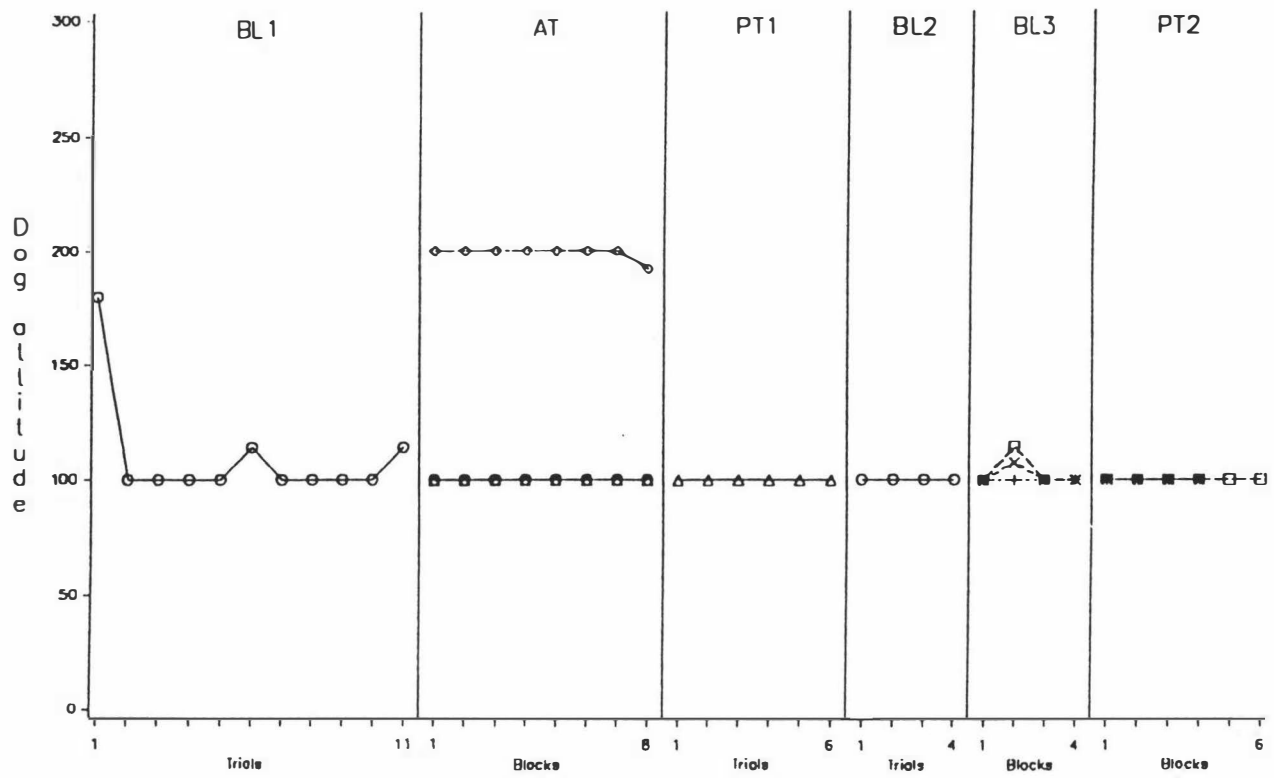


FIGURE D : **Alf's attitude score as rated by both tail position and facial expression for each of three experimenter approach profiles (low, mid, high) and four experimenters, during baseline 1 (BL1), alternating treatments (AT), preferred treatment 1 (PT1), baselines 2 & 3 (BL2, BL3) and preferred treatment 2 (PT2).**

Alf

Tail Rating



Face Rating

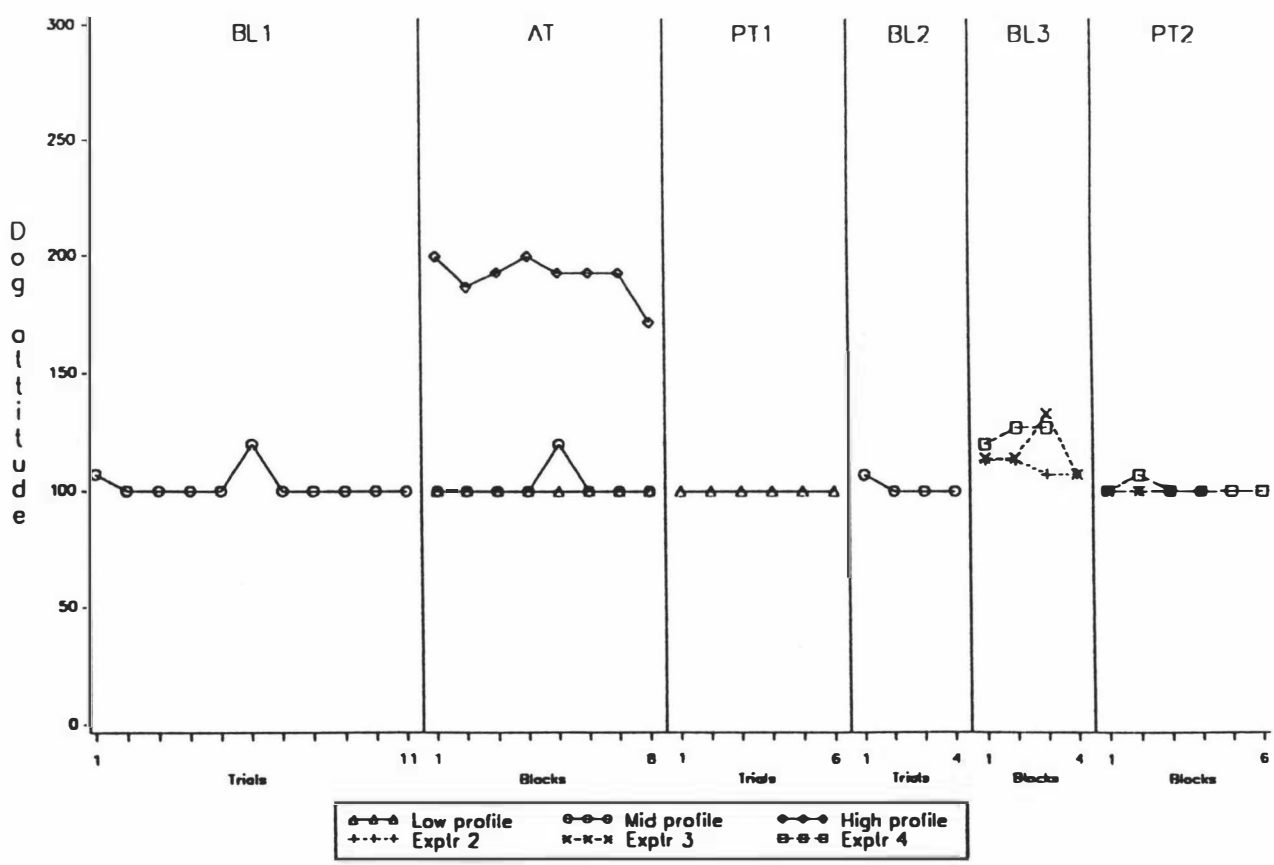
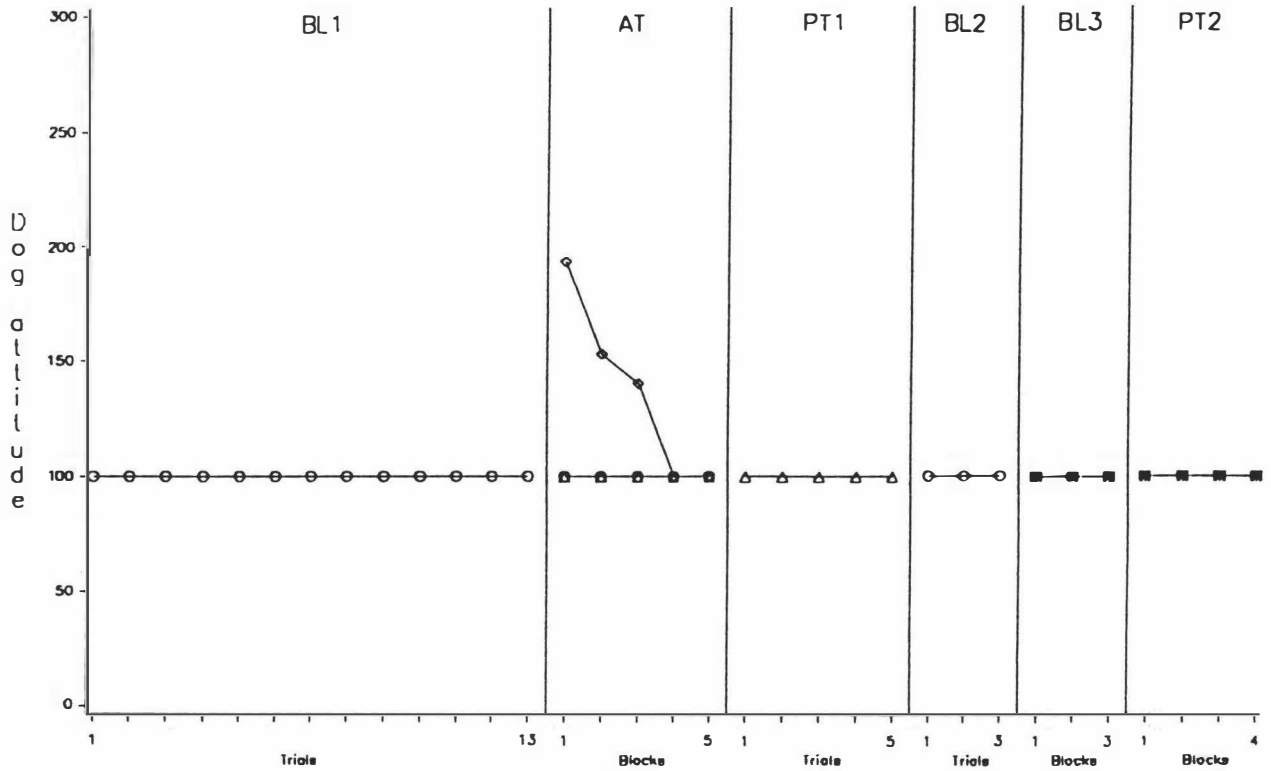


FIGURE E : **Blue's attitude score as rated by both tail position and facial expression for each of three experimenter approach profiles (low, mid, high) and four experimenters, during baseline 1 (BL1), alternating treatments (AT), preferred treatment 1 (PT1), baselines 2 & 3 (BL2, BL3) and preferred treatment 2 (PT2).**

Blue

Tail Rating



Face Rating

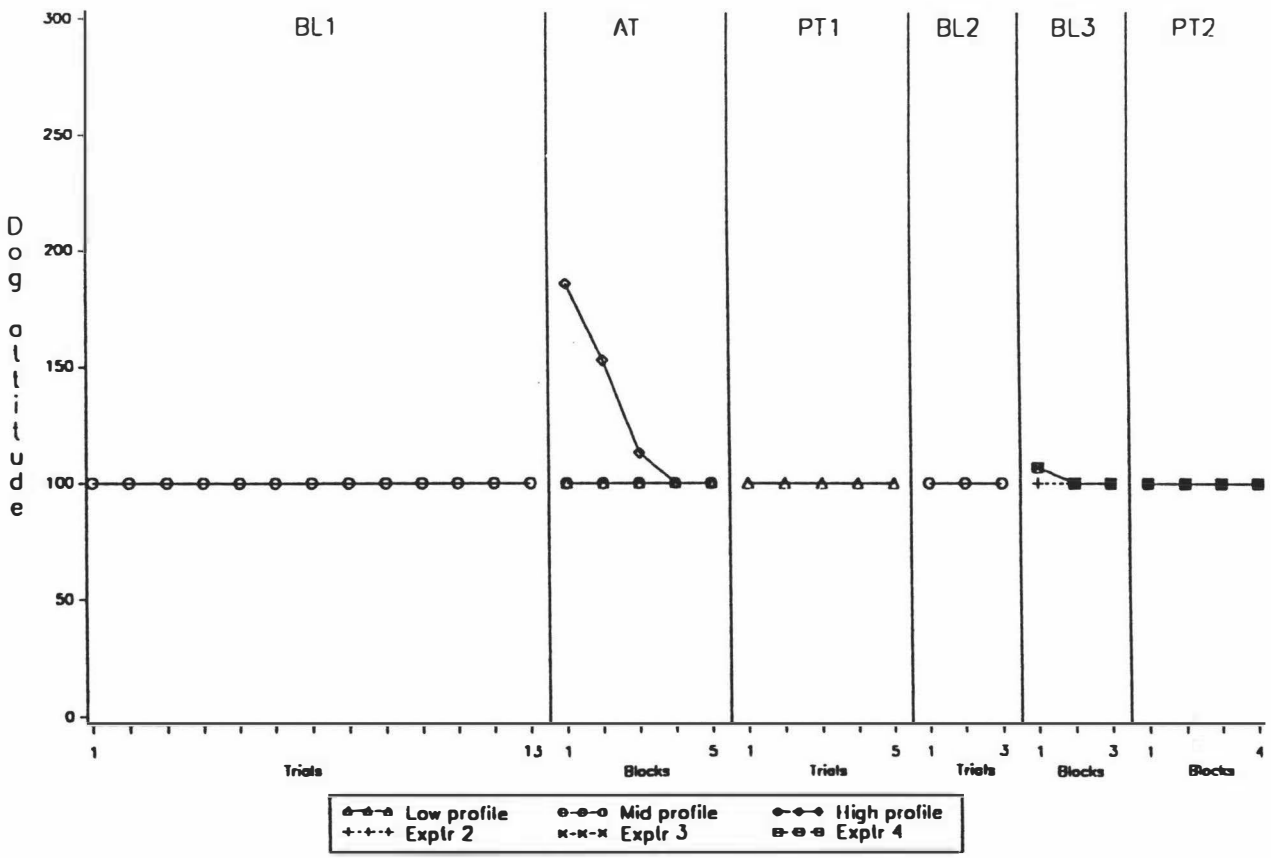
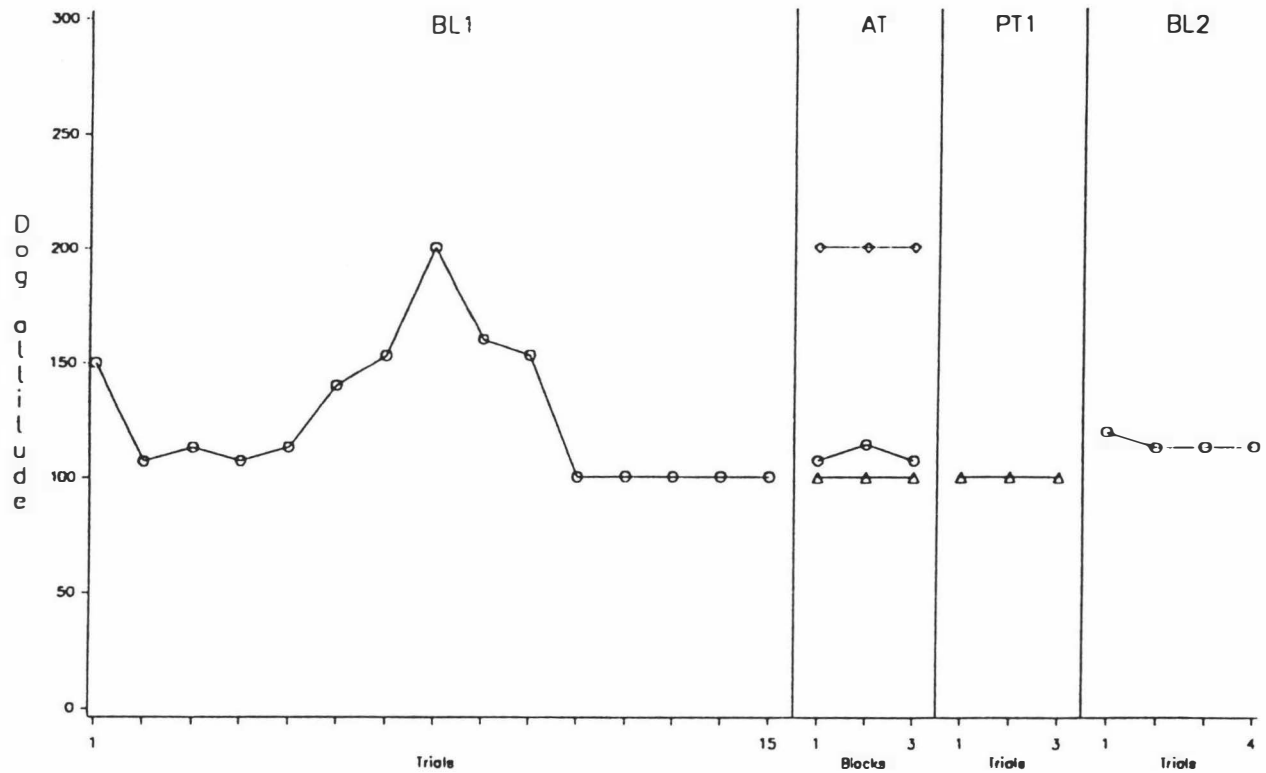


FIGURE F : **Mike's attitude score as rated by both tail position and facial expression for each of three experimenter approach profiles (low, mid, high) with 1 experimenter, during baseline 1 (BL1), alternating treatments (AT), preferred treatment 1 (PT1) and baseline 2 (BL2).**

Tail Rating

Mike



Face Rating

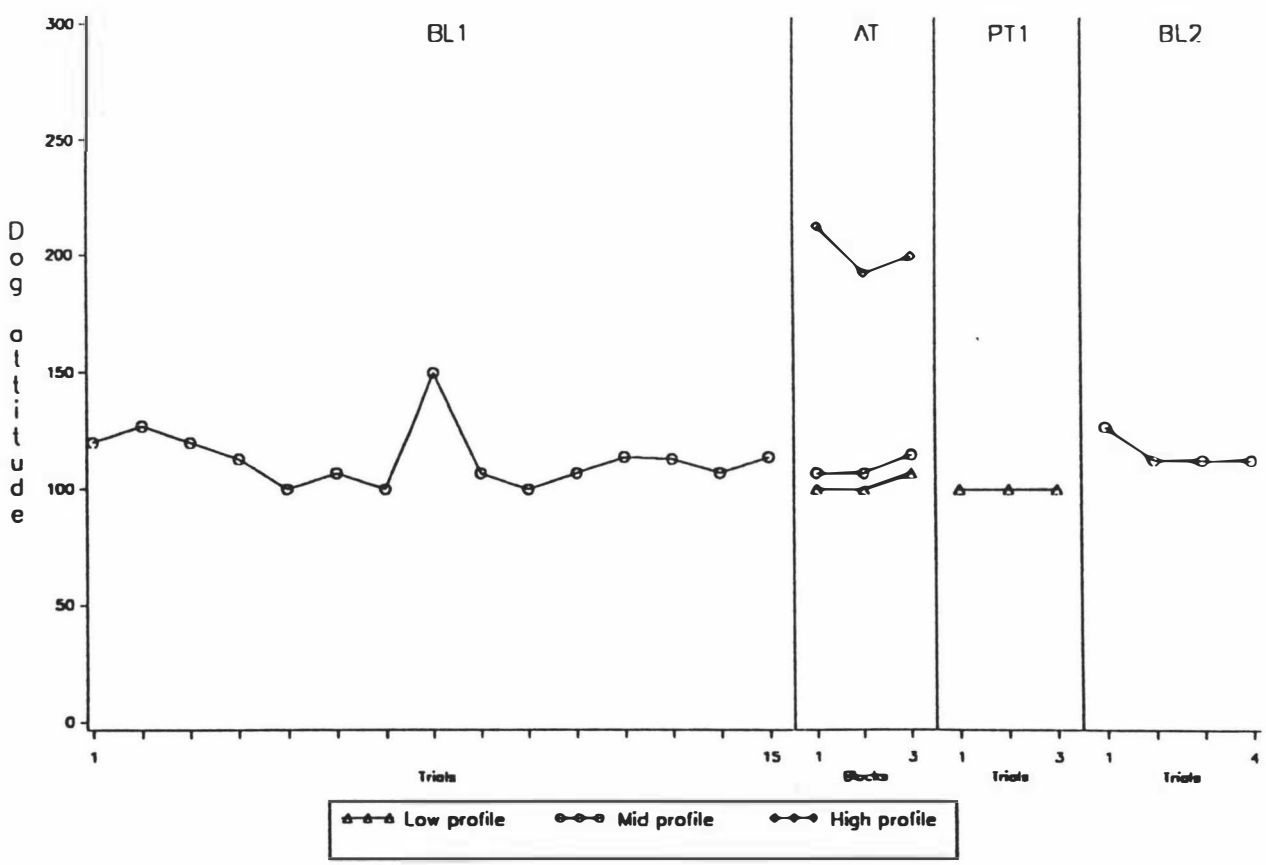


TABLE 5 : Kruskall-Wallis analysis (by chi-square approximation of Wilcoxon scores) for effect of approach profile on dog attitude in alternating treatments phase

Subject	Measure	ChiSq	DF	Prob>ChiSq
All dogs	Face	43.443	2	0.0001
All dogs	Tail	49.744	2	0.0001
Tip	Face	16.370	2	0.0003
Tip	Tail	19.847	2	0.0001
Mike	Face	6.7710	2	0.0339
Mike	Tail	7.7838	2	0.0204
Alf	Face	20.539	2	0.0001
Alf	Tail	22.688	2	0.0001
Blue	Face	6.8978	2	0.0318
Blue	Tail	6.8978	2	0.0318

TABLE 6 : Kruskall-Wallis analysis (by chi-square approximation of Wilcoxon scores) for effect of experimenter on dog attitude in baseline 3 phase

Subject	Measure	ChiSq	DF	Prob>ChiSq
3 Dogs	Face	1.6488	2	0.4385
3 Dogs	Tail	5.9982	2	0.0498
Tip	Face	2.9556	2	0.2281
Tip	Tail	5.5824	2	0.0613
Alf	Face	5.4695	2	0.0649
Alf	Tail	1.4500	2	0.4843
Blue	Face	1.1429	2	0.5647
Blue	Tail	0	2	0.9999

TABLE 7 : Kruskall-Wallis analysis (by chi-square approximation of Wilcoxon scores) for effect of experimenter on dog attitude in preferred treatment 2 phase

Subject	Measure	ChiSq	DF	Prob>ChiSq
3 Dogs	Face	4.0409	2	0.1326
3 Dogs	Tail	0	2	0.9999
Tip	Face	4.8673	2	0.0877
Tip	Tail	0	2	0.9999
Alf	Face	1.3333	2	0.5134
Alf	Tail	0	2	0.9999
Blue	Face	0	2	0.9999
Blue	Tail	0	2	0.9999

TABLE 8 : Spearmans rank correlation analysis between the two measures of dog attitude, tail position and facial expression

Subject	R	Prob ¦R¦ > 0
All dogs	0.64059	0.0001
Tip	0.55899	0.0001
Mike	0.45569	0.0100
Alf	0.66429	0.0001
Blue	0.78868	0.0001

fluctuation even in last few trials. Tips face ratings followed a very similar pattern to the tail, attitude varied between 170 and 100, with a mode score of 105.

Overall a low level of emotion was shown in response to experimenter one by Tip.

A series of 11 trials were conducted in baseline with the subject Alf. The attitude score was 100 for 8 of the 11 tail readings and 9 of the face readings. The only trial which was obviously different is trial 1, where the tail rating was 180. A small increase in attitude score was recorded for both tail and face during trial 6.

Alf's overall trend was for a low level of emotionality toward the experimenter. Highly consistent responding was observed and a plateau reached after only a small number of trials.

Thirteen baseline trials were conducted with subject Blue, thee was no change in dog attitude throughout. The attitude score for both face and tail was 100.

To obtain stable responding from subject Mike, in initial baseline, fifteen trials were carried out. Dog attitude varied between 100 and 200 (mode 100) on the tail scale and between 100 and 150 (mode 110) on the face scale. The highest scores on both scales was recorded on trial 8.

The overall tendency across dogs during this phase was for a low attitude score (around 100) for both the face and tail measures. Some fluctuation occurred in all dogs, except Blue, this was typically during the first few trials.

Alternating Treatments (AT)

The most obvious feature in Tip's results is a marked difference in attitude ratings (both face and tail) between high profile and other approach profiles, with Tip responding at a higher level of emotion to a high profile approach.

For the high profile trials Tip's attitude is consistently near 200. For low profile, attitude scores fluctuate slightly in both face and tail measures. For face the variation is between 140 and 100, with mode of 100. For tail the variation is less, being between 110 and 100, again mode is 100.

The mid profile approach appears to have produced a slightly different attitude response in Tip, for tail this varies between 100 and 130, mode 100. The face scores vary between 140 and 100, with mode of 110.

The scores for mid and low profile remain reasonably stable throughout the ten blocks whilst the last two high profile trials show a large drop in Tip's attitude (measured by tail), from 200 to 115 .

Eight blocks of trials were conducted with Alf under these conditions. A clear visual difference exists in dog attitude between high profile trials and other trials. Mode score for high profile trials being 200 for tail readings and 190 for face readings. The final high profile trial shows a small decrease in score for both head and tail measures.

Alf's mid profile and low profile trials produced almost identical data paths, an attitude rating of 100 was obtained for both face and tail in all but 1 trial.

Blue showed consistent attitude scores of 100 for both face and tail for all mid and low profile trials. For high profile trials the dog initially showed an attitude score of 190, however this rapidly decreased to reach 100 by block 4.

Only three blocks of trials were carried out in this phase, with subject Mike. During high profile trials her tail ratings were consistently 200, face ratings varied between 190 and 210.

Dog attitude was markedly lower for Mike's low profile and mid profile trials. The mode for tail attitude for low profile was 100, and for mid profile was 105. The mode face attitude for low profile was 100 and for mid profile was again 105.

All dogs showed similar behaviour during this phase, the amount of fluctuation did vary once again. Tip produced the most variable data path. All dogs reacted to a high profile approach with a much higher attitude score than either mid or low profile approaches.

It is difficult to distinguish between the mid and low profiles data paths on both the face and tail measures. A close look however suggests that mid profile may produce a slightly higher attitude than overall than low profile.

ANALYSIS - see table 5

<u>Does approach profile effect the dog attitude scores ?</u>

Kruskall-Wallis analyses on the data collected during AT for both head and tail scores, for all dogs combined, indicate very clearly that the null hypothesis can be rejected with some confidence. The probability of 0.0001 is well in excess of the required 0.05. The alternate hypothesis thus suggests that the mean attitude score is

not the same for all three approach profiles.

When the test is broken down dog by dog it is clear that the attitude effect was most marked in Tip and Alf, with probabilities of 0.0001. The results for Mike and Blue were not as convincing (p = 0.03 approx), but still suggest the null hypothesis (all means are equal) can be rejected.

Preferred Treatment (PT1)

During the preferred treatment phase (low profile) Tip had a consistent attitude score of 100 for both tail and face.

Alf's 6 trials also showed an attitude score of 100 under both measures.

All of Blue's trials obtained ratings of 100 for both face attitude and tail attitude.

During this phase Mike's attitude was consistently assessed as 100 on both scales.

All dogs showed identical results in this phase, all trials scored a low attitude score on both head and tail rating scales.

Baseline 2 (BL2)

A return to baseline conditions for Tip produced an attitude rating of 100 for both face and tail for all trials.

Alf's attitude score was 100 for all trials in this phase except for trial 1, where the tail attitude was slightly elevated (105).

Again all trials showed an attitude score of 100 on both measures for Blue.

Mike's attitude scores were elevated slightly on trial one and then consistent at 110 on both scales.

Consistent low level responding was a feature of this phase for all dogs. The attitude scores showed less variability than they did in Bl1, particularly for Tip and Mike. Overall a good reversal to baseline attitude levels.

Baseline 3 (BL3)

The most obvious feature of Tip's behaviour is the different trends shown by the two measures. Tail shows a rapid decrease in attitude score for experimenter 3 and 4, from 180 to 100, and is consistently 100 for

experimenter 2. Face attitude scores fluctuate for all three secondary experimenters between 120 and 180.

Each of the secondary experimenters had 4 trials with Alf. Alf's mode attitude score for tail ratings was 100 for all three experimenters, with a slightly higher score obtained during the second trial with both experimenters 3 and 4. Face ratings were not as consistent with attitude scores levelling out between 105 and 125 for all three experimenters.

Blue showed an attitude rating of 100 toward all three secondary experimenters by tail classification. The face ratings were also highly consistent at 100, except during block one. The dog showed a slightly elevated face rating during the first trial with both experimenter 3 and experimenter 4.

Attitude scores varied noticeably across the three dogs in this phase, particularly Tip. Tip's attitude score on the face scale was higher for all secondary experimenters than the primary experimenter. Otherwise the general trend reflects that of the primary experimenter.

ANALYSIS - see table 6

<u>Do individual experimenters showing mid profile approach behaviour effect dog attitude scores ?</u>

Kruskall-Wallis analyses of Tip, Alf and Blue's BL3 data is presented to test the null hypothesis that mean attitude score for tail and face ratings is the same for all experimenters.

When all three dogs are combined the face ratings very clearly indicate the null hypothesis must be accepted ($p = 0.4385$). For tail values the test is borderline for rejection of the null hypothesis, however to do so would mean high risk of a type 1 error.

The null hypothesis is supported in all cases when broken down dog by dog.

Preferred Treatment 2 (PT2)

During preferred treatment across experimenters the attitude scores are a lot more stable around 100 for Tip on both face and tail rating scales.

Alf had consistent scores for both face and tail attitude across all 3 experimenters. A tail score of 100 was obtained in all trials, for face attitude only one small variance from 100 occurred (experimenter 4).

Blue's face and tail attitude scores of 100 were shown across all experimenters for all 4 blocks of trials.

The behaviour of each dog reflected the others very well. Both the tail and face ratings are consistent with those obtained in PT1.

ANALYSIS - see table seven

Do individual experimenters showing low profile approach behaviour effect dog attitude scores ?

Kruskall- Wallis scores were used to test the hypothesis that the mean attitude score was the same during PT2, irrespective of experimenter. The scores obtained indicate that this null hypothesis must be accepted ($p = 0.0877 - 0.9999$). This held for both the combined and individual scores.

Behaviour of dogs over whole study

Tip

The modal score for baseline conditions (mid profile) remains almost the same for experimenter 1 throughout all phases, the only variation is for face attitude during AT, when the mode is 105. It is difficult to compare experimenter 1 with the other experimenters as only 5 data points are available for each, however the tail scores indicate a downward trend toward 100, and for experimenter 2, is consistently at this level.

It is visually obvious that a high profile approach scores a higher attitude score than mid and low profiles but it is not so clear between mid and low. Mid profile scored a marginally higher attitude than low profile on 9 of the 20 measures (face and tail combined), was the same as low profile 4 times and lower on 7 occasions. Interesting to note the difference between head and tail scores, often when the tail measure indicates a higher score for mid profile the corresponding face measure shows a higher score for low profile.

The degree of score variation is much less for preferred treatments phases than any other phase. The mode score for low profile was consistently 100 for both face and tail measures during both AT and PT1. The graph indicates this is also consistent in PT2, particularly with the tail scores. Again it is difficult to compare across experimenters with any certainty due to a small number of data points being available for experimenters 2,3 and 4.

Alf

There is very little variation in dog attitude, in response to approach profile across phases for this subject. The tail and face ratings are almost always 100

under both mid profile (BL1, AT & BL2) and low profile (AT & PT1) conditions. The only difference in the results of these two approach types was that attitude was slightly more variable when experimenter one exhibited mid profile approaches than low profile approaches. Seven of a possible 46 (tail and face combined) attitude scores were not 100 for mid profile, where as all low profile scores rated 100 for attitude.

An attitude score difference of approximately 100 clearly sets the high profile data path apart from mid and low profile during AT. This trend is obvious for both tail and face ratings, with tail being the more consistent measure.

The attitude scores vary very little across experimenters, with mode tail scores of 100 being recorded for all experimenters in both mid and low profiles. A mode face attitude score of 100 was also obtained for all experimenters showing a low profile. Face ratings for experimenters 2,3 and 4 were slightly higher during baseline conditions than experimenter 1.

Blue

Highly consistent behaviour was observed in this dog, low levels of emotionality were recorded irrespective of experimenter and in most cases approach profile.

A high profile approach by experimenter 1 produced a much higher level of responding, in the short term, than either mid or low profiles. These two profiles had almost identical data paths except for one slight elevation in mid profile during BL3.

Mike

There was some minor fluctuation in response to mid profile approaches across phases. Tail attitude varied from 100 to 110 and face attitude from 105 to 110. Low profile approaches had a mode of 100 in both AT and PT1.

The difference in dog reactivity between approach profiles is most obvious between high profile and the other profiles. In all trials during AT the attitude scores are slightly higher in response to mid profile than low profile approaches. Mode attitude scores (both face and tail) are also slightly higher in PT1 (mid profile) than BL2 (low profile).

No across experimenter data is available for this subject.

Relationship between the two measures of dog attitude

Analysis - see table 8

Is there a relationship between the dog attitude scores obtained by face ratings and the dog attitude scores obtained by tail ratings ?

The Spearmans R values obtained are all positive, suggesting that as one variable increases so does the other.

The R values obtained vary from 0.55899, for Tip, to 0.78868 for Blue. When all four dogs results are pooled, the correlation co-efficient is 0.64059. The face and tail measures of attitude may be said to show a moderate correlation or substantial relationship as the R values generally fall between 0.4 and 0.7 (Martin and Bateson 1988).

The probability values obtained were 0.0001 in all but one case (Mike p = 0.0100) which is most acceptable.

DISCUSSION

Effect of Approach Profiles on Dog Attitude

It was suggested that postural communicators respond differentially to the varying postures of conspecifics. Agonistic communications in particular aim to modify the behaviour of other animals through display (O'Farrell 1990). In the case of the highly social dog, it was further suggested that they would respond to the postures of animals, other than conspecifics, if they accepted that species as members of their social group or pack (Fox 1970).

In this study dogs were presented with three types of human approach behaviour, on the evidence that dogs would react to these behaviours according to their meaning within the dogs normal social communications (Fox 1970, Blackshaw et al 1990).

From the results presented on the previous pages it seems that this has indeed occurred. The measures of dog attitude giving clearly different readings for some styles of approach adopted by human experimenters.

During the AT phase all dogs were exposed to a high profile approach. This approach style reflected the key components of canine dominance communications (see table 1), influenced by those triggers for attack identified by experienced animal handlers (see table 3). Direct eye contact, a large erect body profile and a high degree of movement were the central aspects of this approach type.

It was thought that the subjects would react to this approach type quite differently than less threatening approaches. The less emotive approach profiles again considered suspected, and this time approximated the submissive behaviours of lower ranking dogs. The low profile approach required experimenters to completely avoid eye contact with the dog, reduce their body profile and not move (exposure of the inguinal region and submissive urination were not required). An intermediate profile was also used. This mid profile required neutral behaviours somewhere between the threat of a high profile approach and the submission of a low profile approach.

The approach profile affect was borne out statistically (see tables 5-8) and graphically (see figs C-F). The high profile approach consistently scored higher, on both the face and tail measures of dog attitude, than either mid or low profile. It would appear from this, that much as a dominant approach by a dog may cause another dog to respond with aggression, so to might the dominant approach of a human being.

The function of submissive behaviour is to achieve social integration through appeasement and thus avoid potential harm (Schenkel 1967). It appears that this has been observed across species in the current study. Meaning, that the less confrontational approaches have resulted in much lower attitude scores. These low attitude scores reflecting a calm, relaxed state and low probability of attack. Which is the ideal situation to have when encountering an unfamiliar dog.

The Kruskall-Wallis analysis (table 5) is very clear in supporting the supposition, that approach profile has an effect on dog attitude. The test does not indicate any directionality however. The graphs make it very easy to see the differences in dog attitude between high profile trials and both mid and low profile trials. That there is very little data overlap between high & mid, and high & low, is a good (but not perfect) demonstration of experimental control (Barlow & Hersen 1984, Cooper et al 1987).

What is less clear is the comparison of low profile with mid profile. The difference in attitude between the two scores would be unlikely to withstand statistical testing. Unlike high profile, there is a high degree of overlap between these data paths, making it impossible to demonstrate experimental control (Cooper et al 1987). It is therefore suggested that either, or some combination of both profiles be adopted in an encounter situation, until further study indicates a preference.

The canine social behaviour literature, and most of the anecdotal information gathered, suggest the low profile approach as being preferable due to it's closer resemblance to canine appeasement behaviours (Scott & Fuller 1965, Schenkel 1967, Fox 1969, Vette in Stirling 1990, Fetko 1993).

Low profile was chosen as preferred treatment for the reasons given above, and because low profile scored slightly lower attitude scores than mid profile during AT, on more occasions than mid profile scored lower attitude ratings than low profile. All of the dogs BL1 and BL2 scores were more variable than their PT1 and PT2 scores, which suggests that this decision was an appropriate one.

Effect of Individual Experimenters on Dog Attitude

If a human's behaviour when approaching a dog is to be considered a discriminative stimulus with stimulus control over dog attitude; or either a conditioned or unconditioned stimulus which elicits the dogs response, it must be shown to hold across people. This was the

purpose of BL3 and PT2 (see figures C, D and E). On the whole this point is well supported; as the data paths reflect similar trends for all three experimenters, and all three dogs, on both measures of attitude. That is, the dog responds to the approach profile irrespective of who is approaching with that profile.

Further support for this suggestion is taken from the comparison of the primary and secondary experimenters during corresponding baseline and preferred treatment phases. The baselines and preferred treatments phases show an approximately equal amount of stability and fluctuation in these phases.

The face ratings were slightly elevated in BL3 as compared with BL1, particularly for subject Tip, this may have been an experimenter affect. If a longer baseline had been run with the secondary experimenters this may have settled to the same level, and therefore suggest the elevation was simply a response to a novel situation.

The Kruskall-Wallis analyses presented in tables 6 and 7 showed support for the null hypothesis most convincingly . That hypothesis being, that the mean attitude score for all experimenters was the same (Siegel 1956). That is, there was no statistically significant difference in the attitude ratings of the dogs in the presence of any of the three secondary experimenters. This was found to be the case with the dog's individual and combined scores, for both the face and tail ratings. There was some variation in values across individuals, however at no time was it reasonable to reject the null hypothesis in favour of the alternate, that there was a significant difference in mean attitude scores across experimenters.

Effect of Individual Dogs on Attitude Scores

As would be expected, the individual conditioning histories of the dogs (ontogenetic selection) meant there was variation in the responses of individuals to the same stimuli (Catania 1984).

This variability across research subjects was generally minimal, and did not mask the phylogenetic aspects of canid social behaviour which all four subjects share (Catania 1984, Scott & Fuller 1965). That is, the form of their communications and the type of situations which elicit agonistic behaviour patterns (Scott & Fuller 1965, Fox 1970).

All dogs generally responded with similar levels of emotionality in the same situations. The amount and degree of fluctuation within a phase did vary however. Blue, the more highly socialised dog, consistently responded at very low levels. Tip and Mike, who were the

least well socialised of the dogs, showed more variability and scored slightly higher attitude scores than Alf and Blue when high and mid profiles were adopted (see figures C, D , E and F). Higher scores indicating a less relaxed attitude, rising fear or dominance, and an increasing likelihood of attack. The effect of malsocialisation on dog attitude is well documented in the literature (Wright 1991, O'Farrell 1990, Goddard & Beilharz 1985, Vette cited in Stirling 1990, Fetko 1992). An unfortunate result of such malsocialisation is the fear biting scenario as discussed by Young (1982).

The subject, Mike, rated quite highly and variably during BL1. Physical signs of her sexual receptivity were noted later during the study, suggesting that pre-oestral hormonal and behavioural changes may have had some bearing on her responses (Scott & Fuller 1965).

These dogs share aspects of their phylogenetic history, as all are similarly bred working dogs. Through living within the same research facility for some time (all their lives for Tip, Alf and Mike) they must also share some of the effects of ontogenetic and cultural selection on their behaviour (Catania 1984). It is therefore not surprising to see such clear, consistent behaviour across these individuals.

Limitations and Future Directions

This study was a first attempt to quantify the effect of human approach behaviour on dogs in a scientific fashion. As such no previously tested measures were available, requiring the development of new experimental designs, and measures for both the independent and dependent variables. These procedures were hampered by an inadequate literature, and as such the measures must be viewed in the context of a preliminary investigation. Through use within the research environment inadequacies became apparent which should be addressed in future studies of this type.

By having two measures of dog attitude, one based on facial expression and the other on tail position, it was possible to compare two sets of results and thus assess the effectiveness of the measures to indicate the same thing, dog attitude.

The general trend observed across the dogs in both measures, is for both face and tail ratings to be at similar level at the same time, when a face rating is elevated generally so is the corresponding tail score. Whilst the results in table 8 suggest that the same thing is measured by both scales, the correlation for combined scores is not completely convincing. It is therefore suggested that the scales be refined further, and both

measures continue to be used together to asses dog attitude.

In the case of a dog like Blue, who gave highly consistent head and tail values, and a correlation coefficient of almost 0.8, there may be grounds for assessing attitude on only one scale.

Whilst all efforts were taken to control for observer expectation through reliability checks, the current study involved the primary experimenter in more phases of the experiment than is ideal. In future studies it would be preferable to have all experimenters, and observers, operating blind.

It should be noted however that the treatment integrity test, and checks for observer agreement and drift are at a more than satisfactory level in all cases.

Due to the trial length of two and a half minutes and the large number of trials each dog was exposed to, there is a risk of the results reflecting habituation. This is particularly noticeable during the high profile component of the AT phase. The decreasing attitude trend being most obvious with subject Blue (see fig E) and to a lesser degree with Tip and Alf (see figures C & D).

It may be possible to decrease the chances of habituation in future studies by decreasing the trial time, and using a finer grain time sampling technique. As the initial reaction of both dog and person will have bearing on the outcome of a situation, reduction of trial time in no way decreases the validity of the experiment.

As previously discussed, there are good grounds to accept that it was profile effecting attitude rather than individual experimenters. However it would be unwise to completely rule out the effect of; gender, age, previous experience with dogs and such like, on the grounds of low powered non-parametric tests. The study only involved four experimenters and whilst experience and gender was balanced, the age group was restricted to young adults.

This model could be applied to empirically test many of the bite variables, as presented in the introduction of this study. Particularly work on dog's responses to unfamiliar and familiar people (Rappolt & Thompson 1979, Lore & Eisenberg 1986), Langley's (1992) statistics which suggest New Zealand Maori are more at risk than other New Zealanders, and the unacceptable number of child victims of dog attack (Podberscek and Blackshaw 1991, Blackshaw 1991, Wright 1991, Borchelt et al 1983).

By careful selection of research subjects (to rule out environmental effects) this model also lends itself to an investigation of factors considered to typify the biting

dog. The main factors being; breed, size, age, gender and sexual status (Wright 1991, Szapowski et al 1989, Wright and Nesselrote 1987, Daniels 1986). By holding approach profile and experimenter constant, and running a multiple baseline across dogs, some useful information will certainly be generated.

Whilst attempts were made to stagger phases changes across dogs in the current study, incorporating a multiple baseline more formally into the design would have added strength to this study (Barlow and Hersen 1984). Limitations on experimenter and subject availability prevented this feature from being used.

The small-N design methodology was completely appropriate for this study. However limitations to these findings exist when attempting to make generalisations outside the experimental context. It must be remembered that the subjects used were all healthy, well fed dogs. Ethical constraints meant none of the subjects had previously shown any dominant or aggressive behaviour toward humans. Three of the four dogs often appeared fearful and submissive. It would therefore be with caution that the trends observed be attributed to dogs known to be nasty or highly aroused. This experiment did not test a sexually functioning male dog.

When using an alternating treatments design, the risk of treatment conditions effecting each other is a threat to the studies internal validity, this is called multiple treatment interference (Hayes 1981). To control for this, each treatment condition was paired with a discriminative stimulus as a cue to subjects. The components were also presented in a random, counterbalanced fashion. It may have been useful to increase the time interval between components.

Due to the data being somewhat limited no autocorrelation or other formal test for multiple treatment interference was attempted.

Conclusions

The scientific literature provides evidence for some important factors that trigger aggression, and possibly attacks by dogs on people. It lacks however any sound experimental literature on ways of dealing with these situations. It was found, that the literature outside the scientific publications, were a useful source of this information. The current study is one of very few attempts to investigate dog aggression with a view to not only identifying, but testing key triggers for an attack on a human being. Both the scientific and other literature have formed the theoretical background for the ideas which have been developed.

The study very clearly demonstrated that components of human approach profiles will rate differently on two ordinal scales of dog attitude. Whilst these scales might appear somewhat arbitrary, they were developed from sound evidence. With further development these scales for measuring dog attitude may lend themselves to an interval scale. Future studies may investigate if these approach components have an additive effect or if each effects dog behaviour equally.

The effect of individual experimenters and individual dogs was found to be minimal. The measures were sensitive to the individual variation of subjects however the general trends were highly consistent. Factors such as, how rapidly individuals habituate reflect the ontogenic selection pressures on that dog (Catania 1984). A look at the attitudes across dog breeds would be a useful way of looking at phylogenic factors (Catania 1984).

This study gives sound evidence to support the hypotheses presented in the introduction. It has been shown by graphs of differential attitude scores and Kruskall-Wallis analysis, that how a dog responds to a person will be effected by the posture and approach behaviour of that person.

It was clearly shown in the AT phase that approaching a dog with a high body profile, direct eye contact and movement, scored at almost double on the measures of dog attitude than less threatening approaches, such as avoiding eye contact, reducing movement and profile. Higher scores on the attitude scales indicated a more emotional response in the dog, and thus a greater likelihood that an attack has been triggered. It was difficult to demonstrate experimental control between the two less threatening approaches, as their data paths frequently crossed. This could be clarified with further investigation.

Due to it's preliminary nature, there were many limitations to this study. Irrespective of this there were also many sound findings, developed from good, reliable data. As is desirable within the scientific framework this study has raised many new questions and suggested directions for future research.

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APPENDIX ONE

Canine postural communications and body markings

FIGURE G : **Encounter between two dogs, showing head turning and avoidance of eye contact by the subordinate in response to agonistic T posture and direct stare of the dominant dog.** (From Fox 1969).

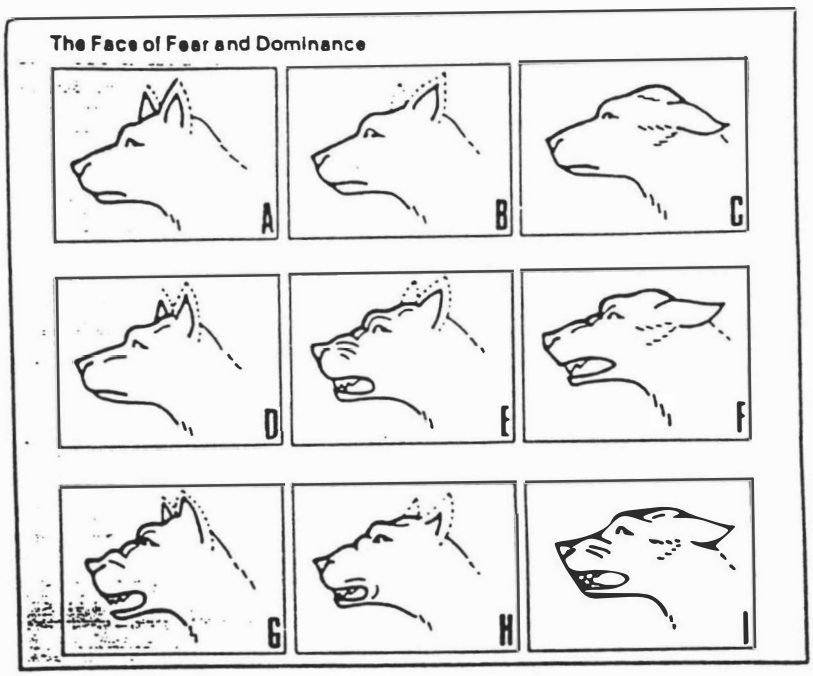

FIGURE H : **Facial expressions of fear and dominance in dogs. Moving left to right displays increasing fear, and top to bottom displays increasing dominance and potential for aggression.** (From Tortora 1981)

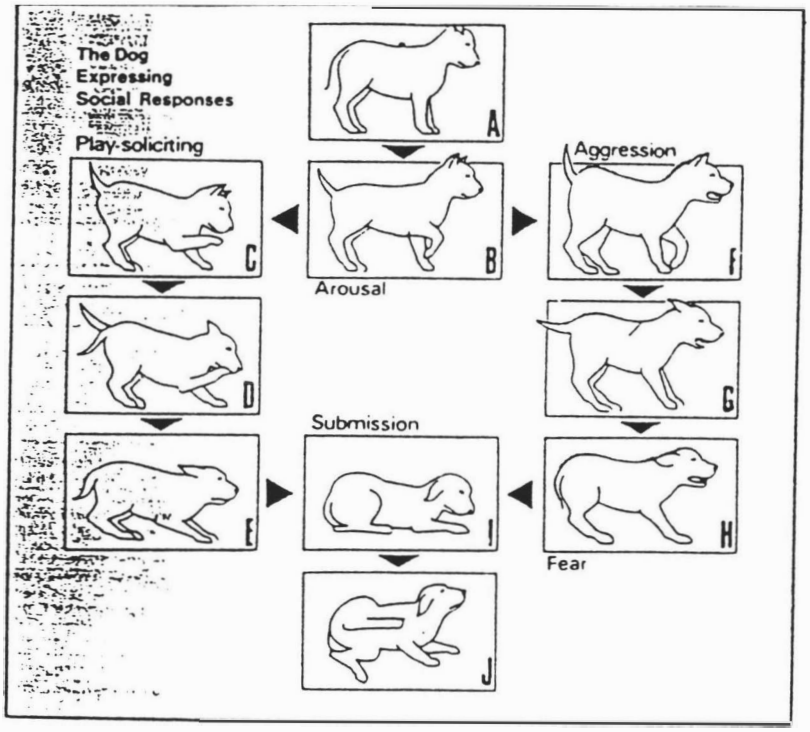

FIGURE I : Body postures of the dog showing various social responses. (From Tortora 1981)

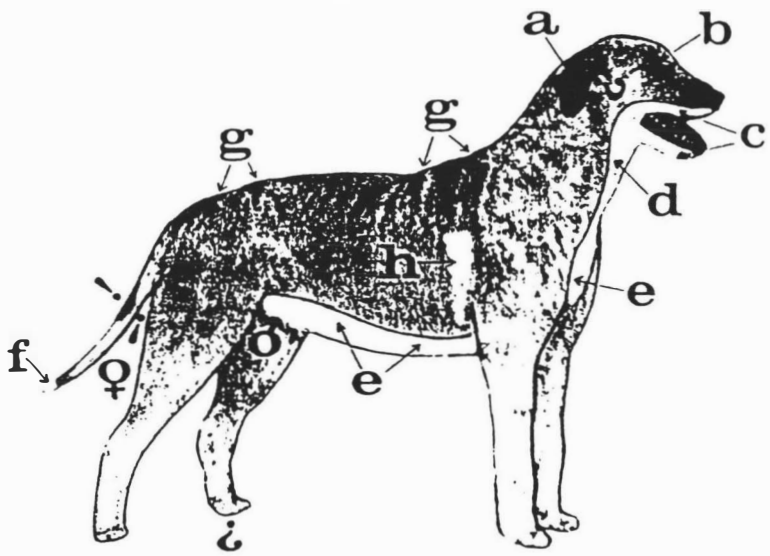

Fig. 15. Summary schema of body markings associated with social behavior (aggression submission, Fox, 1969; facial expressions, Fox, 1969; and social investigation) in a prototype canid. (a) Mobile pinna incorporated into various facial expressions and ? refers to external meatus secretions (cerumen) which may serve some olfactory function to conspecifics. (b) Social stimuli provided by eyes — direct stare or head turning and avoidance of eye contact. (c) White muzzle contrasts black lips and enhances visual signal of mouth position — submissive grin, aggressive pucker *etc.* (d) White cheek (and also white muzzle) may serve to orient attack (cheek wrestling). (e) Pale ventral region for camouflage may serve as 'white flag' of submission when displayed by animal rolling over on to side. (f) White or buff tail tip may enhance tail displays. (g) Rump and shoulder hackles-coarser, longer hairs with variegated color are used in agonistic displays (pilocrection also enhances these visual display structures). (h) Vertical pale shoulder stripe may serve to orient attack in shoulder-scruff wrestling. (!) denote anal and tail gland secretions: situation of latter is demarked by dark patch of hairs. Male ♂ and female ♀ symbols denote possible urinary pheromones in male and female and ? at feet refers to interdigital glands which may serve to mark territory or trail.

FIGURE J : Body markings of a prototype canid and and how these relate to canine social behaviour. (From Fox 1969)

APPENDIX TWO

Example of check sheets used to record data from video recordings using a ten second instantaneous time sampling method

DATA SHEET ONE: DOG BEHAVIOUR DURING TRIAL

Phase ..... **Observer** .....

Trial ..... **Component** .....

Time Intervals

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Tail Position: 1 - 5

Facial Expression: 1 - 6

Summary

Tail rating	# = 1 or 2	# = 3	# = 4 or 5
Facial rating	**# = 1 or 2**	**# = 3**	**# = 4,5 or 6**

FIGURE K : Data sheet one - Dependent variable

DATA SHEET TWO: EXPERIMENTER BEHAVIOUR DURING TRIAL

Phase ..... **Observer** .....

Trial ..... **Component** .....

Time Intervals

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Posture: F = Full size R = Reduced I = Intermediate

Eye contact: D = Direct A = Averted I = Intermediate

Movement: M = Moving S = Still I = Intermediate

Summary **#FDM** **#RAS**

Posture	# of Full size	# of Reduced	# of Intermediate
Eye contact	# of Direct	# of Averted	# of Intermediate
Movement	# of Moving	# of Still	# of Intermediate

FIGURE L : Data sheet two - Independent variable

APPENDIX THREE

Calculating dog attitude scores from tail position and facial expression ratings - a worked example

TABLE NINE : Calculations to obtain attitude scores for a given trial

Facial Rating	Attitude Index	% Time Scored	% Time X Index	Attitude Score
1 - 2	1	83	83	
3	2	17	34	117
4 - 6	3	0	0	
Tail Rating				
1 - 2	2	45	90	
3	1	50	50	155
4 - 5	3	5	15	